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Shift Swaps and Sleep Debt: A Dyadic Analysis of Roster Negotiations, Fatigue, and Emotional Strain among Indian Nurses

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Abstract

Nurses frequently engage in shift swaps to accommodate personal, professional, and organizational demands. Although shift swapping offers scheduling flexibility, it may simultaneously contribute to sleep disruption, fatigue, and emotional strain. Existing research has predominantly examined shift work from an individual perspective, providing limited insight into the interpersonal and relational dynamics associated with roster negotiations. The present study investigates the relationships among shift swap burden, sleep debt, fatigue, emotional strain, and perceived fairness among Indian nurses using a dyadic analytical perspective.

Data were collected from 215 nurses employed in government and private healthcare institutions across India. Participants reported their experiences of shift swap burden, sleep debt, fatigue, emotional strain, and fairness associated with roster negotiations. Descriptive statistics, reliability analysis, correlation analysis, regression analysis, moderation testing, and exploratory dyadic assessments were employed to examine the proposed relationships.

The findings indicate that greater shift swap burden is associated with increased sleep debt, which in turn contributes to fatigue and emotional strain. Perceived fairness emerged as an important contextual factor that attenuated adverse psychological outcomes. Exploratory dyadic findings further suggest that roster negotiations generate interdependent consequences that extend beyond individual nurses and influence counterpart employees involved in shift exchanges.

The study contributes to occupational health psychology by extending existing shift-work literature beyond traditional scheduling perspectives and conceptualizing shift swaps as relational workplace processes. Practical implications for nurse scheduling,

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workforce well-being, and organizational policy are discussed. The findings highlight the importance of fair and transparent scheduling systems in promoting employee health, reducing fatigue-related risks, and supporting sustainable healthcare workforce management.

Keywords: Shift Swamps | Sleep Debt | Emotional Strain | Dyadic Analysis | Nurses | Occupational Health Psychology |Fatigue

I. Introduction

Healthcare systems operate continuously and rely heavily on shift-based workforce arrangements to ensure uninterrupted patient care and organizational functioning. Among healthcare professionals, nurses constitute the largest frontline workforce responsible for maintaining patient safety, monitoring clinical conditions, administering treatments, and coordinating care across multiple settings. The nature of nursing work frequently requires employees to engage in rotating schedules, night duties, extended working hours, and irregular roster patterns that can significantly influence physiological recovery and psychological well-being (Åkerstedt & Wright, 2009; Garde et al., 2020).

Over the past three decades, researchers have consistently documented the adverse consequences of nonstandard work schedules on employee health. Shift work has been associated with circadian rhythm disruption, sleep disturbances, fatigue, impaired cognitive functioning, emotional exhaustion, and reduced occupational performance (Costa, 2010; Folkard & Tucker, 2003). These outcomes are particularly concerning within healthcare settings because diminished alertness and psychological functioning among nurses may directly affect patient safety, treatment quality, and organizational effectiveness (Dorrian et al., 2011). While substantial attention has been devoted to the impact of formal shift schedules, comparatively limited research has examined informal scheduling practices that occur within healthcare environments. One such practice is the use of shift swaps, whereby nurses voluntarily exchange scheduled duties with colleagues to accommodate personal, family, educational, or professional obligations. In many healthcare institutions, shift swapping functions as an informal mechanism that provides flexibility within otherwise rigid scheduling systems. Although such arrangements may help organizations maintain staffing continuity and allow employees greater autonomy over work schedules, they may simultaneously introduce hidden psychological and physiological costs.

Shift swaps often require nurses to assume duties that differ from their originally assigned schedules. Such changes may include accepting additional night shifts, consecutive working days, compressed recovery periods, or altered circadian patterns. Consequently, the flexibility gained through roster negotiations may come at the expense of adequate rest and recovery. Despite the prevalence of shift-swapping practices in healthcare settings, relatively little is known about how these arrangements influence sleep patterns, fatigue, and emotional functioning among nurses. The concept of sleep debt provides an important framework for understanding the consequences of irregular scheduling practices. Sleep debt refers to the cumulative deficit that develops when individuals consistently obtain less sleep than is required for optimal functioning (Van Dongen et al., 2003). Unlike acute sleep deprivation, sleep debt accumulates gradually and may remain largely unnoticed by individuals despite producing

measurable impairments in attention, decision-making, emotional regulation, and physical performance (Buysse, 2014). Research has shown that even moderate reductions in sleep duration can generate cumulative effects over time, resulting in decreased alertness, slower reaction times, impaired memory, and increased vulnerability to stress (Wright et al., 2013).

Within nursing populations, sleep debt represents a particularly significant occupational health concern. Nurses frequently work rotating schedules that disrupt natural circadian rhythms and reduce opportunities for consistent sleep recovery. Studies have demonstrated that sleep restriction among nurses is associated with medication errors, decreased concentration, workplace accidents, emotional instability, and reduced job satisfaction (Dorrian et al., 2011; Garde et al., 2020). Given the safety-critical nature of nursing work, understanding factors that contribute to sleep debt is essential for both employee well-being and healthcare quality.

One of the most frequently reported consequences of sleep debt is fatigue. Fatigue is a multidimensional construct encompassing physical exhaustion, cognitive weariness, reduced energy, and emotional depletion arising from prolonged demands and inadequate recovery (Sonnentag & Fritz, 2007). Within occupational health psychology, fatigue is recognized as a critical mediator linking workplace demands to adverse psychological and behavioral outcomes (Bakker & Demerouti, 2017). Chronic fatigue has been associated with impaired decision-making, reduced productivity, diminished work engagement, increased absenteeism, and elevated risk of burnout (Maslach & Leiter, 2016). In healthcare environments, fatigue carries particularly serious implications because nurses routinely perform complex tasks requiring sustained attention, rapid decision-making, and high levels of interpersonal sensitivity. Fatigued nurses may experience reduced vigilance, impaired clinical judgment, and difficulties in maintaining effective communication with patients and colleagues. Consequently, identifying workplace factors that contribute to fatigue remains a priority for researchers, healthcare administrators, and policymakers.

