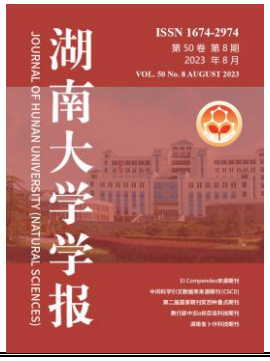

湖南大学学报（自然科学版）
Journal of Hunan University (Natural Sciences)

第 50 卷 第 8 期
2023 年 8 月

Available online at http://jonuns.com/index.php/journal/index

Vol. 50 No. 8
August 2023

Open Access Article

https://doi.org/10.55463/issn.1674-2974.50.8.10

Midline Swaddling and Traditional Swaddling Position and Their Influence on Physical and Autonomic Sign on Newborn Babies

Ismail Sangadji[1], Ali Khatibi[1], Norshafarina Binti Shari[1], S. Jaqualine Tham[1], Cicillia Windiyaningsih[2]

[1] Management and Science University, Selangor, Malaysia

[2] University Respati Indonesia, Jakarta, Indonesia

Received: May 16, 2023 / Revised: June 13, 2023 / Accepted: July 24, 2023 / Published: August 31, 2023

Abstract: The traditional method of swaddling is done with the arms and legs straightened and wrapped tightly with the hips in an adduction position, and newborns are mostly swaddled by traditional methods in Indonesia. When swaddling is properly performed, infants show less awakening and longer sleep, better neuromuscular development, less physiological stress, better motor organization, and better self-regulation abilities. Improper swaddling can result in conditions that are detrimental to newborns, such as SIDS and DDH, which cause stress. Early exposure of neonates to stress results in residual symptoms in behavior and neurobiological disorders. This study aimed to determine the effect of mid-line position compared with traditional swaddling regarding physical and autonomic stress signs. The study population comprised 194 newborns. The mid-line and traditionally swaddled were observed and recorded, and physical and autonomic signs at birth, 10 minutes and 2 hours were documented. This study found that there was a statistically significant difference between the groups in terms of cries at 10 minute and 2 hours and so with the heart rate and respiration rate at birth ($p<0,05$), and a significant difference in oxygen saturation at 10 minutes and 2 hours ($p < 0,05$). Additionally, mid-line swaddling had a larger average decrease in heart rate and respiration rate, and increase in the oxygen saturation. Therefore, this study can deduce that midline position swaddling has a less stressful effect than the traditional position. The same research elsewhere in Indonesia will be costly. Future research would suggest a larger sample that may suggest a more accurate outcome.

Keywords: swaddling, midline position, traditional position, physical sign, autonomic sign.

中线褓和传统褓位置及其对新生的婴儿身体和自主标志的影响

摘要：传统食品的做法是将手臂和腿伸直并将臀部紧紧包裹在内收位置，新生儿在印度尼西亚大多采用传统方法进行。当。衣体正确执行时，婴儿表现出更少的觉醒和更长的睡眠，更好的神经肌肉发育，更少的生理压力，更好的运动组织和更好的自我调节能力。不当的以防新生儿不利,如婴儿 死综合征 和 关节发育不良，从而引起压力。新生儿早期暴露于压力会导致行为和神经生物学障碍的残留症状。本研究旨在确定中线位置与传统 囧 褓相比对身体和自主应激迹象的影响。研究人群包括 194 名新生儿。观察和记录中线和传统 褓局,并记录出生时，10 分钟、2 小时的身体和自主体征。本研究发现，各组在出生时的心率和呼吸率（

p<0,05）在 10 分钟和 2 小时等哭声方面存在统计学显着差异，在 10 分钟和 2 小时时血氧饱和度差异显着（p<0,05）。此外,中线 褓 线 的心率和呼吸率 平均下降较大，血氧饱和度增加。因此，本研究可以推断中线位置,以其与传统相对应,具有更小的压力效应。在印度尼西亚的其他地方进行同样的研究将是昂贵的。未来的研究将提出一个更大的样本，可能会提出更准确的结果.

关键词：襁褓，中线位置，传统位置，物理标志，自主标志.

1. Introduction

The neonatal period is the shortest and crucial period among the other developmental periods, during which a transition occurs between the period in the womb and outside the womb, so that there will be a radical adjustment. The birth process is a very complicated process in which there is a complex adaptation of body systems to adapt to life outside the womb [1]. There will be a big impact on the newborns later life with residual symptoms due to the failure of adaptation, which might result in failure to thrive or poor growth and development. Accordingly, this phase is also known as the vital period because the baby's mental and physical condition becomes a solid foundation for further development and growth as an adult human. During this period, there is also a heavy adaptation in neonatal life because they have to adapt from intrauterine to extrauterine, as well as a very rapid growth process [1, 2]. Therefore, a baby birth attendant becomes an important position so that all decisions and actions can help a newborn to get the best and complete help, and if the babies get good treatment, some of the causes of children with special needs can be reduced, especially for the neonatal itself in the future, the capital as a baby to be able to grow and develop optimally is already owned [2].

From focus group observation on the understanding and application of swaddling and researcher's observations while working as a general practitioner (since 1986) and as a pediatrician (since 1995) until now, it turns out that in some areas in Indonesia, in general, newborns are mostly carried out by traditional swaddling by their mothers and grandmothers, even birth attendants such as midwives and nurses doing the same thing doing swaddling with the traditional technique/way, namely doing swaddling by straightening the baby's arms (side of body) and legs, so that they swaddle from chest to toe very tightly, with one of the goals being to straighten hands and feet**.**

The traditional swaddling method can certainly be detrimental to the newborn, as stated by experts and researchers that the improper way of swaddling can result in conditions that are not good for newborns such as sudden infant death syndrome (SIDS), DDH (developmental dysplasia of the hip) and uncomfortable conditions can even cause stress [3]. From the results of several studies [4-6] it was found that stress generally occurs at the age of the first 14 days, and if it occurs earlier and is more frequent and prolonged in a newborn, it can interfere with further growth and development. Stress that occurs earlier and more often in a newborn can interfere with further growth and development; therefore, birth attendants should be able to parse and avoid things that can lead to stress in newborns.

On the other hand, there are many studies and reports of experts [7-9] who conclude and describe that there are residual symptoms in behavior and neurobiological disorders due to exposure to stress from the start, where the effects of stress on infants, especially premature babies, especially those who are hospitalized, can have an impact on future brain development. Meanwhile, from another study, it was found that providing the correct position and "swaddling" will make the newborn baby feel calmer during treatment.

Another and most challenging issue that became clear during the analysis phase was related to the absence of a standard for how to do swaddling that was good and right and safe for newborns, the principle of positioning according to Petty [10] with perform physiological flexion of limbs with midline position and hand-to-mouth orientation position, Flexion of hips and knees in a symmetrical position, arms forward and flexed, head straight with body is the best position because it almost matches the position of the baby in the womb. This is the basis for thinking about how to interpret swaddling with the midline position.

Other experts and researchers have found that doing swaddling well will make the newborn calmer. On the other hand, negative impacts have also been found when swaddling is performed incorrectly, such as sudden infant death syndrome (SIDS), increases the risk of hip dysplasia or developmental dysplasia of the hip (DDH), and uncomfortable conditions can even cause stress [3]. Another negative impact is that it reduces the baby's ability to cool his body temperature, which can lead to hyperthermia [11]. It was shown that swaddling in the hours after birth was associated with delayed recovery from postnatal weight loss, and the

longer the baby is swaddled, the more abnormal his motor development will be [12].

2. Materials and Methods

This study was conducted at two hospitals, where there was no change in the method of swaddling in newborns at Jatisampurna Hospital (traditional swaddling method), while the Hajj Hospital was a place where the treatment was carried out by changing the swaddling method (midline position). Therefore, at Hajj Hospital, 6 months before the start of the research (research sampling) was conducted, an activity was conducted to equalize the perception of how to do the swaddling midline position for all nurses and midwives who worked in the baby room. Furthermore, an evaluation is carried out every day on how to perform the swaddling midline position until automatically the employes in the baby room have performed the swaddling midline position correctly.

This study is a quantitative interventional observational study using an analytical design of nonrandomized controlled trials in parallel, single blinded (Fig. 1).

In this study, researchers took the population from April 2017 to September 2017, all babies born normally at Haji Hospital and Jatisampurna Hospital. The inclusion criteria are healthy babies and normal at birth, with a birth weight of 2000–4000 g, and the exclusion criteria for infants are babies born with birth weights less than 2000 and more than 4000 grams, abnormal APGAR scores (under 7), and newborns with congenital abnormalities, respiratory disorders, infection, or who need to be referred to a higher level of care.

The sample size is determined on the basis of the sample size rule. There are several sample size rules that can be used in research. According to Hair et al. [13], a sample size of 100 or 150 is sufficient for most applications and supports measurement, and some other rules can be used to determine the sample size. In addition, there is a way to calculate the sample using various formulas. Some researchers suggest that in health research, Lameshow's formulation can be used. In this study, the researcher used the formula for calculating the experimental sample size from Lameshow [14] formula: N = z2 P(1-P)/d2, with a 95% confidence level and an absolute precision of 0.1, and obtained a sample of 96. The number of research samples in each group was 97, so the total sample was 194.

