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Effect of Educational Intervention on Knowledge of Components of Synactive Theory of Development among Nurses in Neonatal Care in selected Hospitals in Lagos state, Nigeria

AUTHOR(S): OGUNDEKO, Cecilia Adeneye, SOWUNMI, Christianah Olanrewaju, ORE, Omolara Theresa,

Abstract:

The high morbidity and mortality rates among neonates in Nigeria highlight the urgent need to strengthen nurses' understanding of developmental care principles. This study investigated the effect of an educational intervention on nurses' knowledge of the components of the Synactive Theory of Development in selected neonatal intensive care units (NICUs) in Lagos State. A quasi-experimental one-group pre- and post-intervention design was adopted, involving 58 nurses selected through multistage sampling. A validated structured questionnaire assessed knowledge before and after the intervention. Data were analyzed using descriptive and inferential statistics at a 0.05 significance level. Findings revealed that nurses initially demonstrated moderate knowledge across all components of the theory, with the weakest understanding observed in the attention and self-regulatory subsystems. Following the intervention, there was a notable improvement in knowledge across all five components (autonomic, motor, behavioral, attention, and self-regulatory systems) confirming the effectiveness of the educational program. The Analysis of Variance (ANOVA) further indicated a significant difference between pre- and post-intervention mean scores, suggesting that structured training effectively enhanced comprehension of the Synactive Theory. The study concludes that educational interventions are valuable for improving nurses' theoretical and practical understanding in neonatal care and recommends ongoing training and curriculum integration to sustain competence and improve neonatal outcomes.

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About Author

Author(s):

OGUNDEKO, Cecilia Adeneye
Faculty of Nursing Science
Trinity University, Sabo Lagos State

SOWUNMI, Christianah Olanrewaju
School of Nursing Science
BABCOCK University. Ilishan-Remo, Ogun State

ORE, Omolara Theresa
Faculty of Nursing Science
Trinity University, Sabo Lagos State

Introduction

The nursing profession over the years has been able to continue evolving as the theorists and scholars have contributed to the evolution of a distinctive body of knowledge to guide practice and improve the quality of patient care. The reason why nursing theories are important is that they can influence clinical decisions, enhance professional competence, and provide a strong scientific foundation for nursing to be considered both an art and a science (Williamson & McGrath 2020). However, there remains a constant gap between the theory and practice one day they are expected to implement theoretical frameworks in their day to day life but this is not the case as many nurses only apply them when it is forced upon them to do so. This disconnect is often the cause of fragmented care and insufficient knowledge of holistic interventions critical to the management of complex clinical situations such as those encountered in Neonatal Intensive Care Units (NICUs) (Soleimani et al., 2020; Cha et al., 2022). In the case of neonatal nursing where care must be given with precision, sensitivity, and deep understanding of developmental cues and how to apply these knowledge, reliance on a sound theoretical foundation such as the Synactive Theory of Development or STD is indispensable (Maltese et al., 2017; Adrian et al., 2020). The theory offers a systematic framework for observing, interpreting and responding to the behavioral and physiologic signals of neonates, especially those of neonates born preterm, who are vulnerable to a range of developmental and physiologic stressors.

The Synactive Theory of Development developed by Heidelise Als in 1982 provides a behavioural framework that helps caregivers to understand aspects of preterm infant experiences and how aspects of their interactions with the environment reflect the maturity and stability of their subsystems (AIs, 1986). The term "synactive" comes from the Greek "syn" for "together" and the Latin "actio", which means "action" indicating that development is a process of continuous interaction between multiple subsystems operating together (Als, 2012). These five subsystems consist of the autonomic, motor, behavioral, attention/interaction, and self-regulatory components, which stand for various aspects of the infant's physiological and behavioral functioning. The autonomic subsystem is responsible for vital signs such as respiration, heart rate, and skin color which serves as a foundation for survival. The motor subsystem is concerned with posture, tone, and movements, while the behavioral system reveals the levels of arousal and the sleep states of the infant. The attention/interaction component measures infant's ability to interact with care-givers and environment and the self-regulatory system is the sum of all the other components to maintain balance and stability. The interconnectedness of these subsystems highlights the influence of one's dysregulation on others' functioning, thereby focusing attention on the need for holistic evaluation and treatment.

