P-ISSN: 2664-3685
E-ISSN: 2664-3693
www.paediatricjournal.com
IJPG 2023; 6(1): 31-42
Received: 05-12-2022
Accepted: 04-01-2023

Ismail Sangadji
Management and Sciences University, Selangor, Malaysia

Ali Khatibi
Management and Sciences University, Selangor, Malaysia

Norshafarina Binti Shari
Management and Sciences University, Selangor, Malaysia

Jaqualine Tham S
Management and Sciences University, Selangor, Malaysia

Cicillia Windiyaningsih
Universitas Respati Indonesia, Jakarta, Indonesia

Corresponding Author:
Ismail Sangadji
Management and Sciences University, Selangor, Malaysia

Midline swaddling and traditional swaddling position and their influence on physical and autonomic sign on newborn babies

Ismail Sangadji, Ali Khatibi, Norshafarina Binti Shari, Jaqualine Tham S and Cicillia Windiyaningsih

DOI: https://doi.org/10.33545/26643685.2023.v6.i1a.198

Abstract
The traditional method of swaddling is done with the arms and legs straightened and wrapped tightly with the hips in an addiction position. When swaddling is properly done, 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 for newborns, like SIDS, DDH, which cause stress. The early exposure of the neonates to stress results to residual symptoms in behavior and neurobiological disorders. This study aims to determine the effect of midline position compared to the traditional swaddling regarding physical and autonomics stress sign. The study population consisted of 194 newborns. The midline and traditionally swaddled were observed and recorded, physical and autonomic signs at birth, 10 minutes and 2 hours were documented. This study found that there is 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, midline 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 less stressful effect than the traditional position. The same research elsewhere in Indonesia will be costly. Future research would suggest for larger sample that may suggest a more accurate outcome.

Keywords: Swaddling, midline position, traditional position, physical sign, autonomic sign

Introduction
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 in this period 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. There will be a big impact on the newborns later life with residual symptoms due to the failure of adaptation, which might results in failure to thrive or poor growth and development. According this phase is also known as the vital period, because the baby's mental and physical condition become a solid foundation for further development and growth as an adult human. In this period, there is also a heavy adaptation in neonatal life, because they have to adapt from intra-uterine to extra-uterine, as well as a very rapid growth process (Carlton, 2011; Beherman, 2020; Astuti 2016) [46, 47, 5]. 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 (Astuti, 2016) [5].

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,

new-borns 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 (Van Sleuwen, 2007; Pease, 2016; The American Academy of Pediatrics, 2017) [48, 36, 2]. From the results of several studies (Asok, 2013; Luby, 2013; Newnham, 2009) [1, 23] 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 and it is found that 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 (Belttran *et al*., 2018; Smith & Pollak, 2020; Pechtel & Pizzagali, 2011) [6, 39, 37] 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 studies, it was found that by 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 Patty (2014) [35] 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 interpretation how to do 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 done 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 (Pease, 2016; Van Sleuwen, 2007; The American Academy of Pediatrics, 2017) [36, 48, 2]. Another negative impact is reduces the baby's ability to cool his body temperature which can lead to hyperthermia (Van Puyvelde, 2015) [44], 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 (Bystrova *et al*., 2007) [7].

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 as 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 carried out, an activity was carried out 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 do the swaddling midline position until automatically the employees in the baby room have done the swaddling midline position correctly.

This study is a quantitative study with analytical interventional observational study, using an analytical design of nonrandomized controlled trials in parallel, single blind.

This study, researchers took the population started from April 2017 to September 2017, all babies born normally at Haji Hospital and Jatisampurna Hospital. With inclusion criteria are healthy babies and normal at birth, with a birth weight of 2000 grams to 4000 grams, and with the exclusion criteria for infants are babies born with birth weight less than 2000 grams 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 based on the sample size rule. There are several sample size rules that can be used in research. According to Hair *et al*. (2017) [16], it is highlighted that 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 also 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 using the formula for calculating the experimental sample size from Lameshow (1997) [21] formula: N = z2 P(1-P)/d2, with a 95% confidence level and an absolute precision of 0.1, then obtained a sample of 96. The number of research samples in each group was 97, so the total sample was 194.