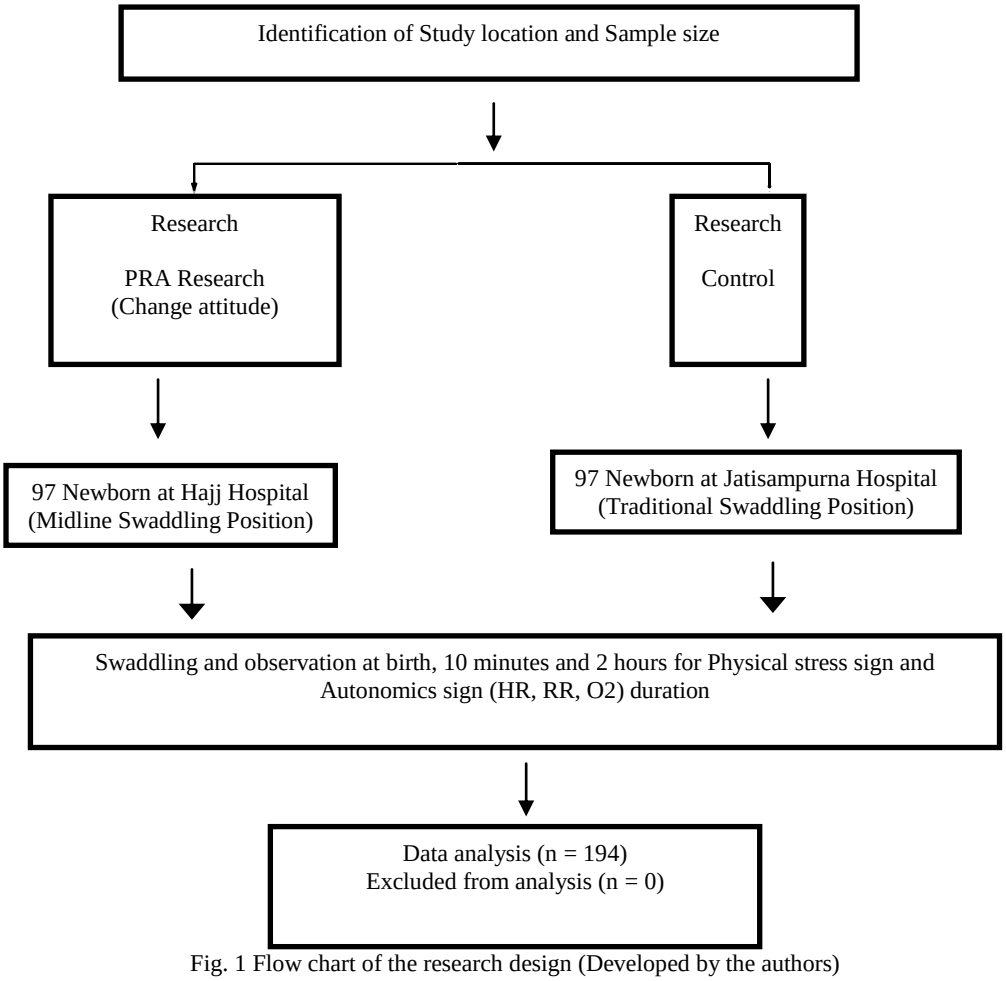

Fig. 1 Flow chart of the research design (Developed by the authors)

After successfully changing attitudes at the Jakarta Hajj Hospital, the study began. Total samples are 97 After successfully changing attitudes at the Jakarta Hajj Hospital, the study began to be conducted. A total of 97 samples were obtained from each hospital (Jakarta Hajj Hospital for swaddling midline position and

Jatisampurna Hospital for swaddling traditional position), then observed at birth (before swaddle), then at 10 minutes and 2 hours after birth (after swaddle). Observations were made for the presence of physiological and autonomic stress signs (Heart rate, Respiration rate and Oxygen saturation). Data are reported as mean and standard deviation (SD) for quantitative variables and frequency (percentage) for qualitative variables. The Kolmogorov-Smirnov test was used to analyze the normality variable of the characteristics of variables, physical sign (Crying, Yawn, Hiccups, hand to mouth, salute, holding hand, sucking, spread fingers and like sitting on air, grunting and jerks movement) and Autonomic stress sign (Heart rate, Respiration rate and Oxygen saturation). To determine which specific data groups are significantly different from each group/sample, Friedman's test was used. To compare the mean variables between two groups, Wilcoxon was used in cases of not normal distribution and a Mann–Whitney test.

3. Results

From the results of the analysis of the normality test of the data in both samples (Swaddling midline position and traditional Swaddling position), using the Kolmogorov–Smirnov test column, the results obtained all data physical stress sign and autonomic stress sign (Heart rate, respiration rate and oxygen saturation) at birth, at 10 minutes and at 2 hours are not normally distributed (p=value< 0.05).

3.1. Physical Stress Sign

Signs of physical stress observed, only four signs that could be observed three times (at birth, 10 minutes and 2 hours) namely crying, grimace, yawning and hiccups. By looking at the distribution of crying babies (Fig. 2) at birth, at 10 and at 2 hours, it can be seen that the midline position has a lower value in the crying distribution on 10 minute and 2 hours after swaddling.

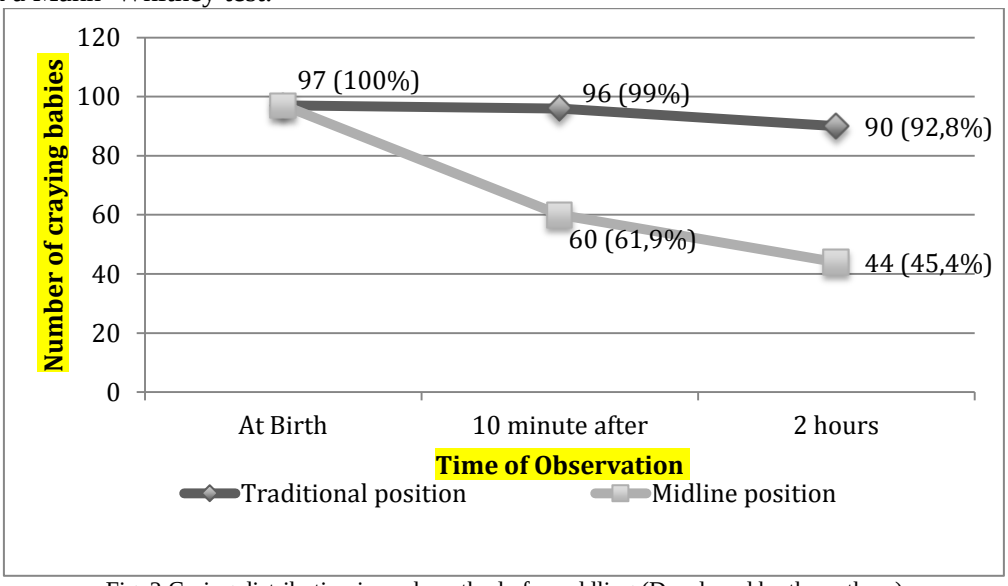

Fig. 2 Crying distribution in each method of swaddling (Developed by the authors)

By looking at the distribution of grimacing, it can be seen that the midline position has a higher decrease value in the grimacing distribution at birth and 10 minute and 2 hours after swaddling (Fig. 3).

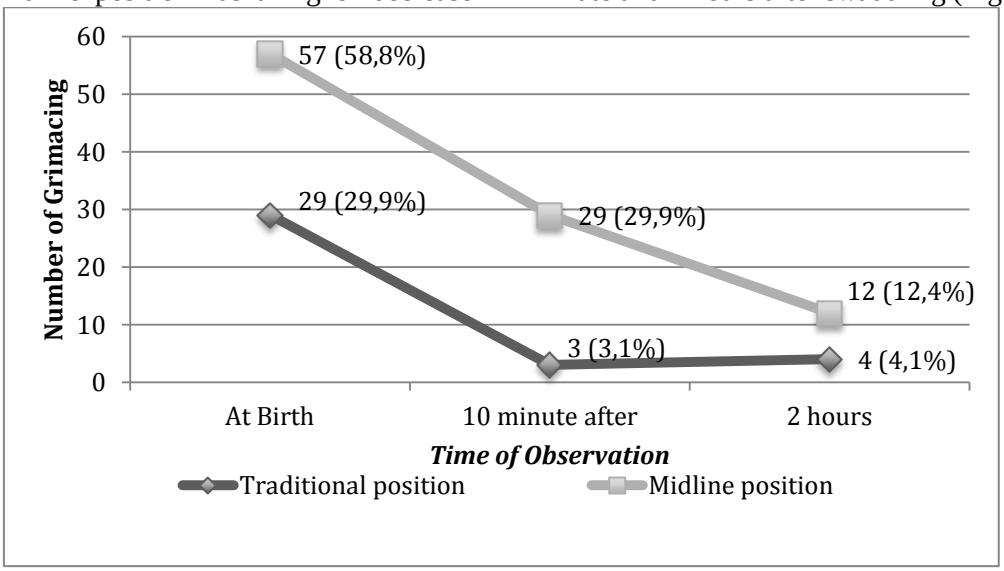

Fig. 3 Grimacing distribution in each method of swaddling (Developed by the authors)

Friedman's test will be carried out to determine which specific data groups are significantly average different from each group. From the results of the analysis, it is seen that only crying and grimace are significantly different (Table 1).

