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The Effect of White Noise and Manual Fetal Positioning During Venous Blood Collection on Pain, Oxygen Saturation, and Vital Signs in Term Newborns

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ABSTRACT

Objective: To determine the effects of white noise and fetal position during venous blood sampling in the neonatal intensive care unit on acute pain, oxygen saturation, and vital signs in term newborns. **Materials and Methods:** This randomized controlled trial was conducted on a total of 160 term newborns. Data were collected using an information form, a vital signs assessment form, and the Neonatal Pain Scale, and were analyzed using descriptive statistics, ANOVA, and repeated-measures ANOVA. **Results:** The study included four groups. There was no significant difference between the groups in terms of demographic characteristics. The procedure time for newborns in the fetal position was significantly shorter than that of newborns in other groups ($p_{control} = 0.041$, $p_{whitenoise} < 0.01$, $p_{whitenoise+fetalposition} = 0.008$). Newborns in the control group experienced significantly more pain during and after the blood draw procedure than those in the other groups ($p < 0.001$). During the procedure, the white noise group experienced the least pain, while after the procedure, it was the white noise + fetal position group. In addition, the average heart rate of participants in the control group was significantly higher than that of participants in the other groups ($p_{whitenoise} = 0.012$; $p_{fetalposition} < 0.01$; $p_{whitenoise+fetalposition} = 0.010$). Furthermore, it was determined that the newborns in the control group had the lowest saturation levels during the procedure ($p < 0,05$). **Conclusion:** The lowest pain score during and after the procedure was observed in the white noise group. Furthermore, no significant difference was found between the white noise group and the white noise + fetal position group.

Keywords: Fetal Position, Pain, Term Newborn, White Noise.

Kan Alma İşlemi Sırasında Dinletilen Beyaz Gürültü ve Elle Verilen Cenin Pozisyonunun Yenidoğanların Ağrı, Oksijen Satürasyonu ve Yaşam Bulgularına Etkisi

ÖZ

Amaç: Yenidoğan yoğun bakım ünitesinde, venöz kan alımı sırasında beyaz gürültünün ve fetüsün pozisyonunun, term yenidoğanlarda akut ağrı, oksijen satürasyonu ve yaşamsal belirtilerine etkisini belirlemektir. **Gereç ve Yöntem:** Bu çalışma, toplam 160 term yenidoğanda gerçekleştirilmiştir. Veriler, bilgi formu, yaşamsal belirtiler değerlendirme formu ve Yenidoğan Bebek Ağrı Ölçeği kullanılarak toplanmış ve tanımlayıcı istatistikler, ANOVA, tekrarlanan ölçümler ANOVA ve kullanılarak analiz edilmiştir. **Bulgular:** Çalışma dört grubu içermektedir. Demografik özellikler açısından gruplar arasında anlamlı bir fark yoktu. Fetal pozisyondaki yenidoğanların işlem süresi, diğer gruplardakilere göre anlamlı olarak daha kısaydı ($p_{kontrol} = 0,041$, $p_{beyazgürültü} <0,01$, $p_{beyazgürültü+fetalpozisyon} = 0,008$). Kontrol grubundaki yenidoğanlar, kan alma prosedürü sırasında ve sonrasında diğer gruplardakilere göre anlamlı derecede daha fazla ağrı hissetmiştir ($p<0,001$). İşlem sırasında en az ağrıyı beyaz gürültü grubu hissederken, işlem sonrası beyaz gürültü+fetal pozisyon grubuydu. Ayrıca kontrol grubundakilerin ortalama kalp atış hızı, diğer gruplardakilere göre anlamlı olarak daha yüksekti ($p_{beyazgürültü} = 0,012$; $p_{fetalpozisyon} <0,01$; $p_{beyazgürültü+fetalpozisyon} = 0,010$). Bunlara ek olarak kontrol grubundaki yenidoğanların, işlem sırasında en düşük satürasyon değerine sahip olduğu da belirlenmiştir ($p<0,05$). **Sonuç:** İşlem sırasında ve sonrasında en düşük ağrı puanı beyaz gürültü grubunda belirlendi. Ayrıca beyaz gürültü ile beyaz gürültü +fetal pozisyon grupları arasında anlamlı farklılık olmadığı da görülmüştür.