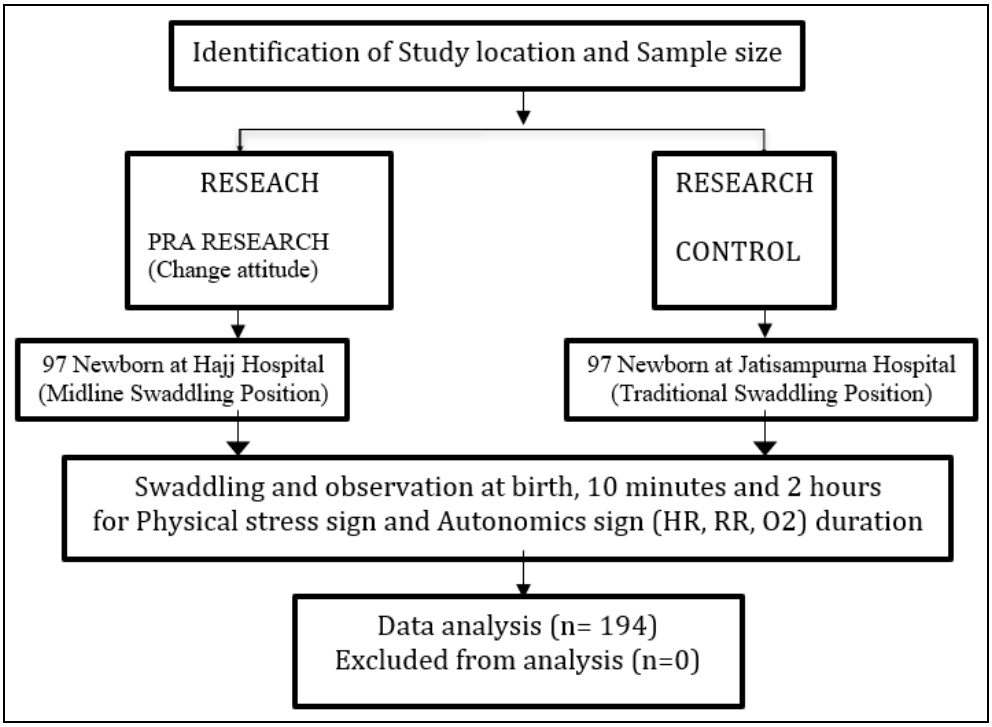

Fig 1: Flow chart of the research design.

After successfully changing attitudes at the Jakarta Hajj Hospital, the study began to be carried out. Total sampels are 97. After successfully changing attitudes at the Jakarta Hajj Hospital, the study began to be carried out. 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 physiologic stress signs and autonomic stress signs (Heart rate, Respiration rate and Oxygen saturation). Data were 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 find out 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 used in cases of not normal distribution and a Mann-Whitney test.

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).By looking at the distribution of cries babes (Figure 2) at birth, at 10 minutes 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.

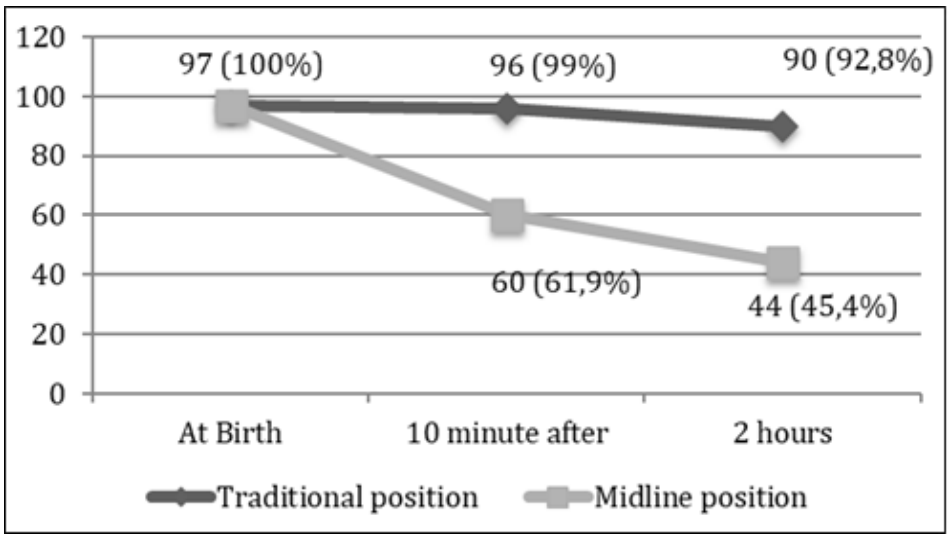

Fig 2: Graphical figure of crying distribution in each method of swaddling.

Friedman's test will be carried out to find out 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 significant average different (table 1).

Table 1: Friedman test on each method of swaddling.