Table 1 Friedman test on each method of swaddling (Developed by the authors)

Crying with Swaddling Midline Position	**N**	**Mean**	**SD**	**Min-Max**	**p-value**
Crying at Birth	97	1.0103	.10153	1.00–2.00	0.000
Crying at 10 Minutes		1.3814	.48826	1.00–2.00	
Crying at 2 Hours		1.5461	.50043	1.00–2.00	
Crying with Swaddling Traditional Position	**N**	**Mean**	**SD**	**Min-Max**	**p-value**
Crying at Birth	97	1.7010	.46018	1.00–2.00	0.000
Crying at 10 Minutes		1.0103	.10153	1.00–2.00	
Crying at 2 Hours		1.0722	.26011	1.00–2.00	
Grimace with Swaddling Midline Position	**N**	**Mean**	**SD**	**Min-Max**	**p-value**
Grimace at Birth	97	1.4124	.49482	1.00–2.00	0.000
Grimace at 10 Minutes		1.7010	.46018	1.00–2.00	
Grimace at 2 Hours		1.8763	.33096	1.00–2.00	
Yawn with Swaddling Midline Position	**N**	**Mean**	**SD**	**Min-Max**	**p-value**
Yawn at Birth	97	1.0103	.10153	1.00–2.00	0.607
Yawn at 10 Minutes		1.3814	.48826	1.00–2.00	
Yawn at 2 Hours		1.5461	.50043	1.00–2.00	
Yawn with Swaddling Traditional Position	**N**	**Mean**	**SD**	**Min-Max**	**p-value**
Yawn at Birth	97	1.9794	.14284	1.00–2.00	1.000
Yawn at 10 Minutes		1.9794	.14284	1.00–2.00	
Yawn at 2 Hours		1.9794	.14284	1.00–2.00	
Hiccups with Swaddling Midline Position	**N**	**Mean**	**SD**	**Min-Max**	**p-value**
Hiccups at Birth	97	1.9794	.14284	1.00–2.00	0.819
Hiccups at 10 Minutes		1.9691	.17402	1.00–2.00	
Hiccups at 2 Hours		1.9794	.14284	1.00–2.00	
Grimace with Swaddling Traditional Position	**N**	**Mean**	**SD**	**Min-Max**	**p-value**
Grimace at Birth	97	1.701	.4602	1.00–2.00	0.000
Grimace at 10 Minutes		1.969	.1740	1.00–2.00	
Grimace at 2 Hours		1.959	.1999	1.00–2.00	
Hiccups with Swaddling Traditional Position	**N**	**Mean**	**SD**	**Min-Max**	**p-value**
Hiccups at Birth	97	1.9897	.10153	1.00–2.00	1.000
Hiccups at 10 Minutes		1.9897	.10153	1.00–2.00	
Hiccups at 2 Hours		1.9897	.10153	1.00–2.00	

3.2. Autonomic Stress Sign

Measurement of autonomic stress signs using an oxymeter (measured heart rate, respiration rate and oxygen saturation), In this study, measurements of autonomic stress signs were taken shortly after birth, 10 minutes later (beginning with swaddling), and 2 hours after being swaddled (will be transferred to the inpatient room with the mother). Data from the anatomical stress sign found in the two sample groups (swaddling midline position and swaddling traditional position).

3.3. Heart Rate

Based on the distribution of heart rate during birth in Table 2, in the group of newborns in the traditional swaddling position. From both groups, it can be seen that the group with the swaddling midline position had a higher average heart rate at birth of 6 beats per minute (155.5 versus 148.7 bpm) and at 10 minutes of 2 beats per minute when compared with the traditional swaddling position (146.8 versus 144.7 bpm).

Table 2 Distribution of the heart rate at birth, 10 minutes and 2 hours (Developed by the authors)

Position	**n**	**Mean**	**SD**	**Min-max**	**95%CI**
Heart rate at birth					
Traditional	97	148.7	8.307	126-164	147.04-150.3
Midline	97	155.5	7.800	140-170	153.9-157.1
Heart rate at 10 minutes					
Traditional	97	144.7	6.133	124-160	143.5-146.0
Midline	97	146.8	6.433	130-160	145.5-148.1
Heart rate at 2 hours					
Traditional	97	141.8	6.303	128-162	140.6-143.1
Midline	97	139.5	9.181	104-156	137.7-141.4

Based on the distribution of heart rate at 2 hours after birth (Table 2), the group of newborns in the midline position had a lower average heart rate of 2 beats per minute (139.5 versus 141.8 bpm). The results

of the analysis in the two groups are shown in Fig. 4. It can be seen that the group with the swaddling midline position experienced a decrease in heart rate by 8 beats per minute when compared to heart rate at birth with 10 minutes (155.5 beats versus 146.8 beats per minute). It was also seen that the swaddling traditional position group experienced a decrease in heart rate by 4 beats per minute when compared to heart rate at birth compared to 10 minutes (148.7 beats versus 144.7 beats per minute). Of the two groups, at birth and 10 minutes, the group with the swaddling mid-line position experienced a greater reduction in heart rate (8.7 beats per minute versus 4 beats per minute). From both groups, it can be seen that the group with the swaddling mid-line position at 2 hours after birth had a lower average heart rate of 2 beats per minute when compared with the traditional swaddling position (139.5 versus 141.8 beats per minute). By looking at the average heart rate at birth, at 10 minutes, and at 2 hours mid-line position group experienced a greater decrease in heart rate in 10 minutes (9 beat versus 4 beat) and in 2 hours (7 beat versus increase 2 beat).

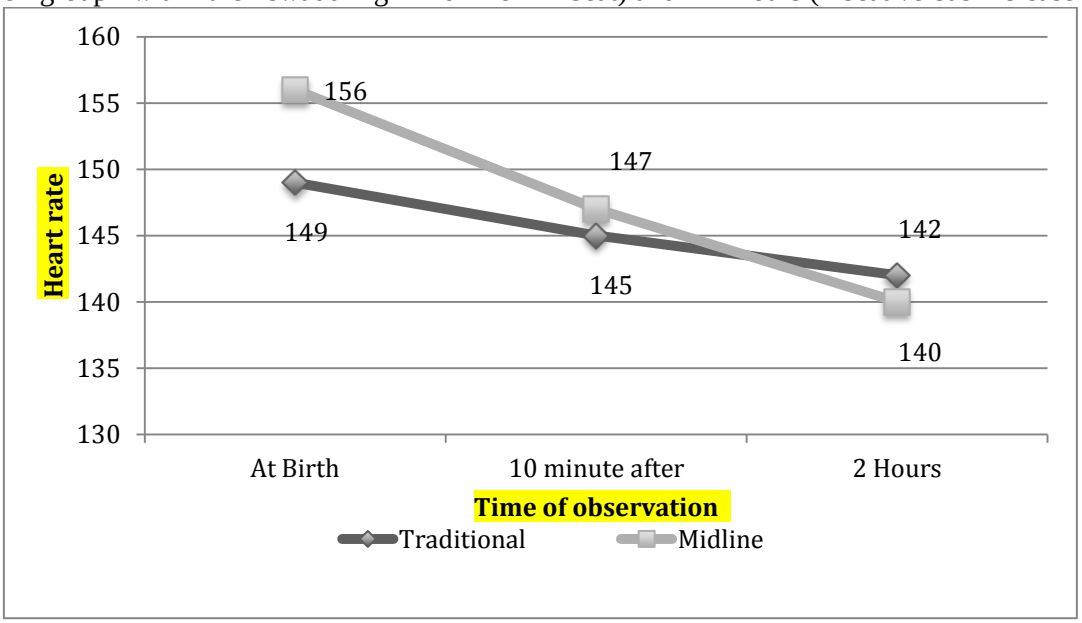

Fig. 4 Heart rate in each method of swaddling (Developed by the authors)

According to Peng et al. [15], Allinson et al. [16], Mooney & Brummelte [17], stress of a newborn can be seen from the heart rate, namely if the Heart rate < 100 bpm or > 160 bpm, or an increase in baseline 5 bpm or more.

Next, an analysis will be carried out with Friedman's test to determine which specific data groups are significantly different from each group of the average heart rate of newborns in each Hajj Hospital (Mid-line position) and Jatisampurna Hospital (Traditional position). The results of the analysis using the Friedman test in the group of infants with swaddling mid-line position and traditional position the p-value is < 0.005 (p = 0.001). From the results of the analysis, it was found that in both ways of swaddling at the time of observation (at birth, 10 minutes and 2 hours) on heart rate, there was a significant difference. To determine which groups between heart rate at birth, heart rate at 10 minutes and heart rate at 2 hours in infants with swaddling mid-line positions and traditional position different from each other. Results of post-hoc analysis with Wilcoxon test in the group of infants in the mid-line position and traditional position. In measuring comparing the babies heart rate at birth, 10 minutes and 2 hours p-value = 0.001, so it can be concluded that the babies heart rate in each group observation (at birth, 10 minutes and 2 hours) are all significant difference (p < 0.005).