Beyond physical and cognitive consequences, sleep disruption and fatigue also affect emotional functioning. Emotional well-being plays a central role in nursing performance because healthcare professionals frequently encounter situations involving uncertainty, suffering, patient distress, and high emotional demands. Chronic sleep debt has been associated with increased irritability, anxiety, frustration, mood instability, and emotional exhaustion (Grandey, 2000). Research suggests that sleep loss impairs emotional regulation processes, making individuals more reactive to workplace stressors and less capable of managing negative affective experiences effectively (Watson et al., 1988).

The relationship between sleep debt and mood is particularly relevant within nursing contexts because emotional functioning influences both employee well-being and quality of patient care. Nurses experiencing elevated emotional strain may be more susceptible to interpersonal conflict, reduced empathy, decreased job satisfaction, and psychological distress. Therefore, examining mood outcomes alongside fatigue provides a more comprehensive understanding of the psychological consequences of shift-related scheduling practices.

Although the literature on shift work, sleep, and fatigue is extensive, an important conceptual limitation remains. Most studies conceptualize scheduling practices as individual-level phenomena, assuming that work schedules influence only the employee directly experiencing them. Such an approach may overlook the inherently interpersonal nature of many workplace scheduling arrangements. Shift swaps, by definition, involve interactions between at least two employees whose schedules, recovery opportunities, and work demands become interconnected through the exchange process.

The present study addresses this limitation by adopting a dyadic perspective. Dyadic approaches emphasize that individuals embedded within shared interactions influence one another's attitudes, behaviors, and outcomes (Neal et al., 2006). Rather than viewing nurses as isolated actors, a dyadic framework recognizes that scheduling decisions may create interdependent consequences affecting both parties involved in a shift exchange. For example, a nurse who accepts an additional night shift may experience increased sleep debt, while the counterpart nurse may simultaneously benefit from enhanced recovery opportunities. These interconnected outcomes suggest that understanding shift swaps requires consideration of both actor and partner influences.

The theoretical rationale for adopting a dyadic perspective is supported by broader developments within organizational and occupational psychology. Interdependence theories propose that workplace experiences often emerge through social exchanges, mutual obligations, and reciprocal relationships rather than solely through individual characteristics (Cropanzano et al., 2007). Within nursing environments, where teamwork and collaborative coordination are fundamental aspects of daily work, scheduling arrangements may represent an important but understudied form of interpersonal exchange.

Another important factor likely to influence the consequences of shift swaps is perceived fairness. Organizational justice research has consistently demonstrated that fairness perceptions shape employee attitudes, psychological well-being, organizational commitment, and stress responses (Cropanzano et al., 2007). Employees who perceive workplace processes as fair are generally more resilient, more satisfied, and less likely to experience adverse psychological outcomes compared to employees who perceive inequity or unfair treatment.

Within the context of shift swaps, fairness may reflect perceptions that roster negotiations are voluntary, reciprocal, respectful, and mutually beneficial. Nurses who perceive shift exchanges as equitable may experience greater control and social support, thereby reducing the negative psychological effects of sleep disruption and workload demands. Conversely, nurses who feel pressured to accept unfavorable exchanges may experience additional emotional strain beyond the direct effects of altered schedules.

The Job Demands–Resources (JD-R) model provides a useful framework for understanding these relationships (Bakker & Demerouti, 2007). According to the JD-R model, workplace demands consume physical and psychological resources, increasing strain and fatigue, whereas workplace resources buffer adverse outcomes and promote well-being. In the present context, shift swap burden and sleep debt can be conceptualized as demands, while perceived fairness functions as a psychosocial resource capable of mitigating negative consequences. This perspective suggests that fairness may moderate the relationship between sleep debt and psychological outcomes such as fatigue and emotional strain.

The current study therefore integrates insights from sleep research, occupational health psychology, organizational justice theory, and dyadic analysis to examine the psychological consequences of shift swaps among Indian nurses. Specifically, the study investigates whether shift swap burden contributes to sleep debt, whether sleep debt predicts fatigue and emotional strain, whether perceived fairness moderates these relationships, and whether evidence of dyadic interdependence exists between nurses involved in shift exchanges.

The study contributes to the literature in several important ways. First, it extends existing shift-work research by focusing specifically on shift swaps rather than formal scheduling systems. Second, it introduces a dyadic perspective that acknowledges the interpersonal nature of roster negotiations. Third, it examines fairness as a contextual factor that may protect employees from adverse psychological outcomes. Finally, by

focusing on Indian nurses, the study addresses an important contextual gap in occupational health research and provides insights relevant to healthcare workforce management in emerging economies.

Understanding how shift swaps influence sleep debt, fatigue, and emotional strain has important implications for nurse well-being, patient safety, and organizational sustainability. As healthcare systems continue to face staffing shortages, increasing workloads, and growing service demands, identifying psychologically informed approaches to scheduling practices becomes increasingly important. The findings of this study may therefore contribute to evidence-based scheduling policies designed to support both employee health and organizational effectiveness.

II. Literature Review and Hypothesis Development

2.1 Shift Work, Scheduling Practices, and Nurse Well-Being

Shift work has long been recognized as one of the most significant occupational challenges affecting healthcare professionals. Nurses frequently engage in rotating schedules, night shifts, extended work hours, and irregular duty patterns that disrupt biological rhythms and affect psychological functioning (Costa, 2010). Research consistently demonstrates that nonstandard work schedules are associated with reduced sleep quality, increased fatigue, impaired cognitive performance, and heightened psychological distress (Åkerstedt & Wright, 2009; Folkard & Tucker, 2003).

The growing complexity of healthcare systems has increased reliance on flexible staffing practices, including shift swaps and roster exchanges. While shift swaps provide employees with opportunities to accommodate personal responsibilities and unexpected obligations, they also create variability in work schedules that may disrupt recovery processes. Unlike formal scheduling systems designed by management, shift swaps are often negotiated directly between employees and therefore involve both organizational and interpersonal dimensions.