Anahtar Kelimeler: Fetal Pozisyon, Ağrı, Term Yenidoğan, Beyaz Gürültü.

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INTRODUCTION

Pain can cause a variety of issues across groups. It can hinder babies' adaptation to their surroundings by interfering with behavior, family-baby bonding, brain and sensory development, and growth (Huda et al., 2025; Karabudak & Ergun, 2013). Newborns are unable to respond to or express themselves in response to painful stimuli. As a result, healthcare providers must closely monitor their patients' reactions. Invasive procedures should be avoided to lessen pain and stress in infants, and pharmacological and non-pharmacological approaches should be used in tandem to alleviate pain. Those who care for babies should receive training in pain management (Eroğlu & Arslan, 2018).

To alleviate pain in infants, fetal position and white noise are employed. White noise is a monotonously favored peaceful sound that masks distracting exterior noises. It contains all audible frequencies for the human ear and is digitally prepared in a laboratory setting. White noise can be soothing and relaxing to neonates (Öz & Demirci, 2025). White noise is similar to womb sounds because it is a continuous, humming sound (Pekyiğit & Açıkgöz, 2023). In the womb, the fetus can hear their mother's heartbeat. As a result, babies feel safe when they hear white noise that mimics their mother's heartbeat in the womb. As a result, neonates who are exposed to white noise can relax more easily. White noise also aids in relaxing babies by diverting their attention (Özçalkap et al., 2025).

The baby's lower and upper extremities are approached to their midline by hand flexing in fetal posture. When babies are stressed, they adopt a flexion position. In the mother's womb, babies have a physiological flexion posture known as the fetal position (Apaydın Cırık & Efe, 2010). Babies sleep better in the fetal position since they are used to it throughout pregnancy (Lachore et al., 2026). The fetal position promotes growth and development, as well as sleep habits and energy conservation in neonates. It also has a pain-controlling synergistic effect (Prescott et al., 2024).

The aim of pain treatment for neonates is to reduce their suffering and help them cope with it. As a result, various pain alleviation strategies are employed in literature. White noise and fetal posture have been studied for their effects on pain reduction. However, no research has been conducted to assess the combined efficacy of these two approaches on pain in infants. In this connection, the purpose of this study was to see how white noise and fetal position affected acute pain and vital signs in term neonates admitted to the neonatal critical care unit during venous blood collection.

Hypotheses

H_1: There was a significant difference between groups in terms of infant pain score in four distinct blood collection procedures.

H_2: There was a significant difference between groups in terms of infant vital signs in four distinct blood collection procedures.

MATERIALS AND METHODS

Study type

This is a randomized controlled study with pre- and post-tests.

Study group

The study's cohort included infants born at or after the 38th week of gestation who were hospitalized in Karaman Training and Research Hospital's Neonatal Intensive Care Unit between August 1 and December 30, 2021.

The sample size for the study was determined using the G*Power 3.1.5 software, based on the known score (Çağlayan, 2011), with a Type 1 error probability (α) of 0.05 (at a 95% confidence level) and a Type 2 error probability (β) of 0.10 (at a 90% power level). It was determined that 32 newborns were needed for each group. However, because it was anticipated that some newborns might be lost during analysis and at the end of data collection, the plan was to recruit 40 newborns per group. As a result of the study, 160 term newborns who met the inclusion criteria were recruited. At the end of the data collection process, a post hoc power analysis was conducted using the newborns' mean NIPS pain scores after the procedure.

F test- ANOVA: Repeated measures, between factors

Analysis:	Post hoc: Compute achieved power	
Input:	Tail (s)	= Four
	Effect size dz	= 0,5000000
	α err prob	= 0,05
	Total sample size	= 160
Output:	Noncentrality parameter δ	= 64,0000000
	Critical F	= 2,6625685
	Df	= 156
	Power (1-β err prob)	= **0,9999999**

Criteria for study inclusion; being in the newborn stage (between the ages of 0 and 28 days); being admitted to a neonatal intensive care unit; being a term baby (born after the 38th week of pregnancy); not having any respiratory issues; feeding 30 minutes before to the operation; lack of a medical condition that would preclude pain evaluation (intracranial bleeding, neuro-motor developmental retardation, etc.); not having used analgesics or sedatives in the previous 24 hours; collecting blood successfully on the first try; having the surgery performed by the same nurse.