3.4. Respiration Rate

The following data are data regarding respiration rate, which can be seen in Table 3.

Table 3 Distribution of the respiration (Developed by the authors)

Position	n	Mean	SD	Min-max	95%CI
Respiration rate at birth					
Traditional	97	53	3.862	44-60	52.2-53.7
Midline	97	57.7	5.183	47-68	56.7-58.8
Respiration rate at 10 minutes					
Traditional	97	51.2	4.06	36-58	50.4-52.05
Midline	97	52.5	4.8	40-60	51.6-53.5
Respiration rate at 2 hours					
Traditional	97	49.53	4.069	38-58	48.71-50.35
Midline	97	49.02	4.769	40-58	48.05-49.98

Based on the distribution of respiration rate at birth in table 3, the group of newborns in the mid-line position had a larger average respiration rate at birth, 10 minutes, and the same respiration rate at 2 Hours.

From both groups, by looking at the average respiration rate at birth, at 10 minutes, and at 2 hours, it can be seen that the swaddling mid-line position group had a larger average decrease in respiration rate, namely 5,2 breaths per minute, then 3,48 breaths per minute, moderate for the swaddling traditional position group, which is 1,8 breaths per minute, then 1,6 breaths

per minute. The results of the analysis can be seen in Fig. 5.

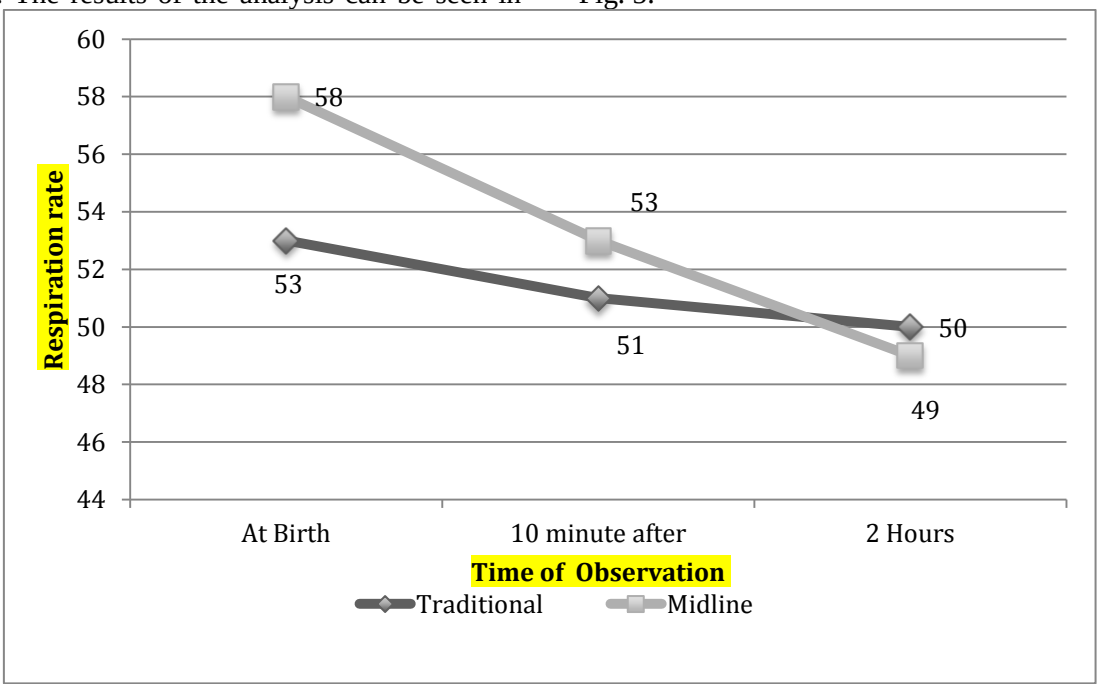

Fig. 5 Respiration rate in each method of swaddling (Developed by the authors)

According to Peng et al. [15], Allinson et al. [16], Mooney & Brummelte [17], stress of a newborn can be seen from the respiration frequency, namely if the respiratory rate < 40 breaths/minute or > 60 breaths/minute or an increase of 7 breaths/minute from the initial frequency. Furthermore, a test of the difference in the average respiration rate of newborns at the Haji Hospital (mid-line position) and Jatisampurna Hospital (Traditional position) was carried out to compare the measurement of the respiration rate of newborns in the study group using the Friedman test. Below are the results of the test of the difference in the average respiration rate of newborns at Haji Hospital (mid-line position) and Jatisampurna Hospital (Traditional position). The results of the analysis using the Friedman test in the group of infants with swaddling mid-line position and traditional are known that the p-value is < 0.005 (p = 0.001). From the results of the analysis, it was found that in both ways of swaddling at the time of observation (at birth, 10 minutes and 2 hours) on respiration rate, there was a significant difference between the observation times. To determine which groups between the respiratory rate observation at birth, at 10 minutes and 2 hours in infants with both way of Swaddling that are different from each other, a post-hoc analysis with the Wilcoxon test was carried out. Results of the post-hoc analysis with Wilcoxon test in the group of infants in the mid-line position and traditional position. In measuring comparing the babies respiration rate at birth, 10 minutes and 2 hours p-value = 0.001, it can be concluded that the babies heart rate in each group observation (at birth, 10 minutes and 2 Hours) are all significant difference (p < 0.005).

3.5. Saturation

The next data are data regarding oxygen saturation (at birth, 10 minutes and 2 hours) which can be seen in Table 4.

Table 4 Distribution oxygen saturation (Developed by the authors)

Position	Mean	SD	Min-max	95%CI
Oxygen saturation at birth				
Traditional	93.05	3.015	86-99	92.4-93.6
Midline	92.5	3.958	84-98	91.7-93.3
Oxygen saturation at 10 minutes				
Traditional	95,5	2,35	89-99	95,07-96,02
Midline	96,4	2,50	90-100	95,9-96,9
Oxygen saturation at 2 hours				
Traditional	97.3	1.992	90-100	96.9-97.7
Midline	98.5	1.477	90-100	98.2-98.8

Based on the distribution of saturation at birth in Table 4, from both groups at birth, it can be seen that the group with the swaddling traditional position had a higher average saturation when compared with the mid-line swaddling position (93.05% versus 92.5%).

From both groups, it can be seen that at 10 minutes, the group with the swaddling mid-line position had a higher average saturation when compared with the traditional swaddling position (96.9% versus 95.5%), and at 2 hours after birth, the group with the swaddling mid-line position had a higher average saturation when compared with the traditional swaddling position (98.5% versus 97.3%). The results of the analysis in the two groups are in Table 4. It can be seen that the two groups, at birth and 10 minutes after birth group with the swaddling mid-line position experienced a greater increase in saturation (2.45% versus 3.9%). It was also seen that of the two groups, the group with the swaddling mid-line position saturation at 10 minutes to 2 hours experienced a greater increasing saturation

(2.1% versus 1.8%).

The results of the analysis can be seen in Fig. 6 below.

Fig. 6 Saturation in each method of swaddling (Developed by the authors)

According to Peng et al. [15], the stress of a newborn can be seen from oxygen saturation, namely if the Oxygen saturation <90%, or a decrease of 2.5% or more from the last value. By looking at the average saturation at birth, at 10 minutes and at 2 hours, it can be seen that the swaddling mid-line position group had an increase in saturation of 2,5%. Furthermore, a test of the difference in the average respiratory frequency of newborns at the Haji Hospital (mid-line position) and Jatisampurna Hospital (Traditional position) was carried out to compare the measurement of the respiratory frequency of newborns in the study group using the Friedman test. Below are the results of the difference in the average oxygen saturation of newborns at Haji Hospital (mid-line position) and Jatisampurna Hospital (Traditional position). The results of the analysis using the Friedman test in the group of infants with swaddling mid-line position and traditional position are known that the p-value is < 0.005 (p = 0.001). From the results of the analysis, it was found that in both ways of swaddling at the time of observation (at birth, 10 minutes and 2 hours) on heart rate, there was a significant difference between the observation times. To determine which groups between oxygen saturation at birth, oxygen saturation at 10 minutes and oxygen saturation at 2 hours in infants with both-way swaddling were different, a post-hoc analysis with the Wilcoxon test was performed. The results of the analysis in Tables 19 and 20 are the results of post-hoc analysis with Wilcoxon test in the group of infants in the mid-line position and traditional position. In measuring comparing the babies oxygen saturation at birth, 10 minutes and 2 hours p-value = 0.001, it can be concluded that the babies heart rate in each group observation (at birth, 10 minutes and 2 hours) are all significant difference (p < 0.005).

3.6. Relationship between Physical Sign in the Type of Swaddling

The assessment of the physical sign is subjective, whereas the assessment of the autonomics sign is more objective. Of course, from the previous analysis, data were found that were not normally distributed, so the Wilcoxon test was performed to see the overall data in each group. Below are the results of the Wilcoxon test of the variables to be analyzed from the two groups (Swaddling mid-line position and Swaddling Traditional position).