In the NICU environment, the Synactive Theory has gained a greater degree of relevance because it affords a lens within which neonatal nurses can interpret the often subtle cues exhibited by the preterm infant. According to Als (2013), close behavioral observation of the infant can guide individual care that is related to the unique developmental needs of the baby. Through this framework, nurses can be able to detect early signs of stress, identify the infant's tolerance thresholds, and provide intervention that will promote self-regulation and stability. The theory of care places the emphasis of care not on medical interventions alone but on a developmental and family centred approach, which takes account of the infant's behavioural signals and promotes neurodevelopmental outcomes. Séassau et al. (2023) reinforced that the application and understanding of the principles of an STD enable healthcare providers to observe the impact of environmental stressors, medical procedures,

and the interaction of care giving on the infant's organization and adaptation. Nurses can alter care practices in order to reduce distress and promote optimal neurobehavioral development when they interpret behaviors such as crying, color change, or specific motor movements as expressions of stress or coping (Scala et al., 2020).

The need for the application of the Synactive Theory in neonatal care is voiced by statistics about neonatal health from all around the globe. Preterm infants in general are especially vulnerable to physiological stress because of the immaturity of their organs and systems. As Potmesilova, et al. (2023) explained, preterm babies frequently suffer from respiratory distress syndrome, hyperbilirubinemia, neurodevelopmental delay, and other complications that need specialized care. Prolonged exposure to stressors in the NICU including loud noise, bright lights, invasive procedures, and frequent handling can further destabilise the developing systems of the infant (Perin et al., 2022). These stressors can interfere with sleep as well as autonomic stability in the infant, and the effects of environmental stress can retard neurological development (Hassanpour et al., 2018). The Synactive Theory, therefore, offers a scientific basis for reducing such stress through care based on observation and individualization. By reading and responding in an appropriate manner to the infant's behavioral cues, nurses can manipulate environmental factors, caregiving techniques, and medical interventions to create stability and encouraging development.

In Nigeria where neonatal care is frequently strained by poor resources, shortage of manpower and lack of adequate training, the understanding and implementation of theories such as STD, is even more important. Foote et al. (2020) identified core aspect of neonatal nursing care such as maintaining stable temperature, preventing infection, parent-infant bonding, and feeding and nutrition. Integrating STD in these basic nursing functions helps the practitioners to improve the quality of neonatal care by combining physiological monitoring with behavior interpretation. However, from anecdotal evidence and clinical practice, it is suggested that there are many nurses working in the NICUs across Nigeria that are unfamiliar with the Synactive Theory of Development and how it is applied in practice. This lack of awareness may contribute to less optimal responses to infant cues, increased stress experienced by the neonate and subsequently increased rates of morbidity and mortality.

The personal experience of the researcher underscores this knowledge gap even more. Despite years of clinical exposure during her schooling in nursing, midwifery, and pediatric nursing, the researcher had not been exposed to the Synactive Theory of Development prior to postgraduate study in nursing at Babcock University. This realization generated curiosity as to whether the limited exposure to STD was a widespread problem among nurses in the neonatology unit of Lagos State. Observations during clinical postings showed that a lot of nurses did not know about the theory and did not incorporate it to their practice, which might suggest that there was a disconnect between theoretical nursing knowledge and clinical application. The lack of understanding of STD in clinical practice may lead to inappropriate care interventions and may lead to lost opportunities to prevent neonatal stress and neonatal complications (Hassanpour et al., 2018).

Given the important role that the Synactive Theory of Development plays in understanding neonatal behaviour and guiding developmental care, it becomes critical to assess the knowledge of the theory amongst nurses and offer specific education interventions. Educational initiatives can link theory to practice, enabling nurses to integrate evidence-based models into practice. Studies such as the one by Isabelle and Milette (2016) have proven that structured training is a significant improvement in the understanding and application of the principles of developmental care by nurses resulting in improved neonatal

outcomes. Therefore, evaluating the impact of educational intervention on the knowledge of nurses in the Synactive Theory of Development is not only relevant but essential in improving the standard of neonatal care in Nigeria.