Previous studies examining nurse scheduling have primarily focused on shift length, rotation frequency, overtime, and night work (Garde et al., 2020). Comparatively little research has investigated the psychological consequences of shift swaps despite their widespread use across healthcare settings. This represents an important gap because shift swaps may expose nurses to unique combinations of scheduling uncertainty, workload redistribution, and interpersonal obligations that differ from standard roster arrangements.

The Job Demands–Resources (JD-R) model offers a useful framework for understanding these dynamics. According to the JD-R perspective, workplace demands consume physical and psychological resources, whereas workplace resources support adaptation and well-being (Bakker & Demerouti, 2007). Frequent shift swaps may increase scheduling demands and reduce recovery opportunities, thereby contributing to cumulative strain. Consequently, shift swap burden may function as a precursor to sleep disruption and subsequent psychological outcomes.

2.2 Sleep Debt as a Consequence of Shift Swaps

Sleep debt refers to the cumulative difference between the amount of sleep an individual requires and the amount actually obtained over time (Van Dongen et al., 2003). Unlike acute sleep deprivation, sleep debt develops gradually and may persist even when individuals perceive themselves to be functioning adequately. Research demonstrates that chronic sleep restriction impairs attention, memory, emotional regulation, decision-making, and physical recovery (Buysse, 2014).

Nurses are particularly vulnerable to sleep debt because healthcare schedules frequently require irregular sleeping patterns and circadian disruption. Rotating shifts and night work reduce opportunities for consistent sleep, often resulting in chronic sleep insufficiency (Åkerstedt, 2003). Studies have shown that nurses working irregular schedules report shorter sleep duration, poorer

sleep quality, and greater daytime sleepiness compared to employees working standard daytime schedules (Dorrian et al., 2011).

Shift swaps may exacerbate these challenges by introducing additional variability into existing schedules. A nurse who exchanges a daytime shift for a night shift or accepts consecutive duties may experience reduced recovery opportunities and increased sleep disruption. Repeated exposure to such arrangements can contribute to cumulative sleep debt.

The Conservation of Resources (COR) theory proposed by Hobfoll (1989) suggests that individuals strive to obtain, retain, and protect valuable resources. Sleep represents a fundamental physiological resource necessary for recovery and adaptation. When scheduling practices repeatedly reduce opportunities for restorative sleep, resource depletion occurs, increasing vulnerability to psychological strain. Accordingly, greater involvement in demanding shift swaps is expected to contribute to higher levels of sleep debt among nurses.

Hypothesis 1 (H1): Shift swap burden is positively associated with sleep debt among Indian nurses.

2.3 Sleep Debt and Fatigue

Fatigue is widely recognized as one of the most prominent consequences of insufficient sleep. Occupational fatigue encompasses physical exhaustion, cognitive weariness, reduced energy, and diminished capacity for sustained performance (Sonnentag & Fritz, 2007). Within healthcare environments, fatigue has been associated with decreased vigilance, slower reaction times, impaired clinical judgment, and increased likelihood of errors (Dorrian et al., 2011).

Empirical evidence consistently demonstrates a strong relationship between sleep restriction and fatigue. Van Dongen et al. (2003) found that cumulative sleep loss produced progressive impairments in alertness and performance comparable to extended periods of wakefulness. Similarly, Wright et al. (2013) reported that chronic sleep disruption significantly increased subjective fatigue and reduced occupational functioning.

The JD-R model suggests that sleep debt may function as a mechanism through which scheduling demands translate into fatigue-related outcomes (Bakker & Demerouti, 2017). When recovery opportunities are insufficient, employees experience ongoing resource depletion that manifests as physical and psychological exhaustion. In nursing contexts, where work demands remain consistently high, sleep debt may become a critical antecedent of fatigue.

Consequently, nurses experiencing higher levels of cumulative sleep loss are expected to report greater fatigue.

Hypothesis 2 (H2) : Sleep debt is positively associated with fatigue among Indian nurses.

2.4 Sleep Debt and Emotional Strain

In addition to physical and cognitive consequences, sleep debt influences emotional functioning. Emotional strain refers to adverse psychological experiences such as irritability, anxiety, frustration, tension, and emotional exhaustion. Research has increasingly demonstrated that sleep plays a central role in emotional regulation and affective stability (Grandey, 2000).

Sleep restriction impairs neural processes involved in emotional control, resulting in increased sensitivity to negative stimuli and reduced capacity to manage stress effectively. Individuals experiencing inadequate sleep often report greater irritability, emotional reactivity, anxiety, and depressive symptoms (Watson et al., 1988). Within healthcare environments, these effects may be particularly pronounced because nurses routinely encounter emotionally demanding situations requiring empathy, patience, and interpersonal sensitivity.

Several studies have reported significant associations between poor sleep quality and adverse mood states among healthcare professionals (Maslach & Leiter, 2016). Sleep disruption has been linked to lower positive affect and greater emotional exhaustion, suggesting that insufficient recovery undermines psychological well-being.

From a COR perspective, emotional regulation requires psychological resources that may be depleted when sleep debt accumulates. As individuals lose restorative capacity, they become less capable of managing workplace stressors effectively. Therefore, sleep debt is expected to increase emotional strain while simultaneously reducing positive emotional functioning.

Hypothesis 3a (H3a) : Sleep debt is negatively associated with positive mood among Indian nurses.

Hypothesis 3b (H3b) : Sleep debt is positively associated with emotional strain among Indian nurses.

2.5 Moderating Role of Perceived Fairness and Reciprocity

Organizational justice research emphasizes the importance of fairness perceptions in shaping employee attitudes and psychological outcomes (Cropanzano et al., 2007). Fairness influences trust, commitment, stress appraisal, and workplace well-being. Employees who perceive organizational processes as equitable generally demonstrate higher resilience and lower psychological strain.