Table 5 Physical stress sign characteristics according to condition (midline position versus traditional position). Bold entries indicate significant difference ($p < .05$) (Developed by the authors)

Motor sign, awareness, body posture	**Swaddling midline (*n* = 97) n (%) or M (SD)**	**Swaddling traditional (n = 97) n (%) or M (SD)**	**P**
Cries at birth			1.000
Yes	97 (100)	97 (100)	
No	0	0	
Cries at 10 minutes			.000
Yes	60 (61.9)	96 (99)	
No	37 (38.1)	1 (1)	

Continuation of Table 5			
Cries at 2 hours			.000
Yes	44 (45.4)	90 (92.8)	
No	53(54.6)	7 (7.2)	
Grimace at birth			.000
Yes	57 (58.8)	29 (29.9)	
No	40 (41.2)	68 (70.1)	
Grimace at 10 minutes			.000
Yes	29 (29.9)	3 (3.1)	
No	68 (70.1)	94 (96.9)	
Grimace at 2 hours			
Yes	12 (12.4)	4 (4.1)	.033
No	85 (87.6)	93 (95.9)	
Grunting at 10 minutes			.317
Yes	0 (0)	0 (0)	
No	97 (100)	97 (100)	
Grunting at 2 hours			1.000
Yes	1 (1)	0 (0)	
No	96 (99)	97 (100)	
Jerky movements at 10 minutes			.000
Yes	20 (20.6)	0 (0)	
No	77 (79.4)	97 (100)	
Jerky movements at 2 hours			.001
Yes	14 (14.4)	0 (0)	
No	83 (85.6)	97 (100)	
Yawning at birth			.257
Yes	5 (5.2)	2 (2.1)	
No	92 (94.8)	95 (97.9)	
Yawning at 10 minutes			.157
Yes	6 (6.2)	2 (2.1)	
No	91 (93.8)	95 (97.9	
Yawning at 2 hours			1.000
Yes	3 (3.1)	2 (2.1)	
No	94 (96.9)	95 (97.9)	
Hiccups at birth			.317
Yes	0 (0)	1 (1)	
No	97 (100)	96 (99)	
Hiccups at 10 minutes			.564
Yes	2 (2.1)	1 (1)	
No	95 (97.9)	96 (99)	
Hiccups at 2 hours			.317
Yes	1 (1)	0 (0)	
No	96 (99)	97 (100)	
Hand to mouth at birth			.000
Yes	47 (48.50)	13 (13.4)	
No	50 (51.5)	84 (86.6)	
Birth salute			.000
Yes	40 (41.2)	3 (3.1)	
No	57 (58.8)	94 (96.9)	
Birth hand holding			.000
Yes	68 (70.1)	37 (38.1)	
No	29 (29.9)	60 (61.9)	
Sucking at birth			.000
Yes	31 (32)	3 (3.1)	
No	66 (68)	94 (96.9)	
Spread finger at birth			.000
Yes	78 (80.4)	45 (46.4)	
No	19 (19.6)	52 (53.6)	
Like sitting on the air			.000
Yes	56 (57.7)	8 (8.2)	
No	41 (42.3)	89 (91.8)	

From the results of the analysis of physical stress signs (Table 5), it is seen that crying is significantly less in the swaddling mid-line position. While other physical signs such as grimace, jerky movements, hand-to-mouth, birth salute, hand holding, sucking, spreading finger, and sitting in the air, the results are significant but occur more in the swaddling midline position.

3.7. Relationship between Autonomic Sign (Heart Rate, Respiration Rate and Oxygen Saturation) in Type of Swaddling

The next analysis is an analysis of the autonomous sign. Below are the results of a table of paired variables

for heart rate, respiration rate, and saturation in each population group of Hajj Hospital (Midline position) and Jatisampurna Hospital (Traditional position).

Table 6 Autonomics sign according to condition (midline position versus traditional position). Bold entries indicate significant difference ($p < .05$) (Developed by the authors)

Autonomic Sign	**Swaddling Midline (n = 97) N(%) or M (SD)**	**Swaddling Traditional (n = 97) N(%) or M (SD)**	**p**
Heart rate at birth	155.55 (7.801)	148.72 (8.308)	.000
Heart rate at 10 minutes	146.80 (6.433)	144.77 (6.133)	.021
Heart rate at 2 hours	139.50 (9.182)	141.88 (6.304)	.129
Respiration rate at birth	57.77 (5.183)	53.00 (3.862)	.000
Respiration rate at 10 minutes	52.59 (4.808)	51.24 (4.069)	.044
Respiration rate at 2 hours	49.02 (4.770)	49.54 (4.070)	.295
Oxy. Saturation at birth	92.56 (3.958)	93.05 (3.015)	.686
Oxy. Saturation at 10 minutes	96.49 (2.505)	95.55 (2.359)	.005
Oxy. Saturation at 2 hours	98.59 (1.477)	97.39 (1.992)	.000

The results of the analysis in Table 6 are the result of post-hoc analysis with Wilcoxon test in both groups swaddling. From the results of some data analysis gives a value of $p < 0.05$, including heart rate at birth ($p = 0.00$) and 10 minutes ($p = 0.21$), respiration rate at birth ($p = 000$) and at 10 minutes ($p = 0.044$), oxygen saturation at 10 minutes ($p = 0.005$) and 2 hours ($p = 0.000$), so it can be concluded that the items are significantly different.

4. Discussion

The aim of this research was to investigate the advantage of one swaddling position over the other. In this case it is the mid-line position swaddling over the traditional swaddling position. The swaddling traditional position is common in Indonesia, straightening the baby's arms and legs so that they swaddle from chest to toe very tightly. From the results of the analysis of the normality test of the data in both samples using the Kolmogorov-Smirnov test column, the results obtained on all data p-value < 0.05 except for age and birth weight data p-value > 0.05, it can be concluded that all data Characteristics of respondents, physical stress sign and autonomic stress sign data are not normally distributed except for age and birth weight.

From the results of the analysis of physical stress signs, it is seen that crying is significantly less in the swaddling mid-line position. While other physical signs such as grimace, jerky movements, hand-to-mouth, birth salute, hand holding, sucking, spreading finger, and like sitting in the air, the results are significant but occur more in the swaddling mid-line position.

Through several studies, it has been found that the physical signs of facial grimace, mouthing/yawing movements, tongue extension, eyes open, and fussing/crying were significantly lower in the experimental group, with the conclusion that swaddle bathing can reduce neonatal stress during bathing [18, 19].

In the results of the analysis of this research, crying is one of the physical stress signs which on average seems to decrease in frequency from time to time during observation results of the descriptive analysis (Fig. 2) show that in each swaddling group, the average crying frequency at birth, 10 minutes, and 2 hours after birth decreased, but the average decrease in the average crying frequency was greater in the group of babies swaddled in the mid-line position, and the average frequency without crying was also higher in the babes with the swaddling mid-line position group. Also, the frequency of crying at birth to 10 minutes and 10 minutes to 2 hours in the swaddling mid-line position was greater decrease than in the traditional position (38,1% and 16.5% compared to 1% and 6,2%). The results of the analysis of this study showed that babies in the mid-line swaddling position were calmer than those in the traditional swaddling position.

Additionally, comparing both swaddling position of the analysis in Physical stress sign10 minutes and 2 hours in significant difference less in the swaddling mid-line position. While other physical signs such as Grimace, Jerky movements, Hand to mouth, birth salute, hand holding, Sucking, Spread finger, and Like sitting in the air, the results are significant but occur more in the swaddling mid-line position.

The results of the next analysis are about autonomics stress sign (heart rate, respiration rate and oxygen saturation). The results of the first analysis are about heart rate, by looking at the average heart rate at birth, at 10 minutes, and at 2 hours, When viewed from the average heart rate at birth, 10 minutes, and at 2 hours, it was seen that the Swaddling mid-line position

group experienced a greater larger average decrease than the traditional swaddling position (8.7 beats per minute and 7.3 beats per minute versus 4 and 2.9 beats per minute). This shows the same results as [15-17, 19-26]. Another study conducted by Efendi et al. [27] found that by swaddling, the heart rate of newborns was lower than that without swaddling during the procedure.

Similarly, the respiration rate from both groups by looking at the average respiration rate among at birth, 10 minutes and 2 hours later, showed that the swaddling mid-line position group had a greater decrease in respiration rate than the traditional swaddling position group (5,2 and 3,48 breaths per minute vs. 1.8 and 1.6 breaths per minute), this shows the same results as [15-17, 19-27].

From the research of Karadag [28], by making the environment more comfortable, such as in the uterus (using nests), it turns out that the mean oxygen saturation increased significantly during the application. In our study, both swaddling methods increased oxygen saturation, but in infants with the swaddling mid-line position at 10 minutes and 2 hours, there was a significant increase in oxygen saturation compared with the swaddling traditional position. When viewed from each group itself, all autonomic signs were found (Heart rate, respiration rate and oxygen saturation). When compared at birth, 10 minutes and 2 hours, all obtained significant differences ($p<0.05$) both in the Swaddling group midline position and traditional position Swaddling group.

