

A study to assess the effectiveness of nesting technique on sleep pattern and physiological parameters among the premature neonates admitted at District hospital, Sasaram, Rohtas, Bihar

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Abstract

Background: The Neonatal Intensive Care Unit is specially built to prevent pain, promote quiet sleep and maintain stable physiological parameters among preterm neonates. The essential components of brain development in neonatal period are sleep. Nesting is individually modelled and specially designed and has proved in providing effective comfort, support and help preterm to develop normally in NICU. Neonatal Nurse requires skill, dedication and emotional strength to care for newborn, preterm and sick infants.

Aims: Thesis of the study is to evaluate effectiveness of nesting on sleep pattern and physiological parameters of preterm infants and also to find the correlation, association between the sleep pattern with physiological parameters.

Method: A Qualitative research, pre-test and post-test control group design was adopted. A total Premature Neonates were selected using non- probability purposive sampling and assigned equally into study (n=30) and control (n=30) groups admitted in SNCU. The study group received nesting technique to assess the sleeping pattern and physiological parameters in premature neonates admitted in SNCU. Sleep pattern assessed by Modified Prechtl's criteria and self-structured observation check list to assess physiological parameters (Heart rate, respiration rate and saturation of oxygen through biomedically tested standard equipment through Cardiac Monitor).

Results: The findings of the study revealed that there was a significant improvement in sleep pattern and Physiological Parameters after intervention of Nesting at 'p' value < 0.05 level of significance. Statistical analysis using paired and unpaired test confirmed the effectiveness of the intervention. Premature Neonatal outcomes were also favorable in the intervention group, with higher sleeping pattern with maintain physiological parameters. In the post-test assessment, a remarkable induction in sleep pattern and maintained physiological parameters in study group. Their mean sleep pattern increased (SD =1.92) compared to (SD=3.45) in the control group. Their mean in physiological parameters (heart rate, respiration rate, saturation of oxygen) stable heart rate to (SD=6.12 to SD 6.12) in control group, respiration rate (SD=5.22 to SD=3.15) in control group and saturation of oxygen (SD= 10.55 to SD=6.60) in control group. The statistical test confirmed a significant difference (t= 5.13, p =<0.001). Premature neonates their physiological parameters also reflected an improved by the Nesting technique intervention.

Conclusion: The mean Post test score of Sleep Pattern and PP (Physiological Parameters)

5.20 and 5.96 and 10.55 were significantly higher than the mean pretest score of 5.13 and 9.96, 4.86, 1.81. The findings clearly revealed that nesting was effective in increasing the Physiological Parameters and Sleep Pattern in the Preterm Neonates. And a significant correlation at p<0.05.

Keywords: Nesting, premature neonates, Prechtl's Criteria, physiological parameter, SNCU

Introduction

Preterm infants are often born before their physiological systems and central nervous systems are fully mature. Consequently, they require a nurturing, womb-like environment to support their continued growth. The Neonatal Intensive Care Unit (NICU) environment, while lifesaving, can be overwhelming. These babies are often subjected to continuous light, harsh noises, and frequent medical procedures, which can lead to sensory overload, stress, erratic sleep patterns, and fluctuating vital signs.

Premature birth is a major global health concern and is associated with increased neonatal morbidity and mortality. A premature neonate is defined as a baby born before 37 completed weeks of gestation. Due to the immaturity of body systems, premature neonates often experience difficulties in maintaining body temperature, stable physiological functions, proper sleep patterns, and growth.

These neonates require specialized care and monitoring in the Neonatal Intensive Care Unit (NICU).

Sleep is an essential component for the growth and neurological development of premature neonates. Adequate sleep promotes brain maturation, energy conservation, tissue repair, and overall physiological stability. However, the NICU environment exposes neonates to excessive light, noise, frequent handling, and medical procedures, which can disturb their sleep and negatively affect physiological parameters such as heart rate, respiratory rate, oxygen saturation, and body temperature.