Randomization

A stratified randomization procedure was utilized in the study to allocate neonates to study groups. The number of cases in each group in our randomized controlled experimental investigation was balanced, and the permutation approach was used to produce a comparable distribution of certain features. The permutation approach generates block sets for each combination of recognized prognostic factors. Because individuals in each layer share comparable

features, layering enhances the study's reliability (Cai & Zhou, 2021; Bodden et al., 2025). Gender and manner of birth (normal/cesarean section) have been identified as variables that may influence infant discomfort (Wolke et al., 2017). A statistician generated the layers using codes derived from a permutation-based computer algorithm (www.randomizer.org).

The letters indicating the groups were selected using the closed-opaque-envelope approach at the start of the investigation. As a result, "A" represented the fetal position group, "B" represented the white noise group, "C" represented the control group, and "D" represented the fetal position + white noise group.

Blinding

Since the study involved newborns undergoing pain and fear assessments, participant blinding was ensured. To prevent bias from the parents involved in the assessment, the groups were not compared with one another. Furthermore, the statistician was blinded during analysis and reporting. The data were classified as A, B, C, and D in the statistics program before being assigned to the study group column by another individual who was unaware of which participants were in the intervention and control groups. As a result, the statistician who examined the data was blinded. CONSORT 2017 (Updated Guidelines for Reporting Randomized Parallel Group Studies) was used for randomization.

Data collection tools

Newborn Information Form: This form asked 15 questions about newborns (weight, height, head circumference, chest circumference, gender, postnatal age, type of delivery, diagnosis, status of staying with mother, status of having analgesic/sedative medication in the last 24 hours before the procedure, status of having a painful procedure in the last half hour before the procedure, status of being fed in the last half hour before the procedure, status of being fed in the last half hour before the procedure).

Vital Signs Evaluation Form: This was used to examine and record the neonates' vital signs (heart rate, respiratory rate, oxygen saturation, and NIPS score) before, during, and after surgery to calculate their recovery time.

Neonatal Infant Pain Scale (NIPS): Lawrence et al. (1993) created the scale, which Akdovan & Yildirim (1999) translated into Turkish. The NIPS is used to assess discomfort in preterm and term newborns that are not incubated during invasive operations. In the study, the scale was utilized to assess newborn discomfort.

Pulse Oximeter: It is used to assess heart rate and oxygen saturation in infants before, during, and after the procedure. This device is appropriate for adult, pediatric, baby, and neonatal patients. Oxygen saturation, heart rate, and perfusion rate are standard measures. It is free to use in mobile patients.

Headphone: It was used to protect neonates from external noise while they listened to white noise. During the operation, the neonates were exposed to 35 decibels of white noise via headphones.

Buzuki Orhan Osman's Colic Album: It is a white noise album used throughout the procedure. The album's song "Don't Let Your Baby Cry" was utilized in research.

Procedures

Parents of babies who met the research inclusion criteria were informed about the study's goal and content prior to data collection, and their signed consent to participate was obtained.

Each infant was given an information sheet before being escorted to the blood collection area. Their sobbing time was recorded using a timer throughout the blood collection procedure, and their blood was obtained by the same nurse. The same observers evaluated their NIPS scores. Throughout the process, their vital signs and oxygen saturation were monitored and recorded. Before, during, and after the surgery, their NIPS scores and vital signs were examined independently. They were tested five seconds before the surgery by placing them under a radiant warmer. The measurements were taken between the beginning and end of the process. Five seconds after the surgery ended, a post-procedure evaluation was completed.

The infants in the control group were kept quiet before the blood collection process after being transferred to the collection room. Their blood was drawn without any interference during standard medical operations.

After being transferred to the blood collection area, neonates in the white noise group listened to white noise (35 dB) using headphones. When they began to listen to the white noise and calmed down, the bloodletting began.

When babies in the fetal position group were brought to the blood collection area, a nurse placed them in fetal position and waited for them to quiet down. When they were calmed down and in the fetal position, the bloodletting began.