The results above conclude that swaddling has an impact on the newborn being calmer or less stressful, which are similar results from several other studies and expert opinions as carried out by [15, 20, 29-39]. However, from all the data analyzed in this study, apart from swaddling making the newborn baby calmer and less stressful, it was also seen that the swaddling midline position has a greater impact on the newborn being calmer or less stressful when compared to the traditional swaddling position.

5. Conclusion

This research was conducted to determine how good swaddling is and how it can help newborns to get assistance in weight adaptation from intrauterine to extrauterine, which often causes stress in newborns. Currently in Indonesia, almost most mothers and birth attendants do swaddling by wrapping tightly from the chest to the baby's feet (Traditional swaddling position). Of course, this method is not in accordance with the situation while in the womb and it is not physiological flexion [10]. It can also cause various disorders such as Sudden Infant Death Syndrome (SIDS), hip hypoplasia, and even causes stress from the start, which results in neurodevelopmental disorders as researched by [40-42], and the longer the baby wrapped then more suspect motor development delayed [43], which should be swaddling can help babies to be calmer, more comfortable and less stressed as stated by [30-33, 37-39, 43].

However, from all the data analyzed in this study, apart from swaddling making the newborn baby calmer and less stressful, it was also seen that the swaddling midline position has a greater impact on the newborn being calmer or less stressful when compared to the traditional swaddling position.

This study provides new insights into the beneficial effects of midline position swaddling. Furthermore, this study provides additional evidence that the use of midline swaddling reduces neonatal stress.

Further studies are suggested that more research needs to be conducted on infant positioning and swaddling methods for optimal development of outcomes, and a larger sample size should be used.

Acknowledgments

The authors would like to express their appreciation to the Haj Hospital Jakarta and Jatisampurna Hospital and all the delivery room and operation room staff of both hospitals, as well as the parents who kindly participated in this study. The authors would also like to thank the Research Consultation Center at the PGC Management and Science University Malaysia for their invaluable assistance in editing this article.

References

[1] BEHRMAN R. E., KLIEGMAN R. M., and JENSON H. B. The Newborn. In: KLIEGMAN R. M., & GEME J. W. (eds.) *Nelson Textbook of Pediatric. 21st edition*. Amsterdam, Elsevier, 2020.

[2] ASTUTI E. W. *Konsep Kebidanan dan Etikolegal dalam Praktik Kebidanan Komprehensif*. Jakarta, Kemenkes RI, 2016.

[3] PEASE A. S., FLEMING P. J., HAUCK F. R., MOON R. Y., HORNE R. S., L'HOIR M. P., PONSONBY A. L., and BLAIR P. S. Swaddling and the risk of sudden infant death syndrome: a meta-analysis. *Pediatrics*, 2016, 137(6): e20153275. https://doi.org/10.1542/peds.2015-3275

[4] ASOK A., BERNARD K., ROTH T. L., ROSEN J. B., and DOZIER M. Parental responsiveness moderates the association between early-life stress and reduced telomere length. *Development and Psychopathology*, 2013, 25(3). https://doi.org/10.1017/s0954579413000011

[5] LUBY, J., BELDEN A., BOTTERON K., MARRUS N., HARMS M. P., BABB C., NISHINO T., and BARCH D. The Effects of Poverty on Childhood Brain Development. *JAMA Pediatrics*, 2013, 167(12): 1135–1142. https://doi.org/10.1001%2Fjamapediatrics.2013.3139

[6] NEWNHAM, C. A., INDER, T. E., and MILGROM, J. Measuring preterm cumulative stressors within the NICU: the Neonatal Infant Stressor Scale. *Early Human Development*, 2009, 85 (9): 549-555. https://doi.org/10.1016/j.earlhumdev.2009.05.002

[7] BELTRAN M., VINKERS C., DUDINK J., and GROENENDAAL F. Behavioral sign of stress in Preterm infant during admission to a neonatal intensiva care unit and

early brain development. *Pediatric Critical Care Medicine*, 2018, 19(6S): 213. http://dx.doi.org/10.1097/01.pcc.0000537988.68871.90

[8] SMITH K. E., & POLLAK S. D. Early life stress and development: potential mechanisms for adverse outcomes. *Journal of Neurodevelopmental Disorders*, 2020, 12: 34. https://doi.org/10.1186/s11689-020-09337-y

[9] PECHTEL P., & PIZZAGALLI D. A. Effects of early life stress on cognitive and affective function: an integrated review of human literature. *Psychopharmacology*, 2011, 214(1): 55–70. https://doi.org/10.1007/s00213-010-2009-2

[10] PETTY J. *Reducing Stress and Optimising Outcomes in neonatal care*. University of Hertfordshire, 2014. https://www.herts.ac.uk/__data/assets/pdf_file/0005/62960/14reducing-stress-pain-in-the-neonate

[11] VAN PUYVELDE M., LOOTS G., MEYS J., NEYT X., MAIRESSE O., SIMCOCK D., and PATTYN N. Whose clock makes yours tick? How maternal cardiorespiratory physiology influences newborns' heart rate variability. *Biological Psychology*, 2015, 108: 132–141. https://doi.org/10.1016/j.biopsycho.2015.04.001

[12] BYSTROVA K., MATTHIESEN A. S., WIDSTRÖM A. M., RANSJÖ-ARVIDSON A. B., WELLES-NYSTRÖM B., VORONTSOV I., and UVNÄS-MOBERG K. The effect of Russian Maternity Home routines on breastfeeding and neonatal weight loss with special reference to swaddling. *Early Human Development*, 2007, 83: 29–39. https://doi.org/10.1016/j.earlhumdev.2006.03.016

[13] HAIR, J. F., BLACK, W. C., BABIN, B. J., ANDERSEN, R. E., & TATHAM R. L. *Multivariate data analysis (7th ed.)*.Upper Saddle River, Pearson Prentice, 2010.

[14] LEMESHOW, S., KLAR J., LWANGA S. K., PRAMONO D., and HOSMER D. W. *Besar sampel dalam penelitian Kesehatan.* Jogyakarta, Fakultas kedokteran Universitas Gajahmada, 1997. https://opac.perpusnas.go.id/DetailOpac.aspx?id=386149

[15] PENG N. H., CHEN C. H., BACHMAN J., LIN H. C., WANG T. M., CHANG Y. C., and CHANG Y. S. To explore relationships between physiological stress signals and stress behaviors in preterm infants during periods of exposure to environmental stress in the Hospital. *Biological Research For Nursing*, 2011, 13(4): 357-363. https://doi.org/10.1177/1099800410392020

[16] ALLINSON L. G., DENEHY L., DOYLE L. W., EELES A. L., DAWSON J. A., LEE K. J., and SPITTLE A. J. Physiological stress responses in infants at 29-32 weeks' postmenstrual age during clustered nursing cares and standardised neurobehavioural assessments. *BMJ Paediatrics Open*, 2017, 1(1): e000025. https://doi.org/10.1136/bmjpo-2017-000025

[17] MOONEY S. M., & BRUMMELTE L. S. Neonatal pain and reduced maternal care: Early-life stressors interacting to impact brain and behavioral development. *Neuroscience*, 2017, 342: 21-36. https://doi.org/10.1016/j.neuroscience.2016.05.001

[18] EDRAKI M., PARAN M., MONTASERI S., RAZAVI NEJAD M., and MONTASERI Z. Comparing the Effects of Swaddled and Conventional Bathing Methods on Body Temperature and Crying Duration in Premature Infants: A Randomized Clinical Trial. *Journal of Caring Sciences*, 2014, 3(2), 83–91. https://doi.org/10.5681/jcs.2014.009

[19] PARAN M., EDRAKI M., MONTASERI S., and NEJAD M. R. Comparing the Effects of Swaddle and Conventional Bathing Methods on Behavioral Responses in Preterm Neonates. *Iranian Journal of Neonatology*, 2016, 7(4): 35-40. http://dx.doi.org/10.22038/ijn.2016.7778

[20] PENG N. H., BACHMAN J., and JENKINS R. Relationships between environmental stressors and stress bio behavioral responses of preterm infants in NICU. *The Journal of Perinatal & Neonatal Nursing*, 2009, 23(4): 363-371. https://doi.org/10.1097/jpn.0b013e3181bdd3fd

[21] PENG N. H., BACHMAN J., CHEN C. H., HUANG L. C., LIN H. C., and LI T. C. Energy expenditure in preterm infants during periods of environmental stress in the neonatal intensive care unit. *Japan Journal of Nursing Science*, 2014, 11(4): 241-247. https://doi.org/10.1111/jjns.12025

[22] KOMMERS D. R., JOSHI R., VAN PUL C., FEIJS L., OETOMO S. B., and ANDRIESSEN P. Changes in autonomic regulation due to Kangaroo care remain unaffected by using a swaddling device. *Acta Paediatrica*, 2019, 108(2). https://doi.org/10.1111%2Fapa.14484

[23] TANE R., RUSTINA Y., and WALUYANTI F. Nesting with Fixation and Position to Facilitate Quiet Sleep and Oxygen Saturation on Low-Birth Weight Infants. *Comprehensive Child and Adolescent Nursing*, 2019, 42: 29-37. https://doi.org/10.1080/24694193.2019.1577923

[24] SATHISH Y., & LEWIS L. Clinical outcomes of Snuggel up Position Using Positioning Aids for Preterm (27-32 week) infant. *Iranian Joiurnal of Neonatology*, 2017, 8(1). https://doi.org/10.22038/ijn.2016.7709

[25] COVIELLO C., POPPLE M. M., DROVANDI L., CORSINI I., LEONARDI V., LUNARDI C., ANTONELLI C., PRATESI S., and DANI C. Painful procedures can affect post-natal growth and neurodevelopment in preterm infants. *Acta Paediatrica*, 2018, 107: 784–790. https://doi.org/10.1111/apa.14222

[26] PHILBIN M. K. The sound environments and auditory perceptions of the fetus and preterm newborn In: FILIPPA M., KUHN P., and WESTRUP B. (eds.) *Early vocal contact and preterm infant brain development*. Cham, Springer, 2017: 91–111.