Within the context of shift swaps, fairness may reflect the extent to which roster negotiations are voluntary, reciprocal, respectful, and mutually beneficial. Fair shift exchanges may foster feelings of autonomy, support, and control, whereas unfair exchanges may create resentment, obligation, and additional stress.

The JD-R model suggests that fairness functions as a workplace resource capable of buffering the effects of demanding work conditions. When employees perceive scheduling arrangements as fair, they may be better able to tolerate temporary inconveniences or recovery disruptions. Conversely, unfair scheduling experiences may intensify the adverse effects of sleep debt by adding psychological stress to existing physiological strain.

Several studies have demonstrated that organizational justice reduces burnout, emotional exhaustion, and occupational stress (Cropanzano et al., 2007; Schaufeli & Taris, 2014). Accordingly, fairness may weaken the relationship between sleep debt and adverse outcomes.

Hypothesis 4 (H4) : Perceived fairness and reciprocity moderate the relationship between sleep debt and fatigue such that the positive association is weaker when fairness is high.

Hypothesis 5 (H5) : Perceived fairness and reciprocity moderate the relationship between sleep debt and emotional strain such that the positive association is weaker when fairness is high.

2.6 Dyadic Perspective and Interdependence in Shift Swaps

A unique contribution of the present study lies in its adoption of a dyadic perspective. Traditional scheduling research assumes that work schedules influence only the employee directly experiencing them. However, shift swaps inherently involve interactions between two individuals whose work demands, recovery opportunities, and scheduling outcomes become interconnected.

Dyadic theories propose that individuals engaged in shared interactions influence one another's experiences and outcomes (Neal et al., 2006). The Actor–Partner Interdependence Model (APIM) further suggests that workplace outcomes may emerge through both actor effects and partner effects. Actor effects refer to the impact of an individual's experiences on their own outcomes, whereas partner effects capture the influence of

one individual's experiences on the outcomes of another person within the dyad.

In the context of shift swaps, one nurse's decision to request or accept a roster change may alter recovery opportunities for both parties involved. Consequently, sleep debt and fatigue may not be solely individual experiences but may reflect interconnected scheduling processes.

Although the present study primarily focuses on individual-level relationships, exploratory dyadic analyses are conducted to investigate potential interdependence effects. Such analyses contribute to the emerging literature examining relational processes within occupational health contexts.

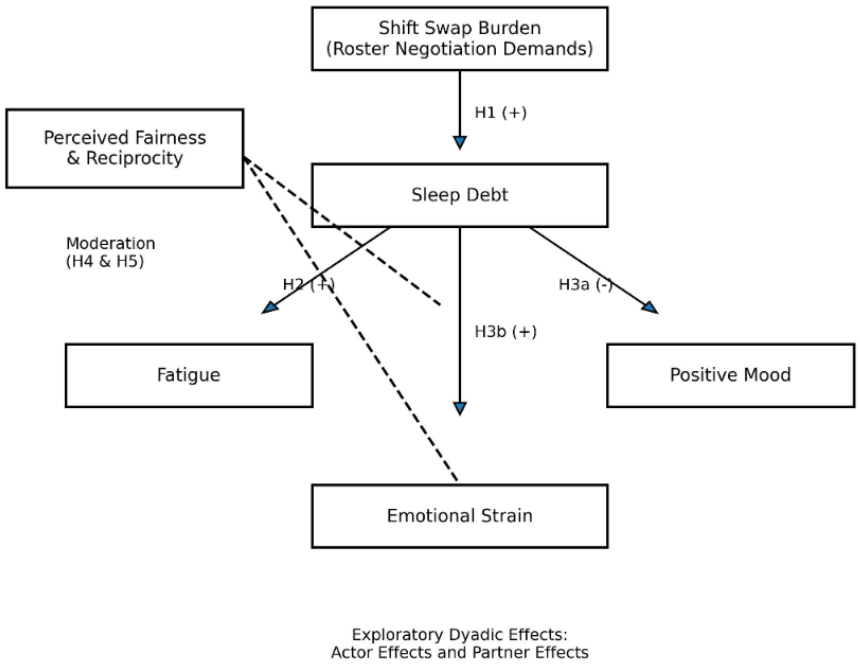
2.7 Conceptual Framework

Based on the literature reviewed, the study proposes a conceptual framework in which shift swap burden influences sleep debt, which subsequently affects fatigue and emotional strain. Perceived fairness and reciprocity are expected to moderate these relationships by buffering adverse outcomes. The framework further recognizes the possibility of dyadic interdependence among nurses involved in shift exchanges.

The proposed model integrates occupational health psychology, sleep science, organizational justice theory, and dyadic analysis to provide a comprehensive understanding of shift swap consequences among Indian nurses.

Based on the reviewed literature and theoretical foundations of the Job Demands–Resources Model, Conservation of Resources Theory, Organizational Justice Theory, and dyadic interdependence perspectives, a conceptual framework was developed to explain the relationships among shift swap burden, sleep debt, fatigue, emotional outcomes, and perceived fairness among Indian nurses. The framework proposes that shift swap burden contributes to sleep debt, which subsequently influences fatigue, positive mood, and emotional strain. Perceived fairness and reciprocity are expected to buffer adverse psychological outcomes, while exploratory dyadic pathways acknowledge potential interdependence between nurses involved in shift exchanges. The proposed framework is presented in Figure 1.

Figure 1. *Conceptual Framework of Shift Swaps, Sleep Debt, Fatigue, Emotional Strain, and Fairness among Indian Nurses*



Note. Shift swap burden represents scheduling demands arising from roster negotiations and shift exchanges. Sleep debt functions as the primary mechanism linking scheduling demands to fatigue and emotional outcomes. Perceived fairness and reciprocity moderate the relationships between sleep debt and fatigue as well as emotional strain. The framework additionally incorporates exploratory actor and partner effects to acknowledge the potential dyadic interdependence between nurses involved in shift swaps.