Statement of The Problem

A study to assess the effectiveness of nesting technique on sleep pattern and physiological parameters among the premature neonates admitted at district hospital, Sasaram, Rohtas, Bihar.

Objectives

1. To assess & compare pretest level of sleep pattern, physiological parameters among the premature neonates between the study & control group.
2. To assess & compare post-test level of sleep pattern, physiological parameters among the premature neonates between the study and control group.
3. To evaluate the effectiveness of nesting on sleep pattern, physiological parameters the among premature neonates in the study group.
4. To correlate the pretest & post-test level of sleep pattern with physiological parameters the among premature neonates in the study group & in control group.
5. To associate the pre-test and post-test level of sleep pattern with physiological parameters with demographic variables in study and control group.

Operational Definition

Assess: Systematic measurement and observation of sleep pattern and physiological parameters among premature neonates.

Effectiveness: The extent to which the impact of the nesting technique has brought about the desired increase in sleeping pattern and physiological parameters among premature infants at SNCUs, measured using standardized observation tools.

Nesting: Positioning premature neonates in a flexed and contained posture using rolled towels to simulate the intrauterine environment, given for an interval of 30 minutes up to 2 hours per day for 6 days after 20–25 minutes of breastfeeding.

Sleep Pattern: Total amount of time (in minutes) of uninterrupted sleep observed among premature neonates during the observation period, assessed by Precht's criteria sleep score cycle.

Physiological Parameters: Measurable characteristics reflecting normal body functioning, including respiratory rate, heart rate, body temperature, and oxygen saturation (SpO_2).

Respiration Rate: Number of breaths taken by the premature neonate in one full minute, assessed via a standardized neonatal cardiac monitor.

Heart Rate: Number of heartbeats measured in one full minute using a calibrated stethoscope or standardized neonatal monitor.

Oxygen Saturation: Percentage of oxygen bound to haemoglobin in the blood, measured using a standardized pulse oximeter (SpO_2).

Premature Neonates: Infants born between 32–36 weeks of gestational period hospitalized in the SNCU.

SNCU: Specialized Neonatal Care Unit providing intensive and supportive care for sick and premature neonates.

Research Hypothesis

RH1: There is a significant difference in the pretest level of sleep pattern, and physiological parameters among premature neonates between the study & control group.

RH2: There is a significant difference in the post-test level of sleep pattern and physiological parameters among premature neonates between the study & control group.

RH3: There is a significance difference between the pretest & post-test level of sleep pattern, and physiological parameters among premature neonates in the study group.

RH4: There is a significant correlation of the pretest & post-test level of sleep pattern, and physiological parameters among premature neonates with their demographic variables in the study group & control group.

RH5: There is a significant association between pre-test and post-test level of sleep pattern and physiological parameters with demographic variables among the premature neonates in study and control group.

Assumptions

- Premature neonates may experience disturbed sleep due to environmental factors in SNCU.
- Proper positioning helps in maintaining physiological stability.
- Nesting technique provides comfort and promotes sleep in premature neonates. • Physiological parameters can improve with supportive positioning intervention.

Delimitations

- Data collection is 4 weeks
- Premature neonate between (32-36 weeks) admitted in SNCU.
- Neonates available during the period of data collection.

Conceptual Framework

Betty Neuman's General Nursing Theory is a holistic, stress-based nursing theory. It views the client as an open system in constant interaction with internal and external environments. The primary goal of nursing is to maintain system stability by preventing or reducing stressors through appropriate nursing interventions.

Nursing Intervention (Nesting Technique)

Neuman's Related Needs Addressed (Physiological Needs: Nesting supports, Developmental Needs: Nesting simulates the intrauterine environment, Psychological Needs: nesting improves comfort and sense of security. Environmental Needs: Nesting acts as a buffer against SNCU environmental stressors).

Mechanism of Action (Stressors: To improved Sleep duration by Nesting technique. Holistic Support: Nesting addresses physiological, developmental, psychological, and environmental needs.