After being brought to the blood collection room, neonates in the white noise + fetal position group were exposed to white noise. When they were calmed down and placed in the fetal position by a nurse, the bloodletting began.

Statistical analysis

The results were categorized and analyzed using the SPSS 12 (Statistical Package for the Social Sciences) application once the data were obtained. The Kolmogorov-Smirnov test was used to evaluate whether the data had a normal distribution, the chi-square test was used to compare categorical data, the one-way ANOVA was used to compare data with a normal distribution, and the repeated measures ANOVA was used to analyze within-group comparisons. $p<0.05$ value was considered statistically significant.

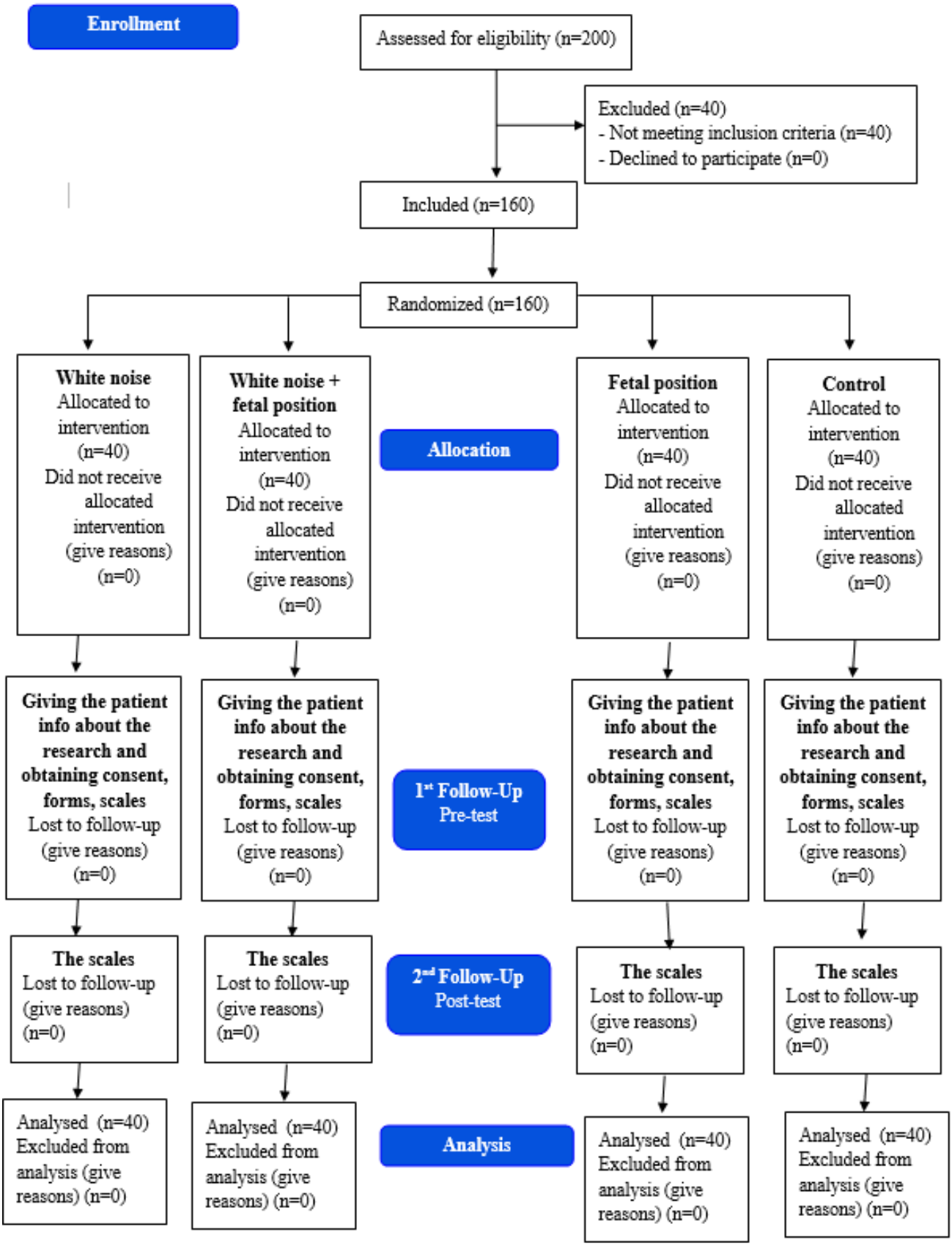


Figure 1. CONSORT 2017 flowchart for this study.