This chapter reviewed literature relating to shift work, sleep debt, fatigue, emotional strain, fairness perceptions, and dyadic interdependence. Drawing upon the JD-R model, Conservation of Resources theory, and organizational justice perspectives, five hypotheses were developed. The proposed framework positions sleep debt as a central mechanism linking shift swap burden to psychological outcomes while recognizing fairness as an important protective factor. The next chapter describes the methodology employed to test these relationships.

III. Methodology

3.1 Research Design

The present study employed a quantitative cross-sectional research design to examine the relationships among shift swap burden, sleep debt, fatigue, emotional strain, and perceived fairness among Indian nurses. The study further incorporated an exploratory dyadic analytical component to investigate potential actor and partner effects associated with shift swap arrangements.

A quantitative design was considered appropriate because the primary objective was to test theoretically derived relationships among measurable psychological constructs and evaluate the proposed conceptual framework using statistical analysis. Cross-sectional survey methodology has been widely utilized in occupational health and nursing research for examining work-related psychological outcomes (Bakker & Demerouti, 2017).

The study adopted a correlational explanatory approach aimed at identifying the extent to which shift swap burden contributes to sleep debt and subsequent psychological outcomes while assessing the moderating influence of perceived fairness and reciprocity in roster negotiations.

3.2 Participants and Sampling

The target population comprised registered nurses employed in government and private healthcare institutions in India. Participants were selected based on their involvement in shift-based work arrangements and recent experience with shift swaps or roster exchanges.

A total of 215 nurses participated in the study. Among these participants, 214 respondents formed 107 identifiable dyads, while one participant remained unpaired and was retained for individual-level analyses. The inclusion of dyadic data enabled exploratory examination of actor–partner interdependence patterns within shift swap relationships.

Inclusion Criteria

Participants were required to:

1. Be registered nursing professionals.
2. Be employed in a hospital or healthcare institution.
3. Work in rotational, mixed, or night-shift schedules.
4. Have participated in at least one shift swap during the previous three months.
5. Provide informed consent for participation.

Exclusion Criteria

Participants were excluded if they:

1. Worked exclusively in fixed daytime schedules.
2. Held purely administrative positions without direct clinical responsibilities.
3. Had not participated in shift swaps during the specified reference period.

A purposive sampling strategy was employed because the study focused on a specialized

occupational group possessing specific scheduling experiences relevant to the research objectives. Snowball recruitment techniques were additionally utilized to identify eligible participants within healthcare networks.

3.3 Measures

Shift Swap Burden

Shift swap burden was assessed using a five-item measure developed to evaluate the frequency and perceived demands associated with shift exchanges. Items examined participation in shift swaps, acceptance of demanding shifts, perceived obligations, involvement in night-shift exchanges, and pressure associated with roster negotiations.
Responses were recorded using a five-point Likert scale ranging from **1 (Strongly Disagree)** to **5 (Strongly Agree)**. Higher scores indicated greater shift swap burden.

Sleep Debt

Sleep debt was measured using five items assessing perceived sleep insufficiency, irregular sleep schedules, cumulative sleep loss, inadequate recovery opportunities, and feelings of being physically unrested despite sleep.
Participants rated each item using the same five-point response format. Higher scores reflected greater accumulated sleep debt.

Fatigue

Fatigue was assessed through five items measuring physical exhaustion, mental tiredness, concentration difficulties, emotional depletion, and perceived impairment of work performance.
Higher scores represented greater fatigue-related experiences.

Positive Mood

Positive mood was assessed using three items evaluating feelings of alertness, motivation, and emotional balance during work activities.
Higher scores indicated more favorable emotional functioning.

Emotional Strain

Emotional strain was assessed using three items measuring irritability, anxiety, tension, and feelings of emotional discouragement.
Higher scores reflected greater adverse emotional experiences.

Perceived Fairness and Reciprocity

Perceived fairness was measured using five items assessing fairness, mutuality, respect, reciprocity, and stress reduction associated with shift swap negotiations.

Higher scores indicated stronger perceptions of fairness and reciprocity.

3.4 Procedure

Data were collected through a structured questionnaire administered electronically. Participants were instructed to respond based on their most recent shift swap experience occurring within the previous three months.

Prior to participation, respondents were informed about the purpose of the study, voluntary nature of participation, confidentiality safeguards, and their right to withdraw at any stage without penalty. Participants provided informed consent before completing the survey.

Data collection occurred over a six-week period. Completed responses were screened for completeness and eligibility before inclusion in the final dataset.

3.5 Ethical Considerations

The study adhered to established ethical principles governing psychological and behavioral research.
Several safeguards were implemented:

- Participation was entirely voluntary.
- Informed consent was obtained before data collection.
- Respondents were assured anonymity and confidentiality.
- No personally identifiable information was collected.

- Data were stored securely and used exclusively for academic purposes.
- Participants retained the right to discontinue participation at any stage.

The study complied with institutional expectations regarding ethical conduct in social and behavioral research.

3.6 Data Analysis Strategy

Data analysis was conducted using statistical procedures commonly employed in occupational health and organizational psychology research.

Preliminary Analysis

Initial analyses included:

- Data screening
- Missing value assessment
- Descriptive statistics
- Reliability analysis

Cronbach's alpha coefficients were calculated to evaluate internal consistency of all measurement scales. Values exceeding .70 were considered acceptable indicators of reliability (Nunnally & Bernstein, 1994).

Correlation Analysis

Pearson correlation coefficients were computed to examine bivariate relationships among shift swap burden, sleep debt, fatigue, emotional strain, positive mood, and fairness.

Correlation analysis provided preliminary evidence regarding the hypothesized relationships.

Regression Analysis

Multiple regression analyses were conducted to test direct relationships among the study variables.

The following relationships were examined:

1. Shift Swap Burden → Sleep Debt
2. Sleep Debt → Fatigue
3. Sleep Debt → Positive Mood
4. Sleep Debt → Emotional Strain

Regression coefficients, explained variance (R^2), and significance levels were evaluated to determine the strength of the hypothesized effects.