Outcomes (Heart rate and respiration rate stability, Oxygen saturation maintenance within normal range, Sleep quality reduced awakenings and startle responses)

Research Methodology

A Qualitative research, pre-test & post-test control group design was adopted. A total Premature Neonates were selected using non- probability purposive sampling and assigned equally into study ($n=30$) and control ($n=30$) groups admitted in SNCU.

Research Design A Quasi Experimental Pre-Test Post-Test research design. Was adopted involving random selection,

manipulation of the independent variable and a control group.

Research Variables

Independent Variable: Nesting technique.

Dependent Variable: The Sleep pattern & physiological parameters of the Premature neonates.

Research Setting: The main study conducted in Sadar Hospital, Sasaram in Rohtas District. And pilot study conducted Narayan Medical College & Hospital, Jamuhar, Rohtas, Bihar.

Population: Population includes entire set of individuals with some common characteristics. It encompasses both target and accessible population.

Target population: The target in the current study are all the premature neonates admitted in hospital of Sasaram, Rohtas, Bihar.

Accessible Population: The Accessible Population in the current study are all the premature neonates admitted SNCU at Government (Sadar) district hospital, Sasaram, Rohtas, Bihar.

Samples: The Accessible Population in the current study are all the premature neonates admitted SNCU at Government (Sadar) district hospital, Sasaram, Rohtas, Bihar, who fulfils the selection criteria.

Sampling Technique: Adopted non-probability purposive sampling technique for selecting studies for both study and control group.

Sample Size: The total sample size was 60 (30 participant in study group and 30 in control group).

Sampling Criteria

Inclusion Criteria

- Premature neonates who delivered between 32- 36 weeks of gestation.

- Premature neonates who admitted at SNCU of district hospital, Sasaram.
- Premature neonates admitted within 25 days of delivery.
- Premature neonates who's weight under 1500- 2000 grams.
- Those who breath spontaneously or, receiving non-invasive support if, stable.
- Premature neonates have parental or legal guardian informed consent.

Exclusion criteria

- Neonates completed one month after delivery.
- High risk babies like ventilator support & respiratory distress syndrome etc. are not be the part of study.
- Babies who have congenital anomalies genetic disorders like Hydrocephalus, spina bi Fida etc.
- Neonates who suffered severe birth asphyxia/ hypoxic Ischemic Encephalopathy

Development & description of the tool

- **Part A & B:** Structured questionnaire for demographic, neonatal, and clinical variables.
- **Part C:** Modified Prechtl's Criteria Scale (MPCS, 1993) ranging from 0–26 to assess sleep patterns (0–8 Quiet sleep, 9–17 Active sleep, 18–26 Indeterminate sleep).
- **Part D:** Self-structured observational checklist to assess physiological parameters (Heart Rate, Respiration Rate, and SpO₂) on a scale of 0–9.

Reliability of the Tool: Established via inter-rater reliability, yielding $r = 0.92$ for Modified Prechtl's scale and $r = 0.9$ for physiological parameters.

Ethical Consideration: Approved by the institutional ethics committee of Narayan Nursing College.

Result

Table 1: Frequency & Percentage distribution of the demographic variables of parents of premature neonates. N=60 (30+30)

Description of the variables	Study group (n=30)		Control group (n=30)	
	Frequency (f) (%)	Percentage	Frequency	Percentage (f) (%)
Age of mother				
18-21 yrs	4	13.3	5	16.7
22-25 yrs	12	40	11	36.7
26-29 yrs	10	33.3	10	33.3
≥30 yrs	4	13.3	4	13.3
Number of children				
1	18	60	15	50
2	8	26.7	10	33.3
3 or more than	4	13.3	5	16.7
Mode of conception				
Spontaneous	25	83.3	26	86.7
IVF	3	10	2	6.7
Other	2	6.7	2	6.7
Any complications				
Yes	7	23.3	6	20
No	23	76.7	24	80
Education of parents				
Profession	7	23.3	6	20
Graduate	23	76.7	24	80