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	
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	
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	
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	
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	

Autonomic stress sign.

Measurement of autonomic stress signs by 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).

Heart Rate

Based on the distribution of heart rate during birth in table 6, 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 to the traditional swaddling position (146.8 versus 144.7 bpm).

Table 2: Distribution of the heart rate (at Birth, 10 minutes and 2 hours)

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 at10 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), in 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 in figure 3, it can be seen that the group with the swaddling midline position group 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 midline position experienced a greater reduction in heart rate (8.7 versus 4 beats per minute). From both groups, it can be seen that the group with the swaddling midline position at 2 hours after birth had a lower average heart rate of 2 beats per minute when compared to 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, swaddling midline position group experienced a greater decrease heart rate in 10 minutes (beat versus 4 beat) and in 2 Hours (7 beat versus increase 2 beat).

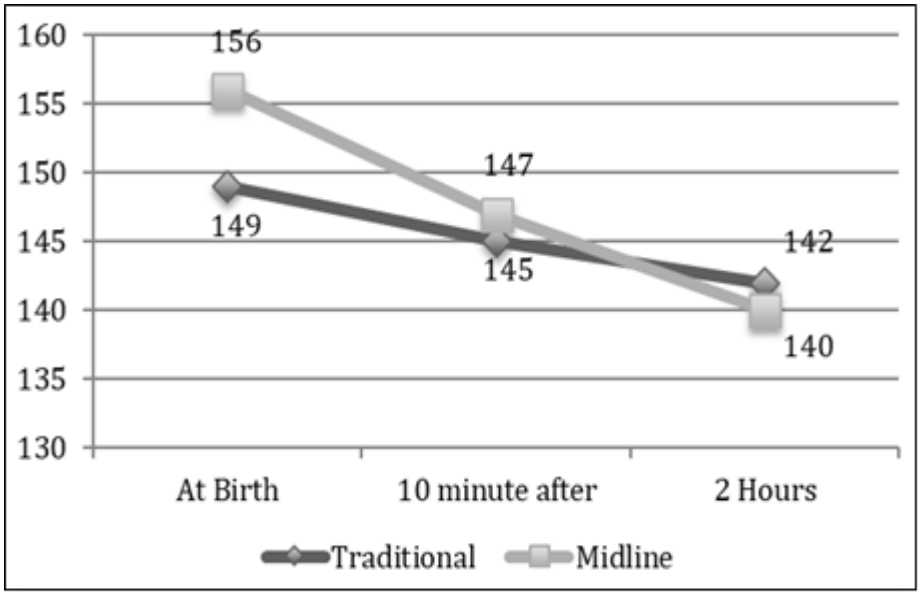

Fig 3: Graphical figure of Heart rate in each method of swaddling.

According to Peng *et al*. (2011) [33], Allinson LG, *et al*. (2017) [3], Mooney SM & Brummelte LS (2017) [24], it is said that the 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 find out which specific data groups are significantly different from each group of the average heart rate of newborns in each Hajj Hospital (Midline position) and Jatisampurna Hospital (Traditional position). The results of the analysis using the Friedman test in the group of infants with Swaddling midline position and traditional position It is 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. To find out which groups between heart rate at birth, heart rate at 10 minutes and heart rate at 2 hours in infants with Swaddling midline positions and traditional position different from each other. The result of Post-Hoc analysis with Wilcoxon test in the group of infants in the midline 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).

Respiration Rate

The next data is data regarding respiration rate which can be seen in table 3.

Table 3: Distribution of the respiration.

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, in the group of newborns in the midline position had a larger average in respiration rate at birth, 10 minutes and same value 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 midline 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 the figure graph 4 below.