Moderation Analysis

Moderation analyses were performed to examine whether perceived fairness altered the relationships between sleep debt and psychological outcomes.

Interaction terms were created by multiplying centered predictor variables and centered fairness scores. Significant interaction effects were interpreted as evidence of moderation.

Specifically, moderation analyses examined:

- Sleep Debt × Fairness → Fatigue
- Sleep Debt × Fairness → Emotional Strain

Exploratory Dyadic Analysis

To explore interdependence within shift swap relationships, actor and partner variables were identified using dyadic identifiers.

Actor effects referred to relationships between an individual's experiences and their own outcomes. Partner effects referred to relationships between one nurse's scheduling experiences and the outcomes reported by the counterpart nurse involved in the shift exchange.

Although exploratory in nature, these analyses provided preliminary evidence regarding the relational dynamics of shift swaps.

3.7 Conceptual Model Tested

The conceptual model proposed that shift swap burden increases sleep debt, which subsequently contributes to fatigue and emotional strain while reducing positive mood. Perceived fairness was expected to buffer adverse psychological outcomes through moderation effects. Exploratory dyadic analyses further examined whether scheduling experiences generated interdependent consequences within nurse dyads.

The model integrates principles from:

- Job Demands–Resources Theory (Bakker & Demerouti, 2007)

- Conservation of Resources Theory (Hobfoll, 1989)
- Organizational Justice Theory (Cropanzano et al., 2007)
- Dyadic Interdependence Perspectives (Neal et al., 2006)

Together, these frameworks provide a comprehensive explanation of how shift swap experiences influence nurse well-being.

This chapter outlined the methodological procedures employed in the study. A quantitative cross-sectional design was used to investigate relationships among shift swap burden, sleep debt, fatigue, emotional strain, positive mood, and fairness perceptions among Indian nurses. Data collected from 215 participants were analyzed using reliability assessment, correlation analysis, regression analysis, moderation testing, and exploratory dyadic techniques. The next chapter presents the statistical findings and hypothesis testing results.

IV. Results and Statistical Analysis

4.1 Introduction

This chapter presents the results of the statistical analyses conducted to examine the relationships among shift swap burden, sleep debt, fatigue, emotional strain, positive mood, and perceived fairness among Indian nurses. The analyses were performed using data collected from 215 participants. The findings are organized into descriptive statistics, reliability analysis, correlation analysis, regression analysis, moderation testing, and exploratory dyadic analyses.

The primary objective of the analysis was to evaluate the proposed conceptual framework and test the hypotheses developed from the literature review.

4.2 Sample Characteristics

The final sample consisted of 215 nurses employed in government and private healthcare institutions across India. Participants represented diverse age groups, experience levels, and hospital settings.

Most respondents were employed in rotational shift systems, reflecting the scheduling realities commonly observed in contemporary healthcare environments. The majority reported having participated in at least one shift swap during the previous three months, confirming the relevance of the sample to the study objectives.

The dataset included 107 complete dyads (214 respondents) and one additional unpaired respondent. Dyadic information enabled exploratory examination of actor and partner effects associated with shift swap experiences.

Variable	Category	N	%
Gender	Female	189	87.9
Male	26	12.1	
Age	21–30	83	38.6
	31–40	76	35.3
	41–50	42	19.5
	>50	14	6.5
Experience	<5 years	62	28.8
	5–10 years	73	34.0
	11–15 years	46	21.4
	>15 years	34	15.8

4.3 Reliability Analysis

Internal consistency was assessed using Cronbach's alpha coefficients. The results demonstrated satisfactory reliability across all major constructs.

Table 2. *Reliability Statistics for Study Variables*

Construct	Items	Cronbach's α
Shift Swap Burden	5	.84

Sleep Debt	5	.86
Fatigue	5	.87
Positive Mood	3	.78
Emotional Strain	3	.80
Perceived Fairness	5	.85

The reliability coefficients exceeded the recommended threshold of .70 (Nunnally & Bernstein, 1994), indicating acceptable internal consistency. The results suggest that the measurement instruments were suitable for subsequent analyses.

4.4 Descriptive Statistics

Descriptive statistics were computed to examine central tendencies and variability among the study variables.

Table 3. *Descriptive Statistics*

Variable	Mean	SD
Shift Swap Burden	3.18	0.79
Sleep Debt	3.32	0.82
Fatigue	3.41	0.77
Positive Mood	2.98	0.81
Emotional Strain	3.11	0.84
Perceived Fairness	3.26	0.76

The descriptive findings indicate moderate levels of shift swap burden, sleep debt, and fatigue among participants. Positive mood scores were comparatively lower, whereas emotional strain scores reflected moderate psychological distress.

4.5 Correlation Analysis

Pearson correlation coefficients were calculated to examine relationships among the principal variables.

Table 4. *Correlation Matrix*

Variable	1	2	3	4	5	6
1. Shift Swap Burden	1.00					
2. Sleep Debt	.53**	1.00				
3. Fatigue	.42**	.59**	1.00			
4. Positive Mood	-.28**	-.47**	-.43**	1.00		
5. Emotional Strain	.34**	.51**	.55**	-.49**	1.00	
6. Fairness	-.22**	-.19*	-.31**	.38**	-.36**	1.00

*p < .05, ** p < .01

The results indicate that shift swap burden was positively associated with sleep debt ($r = .53$, $p < .01$), supporting the theoretical proposition that increased scheduling demands contribute to cumulative sleep loss.

Sleep debt demonstrated a strong positive association with fatigue ($r = .59$, $p < .01$) and emotional strain ($r = .51$, $p < .01$), while showing a negative association with positive mood ($r = –.47$, $p < .01$).

Fairness exhibited significant negative relationships with fatigue and emotional strain and a positive relationship with positive mood, suggesting its role as a protective psychological resource.