Intermediate	8	26.7	5	16.7
High school	7	23.3	6	20
Middle school	6	20	10	33.3
Primary school	4	13.3	4	13.3
Illiterate	1	3.3	2	6.7
Occupation of parents				
Profession	3	10	2	6.7
Semi-Profession	4	13.3	5	10
Clerical/Farmer	8	26.7	7	23.3
Skilled worker	6	20	8	26.7
Semi-skilled worker	4	13.3	3	10
Unskilled worker	3	10	4	13.3
Unemployed	2	6.7	1	3.3
family income				
>1,06,000	2	6.7	1	3.3
53,000-1,05,999	4	13.3	5	16.7
39,750- 52,999	6	20	7	23.3
31,800-39,749	8	26.7	6	20
21,200-31,799	5	16.7	6	20
10,600-21,199	3	10	4	13.3
<10,599	2	6.7	1	3.3
Mode of delivery				
Normal delivery	12	40	14	46.7
L.S.C. S	15	50	13	43.3
Forceps Delivery	3	10	3	10
Order of birth				
Singleton	24	80	25	83.3
Twins/multiple	6	20	5	16.7

Table 2: Frequency & Percentage distribution of the neonatal variables of premature neonates. N= 60 (30+30)

Description of the variables	Study group (n=30)		Control group (n=30)	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
Gestational age of delivery				
32-33 weeks	10	33.3	9	30
34-35 weeks	12	40	13	43.3
36 weeks	8	26.7	8	26.7
Age of birth				
1-8 days	9	30	10	33.3
9-16 days	12	40	5	16.7
17-25 days	9	30	15	50
Length of baby				
35-39 cm	5	16.7	6	20
40-44 cm	16	53.3	08	26.7
45-48 cm	10	33.3	15	5
Head circumference				
25-28 cm	8	26.7	9	30
29-30 cm	14	46.7	8	26.7
31-33 cm	8	26.7	13	43.3
Light conditions during sleep				
Dim	14	46.7	10	33.3
Normal	11	36.6	12	40
Bright	6	20	7	23.3

Table 3: Frequency percentage distribution of the clinical variables of the premature neonates. N= 60 (30+30)

Description of the variables	Study group		Control group	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
Age in days				
1 – 8 days	15	50	14	46.7
9 – 16 days	10	33.3	11	36.7
17 – 25 days	5	16.7	5	16.7
Gender				
Male	17	56.7	16	53
Female	13	43.3	14	46.7
Other	0	0	0	0
Birth weight				

1500 – 1700 gm	18	60	17	56.7
1800 – 2000 gm	12	40	13	43.3
Apgar score				
0 – 3	2	6.7	3	10
4 – 6	9	30	10	33.3
7 – 10	19	63.3	17	56.7
Feeding method				
Breastfeeding	20	66.7	19	63.3
Katori spoon feeding	8	26.7	9	30
Other	2	6.7	2	6.7
Duration of SNCU stay				
1 – 6 days	12	40	13	43.3
7 – 12 days	14	46.7	13	43.3
>12 days	4	13.3	4	13.3

Table 4: Mean, Standard Deviation, Unpaired t-test of sleep pattern & physiological parameters among premature neonates in study & control group. N=60 (30+30)

Clinical variable	Group	Mean	SD	Mean Difference	Unpaired t- test
Sleep pattern	Study group	10.14	3.15	0.70	t- 0.80, df-58 p= 0.42/ NS
	Control group	10.14	3.54		
Heart Rate	Study Group	142.71	10.33	1.01	t- 0.39, df-58 p=0.69/ NS
	Control group	143.72	9.36		
Respiration Rate	Study Group	49.47	4.08	1.37	t- 1.06, df-58 p=0.29/ NS
	Control group	48.10	5.79		
Saturation of Oxygen	Study Group	93.70	1.53	0.74	t- 1.40, df 58 p= 0.17/ NS
	Control group	92.96	2.46		

*p <0.005 Significant, ** p High Significant, *** p<0.001 Very High Significant

Table.5: Evaluate the effectiveness of nesting technique test on sleep pattern & physiological parameters among premature neonates in study group.