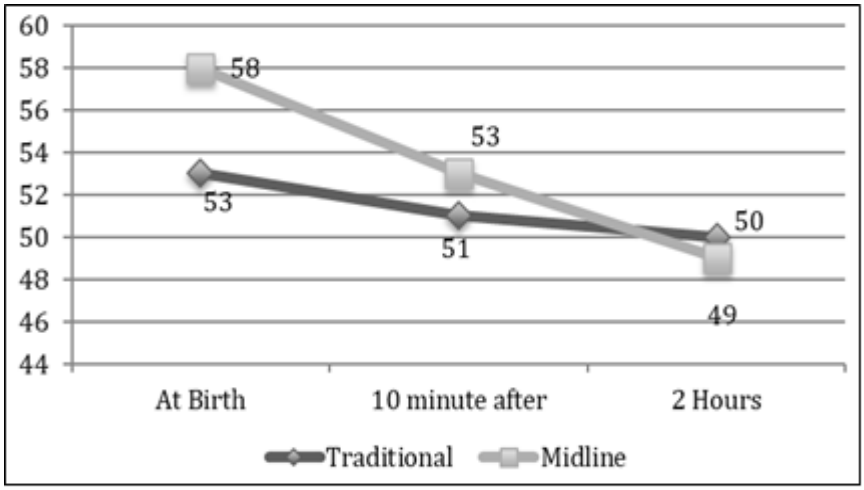

Fig 4: Graphical figure of Respiration rate in each method of swaddling

According to Peng *et al*. (2011) [33], Allinson LG, *et al*. (2017) [3], Mooney SM & Brummelte LS (2017) [24], it is said that the 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 (midline position) and Jatisampurna Hospital (Traditional position) was carried out to compare each time 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 (midline position) and Jatisampurna Hospital (Traditional position). The results of the analysis using the Friedman test in the group of infants with Swaddling midline 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 find out 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. The results of the analysis of Post-Hoc analysis with Wilcoxon test in the group of infants in the midline position and traditional position. In measuring comparing the babies respiration 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).

Saturation

The next data is data regarding oxygen saturation (at birth, 10 minutes and 2 Hours) which can be seen in table 4.

Table 4: Distribution oxygen saturation

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 to the midline swaddling position (93.05% versus 92.5%).

From both groups, it can be seen that at 10 minutes the group with the swaddling midline position had a higher average saturation when compared to the traditional swaddling position (96.9% versus 95.5%) and it can be seen that at 2 hours after birth the group with the swaddling midline position had a higher average saturation when compared to the traditional swaddling position (98.5% versus 97.3%). The results of the analysis in the two groups are in tables 16, it can be seen that the two groups, at birth and 10 minutes after birth the group with the swaddling midline position experienced a greater increasing in saturation (2.45% versus 3.9%). It was also seen that of the two groups, the group with the swaddling midline 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 the figure graph 5, below.

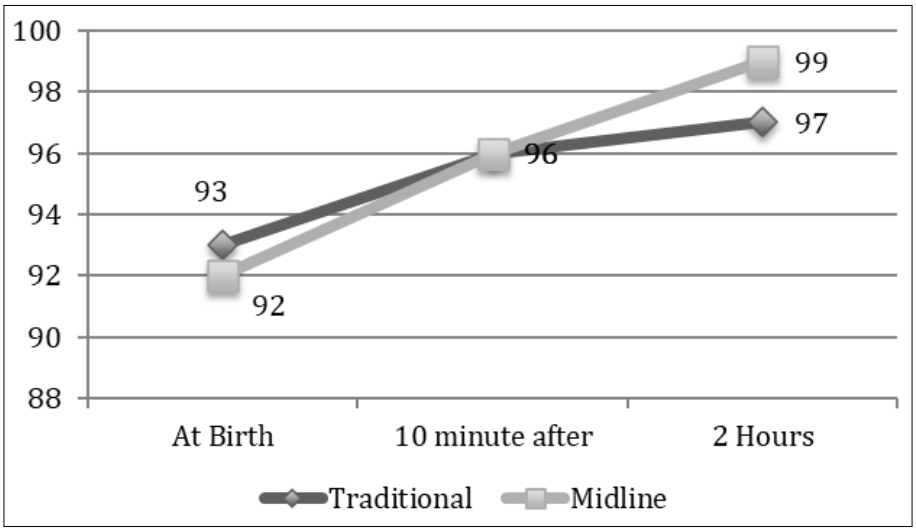

Fig 5: Graphical figure of Saturation in each method of swaddling.

According to Peng *et al*. (2011) [33], it is said that 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 midline position group had increase in saturation of 2, 5%. Furthermore, a test of the difference in the average respiratory frequency of newborns at the Haji Hospital (midline position) and Jatisampurna Hospital (Traditional position) was carried out to compare each time 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 (midline position) and Jatisampurna Hospital (Traditional position). The results of the analysis using the Friedman test in the group of infants with Swaddling midline 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 find out 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 the table 19 and 20, is the result of Post-Hoc analysis with Wilcoxon test in the group of infants in the midline position and traditional position. In measuring comparing the babies oxygen saturation 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).

Relationship between physical sign in the type of swaddling.

The assessment of the physical sign is subjective, while 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 carried out to see the overall data in each group. Below are the results of the Wilcoxon Test of all the variables to be analyzed from the two groups (Swaddling midline position and Swaddling Traditional position).