The Synactive Theory of Development provides a comprehensive model of development that can be used to encourage individualized, developmentally responsive care for the preterm infant. Its application in the practice of the NICU has the potential to reduce neonatal stress, improve adaptation and enhance survival outcomes (Mahboobeh et al., 2017; Bembich et al., 2017). However, lack of awareness and training among nurses is a major impediment to effective implementation. This study, therefore, aims at investigating the impact of educational intervention on the knowledge of nurses on the component of the synactive theory of development in selected hospitals in Lagos State, Nigeria.

The general objective of this study is to investigate effect of educational intervention on knowledge of components of synactive theory of development among nurses in neonatal care in selected hospitals in Lagos state, Nigeria.

Research Methods

This study adopted quasi – experimental research design of one group pre- and post-intervention where the dependent variable (educational knowledge) was measured before and after intervention. The target population comprised nurses working in the Neonatal Intensive Care Units (NICU) of selected hospitals in Lagos State, where 26 general hospitals exist. Using Taro Yamane's formula, with a target population (N) of 61 and a 5% margin of error, the calculated sample size was 53, increased by 10% for attrition, resulting in 58 nurses. Inclusion criteria required that participants be nurses working specifically in the NICU, regardless of cadre or years of experience, while those in other pediatric units were excluded. A multistage sampling technique was employed: first, simple random sampling selected 50% (three out of six) hospital zones in Lagos State; second, purposive sampling was used to select hospitals within these zones based on relevance; and third, convenience sampling was applied to recruit available nurses due to pandemic-related operational constraints. This approach ensured a representative and feasible sample for the study.

A self-developed structured questionnaire was designed and used to assess nurses' knowledge of the Synactive Theory of Development (STD) and evaluate the impact of an educational intervention. The instrument, developed from the study's objectives, research questions, and literature review, consisted of two sections: Section A captured demographic characteristics such as age, sex, marital status, education, and years of experience; Section B measured participants' knowledge of STD concepts, components, stress signs, and related nursing interventions through 63 true-or-false items, scored to categorize knowledge as below average, average, or high. The questionnaire's content and face validity were reviewed and approved by two nursing experts, while its reliability, confirmed through pilot testing at Lagos State University Teaching Hospital, yielded a Cronbach's Alpha coefficient of 0.95, indicating high internal consistency. Data collection occurred in three phases: pre-intervention (orientation, consent, and pretest), intervention (two sessions of structured teaching on the theory and identification of neonatal stress cues), and post-intervention (administered two weeks later to evaluate knowledge improvement). The researcher ensured confidentiality and collaboration from participants, emphasizing the educational purpose of the study.

Data were collected, entered, cleaned, and analyzed using SPSS version 28. Descriptive statistics such as frequency, percentage, mean, and standard deviation described participants' demographics and knowledge of the synactive theory, while Analysis of Variance (ANOVA)

tested the collected data at a 0.05 significance level. Ethical approval was obtained from Babcock University Health Research Ethical Committee, with informed consent secured from participants. Principles of respect, beneficence, non-maleficence, and justice guided the study, ensuring confidentiality and voluntary participation. The study's outcome is expected to benefit nurses, neonates, parents, and students by improving knowledge, reducing neonatal morbidity and mortality, and enhancing overall healthcare outcomes.