Ethical considerations

Ethical approval was granted by the Non-Interventional Ethics Committee of the Faculty of Health Sciences at Karamanoglu Mehmetbey University (Date: May 26, 2021, Approval No.: 03-2021/25); institutional approval was granted by the Karaman Governor's Office, Provincial Health Directorate, and Karaman Training and Research Hospital. Parents who decided to take part in the research were required to complete an informed consent form. Permissions were also secured to utilize the colic album and the NIPS. Kar

RESULTS

52.5% (n=21) of the babies in each group were female, and 57.5% (n=23) had normal delivery. There was no statistically significant difference between groups based on gender, manner of delivery, diagnosis, general health status, or diet (Table 1, p>0.05).

Table 1. Comparison of newborns between groups according to demographic characteristics (n=160).

	Group 1 (n=40) n (%)	Group 2 (n=40) n (%)	Group 3 (n=40) n (%)	Group 4 (n=40) n (%)	x^2 p
Diagnosis					
Inability to feed	-	-	1 (2.5)	1 (2.5)	
Dehydration	3 (7.5)	-	3 (7.5)	1 (2.5)	
Hypoglycemia	-	1 (2.5)	1 (2.5)	1 (2.5)	
Impetigo	-	-	1 (2.5)	-	
Diarrhea-vomiting	-	1 (2.5)	1 (2.5)	-	
Omphalitis	3 (7.5)	-	1 (2.5)	1 (2.5)	
Pneumonia	-	-	1 (2.5)	-	4.122**
Hyperbilirubinemia	20 (50)	22 (55)	19 (47.5)	16 (40)	0.249
Sepsis	14 (35)	12 (30)	12 (30)	20 (50)	
General health condition					
Poor	-	-	-	-	
Moderate	-	2 (5)	2 (5)	2(5)	***
Good	40 (100)	38 (95)	38 (95)	38 (95)	
Diet					
Breast milk	29 (72.5)	29 (72.5)	26 (65)	29 (72.5)	0.808
Breast milk + formula	11 (27.5)	11 (27.5)	14 (35)	11(27.5)	0.847

*** Group 1:** Control Group, **Group 2:** White noise group, **Group 3:** Fetal position group, **Group 4:** White noise and fetal position group, **x^2:** chi-square; **p:** Significance level**; n:** Count, **%:** Column percentage.

There was no statistically significant difference between the groups in terms of gestational age, postnatal age, height, weight, head circumference, or chest circumference (p>0.05). The process duration for newborns in the fetal position group was considerably lower than for the other groups (pcontrol=0.041, pwhitenoise 0.01, pwhitenoise + fetal position=0.008) (Table 2, p<0.05).

Table 2. Comparison of the newborns' age, physical measurements, and procedure time by group (N=160)

	Group 1 (n=40) Mean ± sd Min-Max	Group 2 (n=40) Mean ± sd Min-Max	Group 3 (n=40) Mean ± sd Min-Max	Group 4 (n=40) Mean ± sd Min-Max	F p
Gestational age (days)	272.43±5.67 266-290	273.08±6.26 266-287	272.08 ± 6.77 266-280	271.40±8.51 252-287	0.861 0.463
Postnatal age (days)	4.03±3.46 1-20	4.23±4.59 1-22	5.35 ± 6.88 1-28	3.50±4.13 1-25	0.998 0.396
Height (cm)	49.73±1.36 48-52	49.48±1.04 48-52	49.90 ± 1.11 47-52	49.70±0.99 47-51	1.164 0.325
Weight (gr)	3162±309.76 2580-3915	3354±371.29 2650-3990	3342 ± 298.43 2620-3970	3267±382.91 2520-3995	0.949 0.418
Head circumference (cm)	34.83 ± 0.39 34-35	34.95±0.45 34-36	34.88-0.34 34-35	34.85±0.43 34-36	0.724 0.539
Chest circumference (cm)	32.83±0.45 32-34	33.03±0.42 32-34	33.03 ± 0.16 33-34	33.03±0.42 32-35	0.749 0.541
Procedure time (sec)	41.68±14.96 20-70	45.63±11.99 20-70	34.50 ± 8.04 20-50	43.98±11.48 25-70	6.407 <0.001

*** Group 1:** Control Group, **Group 2:** White noise group, **Group 3:** Fetal position group, **Group 4:** White noise and fetal position group, **F:** ANOVA; **p:** Significance level.