Clinical Variable	Pre-Test Mean SD	Post-Test Mean SD	Mean	SD	t-value	df	p-value
Sleep Pattern	10.14 ± 3.15	14.86 ± 1.92	4.72	7.12	5.13	29	<0.001 Significant
Heart Rate	142.71 ± 10.33	134.20 ± 6.12	8.51	4.68	9.96	29	<0.001 Significant
Respiration Rate	49.47 ± 4.08	41.30 ± 3.15	8.17	9.14	4.86	29	<0.001 Significant
Saturation of Oxygen	93.70 ± 1.53	97.80 ± 1.10	4.10	12.35	1.81	29	<0.001 Significant

Table 6: Evaluate the effectiveness of nesting technique test on sleep pattern & physiological parameters among premature neonates in control group

Clinical Variable	Pre-Test Mean SD	Post-Test Mean SD	Mean	SD	t-value	Df	p-value
Sleep Pattern	10.14 ± 3.54	10.22 ± 3.42	0.08	0.35	1.25	29	>0.082 Non-Significant
Heart Rate	142.71 ± 9.36	143.55 ± 9.10	0.17	1.15	0.81	29	>0.094 Non-Significant
Respiration Rate	48.10 ± 5.79	48.35 ± 5.62	0.25	1.30	1.05	29	>0.057 Non-Significant
Saturation of Oxygen	92.96 ± 2.46	93.10 ± 2.35	0.14	0.75	1.02	29	>0.214 Non-Significant

Table 7: Correlation between sleep pattern & physiological parameters among premature neonates in study & control group. N=60(30+30)

Group	Sleep Pattern Vs Heart Rate		Sleep Pattern Vs Respiration Rate		Sleep Pattern Vs Saturation of oxygen		Interpretation
	r value	p value	r value	p value	r value	p value	

Study Group							
Pre-test	0.28	0.13	0.24	0.19	0.31	0.008	NS
Post-test	0.74	<0.001	0.69	<0.001	0.78	<0.001	S
Control Group							
Pre-test	0.25	0.17	0.22	0.24	0.19	0.29	NS
Post-test	0.21	0.25	0.18	0.33	0.24	0.19	NS

Table 8: Association of Pre-test & Post-test of sleep pattern & physiological parameters with demographic, neonatal & clinical variables in study & control group. N=60(30+30)

Demographic/ Neonatal/ clinical variables	Study Group		Control Group	
	Pre-test	Post-test	Pre-test	Post-test
Age of Mother	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Number of children	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Mode of conception	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Any complications	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Parents Education	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Parents Occupation	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Family Income	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Mode of delivery	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Order of Birth	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Gestational age of delivery	S (p<0.001)	S (p<0.001)	S (p<0.001)	S (p<0.001)
Age of Birth	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Length of baby	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Head circumference	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Light conditions while sleeping	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Age in Days	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Gender	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Birth weight	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Apgar score	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Feeding method	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)
Duration of SNCU stay	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)	NS (p>0.05)

Data Analysis and Interpretation

The data collected from 60 premature neonates (30 in the study group and 30 in the control group) were coded, tabulated, and analysed using descriptive and inferential statistics via SPSS version 29.0.

Summary pre-test homogeneity: Baseline comparisons using independent t-tests confirmed no statistically significant differences between the study and control groups regarding sleep patterns, heart rate, respiration rate, or oxygen saturation ($p > 0.05$). Post-test effectiveness: Following the implementation of the nesting technique, the study group demonstrated highly significant improvements compared to the control group. Sleep Pattern: 86.67% of neonates in the study group transitioned into consolidated quiet sleep, whereas control group infants mostly remained in active or fragmented sleep. Physiological Parameters: Significant stabilization was observed in the study group, with the majority achieving optimal moderate heart rates, regulated respiration rates, and high optimal oxygen saturation (95 – 100%) without hypoxic dips.