Table 5: Physical stress sign characteristics according to condition (midline position versus traditional position). Bold face entries indicate significant difference (p < .05).

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

From the results of the analysis in Physical stress sign (table 5), it is seen that only crying is significantly less in the swaddling midline 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 midline position.

Relationship between autonomic sign (Heart rate, Respiration rate and Oxygen saturation) in type of swaddling

The next analysis is an analysis of the Autonomic sign, then below are the results 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 face entries indicate significant difference (p<0.05).

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 the table 6, is the result of Post-Hoc analysis with Wilcoxon test in the both group 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.

Discussion

The aim of this research was to investigate the advantage of one swaddling position over the other. In this case it is the midline position swaddling over the traditional used swaddling position. Swaddling traditional position is common in Indonesia, straighten 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 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 in physical stress sign, it is seen that only crying is significantly less in the swaddling midline 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 midline position.

Through several studies it is 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, and with the conclusion that swaddle bathing can reduce the neonatal stress during bathing (Edraki M *et al*., 2014; Paran M *et al*., 2016) [14, 30].

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, that the results of the descriptive analysis (Figure 2) it can be seen that in each swaddling group the average crying frequency at birth, 10 minutes and 2 hours after birth were decreased, but the average decrease in the average crying frequency was greater in the group of babes swaddled in midline position, and the average frequency without crying is also higher in the babes with swaddling midline position group, also the frequency of crying at birth to 10 minutes and 10 minutes to 2 hours swaddling midline position was greater decrease than the traditional position (38,1% and 16.5% compared to 1% and 6, 2%). The results of the analysis of this study, it showed that babies in the midline swaddling position were calmer than babies 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 midline 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 midline 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 is 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 midline 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 those studied by Peng (2009) [32] and several other studies (Peng NH, *et al*., 2011; Peng NH *et al*., 2014; Kommers DR *et al*., 2019; Paran M *et al*., 2016; Tane R *et al*., 2019; Allinson LG, *et al*. 2017; Mooney SM & Brummelte LS, 2017; Allinson LG, *et al*. 2017; Mooney SM & Brummelte LS, 2017; Sathish Y & Lewis L, 2017; Rudhiati F, Murtiningsih M, 2022; Coviello C *et al*., 2018; Philbin MK, 2017; Pineda R *et al*., 2021) [33, 14, 30, 43, 3, 24, 40, 49, 10, 34, 50]. From another study conducted by Efendi *et al*. (2018) [13], it was found that by swaddling, the heart rate of newborns was lower than 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 midline 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 those studied by Peng (2009) [32] and several other studies (Peng NH, *et al*., 2011; Peng NH *et al*., 2014; Kommers DR *et al*., 2019; Paran M *et al*., 2016; Tane R *et al*., 2019; Allinson LG, *et al*. 2017; Mooney SM & Brummelte LS, 2017; Sathish Y & Lewis L, 2017; Rudhiati F, Murtiningsih M, 2022; Coviello C *et al*., 2018; Philbin MK, 2017; Pineda R *et al*., 2021) [33, 14, 30, 43, 3, 24, 40, 49, 10, 34, 50]. From another study conducted by Efendi *et al*. (2018) [13].

From the research of Karadag O E (2021) [20] 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 swaddling midline position at 10 minutes and 2 hours the result was a significant increase in oxygen saturation compare with swaddling traditional position. When viewed from each group itself, all autonomic signs were found (Heart rate, Respiration rate and Oxygen saturation), when compared among 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, concludes that swaddling has an impact on the newborn being calmer or less stressful, that are similar results from several other studies and expert opinions as carried out by Peng (2009) [32], Gupta (2001) [15], Haveson (2010), Damayanti (2019) [11] and Karimi (2019) [18], Renginar ÖD (2019) [38], Yilmaz D & Inal S (2020) [45], and others research (Peng NH, *et al*., 2011; Al-Sagarat AY *et al*., 2016; Wulandari NA, Setyorini E, 2014; Novita R, *et al*., 2016; Syatriawati S & Sembiring IM, 2020; Lai Ping Ho RN, *et al*., 2016; Cignacco E, 2012; Karimi AA *et al*., 2019; Möller EL, *et al*., 2021; Bilgin, A. & Wolke, D, 2017; Martiningsih W & Setijaningsih T, 2015) [33, 4, 28, 41, 22, 51, 18, 27, 9, 52]. However, from all the data analyzed in this study, apart from swaddling making 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.