During and after the blood collection process, newborns in the control group experienced considerably more pain than those in the other groups ($p<0.001$), followed by those in the fetal position, white noise, and white noise + fetal position groups, in that order. Furthermore, there was no significant difference in pain mean ratings between the control and fetal position groups, or between the white noise and white noise + fetal position groups ($p>0.05$). There was, however, a significant difference in the pain mean ratings of the other groups ($p<0.05$, Table 3).

Those in the control group exhibited substantially greater mean heart rates during and after the process than those in the other groups (pwhitenoise=0.012; pfetalposition=0.01; pwhitenoise+fetalposition =0.010). The fetal position group had statistically significantly lower mean heart rate than the other groups during and after the process (Table 3).

There was no significant difference in mean respiratory rates assessed post-processing between the control and white noise groups ($p>0.05$). In all other paired comparisons, however, there was a significant difference between the groups ($p<0.001$). The lowest post-procedural respiratory rate was measured in the fetal position and fetal position + white noise groups (Table 3).

There was no significant change in oxygen saturation between the fetal position and white noise + fetal position groups ($p>0.05$). In all other paired comparisons, however, there was a significant difference between the groups ($p<0.001$, Table 3).

Table 3. Comparison of the newborns' intra- and inter-group vital signs and crying times before, during and after the processing (n=160).

	Group 1 (n=40) Mean ± sd	Group 2 (n=40) Mean ± sd	Group 3 (n=40) Mean ± sd	Group 4 (n=40) Mean ± sd	F / p
NIPS					
Pre-processing[a]	0.38±0.49	0.43±0.50	0.53±0.51	0.55±0.50	1.091/ 0.355
Processing[b]	4.50±0.72	2.50±1.04	2.88±0.84	2.68±0.83	45.198/ <0.001
Post-processing[c]	1.30±0.76	0.68±0.53	1.20±0.69	0.50±0.60	14.566/ <0.001
F	596.241	105.305	218.717	205.968	
p	<0.001	<0.001	<0.001	<0.001	
Significant	a<c<b	a, c<b	a<c<b	a, c<b	
Heart rate (/min)					
Pre-processing[a]	127.38±1.21	128.05±10.55	124.25±8.85	127.45±9.33	1.169 / 0.324
Processing[b]	155.43±2.34	143.78±25.51	138.05±12.24	143.53±13.16	7.601 / <0.001
Post-processing[c]	135.13±9.37	131.65 ± 8.53	124.68±10.53	130.50±8.93	8.598 / <0.001
F	201.148	14.920	53.465	105.556	
p	<0.001	<0.001	<0.001	<0.001	
Significant	a<c<b	a<c<b	a, c<b	a<c<b	
Respiration(/min)					
Pre-processing	44.65±3.25	43.80±2.39	43.75±1.93	43.30±2.42	1.967 / 0.121
Post-processing	48.10±1.63	48.35±1.49	46.45±2.29	46.45±2.66	9.871 / <0.001
t	-7.104	-14.212	-9.000	-7.556	
p	<0.001	<0.001	<0.001	<0.001	
Saturation (%)					
Pre-processing[a]	99.73±0.60	99.83±0.39	99.45±1.20	99.45±1.20	1.749 / 0.159
Processing[b]	95.80±2.49	97.55±2.00	98.68±0.97	98.85±1.05	25.683/<0.001
Post-processing[c]	99.00±1.16	99.78±0.42	99.98±0.16	98.68±1.21	0.887 / 0.449
F	95.580	56.664	22.573	0.284	
p	<0.001	<0.001	<0.001	0.610	
Significant	b<c<a	b<a.c	b<a<c		
Crying time (sec) during the procedure	20.40±6.87	19.26±17.31	15.85±6.10	12.60±3.60	5.064 / 0.002
Heart rate recovery time	15.38±6.14	16.50±9.75	15.98±6.23	12.60±3.60	2.615 /0.053
Saturation recovery time	14.68±6.11	16.50±9.75	15.98±6.23	12.60±3.60	2.620 / 0.053