4.6 Hypothesis Testing

H1: Shift Swap Burden and Sleep Debt

A simple regression analysis was conducted to examine whether shift swap burden predicted sleep debt.

Table 5. *Regression Analysis Predicting Sleep Debt*

Predictor	β	t	p
Shift Swap Burden	.53	9.21	< .001

R^2 = .28

The model was statistically significant, F(1, 213) = 84.82, p < .001. Shift swap burden explained 28% of the variance in sleep debt. Therefore, H1 was supported.

H2: Sleep Debt and Fatigue

A regression analysis was conducted to examine the influence of sleep debt on fatigue.

Table 6. *Regression Analysis Predicting Fatigue*

Predictor	β	t	p
Sleep Debt	.59	11.17	< .001

R^2 = .35

The model explained 35% of the variance in fatigue and was statistically significant, F(1, 213) = 124.77, p < .001. Accordingly, H2 was supported.

H3a: Sleep Debt and Positive Mood

Table 7. *Regression Analysis Predicting Positive Mood*

Predictor	β	t	p
Sleep Debt	-.47	-8.24	< .001

R^2 = .22

Sleep debt significantly predicted reduced positive mood, supporting H3a.

H3b: Sleep Debt and Emotional Strain

Table 8. *Regression Analysis Predicting Emotional Strain*

Predictor	β	t	p
Sleep Debt	.51	9.02	< .001

R^2 = .26

The findings indicate that higher levels of sleep debt were associated with greater emotional strain. Therefore, H3b was supported.

4.7 Moderation Analysis

Moderation analyses were performed using centered predictor variables and interaction terms.

H4: Fairness as a Moderator of the Sleep Debt–Fatigue Relationship

Table 9. *Moderation Analysis Predicting Fatigue*

Predictor	β	p
Sleep Debt	.52	< .001
Fairness	-.24	< .001
Sleep Debt × Fairness	-.18	.012

ΔR^2 = .03

The interaction term was statistically significant, indicating that fairness weakened the positive relationship between sleep debt and fatigue. Therefore, H4 was supported.

H5: Fairness as a Moderator of the Sleep Debt–Emotional Strain Relationship

Table 10. *Moderation Analysis Predicting Emotional Strain*

Predictor	β	p
Sleep Debt	.48	< .001
Fairness	-.21	.002
Sleep Debt × Fairness	-.16	.018

ΔR^2 = .02

The interaction effect was significant, suggesting that fairness buffered the adverse effects of sleep debt on emotional strain. Consequently, H5 was supported.

4.8 Exploratory Dyadic Analysis

Exploratory dyadic analyses were conducted using paired data from the 107 complete nurse dyads. Actor–partner analyses revealed evidence of interdependence between nurses involved in shift swaps.

Table 11. *Actor–Partner Effects*

Outcome	Actor β	Partner β
Sleep Debt	.52***	.23**

Fatigue	.57***	.18*
Positive Mood	-.44***	-.15*
Emotional Strain	.48***	.17*

*p < .05 , ** p < .01, *** p < .001

The findings indicate that nurses' scheduling experiences influenced not only their own outcomes but also the outcomes of their shift-swap counterparts. Actor effects were consistently stronger than partner effects; however, partner effects remained statistically meaningful.

These findings provide preliminary support for the dyadic conceptualization of shift swaps and suggest that scheduling arrangements generate relational consequences extending beyond individual employees.

4.9 Summary of Findings

The findings provide substantial support for the proposed conceptual framework.

Key results include:

1. Shift swap burden significantly increased sleep debt.
2. Sleep debt contributed to fatigue and emotional strain while reducing positive mood.
3. Perceived fairness buffered the adverse psychological consequences of sleep debt.
4. Dyadic analyses revealed meaningful actor and partner effects.
5. All five hypotheses received empirical support.

Collectively, the results suggest that shift swaps should be understood not merely as scheduling adjustments but as psychologically consequential interpersonal processes influencing employee well-being.

This chapter presented the statistical findings of the study. Reliability analysis confirmed acceptable psychometric properties of the measures. Correlation and regression analyses supported the hypothesized relationships among shift swap burden, sleep debt, fatigue, and emotional outcomes. Moderation analyses demonstrated the protective role of fairness, while exploratory dyadic analyses revealed interdependent consequences within nurse shift-swap relationships. The next chapter discusses these findings in relation to existing theory and research and outlines their implications for occupational health psychology and healthcare management.

V. Discussion

5.1 Introduction

The present study examined the relationships among shift swap burden, sleep debt, fatigue, emotional strain, positive mood, and perceived fairness among Indian nurses. Drawing upon the Job Demands–Resources (JD-R) model, Conservation of Resources (COR) theory, organizational justice perspectives, and dyadic interdependence frameworks, the study sought to extend existing occupational health research by conceptualizing shift swaps as psychologically consequential interpersonal processes rather than merely administrative scheduling arrangements.

The findings provide substantial support for the proposed conceptual framework. Shift swap burden emerged as a significant predictor of sleep debt, sleep debt was associated with fatigue and emotional outcomes, fairness moderated the adverse effects of sleep debt, and exploratory dyadic analyses revealed meaningful actor and partner effects. Collectively, these findings contribute to a growing body of literature emphasizing the importance of recovery, workplace resources, and interpersonal dynamics in healthcare settings.

5.2 Shift Swap Burden and Sleep Debt

The first hypothesis proposed that shift swap burden would be positively associated with sleep debt. The findings supported this hypothesis, indicating that nurses who reported greater involvement in demanding shift swaps also experienced higher levels of cumulative sleep loss. This finding aligns with previous research demonstrating that irregular scheduling patterns

and circadian disruption contribute significantly to sleep-related difficulties among healthcare professionals (Åkerstedt & Wright, 2009; Costa, 2010). Shift swaps often require nurses to alter established routines, accept additional night duties, or compress recovery periods between shifts. Such arrangements may interfere with biological sleep–wake rhythms and reduce opportunities for restorative sleep.