Conclusion

This research was conducted to be able to answer how good swaddling is and can help newborns to get assistance in weight adaptation from intra uterine to extra uterine 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 (J Petty, 2014) [35], 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 Horne, R SC (2018) [17], Rachel Y. Moon (2016) [53], Torjesen I (2013) [54], and the longer the baby warpped then more suspect motor development delayed (Solikah SN, 2017) [42] (197), which should be swaddling can help babies to be calmer, more comfortable and less stressed as stated by Damayanti Y (2019) [11], Yilmaz D & Inal S (2020) [45], Grenier I R (2016) [55] and several other studies (Lai Ping Ho RN, *et al*., 2016; Karimi AA *et al*., 2019, Renginar ÖD & Ayala BT, 2019; Möller EL *et al*., 2019; Bilgin A, Wolke D, 2017; Martiningsih W & Setijaningsih T, 2015; Solikah SN & Suminar S, 2017) [22, 38, 18, 27, 9, 52, 42].

However, from all the data analyzed in this study, apart from swaddling making 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 done on infant positioning and swaddling methods for optimal development of outcomes, a larger sample size should be used.

Acknowledgments

The authors would like to show 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 PGC Management and Science University Malaysia for their invaluable assistance in editing this article.

Conflicts of interests

The authors of the present study declare no conflicts of interest.

References

1. Asok A, Bernard K, Roth TL, Rosen JB, Dozier M. Parental responsiveness moderates the association between early-life stress and reduced telomere length. Development and Psychopathology. 2013 Aug;25(3): 577-85.
2. American Academiy of Paediatrics. Swaddling: Is it Safe?; c2017. www.healthychildren.org. Retrieved 23 Dec 2021. From: https://www.healthychildren org/english/agesstages/baby/diapersclothing/pages/ swaddling-is-it-safe.aspx.
3. Allinson LG, *et al.* Physiological stress responses in infants at 29-32 weeks' postmenstrual age during clustered nursing cares and standardised neuro-behavioral assessments. BMJ Paediatr Open. 2017 Nov 25;1(1):e000025. DOI: 10.1136/bmjpo-2017-000025.
4. Al-Sagarat AY, *et al.* Traditional practices adopted by jordanian mother when caring for their infants in rural areas. Afr J Tradit Complement Altern Med. 2016 Nov 23;14(1):1-9.
5. Astuti EW. Konsep Kebidanan dan Etikolegal dalam Praktik Kebidanan Komprehensif. Jakarta: Kemenkes RI; c2016, 1-159.
6. Beltran M, *et al.* A. Behavioral sign of stress in Preterm infant during admission to a neonatal intensiva care unit and early brain development. Pediatric Critical Care Medicine. June 2018;19(6S):213.
7. Bystrova, *et al*. The effect of Russian Maternity Home routines on breastfeeding and neonatal weight loss with special reference to swaddling. In: Early Human Development. 2007;83:1.
8. Behrman RE, Kliegman RM, Jenson HB. The Newborn in: Nelson Textbook of Pediatric. 21st Edition. 2020. Chapter 9.
9. Bilgin A, Wolke D. Development of comorbid crying, sleeping, feeding problems across infancy: Neurode-velopmental vulnerability and parenting. Early Human Development. 2017;109:37-43.
10. Coviello C, Popple MM, Drovandi L, *et al.* Painful procedures can affect post-natal growth and