*** Group 1:** Control Group, **Group 2:** White noise group, **Group 3:** Fetal position group, **Group 4:** White noise and fetal position group, **F:** ANOVA; **p:** Significance level

During the processing, the white noise + fetal position group had the smallest mean crying time, whereas the control group had the longest mean crying time. In addition, heart rate and saturation returned to normal faster in the fetal position + white noise group but did not differ significantly between the groups ($p>0.05$, Table 3).

DISCUSSION

The effect of external factors was minimized by keeping the distribution of newborns similar between groups according to demographic characteristics. The fetal position group had a considerably shorter mean procedure duration than the other groups ($p_{control}$=0.041, $p_{whitenoise}$<0.001, $p_{whitenoise+fetalposition}$ =0.008), with a significant difference across the groups (p<0.05). In a similar study, pain during the heel prick procedure was assessed, and similar results were obtained (Pekyiğit & Açıkgöz, 2023). This might be because the infant felt more at ease in the fetal position, requiring no additional time for the process.

The discomfort experienced during and after the treatment varied greatly between groups. The newborns in the control group experienced the most severe pain following the blood sampling procedure, followed by those in the fetal position, white noise, and white noise+fetal position groups, in that order. There are studies in literature with comparable outcomes. Sener Taplak (2017) found that babies in the white-noise + fetal-position group experienced less discomfort than those in the control group.

The rise in pain mean ratings over time was statistically significant (p<0.05) in all four groups. Caglayan (2011) used 41 premature neonates in a study to assess the influence of fetal position on pain in preterm newborns during heel lance operation. The author came to the conclusion that neonates in the control group had more discomfort during and after the surgery than those in the fetal position group. This finding implies that neonates experience pain regardless of whether a non-pharmacological pain control strategy is utilized, but that some strategies can greatly lessen their agony.

Study Limitations and Strengths

A limitation of the study is that it was conducted at a single center. The main strengths of this study are that it was conducted as a randomized controlled experimental study. In this study, which was conducted across four different groups, bias was prevented through random group assignment. Furthermore, the use of previously validated survey instruments to measure the study outcomes, combined with a data set size that reached a post hoc 99% power, demonstrates that the sample size was quite sufficient.

CONCLUSION

As a result of this study, the following outcomes were obtained.

•The process duration for newborns in the fetal position group was considerably lower than for the other groups.

•During and after the blood collection process, newborns in the control group experienced considerably more pain than those in the other groups (p<0.001).

•The difference in heart rate mean scores assessed pre-processing, processing, and post-processing was smallest in newborns in the fetal position

•The fetal position group had statistically significantly lower mean heart rate than the other groups during and after the process

•The lowest post-procedural respiratory rate was measured in the fetal position and fetal position + white noise groups.

•The lowest saturation during the procedure was measured in the control group.

•During the procedure, the white noise + fetal position group had the smallest mean crying time, whereas the control group had the longest mean crying time.

•In addition, heart rate and saturation returned to normal faster in the fetal position + white noise group but did not differ significantly between the groups.

It is very critical to educate all pediatric nurses on pain management techniques. As a result, they should be educated on white noise, fetal position, and other atraumatic care approaches so that they may include them in their pediatric care practices. Clinics' physical conditions should be improved so that pediatric nurses can use white noise and fetal position. It is essential that healthcare personnel get appropriate in-service training to raise their understanding of white noise and fetal position. To integrate white noise and fetal position care practices in newborn clinics, relevant health policies should be implemented. Because research on the effects of white noise and fetal position on newborn pain is lacking, further research should be conducted on this topic.

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Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Author Contributions

Plan, design: DBK, AST; **Material, methods;** DBK, AST; **Data collection:** DBK; **Data analysis and comments:** AST; **Writing and corrections:** DBK, AST

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Ethical Approval

Institution: Karamanoglu Mehmetbey University the Faculty of Health Sciences Non-Interventional Ethics Committee
Date: 26.05.2021
Approval no: 03-2021/25

REFERENCES

Akdovan, T. & Yıldırım, Z. (1999). Evaluation of pain in healthy newborns, investigation of the effect of pacifier giving and holding method. *Journal of Perinatology, 7*(2), 107.