Results

Table 1: Demographic Characteristics of Respondents

Variables		Pre-intervention N=52		Post-intervention N=50	
		Frequency N	Percentage %	Frequency N	Percentage %
Age	25-29years	4	7.7	3	6
	30-34years	13	25	12	24
	35-39years	8	15	8	16
	40years and above	27	51.9	27	54
	Mean age= 39.8; Std dev.= ±5.21				
Gender	Male	6	11.5	6	12
	Female	46	88.5	44	88
Educational qualification	Diploma	26	50	25	50
	Bsc	22	42.3	21	42
	Msc	4	7.7	4	8
Working experience	2-5years	22	42.3	20	40
	6-10years	9	17.3	9	18
	11-16years	3	6.3	3	6.3
	17-20years	4	6.7	4	6.7
	20years and above	14	26.9	14	28
Hospitals	Ifako	18	34.6	18	36
	Massey	20	38.5	18	36
	Randle	14	26.9	14	28

Table 1 presents the demographic characteristics of respondents before and after the intervention. The results show that most participants were aged 40 years and above (51.9% pre-intervention; 54% post-intervention), with a mean age of 39.8 years (SD = ±5.21). The sample was predominantly female (88.5% pre-intervention; 88% post-intervention). In terms of educational qualification, half of the respondents held diplomas, about 42% had bachelor's degrees, and only a small proportion (around 8%) possessed master's degrees. Regarding work experience, most had between 2–5 years of experience (42.3% pre; 40% post), while about one-quarter had over 20 years of experience. The distribution across hospitals indicated that respondents were fairly evenly spread, with Massey accounting for the largest proportion (38.5% pre; 36% post), followed by Ifako (34.6% pre; 36% post) and Randle (26.9% pre; 28% post). Overall, the demographic composition remained consistent across pre- and post-intervention phases.

Table 2: Level of knowledge of nurses working in NICU on five components of synactive theory before intervention

Synactive Components	Levels of knowledge	Category of Scores	Pre-intervention		
			F=52	%=100	Mean±SD
Autonomic	Above average	>4	12	23%	3.69±1.35

Nervous system	Average	2-4	36	69.2%	
	Below average	<2	4	7.7%	
Motor system comp	Above average	3-4	33	63.5%	2.51±0.98
	Average	1-2	17	32.7%	
	Below average	<1	2	3.8%	
Behavioural-system	Above average	4-5	22	42.3%	2.76±1.27
	Average	2-3	21	40.4%	
	Below average	0-1	9	17.3%	
Attention components	Above average	>2	3	5.8%	1.57±0.75
	Average	1-2	44	84.6%	
	Below average	<1	5	9.6%	
Self-regulatory	Above average	4-5	10	19.2%	2.69±1.27
	Average	2-3	32	61.5	
	Below average	0-1	10	19.2%	

Table 2 presents the pre-intervention level of knowledge of nurses working in the Neonatal Intensive Care Unit (NICU) across the five components of the synactive theory. Overall, the findings indicate that nurses demonstrated moderate knowledge before the intervention, with most scoring within the "average" category across components. Knowledge of the autonomic nervous system was relatively higher, with 23% scoring above average and a mean of 3.69±1.35, while the motor system component recorded a mean of 2.51±0.98, with 63.5% performing above average. In contrast, knowledge of attention components was the weakest, reflected by a low mean score of 1.57±0.75, where only 5.8% scored above average and 84.6% were average. Similarly, behavioural and self-regulatory components showed moderate understanding, with mean scores of 2.76±1.27 and 2.69±1.27 respectively. These results suggest that while nurses had some foundational awareness of synactive theory concepts, their knowledge was uneven and generally limited, highlighting the need for targeted educational interventions to strengthen understanding across all components.

Table 3: Level of knowledge of nurses working in NICU on the five components of synactive theory after intervention

	Levels of knowledge	**Category of Scores**	**Post-intervention**		**Mean±SD**
			F	%	
Autonomic Nervous system	High	>3	38	76%	4.30; ±1.95
	Average	2-3	12	24%	
	Low	<2	-		
Motor system components	High	3-4	42	84%	3.08±0.63
	Average	1-2	8	16%	
	Low	<1	-		
Behavioural component	High	>3	39	78%	3.72±1.14
	Average	2-3	7	14%	
	Low	0-1	4	8%	
Attention component	High	2-3	42	84%	2.10±0.81
	Average	1- <2	5	10%	
	Low	<1	3	6%	
Self-regulatory	High	3-5	44	88%	3.34±0.91
	Average	2- < 3	5	10%	
	Low	0-1	1	2%	