[27] EFENDI D., RUSTINA Y., and GAYATRI D. Pacifier and swaddling effective in impeding premature infant's pain score and heart rate. *Enfermería Clínica*, 2018, 28: 46-50. https://doi.org/10.1016/S1130-8621(18)30035-4

[28] KARADAG O. E., YILDIZ G. K., AKDOGAN R., and YILDIZ S. The effect of simulative heartbeat nest used in preterm new-borns on vital signs, pain, and comfort in Turkey: A randomized controlled study. *Journal of Pediatric Nursing*, 2021, 62: e170-e177. https://doi.org/10.1016/j.pedn.2021.10.003

[29] GUPTA, G. NICU Environment and The Neonate. *Journal of Neonatology*, 2001, 15(4). https://doi.org/10.1177/0973217920010403

[30] DAMAYANTI Y., SUTINI T., and SULAEMAN S. The combination intervention between swaddling and KMC is more significant compared to swaddling intervention alone and KMC intervention alone. *Journal of Telenursing*, 2019, 1(2). https://doi.org/10.31539/joting.v1i2.840

[31] KARIMI A. A., JAHANPOUR F., MIRZAEI K., and AKEBERIAN S. The Effect of Swaddling in Physiological Changes and Severity of Pain Caused by Blood Sampling in Preterm Infants: Randomized Clinical Trial. *International Journal of Pharmaceutical and Phytopharmacological Research*, 2019, 9(6). https://eijppr.com/0zO43a2

[32] RENGINAR Ö. D., & AYLA B. T. Effect of soothing techniques on infants' self- regulation behaviors (sleeping,

crying, feeding): A randomized controlled study. *Japan Journal of Nursing Science*, 2019, 16: 407–419 https://doi.org/10.1111/jjns.12250
[33] YILMAZ D., & INAL S. Effects of three different methods used during heel lance procedures on pain level in term neonates. *Japan Journal of Nursing Science*, 2020, 17(4): e12338. https://doi.org/10.1111/jjns.12338
[34] AL-SAGARAT A. Y., & AL-KHARABSHEH, A. Traditional Practices Adopted by Jordanian Mother when Caring for their Infants in Rural areas. *African Journal of Traditional, Complementary and Alternative Medicines*, 2016, 14(1): 1-9. https://doi.org/10.21010/ajtcam.v14i1.4499
[35] NOVITA R. V. T., ASTUTI N. Y., and SUSILO, W. The Effectivenessof Calming Baby Tips in Overcoming Crying Babies. *Journal of Ners and Midwifery*, 2016, 1(3): 239-253. https://doi.org/10.36780/jmcrh.v1i2.24
[36] SYATRIAWATI S., & SEMBIRING I. M. Pengaruh Metode 5'S (Swadding, Stomach Position, Sushing, Swingging, Sucking) terhadap Respon Nyeri Bayi Setelah Imunisasi HB-0. *Journal Riset Hesti Medan Akper Kesdam*, 2020, 5(2): 141-148. http://dx.doi.org/10.30829/jumantik.v6i4.10474
[37] LAI PING HO R.N., HO S. S., LEUNG D. Y., SO W. K., and CHAN, C. W. A feasibility and efficacy randomised controlled trial of swaddling for controlling procedural pain in preterm infants. *Journal of Clinical Nursing*, 2016, 25 (3-4): 472-482. https://doi.org/10.1111/jocn.13075
[38] MÖLLER E.L., DE VENTE W., and RODENBURG R. Infant crying and the calming response: Parental versus mechanical soothing using swaddling, sound, and movement. *PLoS one*, 14(4): e0214548. https://doi.org/10.1371/journal.pone.0214548
[39] BILGIN, A., & WOLKE, D. Development of comorbid crying, sleeping, feeding problems across infancy: Neurodevelopmental vulnerability and parenting. *Early Human Development*, 2017, 109: 37–43. https://doi.org/10.1016/j.earlhumdev.2017.04.002
[40] HORNE R. S. C. Autonomic Cardiorespiratory Physiology and Arousal of the Fetus and Infant. In: DUNCAN J. R., BYARD R. W. (eds.) *SIDS Sudden Infant and Early Childhood Death: The Past, the Present and the Future*. Adelaide, University of Adelaide Press, 2018. https://pubmed.ncbi.nlm.nih.gov/30035958/
[41] MOON R. Y., DARNALL R. A., FELDMAN-WINTER L., GOODSTEIN M. H., and HAUCK F. R. Task Force on Sudden Infant Death Syndrome. *Pediatric,* 2016, 138(5): e20162938. https://doi.org/10.1542/peds.2016-2938
[42] MOON, R. Y. *How to Keep Your Sleeping Baby Safe: AAP Policy Explained*. Healthy Children, 2016. https://www.healthychildren.org/English/ages-stages/baby/sleep/Pages/a-parents-guide-to-safe-sleep.aspx
[43] SOLIKAH S. N., & SUMINAR S. Pengaruh pemberian bedong terhadap perkembangan motorik bayi usia 3 bulan. *UNNES Journal of Public Health* 2017, 6(3). http://dx.doi.org/10.15294/ujph.v6i3.15753

参考文:

[1] BEHRMAN R. E., KLIEGMAN R. M., 和 JENSON H. B. 新生儿。在: KLIEGMAN R. M., 和 GEME J. W.（编辑。）纳尔逊儿科教科书。第 21 版。阿姆斯特丹,爱思唯尔, 2020.
[2] ASTUTI E. W. 综合产科实践中的产科和伦理法律概念。雅加达，卫生部, 2016.
[3] PEASE A. S., FLEMING P. J., HAUCK F. R., MOON R. Y., HORNE R. S., L'HOIR M. P., PONSONBY A. L., 和 BLAIR P. S. 襁褓和婴儿猝死综合征的风险：荟萃分析。儿科学，2016, 137(6): e20153275. https://doi.org/10.1542/peds.2015-3275
[4] ASOK A., BERNARD K., ROTH T. L., ROSEN J. B., 和 DOZIER M. 父母的反应性缓和了早期生活压力和端粒长度减少之间的关联。发展与精神病理学, 2013, 25(3). https://doi.org/10.1017/s0954579413000011
[5] LUBY, J., BELDEN A., BOTTERON K., MARRUS N., HARMS M. P., BABB C., NISHINO T., 和 BARCH D. 贫困对儿童大脑发育的影响。美国医学会儿科杂志, 2013, 167(12): 1135–1142. https://doi.org/10.1001%2Fjamapediatrics.2013.3139
[6] NEWNHAM, C. A., INDER, T. E., 和 MILGROM, J. 测量新生儿重症监护病房内的早产累积压力源：新生儿婴儿压力源量表。早期人类发展, 2009, 85 (9): 549-555. https://doi.org/10.1016/j.earlhumdev.2009.05.002
[7] BELTRAN M., VINKERS C., DUDINK J., 和 GROENENDAAL F. 早产儿入院新生儿重症监护室和早期大脑发育过程中应激的行为标志。儿科重症监护医学, 2018, 19(6S): 213. http://dx.doi.org/10.1097/01.pcc.0000537988.68871.90
[8] SMITH K. E., & POLLAK S. D. 早期生活压力和发展：不良结果的潜在机制。神经发育障碍杂志, 2020, 12: 34. https://doi.org/10.1186/s11689-020-09337-y
[9] PECHTEL P., 和 PIZZAGALLI D. A. 早期生活压力对认知和情感功能的影响：人类文献的综合综述。精神药理学, 2011, 214(1): 55–70. https://doi.org/10.1007/s00213-010-2009-2
[10] PETTY J. 在新生儿护理中减少压力并优化结果。赫特福德大学，2014. https://www.herts.ac.uk/__data/assets/pdf_file/0005/62960/14reducing-stress-pain-in-the-neonate
[11] VAN PUYVELDE M., LOOTS G., MEYS J., NEYT X., MAIRESSE O., SIMCOCK D., 和 PATTYN N. 谁的时钟使你滴答作响? 母体心肺生理学如何影响新生儿的心率变异性。生物心理学, 2015, 108: 132–141. https://doi.org/10.1016/j.biopsycho.2015.04.001
[12] BYSTROVA K., MATTHIESEN A. S., WIDSTRÖM A. M., RANSJÖ-ARVIDSON A. B., WELLES-NYSTRÖM B., VORONTSOV I., 和 UVNÄS-MOBERG K. 俄罗斯产科家庭惯例对母乳喂养和新生儿减肥的影响，特别是关于襁褓。早期人类发展，2007, 83: 29–39. https://doi.org/10.1016/j.earlhumdev.2006.03.016
[13] HAIR, J. F., BLACK, W. C., BABIN, B. J., ANDERSEN, R. E., 和 TATHAM R. L. 多变量数据分析（第7版。). 上鞍河,皮尔逊普伦蒂斯, 2010.
[14] LEMESHOW, S., KLAR J., LWANGA S. K., PRAMONO D., 和 HOSMER D. W. 健康研究的大样本。日惹，加贾马达大学医学院，1997. https://opac.perpusnas.go.id/DetailOpac.aspx?id=386149
[15] PENG N. H., CHEN C. H., BACHMAN J., LIN H. C., WANG T. M., CHANG Y. C., 和 CHANG Y. S. 探讨早产儿在医院环境应激期间的生理应激信号与应激行为之间的关系。护理生物学研究，2011, 13(4): 357-363. https://doi.org/10.1177/1099800410392020