neurodevelopment in preterm infants. Acta Paediatrica. 2018;107(5):784-790.
11. Damayanti Y, Sutini T, Sulaeman S. Swaddling dan Kangaroo Mother Care Dapat Mempertahankan Suhu Tubuh Bayi Berat Lahir Rendah (BBLR). Journal of Telenursing (Joting). 2019 Dec 22;1(2):376-85.
12. Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion. About SUID and SIDS.U.S Department of Health & Human Services, Washington DC, 2021. Retrieved 2 Dec 2021. From http://www.hhs.gov.
13. Efendi D, Rustina Y, Gayatri D. Pacifier and swaddling effective in impeding premature infant's pain score and heart rate. Enfermeria clinica. 2018 Feb 1;28:46-50.
14. Edraki M, Paran M, Montaseri S, Nejad MR, 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 Jun;3(2):83.
15. Gupta G. NICU environment and the neonate. Journal of Neonatology. 2001 Dec;15(4):7-15.
16. Hair JF Jr, Black WC, Babin BJ, Andersen RE, Tatham RL. Multivariate data analysis (7th ed). Upper Saddle River, NJ: Pearson Prentice; c2010.
17. Horne RSC. Autonomic Cardiorespiratory Physiology and Arousal of the Fetus and Infant. In: Duncan JR, Byard RW, editors. SIDS Sudden Infant and Early Childhood Death: The Past, the Present and the Future. Adelaide (AU): University of Adelaide Press; 2018, May. Chapter 1. PMID: 30035958 Free Books & Documents. Review. Retrieved 23 Dec 2021, from: https://pubmed.ncbi.nlm.nih.gov/30035958/.
18. Karimi AA, Jahanpour F, Mirzaei K, Akeberian S. The Effect of Swaddling in Physiological Changes and Severity of Pain Caused by Blood Sampling in Preterm Infants: Randomized Clinical Trial. Int J Pharm Phytopharm Res. 2019;9:6.
19. Kommers DR, Joshi R, van Pul C, Feijs L, Bambang Oetomo S, Andriessen P. Changes in autonomic regulation due to Kangaroo care remain unaffected by using a swaddling device. Acta Paediatrica. 2019 Feb;108(2):258-65.
20. Karadag OE, Yildiz GK, Akdogan R, Yıldız S. The effect of simulative heartbeat nest used in preterm newborns on vital signs, pain, and comfort in Turkey: A randomized controlled study. Journal of Pediatric Nursing; c2021.
21. Lameshow S, Hoamer DW, *et al.* terjemahan Pramono D. Besar sampel dalam penelitian Kesehatan. Fakultas kedokteran Universitas Gajahmada. Jogyakarta; c1997.
22. Lai Ping Ho, RN. *et al.* A feasibility and efficacy randomised controlled trial of swaddling for controlling procedural pain in preterm infants. JCN Journal of Clinical Nursing. 2016 Feb;25(3-4):472-82.
23. Luby J, *et al.* The Effects of Poverty on Childhood Brain Development. JAMA Pediatr. 2013 Dec 1;167:2.
24. Mooney-Leber SM, Brummelte S. Neonatal pain and reduced maternal care: early-life stressors interacting to impact brain and behavioral development. Neuroscience. 2017 Feb 7;342:21-36.
25. Moon RY. Task Force on Sudden Infant Death Syndrome, Pediatric. November 2016;138:5.
26. Moon RY. How to Keep Your Sleeping Baby Safe: AAP Policy Explained American Academy of Paediatrics; c2016.
27. Möller EL, de Vente W, Rodenburg R. Infant crying and the calming response: Parental versus mechanical soothing using swaddling, sound, and movement. PLoS One. 2019 Apr 24;14(4):e0214548. From: http://journals.plos.org/plosone/article?id=10.1371/journal.
28. Novita RVT, Astuti NY, Susilo W. The Effectiveness of calming baby tips in overcoming crying babies. Journal of Ners and Midwifery. 2016;1(3):1.
29. Newnham CA, Inder TE, Milgrom J. Measuring preterm cumulative stressors within the NICU: The Neonatal Infant Stressor Scale. Early Hum Dev. 2009;85(9):549-555.
30. Paran M, Edraki M, Montaseri S, Nejad MR. A comparison between the effects of swaddled and conventional bathing methods on some behavioral responses in premature infants. Iranian Journal of Neonatology. 2016;7(Serial Number 4):35-40.
31. Peng NH, *et al.* Energy expenditure in preterm infants during periods of environmental stress in the neonatal intensive care unit. JPN J Nurs Sci. 2014 Oct;11(4):241-7.
32. Peng NH, Bachman J, Jenkins R. Relationships between environmental stressors and stress bio behavioral responses of preterm infants in NICU. J Perinat Neonatal Nurs. 2009;23(4):363-371.
33. Peng NH, *et al.* To explore relationships between physiological stress signals and stress behaviours in preterm infants during periods of exposure to environmental stress in the Hospital. Biol Res Nurs. 2011 Oct;13(4):357-63.
34. Philbin MK. The sound environments and auditory perceptions of the fetus and preterm newborn In: Filippa M, Kuhn P, Westrup B, editors. Early vocal contact and preterm infant brain development. Cham, Switzerland: Springer; c2017. p. 91-111.
35. Petty J. Reducing Stress and Optimising Outcomes in neonatal care; c2014. Retrieved 3 Desember 2021, From: https://www.herts.ac.uk/__data/assets/pdf_file/0005/62960/14reducing-stress-pain-in-the-neonate.
36. Pease AS, *et al.* Swaddling and the risk of sudden infant death syndrome: A meta-analysis. Paediatrics. 2016;137(6):1-9.
37. Pechtel P, Pizzagalli DA. Effects of early life stress on cognitive and affective function: an integrated review of human literature. Psychopharmacology. 2011;214(1):55-70.
38. Renginar ÖD, Ayla BT. Effect of soothing techniques on infants' self- regulation behaviours (sleeping, crying, feeding): A randomized controlled study. Japan Journal