Table 3 shows that after the intervention, nurses working in the Neonatal Intensive Care Unit (NICU) demonstrated a generally high level of knowledge across all five components of the synactive theory. The highest level of knowledge was observed in the self-regulatory component, where 88% of the nurses scored within the high category (Mean = 3.34 ± 0.91). This was followed by the motor system (84%, Mean = 3.08 ± 0.63) and attention components (84%, Mean = 2.10 ± 0.81), indicating strong understanding of these aspects. Similarly, 78% of the participants displayed high knowledge of the behavioural component (Mean = 3.72 ± 1.14), while 76% had high knowledge of the autonomic nervous system (Mean = 4.30 ± 1.95). Overall, the results suggest that the intervention significantly improved the nurses' understanding of all components of the synactive theory, with only a small proportion falling within the average or low knowledge categories.

Table 4: Comparison of pre and post knowledge of components of synactive theory among nurses working in NICU

Knowledge	**Scores**	**Hospitals**		**Pre-Intervention**		**Post-intervention**	
			N	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**
Components of Synactive theory							
1. Autonomic Nervous component system	0-6	Ifako	18	3.94	±0.3	3.89	±0.75
		Massey	20	3.80	±1.64	4.83	±3.01
		Randle	14	3.2	±1.31	4.14	±1.02
		Average mean± SD		**3.69±1.35**		**4.30±1.95**	
2. Motor-component system	0-4	Ifako	18	2.33	±0.97	2.94	±0.53
		Massey	20	2.75	±0.96	3.05	±0.80
		Randle	14	2.42	±1.01	3.29	±0.46
		Average mean± SD		**2.51±0.98**		**3.08±0.63**	
3. Behavioural-system	0-4	Ifako	18	2.94	±0.97	3.83	±0.85
		Massey	20	2.90	±1.37	3.66	±1.18
		Randle	14	2.35	±1.33	3.64	±1.44
		Average mean± SD		**2.76±1.28**		**3.72±1.14**	
4. Attention-system	0-3	Ifako	18	1.66	±0.84	2.11	±0.67
		Massey	20	1.60	±0.68	2.22	±0.87
		Randle	14	1.42	±0.75	1.92	±0.92
		Average mean± SD		**1.57±0.75**		**2.10±0.81**	
5. Self-regulatory-system	0-5	Ifako	18	2.8	±1.09	3.11	±0.67
		Massey	20	2.80	±1.32	3.55	±1.14
		Randle	14	2.35	±1.44	3.35	±0.84
		Average mean± SD		**2.69±1.27**		**3.34±0.92**	
Overall components	0-22	**Mean**		**14.03±3.78**		**17.54±5.58**	

The results in Table 4 show a general improvement in nurses' knowledge of the components of the Synactive Theory following the intervention across all the participating hospitals. Before the intervention, the overall mean score for knowledge was 14.03 ± 3.78, which increased to 17.54 ± 5.58 after the intervention. This indicates a positive impact of the training on participants' understanding of the theory. Specifically, all five components such as autonomic nervous system, motor system, behavioural system, attention system, and self-regulatory system recorded higher post-intervention mean scores compared to pre-intervention values. The highest improvement was observed in the motor and behavioural system components, suggesting that the training particularly enhanced nurses' awareness of observable developmental and behavioural cues in neonates.

When comparing across hospitals, Massey Hospital generally recorded the highest post-intervention mean scores across most components, indicating a greater knowledge gain compared to Ifako and Randle. This variation may be due to differences in staff experience, engagement levels, or prior exposure to neonatal developmental care practices. Despite slight variations, all hospitals demonstrated improved understanding across components, confirming that the educational intervention was effective in strengthening nurses' comprehension of the Synactive Theory and its application in neonatal intensive care settings.