Discussion

The present study was undertaken to evaluate the effectiveness of nesting technique as a nursing intervention on sleep pattern and physiological parameters among premature neonates. Data was collected from a total of 60 premature neonates (30 in study group, 30 in control group) and was analysed for demographic variables, neonatal variables and clinical variables, sleep pattern and physiological parameters. The discussion is organized under

the following sections. Post-test scores showed a significant reduction in the study group compared to controls ($p<0.001$) with paired t-test analysis confirming improvement from indeterminant to quite sleep. These findings highlight nesting technique is a safe, cost effective, and culturally acceptable adjunct for managing physiological parameters (heart rate, respiration rate and saturation of oxygen).

Nursing Implications

The findings of the study have certain important implications for the nursing services, education, administration and nursing research. Nursing Practice

- **Non-Pharmacological Intervention:** Nurses should utilize nesting as a primary, cost-effective strategy to stabilize SPO₂ and heart rate (HR), particularly after stressful procedures like diaper changes or blood draws.
- **Cluster Care Integration:** Nesting should be timed with "cluster care" to maximize Quiet Sleep (State 1). Research shows nesting increases total sleep pattern, which is vital for brain maturation.
- **Energy Conservation:** Practice should prioritize nesting to reduce "startle" reflexes and spontaneous movements, thereby conserving glucose and calories for physical growth. Nursing Education
- **Curriculum Development:** Incorporate "Developmentally Supportive Care" modules in paediatric nursing curricula, specifically teaching the

"U" or "O" shape nesting methods using sterilized materials.

- **Staff Competency Programs:** Nurse educators should implement training workshops. Studies indicate that structured teaching can increase nurse knowledge/practice accuracy from ~60% to over 90%.
- **Parental Teaching:** Nurses must educate parents on the why (physiological stability) and how (mimicking the womb) of nesting, while strictly teaching Safe Sleep Guidelines for transition to home and reduce the sudden infant death syndrome.

Nursing Administration

- **Protocol Standardization:** Administrators should develop and mandate a **NICU Positioning Protocol**. Without a formal policy, nesting remains an "optional" task rather than a standard of care.
- **Resource Allocation:** Ensure the availability of high-quality, breathable, and biocompatible nesting materials (like specialized "bumpers" or soft turkey towels) to avoid skin breakdown or overheating.
- **Policy & Safety:** Managers must ensure that nesting is only used for monitored neonates in the NICU. Policies should include strict criteria for weaning infants off nests as they approach discharge. Nursing Research
- **Longitudinal Studies:** Future research should move beyond short-term physiological stability to track long-term neurodevelopmental and motor outcomes (e.g., incidence of plagiocephaly or hip dysplasia).
- **Comparative Effectiveness:** Conduct studies comparing "homemade" nests (rolled towels) versus commercial "nesting aids" to determine cost-effectiveness and safety profiles.
- **Biomarker Analysis:** Research could explore the effect of nesting on cortisol levels (stress hormone) to provide more objective data on psychological wellbeing.

Recommendations

A similar study can be done in a large multistage sample size.

A similar study can be done in a different setting (Hospital & Community).

A comparative study between premature neonates and mature infants.

Limitations

The data collection period was only one month.

Mother was taking the babies for breastfeeding.

Sometimes the babies are passing the urine and unable to sleep early.

Early discharge from hospital.

Conclusion

A midwife role and the outmost goal is to focus on the ways to promote sleep and stable physiological parameters and make premature neonates relax and calm in SNCU. The study result concludes that nursing intervention like nesting

technique has great impact and is effective in inducing sleeping pattern and stable physiological parameters. The researcher feels that the discomforts faced by the premature neonates must be given more emphasis by the midwives while caring for their major needs involving the neonates and their family members.

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