Apaydın Cirik, V. & Efe, E. (2010). Despite the non-pharmacological methods recommended for reducing pain in orogastric tube insertion, limited studies: Literature review. *Turkiye Klinikleri Journal of Nursing Sciences, 12*(2), 263-71. https://doi.org/10.5336/nurses.2019-65005

Bodden, D., Hilgers, R.D. & König, F. (2025). Randomization in clinical trials with small sample sizes using group sequential designs. *PLoS One, 20*(6), e0325333. https://doi.org/10.1371/journal.pone.0325333

Caglayan, N. (2011). *The effect of manually given fetal position on pain during heel blood collection in preterm newborns*. Master Thesis, Istanbul University Institute of Health Sciences, Istanbul (unpublished data).

Cai, H.W. & Zhou, X. (2021). Replacing permuted block design with big stick design in stratified randomization. *Contemporary Clinical Trials,* 106:106450. https://doi.org/10.1016/j.cct.2021.106450

Eroglu, A. & Arslan, S. (2018). Perception, evaluation and management of pain in the newborn. *Duzce University Journal of Health Sciences Institute, 8*(1), 52-60.

Huda, M.H., Hasan, F., Banda, J.K., Rustina, Y., Putra, H.E., Selviany, M., ... & Ramdhanie GG. (2025). A systematic review and network meta-analysis of non-pharmacological interventions involving parents on pain during invasive procedures among newborns. *Journal of Neonatal Nursing, 31*(1), 178-185.

Karabudak, S.S. & Ergün, S. (2013). Neonatal diseases and nursing care. *Pediatric Nursing*, Conk, Z., Başbakkal, Z., Bal Yılmaz, H., Bolışık, B., (eds). Academician Medical Bookstore, Ankara, Turkiye, 89-352.

Lachore, T.D., Bekele, T.T., Tekle, A.B., Degefa, N. & Assefa, G. (2026). Maternal knowledge and practice of safe infant sleep position in South Ethiopia: Implications for preventing sleep-related infant deaths. *PloS One, 21*(2), e0339408. https://doi.org/10.1371/journal.pone.0339408

Lawrence, J., Alcock, D., McGrath, P., Kay, J., MacMurray, & S.B., Dulberg, C. (1993). The development of a tool to assess neonatal pain. *Neonatal Network, 12*(6), 59-66.

Öz, T., & Demirci, N. (2025). Applications of white noise in maternal and neonatal care: a comprehensive review on sleep, stress, and pain outcomes. *Noise and Health, 27*(129), 668-675.

Özçalkap, N., Çuvadar, A. & Yücetürk, S. (2025). The effect of white noise on pain levels in newborns: a meta-analysis study. *The Iranian Journal of Medical Sciences, 26*. https://doi.org/10.1007/s11845-025-04237-3

Pekyiğit, A. & Açıkgöz, A. (2023). Effects of white noise and facilitated tucking during heel stick sampling on the pain response of healthy term newborns: a randomized controlled study. *The Journal of Pediatric Research, 10*(1), 43-54.

Prescott, M.G., Geist, M., Olsson, E., Fiander, M., Soll, R.F. & Bruschettini, M. (2024). Infant positioning for promoting development and preventing morbidity in preterm infants. *Cochrane Database Systematic Reviews, 12*: CD016029. https://doi.org/10.1002/14651858.cd016029

Sener-Taplak, A. (2017). The effect of three different nonpharmacological methods applied during endotracheal aspiration on pain and physiological findings in ventilated preterms. *Doctoral Thesis*, Erciyes University Faculty of Health Sciences, Kayseri (unpublished data).

Wolke, D., Bilgin, A. & Samara, M. (2017). Systematic review and meta-analysis: Fussing and crying durations and prevalence of colic in infants. *The Journal of Pediatrics, 185*, 55-61. https://doi.org/10.1016/j.jpeds.2017.02.020

www.randomizer.org, Randomisation. (date of access: 03.05.2021).