Table 5: Analysis of variance (ANOVA) of difference between pre and post-intervention knowledge of the five components of synactive theory of development

		Sum of Squares	df	Mean Square	F	Sig.
Components of synactive theory	Between Groups	312.529	1	312.529	23.000	0.000
	Within Groups	1358.345	100	13.583		
	Total	1670.873	101			
	Pre-test mean; SD= 14.03±3.783					
	Post-test mean; SD= 17.53±5.58					
Components						
Autonomic nervous subsystem	Between Groups	9.413	1	9.413	3.367	0.69
	Within Groups	279.577	100	2.796		
	Total	288.990	101			
	Pre-test mean; SD= 3.69±1.35					
	Post-test mean; SD= 4.30±1.95					
Motor sub system component	Between Groups	8.016	1	8.016	11.674	0.001
	Within Groups	68.661	100	.687		
	Total	76.676	101			
	Pre-test mean SD =2.51±0.98					
	Post-test mean± SD = 3.08±0.63					
Behavioural sub system component	Between Groups	23.042	1	23.042	15.642	0.000
	Within Groups	147.311	100	1.473		
	Total	170.353	101			
	Pre-test mean ± SD =2.72±1.27					
	Post-test mean ±SD= 3.72±1.14					
Attention sub system component	Between Groups	6.974	1	6.974	11.397	0.001
	Within Groups	61.192	100	.612		
	Total	68.167	101			
	Pre-test mean; ±SD= 1.57±0.75					
	Post-test mean± SD = 2.10±0.81					
Self-Regulatory sub system component	Between Groups	10.693	1	10.693	8.603	0.004
	Within Groups	124.297	100	1.243		

	Total	134.990	101			
	Pre-test mean; SD	2.69±1.27				
	Post-test mean; SD	3.34±0.91				

The analysis of variance (ANOVA) in Table 5 reveals a statistically significant difference between the pre- and post-intervention knowledge of the five components of the synactive theory of development among participants. The overall F-value of 23.000 with a p-value of 0.000 ($p < 0.05$) indicates that the intervention had a significant impact on participants' overall knowledge. The mean knowledge score increased notably from 14.03 ± 3.78 before the intervention to 17.53 ± 5.58 afterward, suggesting that the intervention effectively enhanced understanding of the synactive theory's principles. This finding implies that the educational or training intervention successfully improved participants' comprehension of the developmental framework.

When each component was analyzed individually, varying degrees of improvement were observed. Significant differences were recorded in the motor subsystem ($F = 11.674$, $p = 0.001$), behavioral subsystem ($F = 15.642$, $p = 0.000$), attention subsystem ($F = 11.397$, $p = 0.001$), and self-regulatory subsystem ($F = 8.603$, $p = 0.004$), showing that participants' knowledge improved meaningfully across these areas after the intervention. However, the autonomic nervous subsystem ($F = 3.367$, $p = 0.069$) did not show a statistically significant difference, suggesting that this aspect was less influenced by the intervention. Overall, the findings indicate that while the intervention was generally effective, additional emphasis may be needed on the autonomic nervous subsystem to achieve balanced improvement across all five components of the synactive theory.

Discussion of Findings

The findings of this study provide a comprehensive understanding of the demographic characteristics, baseline knowledge, and the effect of the educational intervention on nurses' understanding of the five components of the Synactive Theory of Development (STD). The mean age of the participants was 39.8 years, with a standard deviation of ±5.21. Most of the nurses were within the age bracket of 40 years and above. This age distribution may be attributed to the fragile nature of the neonatal intensive care unit (NICU), which requires mature, emotionally stable, and experienced personnel. Handling neonates especially preterm or medically fragile infants demands high levels of sensitivity, observation, and judgment. Therefore, the predominance of older and more experienced nurses suggests that the unit prioritizes maturity and professional competence, which are essential for identifying developmental challenges and ensuring effective neonatal care.

Regarding educational qualification, half of the participants (50%) possessed a nursing diploma, while 42.3% held a Bachelor of Science in Nursing (BSc), and only a small proportion had a Master's degree. This limited number of postgraduate-qualified nurses might be due to staffing shortages and the demanding work schedules typical of NICUs, which leave little time for further studies. The shortage of nurses in specialized units often results in heavy workloads and shift duties, making it difficult for nurses to pursue higher academic qualifications. Despite these constraints, the high percentage of diploma and bachelor's degree holders indicates that the participants had a solid foundational knowledge in nursing practice. Additionally, most participants had a minimum of six years of experience, while less than half had between two and five years of experience mainly student nurses or fresh graduates. The finding that 57.7% of participants were experienced implies substantial exposure to a variety of neonatal cases. This depth of experience is likely to have enhanced

their practical understanding of developmental care and influenced their ability to apply theoretical knowledge to clinical situations effectively.