of Nursing Science. 2019 Oct;16(4):407-19. DOI: 10.1111/jjns.12250.
39. Smith KE, Pollak SD. Early life stress and development: Potential mechanisms for adverse outcomes. Journal of Neurodevelopmental Disorders. 2020;12:34.
40. Sathish Y, Lewis L. Clinical outcomes of Snuggel up Position Using Positioning Aids for Preterm (27-32 week) infant. Iranian Journal of Neonatology IJN. 1 March 2017.
41. Syatriawati S, Sembiring IM. Pengaruh Metode 5'S (Swadding, Stomach Position, Sushing, Swingging, Sucking) terhadap Respon Nyeri Bayi Setelah Imunisasi HB-0. Journal Riset Hesti Medan Akper Kesdam 1/BB Medan. 2020;5(2):141-148.
42. Solikah SN, Suminar S. Pengaruh pemberian bedong terhadap perkembangan motorik bayi usia 3 bulan. Unnes Journal of Public Health. 2017;6:3.
43. Tane R, Rustina Y, Waluyanti FT. Nesting with fixation and position to facilitate quiet sleep and oxygen saturation on low-birth weight infants. Comprehensive Child and Adolescent Nursing. 2019 Mar 29;42(sup1): 29-37.
44. Van Puyvelde M, *et al*. Whose clock makes yours tick? How maternal cardiorespiratory physiology influences newborns' heart rate variability. Biol Psychol. 2015;108:132-41.
45. 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 Oct;17(4):e12338.
46. Carlton J, Kaltenthaler E. Amblyopia and quality of life: a systematic review. Eye. 2011 Apr;25(4):403-13.
47. Behrman J, Gonalons-Pons P. Women's employment and fertility in a global perspective (1960-2015). Demographic Research. 2020 Jul;43:707.
48. Van Sleuwen BE, Engelberts AC, Boere-Boonekamp MM, Kuis W, Schulpen TW, L'Hoir MP. Swaddling: a systematic review. Paediatrics. 2007 Oct;120(4):e1097-106.
49. Rudhiati F, Murtiningsih M. Effects of Swaddle Bath on Temperature, Heart Rate and Oxygen Saturation in Premature Infants. KnE Life Sciences. 2022 Feb 7:852-62.
50. Pineda R, Smith J, Roussin J, Wallendorf M, Kellner P, Colditz G. Randomized clinical trial investigating the effect of consistent, developmentally-appropriate, and evidence-based multisensory exposures in the NICU. Journal of Perinatology. 2021 Oct;41(10):2449-62.
51. Cignacco EL, Sellam G, Stoffel L, Gerull R, Nelle M, Anand KJ, Engberg S. Oral sucrose and "facilitated tucking" for repeated pain relief in preterms: A randomized controlled trial. Paediatrics. 2012 Feb;129(2):299-308.
52. Martiningsih W, Setijaningsih T. The effect of physical intervention 5s's (swaddling, side-stomach, shushing, swinging, sucking) toward pain and the duration of crying in infants with DPT immunization. The Malaysian Journal of Nursing (MJN). 2015 Jul 1;7(1):38-42.
53. Rachel Moon Y, Darnall RA, Feldman-Winter L, Goodstein MH, Hauck FR, Task Force on Sudden Infant Death Syndrome. SIDS and other sleep-related infant deaths: Evidence base for 2016 updated recommendations for a safe infant sleeping environment. Pediatrics. 2016 Nov 1;138:5.
54. Torjesen, Stina. "Towards a theory of ex-combatant reintegration"; c2013.
55. Grenier F, Hagmann J. Sites of knowledge (re-) production: Toward an institutional sociology of international relations scholarship. International Studies Review. 2016 Jun 1;18(2):333-65.

How to Cite This Article
Sangadji I, Khatibi A, Shari NB, Jaqualine Tham S, Windiyaningsih C. Midline swaddling and traditional swaddling position and their influence on physical and autonomic sign on newborn babies. International Journal of Paediatrics and Geriatrics. 2022;5(2):XX-XX.