[16] ALLINSON L. G., DENEHY L., DOYLE L. W., EELES A. L., DAWSON J. A., LEE K. J., 和 SPITTLE A. J. 在集群护理和标准化的神经行为评估期间，29-32 周后经年龄婴儿的生理应激反应。生物医学期刊儿科公开，2017，1(1)：e000025. https://doi.org/10.1136/bmjpo-2017-000025
[17] MOONEY S. M., 和 BRUMMELTE L. S. 新生儿疼痛和产妇护理减少：早期生活压力源相互作用影响大脑和行为发育。神经科学，2017，342：21-36. https://doi.org/10.1016/j.neuroscience.2016.05.001
[18] EDRAKI M., PARAN M., MONTASERI S., RAZAVI NEJAD M., 和 MONTASERI Z. 比较襁褓和常规沐浴方法对早产儿体温和哭泣持续时间的影响：一项随机临床试验。关怀科学杂志，2014，3(2)，83–91. https://doi.org/10.5681/jcs.2014.009
[19] PARAN M., EDRAKI M., MONTASERI S., 和 NEJAD M. R. 比较斯瓦德尔和常规沐浴方法对早产儿行为反应的影响。伊朗新生儿学杂志，2016，7(4)：35-40. http://dx.doi.org/10.22038/ijn.2016.7778
[20] PENG N. H., BACHMAN J., 和 JENKINS R. 环境应激源与新生儿重症监护室早产儿应激生物行为反应的关系。围产期与新生儿护理杂志，2009，23(4)：363-371. https://doi.org/10.1097/jpn.0b013e3181bdd3fd
[21] PENG N. H., BACHMAN J., CHEN C. H., HUANG L. C., LIN H. C., 和 LI T. C. 新生儿重症监护室环境应激期间早产儿的能量消耗。日本护理科学杂志，2014，11(4)：241-247. https://doi.org/10.1111/jjns.12025
[22] KOMMERS D. R., JOSHI R., VAN PUL C., FEIJS L., OETOMO S. B., 和 ANDRIESSEN P. 由于袋鼠护理而导致的自主调节的变化不受使用襁褓装置的影响。儿科学，2019，108(2). https://doi.org/10.1111%2Fapa.14484
[23] TANE R., RUSTINA Y., 和 WALUYANTI F. 嵌套固定和位置，以促进安静的睡眠和氧饱和度低出生体重婴儿。儿童及青少年综合护理，2019，42：29-37. https://doi.org/10.1080/24694193.2019.1577923
[24] SATHISH Y., 和 LEWIS L. 早产（27-32 周）婴儿依偎姿势的临床结果。伊朗新生儿学杂志，2017，8(1). https://doi.org/10.22038/ijn.2016.7709
[25] COVIELLO C., POPPLE M. M., DROVANDI L., CORSINI I., LEONARDI V., LUNARDI C., ANTONELLI C., PRATESI S., 和 DANI C. 痛苦的过程会影响早产儿的产后生长和神经发育。儿科学，2018，107：784–790. https://doi.org/10.1111/apa.14222
[26] PHILBIN M. K. 胎儿和早产儿的声音环境和听觉感知: FILIPPA M., KUHN P., 和 WESTRUP B.（编辑。）早期声音接触和早产儿大脑发育。湛,斯普林格，2017：91–111.
[27] EFENDI D., RUSTINA Y., 和 GAYATRI D. 安抚奶嘴和襁褓有效地阻碍早产儿的疼痛评分和心率。临床护理，2018，28：46-50. https://doi.org/10.1016/S1130-8621(18)30035-4
[28] KARADAG O. E., YILDIZ G. K., AKDOGAN R., 和 YILDIZ S. 早产新生儿使用的模拟心跳巢对土耳其生命体征，疼痛和舒适度的影响：一项随机对照研究。儿科护理杂志，2021，62：e170-e177. https://doi.org/10.1016/j.pedn.2021.10.003
[29] GUPTA, G. 新生儿重症监护室环境和新生儿. 新生儿学杂志，2001，15(4). https://doi.org/10.1177/0973217920010403
[30] DAMAYANTI Y., SUTINI T., 和 SULAEMAN S. 与单独的襁褓干预和单独的袋鼠母车干预相比，襁褓和袋鼠母亲护理之间的组合干预更为显着。远程护理杂志，2019，1(2). https://doi.org/10.31539/joting.v1i2.840
[31] KARIMI A. A., JAHANPOUR F., MIRZAEI K., 和 AKEBERIAN S. 襁褓对早产儿采血引起的生理变化和疼痛严重程度的影响：随机临床试验。国际药物和植物药理学研究杂志，2019，9(6). https://eijppr.com/0zO43a2
[32] RENGINAR Ö. D., 和 AYLA B. T. 舒缓技术对婴儿自我调节行为（睡眠，哭泣，喂养）的影响：一项随机对照研究。日本护理科学杂志，2019，16：407–419 https://doi.org/10.1111/jjns.12250
[33] YILMAZ D., 和 INAL S. 足跟喷枪手术中使用的三种不同方法对新生儿疼痛水平的影响. 日本护理科学杂志，2020，17(4)：e12338. https://doi.org/10.1111/jjns.12338
[34] AL-SAGARAT A. Y., 和 AL-KHARABSHEH, A. 约旦母亲在农村地区照顾婴儿时采取的传统做法。非洲传统、补充和替代药物杂志，2016，14(1)：1-9. https://doi.org/10.21010/ajtcam.v14i1.4499
[35] NOVITA R. V. T., ASTUTI N. Y., 和 SUSILO, W. 镇静婴儿提示在克服哭泣婴儿的有效性。护士和助产杂志，2016，1(3)：239-253. https://doi.org/10.36780/jmcrh.v1i2.24
[36] SYATRIAWATI S., 和 SEMBIRING I. M. 方法5对血红蛋白-0免疫后婴儿疼痛反应的影响.欢迎浏览，2020，5(2)：141-148. http://dx.doi.org/10.30829/jumantik.v6i4.10474
[37] LAI PING HO R.N., HO S. S., LEUNG D. Y., SO W. K., 和 CHAN, C. W. 襁褓控制早产儿程序性疼痛的可行性和有效性随机对照试验。临床护理杂志，2016，25 (3-4)：472-482. https://doi.org/10.1111/jocn.13075
[38] MÖLLER E.L., DE VENTE W., 和 RODENBURG R. 婴儿哭泣和平静的反应：父母与机械抚慰使用襁褓，声音和运动。普洛斯一号，14(4)：e0214548. https://doi.org/10.1371/journal.pone.0214548
[39] BILGIN, A., 和 WOLKE, D. 婴儿期的合并症哭闹，睡眠，喂养问题的发展：神经发育脆弱性和育儿。早期人类发展，2017，109：37–43. https://doi.org/10.1016/j.earlhumdev.2017.04.002
[40] HORNE R. S. C. 胎儿和婴儿的自主心肺生理学和唤醒。在: DUNCAN J. R., BYARD R. W.（编辑。婴儿猝死综合征婴儿猝死和儿童早期死亡：过去，现在和未来。卤戮戮拢篓香港六合彩开奖结果拢漏谩鹿漏鹿，2018. https://pubmed.ncbi.nlm.nih.gov/30035958/
[41] MOON R. Y., DARNALL R. A., FELDMAN-WINTER L., GOODSTEIN M. H., 和 HAUCK F. R. 婴儿猝死综合症专责小组。儿科学，2016，138(5)：e20162938. https://doi.org/10.1542/peds.2016-2938
[42] MOON, R. Y. 如何保持您的睡眠宝宝安全：阿普政策解释。健康儿童，2016. https://www.healthychildren.org/English/ages-stages/baby/sleep/Pages/a-parents-guide-to-safe-sleep.aspx
[43] SOLIKAH S. N., 和 SUMINAR S. 襁褓对3个月龄婴儿运动发育的影响。三宝垄州立大学公共卫生杂志，2017，6(3). http://dx.doi.org/10.15294/ujph.v6i3.15753