At the pre-intervention stage, results revealed that participants demonstrated only average knowledge across the five components of the Synactive Theory of Development such as autonomic, motor, behavioural, attention, and self-regulatory subsystems. This aligns with the findings of Isabelle Milette (2016), who reported that nurses exhibited average to high pre-test knowledge levels, particularly in areas related to attention and behavioural components. Milette attributed these findings to prior short-term training sessions and accumulated professional experience with developmental care in NICUs. However, the current study's result contrasts with Soleimani et al. (2020), who found that nurses in developing countries such as Jordan had limited knowledge of developmental care practices and the components of the Synactive Theory, highlighting a gap in formal education and continuing professional development. The contrasting outcomes may be explained by contextual differences in training opportunities and healthcare infrastructure between Nigeria and other developing settings.

Following the intervention, a remarkable improvement in participants' knowledge was recorded. The mean knowledge score increased from 14.03 to 17.54, representing a mean difference of 3.51. This increase demonstrates that the educational intervention had a positive and measurable impact on the nurses' understanding of the Synactive Theory and its practical components. Participants gained broader insight into how each subsystem interrelates in neonatal development and care. This improvement is consistent with findings by Scala et al. (2020), who reported that nurses trained to manage environmental and procedural stressors in NICUs contributed to reducing neonatal stress responses and even the risk of sudden infant death syndrome. The implication is that enhanced knowledge through training translates to better care practices and improved neonatal outcomes.

Furthermore, statistical analysis showed a significant difference between pre- and post-intervention knowledge (mean difference = 3.50; $t = -4.797$; $p < 0.05$), signifying that the intervention program had a tangible and positive impact. The low p-value indicates that the observed difference did not occur by chance but resulted from the structured educational program. This outcome reinforces the importance of continuous professional education in improving clinical competence among nurses. In the same vein, Isabelle and Milette (2016) also found a statistically significant increase in nurses' knowledge following training on the Synactive Theory, emphasizing the power of structured learning in shaping professional practice.

Conclusion

The findings of this study clearly demonstrate that the educational intervention had a meaningful impact on improving nurses' understanding of the Synactive Theory of Development and its five major components such as autonomic, motor, behavioural, attention, and self-regulatory subsystems. Before the intervention, nurses' knowledge levels were generally moderate, with some gaps, particularly in the attention and self-regulatory components. Following the intervention, however, a marked improvement was observed across all areas, indicating that the training successfully deepened the participants' comprehension and ability to apply the theory to neonatal care. The enhancement in knowledge also suggests that structured, context-specific educational programs can effectively build the capacity of nurses working in Neonatal Intensive Care Units (NICUs), thereby promoting better developmental care for neonates. Nonetheless, the relatively lower improvement observed in the autonomic nervous subsystem highlights the need for more

focused instructional strategies in this area to ensure balanced competency across all components.

Recommendations

1. Regular refresher courses and workshops should be organized for NICU nurses to sustain and enhance knowledge on the components of the Synactive Theory and their practical applications in neonatal care.
2. Nursing schools and training institutions should integrate the Synactive Theory of Development into neonatal nursing curricula to ensure early exposure and understanding among future practitioners.
3. Future educational interventions should devote more attention to less improved areas, particularly the autonomic nervous subsystem, through simulation-based and case-driven teaching approaches.
4. Hospital management should create enabling environments that encourage nurses to pursue continuous education by providing time allowances, sponsorships, and access to professional development resources.
5. A systematic monitoring system should be established to evaluate the long-term impact of such training programs on nursing practice and neonatal outcomes, ensuring sustained knowledge retention and clinical application.

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