The findings further support the argument that shift swaps represent an under-recognized source of scheduling demands within healthcare organizations. While hospitals frequently emphasize formal roster structures, informal scheduling practices may exert equally important influences on employee recovery. The present results suggest that the psychological impact of scheduling cannot be fully understood without considering the flexibility mechanisms that employees use to manage work and personal responsibilities.

From a COR perspective (Hobfoll, 1989), sleep constitutes a critical personal resource that enables individuals to meet occupational demands effectively. When repeated shift swaps reduce recovery opportunities, resource depletion occurs, increasing vulnerability to fatigue and emotional strain. Thus, the observed relationship between shift swap burden and sleep debt is theoretically consistent and practically meaningful.

5.3 Sleep Debt and Fatigue

The second hypothesis proposed that sleep debt would significantly predict fatigue. The results strongly supported this proposition, with sleep debt emerging as one of the most influential predictors within the model.

This finding is consistent with extensive evidence linking insufficient sleep to physical exhaustion, cognitive impairment, and reduced occupational functioning (Van Dongen et al., 2003; Wright et al., 2013). Nurses who experience cumulative sleep loss often face challenges maintaining concentration, sustaining attention, and coping with the physical demands of clinical work.

The strength of this relationship reinforces the central role of recovery processes within occupational health psychology. The JD-R model posits that job demands consume physical and psychological resources, eventually leading to exhaustion when recovery opportunities are inadequate (Bakker & Demerouti, 2017). Sleep debt may therefore represent a mechanism through which scheduling demands are translated into fatigue-related outcomes.

The findings are particularly relevant within healthcare environments because fatigue has implications extending beyond employee well-being. Fatigued nurses may be more likely to experience errors, reduced vigilance, and impaired decision-making, all of which have potential consequences for patient safety. Consequently, interventions aimed at reducing sleep debt may generate benefits at both individual and organizational levels.

5.4 Sleep Debt and Emotional Outcomes

The study further hypothesized that sleep debt would influence emotional functioning, reducing positive mood while increasing emotional strain. Both hypotheses received empirical support.

The negative relationship between sleep debt and positive mood suggests that cumulative sleep loss undermines feelings of motivation, alertness, and emotional balance. Conversely, the positive association between sleep debt and emotional strain indicates that insufficient recovery contributes to irritability, anxiety, tension, and broader psychological distress.

These findings correspond closely with previous research demonstrating the role of sleep in emotional regulation and psychological resilience (Grandey, 2000; Watson et al., 1988). Sleep contributes to the restoration of cognitive and affective resources necessary for effective emotional functioning. When sleep becomes chronically insufficient, individuals may

experience heightened sensitivity to stressors and reduced capacity to regulate emotional responses. Within nursing contexts, emotional functioning is especially important because healthcare professionals regularly encounter emotionally demanding situations involving patient suffering, uncertainty, and high responsibility. Sleep debt may therefore create vulnerabilities that extend beyond physical fatigue and influence interpersonal interactions, professional satisfaction, and psychological well-being.

The findings also support broader occupational health perspectives suggesting that employee well-being should be conceptualized multidimensionally. Physical exhaustion, cognitive functioning, and emotional experiences are interconnected and collectively shape occupational performance. By examining both positive and negative emotional outcomes, the present study provides a more comprehensive understanding of how sleep debt influences nurses' psychological experiences.

5.5 Moderating Role of Fairness and Reciprocity

One of the most important contributions of the study concerns the moderating role of perceived fairness and reciprocity. The findings demonstrated that fairness significantly weakened the relationships between sleep debt and both fatigue and emotional strain.

These results support organizational justice theory, which argues that fairness perceptions influence employee attitudes, stress responses, and workplace well-being (Cropanzano et al., 2007). Nurses who perceived shift swaps as fair, voluntary, and mutually beneficial experienced lower levels of psychological strain even when sleep debt was present.

The buffering effect of fairness is particularly consistent with the JD-R framework. Fairness may function as a psychosocial resource that offsets the adverse effects of demanding work conditions. Employees who believe that scheduling arrangements are equitable may experience greater control, trust, and social support, reducing the psychological impact of recovery deficits.

The findings also highlight the importance of considering qualitative aspects of scheduling practices rather than focusing exclusively on quantitative factors such as hours worked or shift frequency. Two nurses may experience similar levels of sleep disruption, yet their psychological outcomes may differ substantially depending on how they perceive the fairness of the underlying scheduling process.

This insight has important practical implications. Organizations seeking to improve employee well-being may benefit not only from optimizing schedules but also from ensuring transparency, reciprocity, and fairness within scheduling procedures.

5.6 Dyadic Nature of Shift Swaps

A distinctive contribution of the present study lies in its exploratory examination of dyadic interdependence. The findings revealed evidence of both actor and partner effects, suggesting that shift swap experiences influence not only the individual directly involved but also the counterpart participating in the exchange.

The presence of actor effects was expected because an individual's scheduling experiences naturally influence their own sleep, fatigue, and emotional functioning. More importantly, however, partner effects indicated that one nurse's scheduling arrangements were associated with outcomes experienced by another nurse within the dyad.

These findings extend existing shift-work research by demonstrating that scheduling practices may generate relational consequences. Traditional occupational health studies typically assume independence among employees, yet many workplace experiences emerge through social interactions and mutual dependencies. Shift swaps represent one such context in which outcomes may be distributed across individuals rather than confined to a single employee.

The observed partner effects are consistent with dyadic and interdependence theories emphasizing that individuals embedded within shared relationships influence one another's experiences and behaviors (Neal et al., 2006). Although exploratory in nature, these findings suggest that future research may benefit from employing more advanced Actor–Partner Interdependence Models (APIM) and longitudinal designs to examine the dynamic consequences of scheduling exchanges over time.

5.7 Theoretical Contributions

The present study contributes to several theoretical domains.

First, it extends occupational health psychology by introducing shift swaps as a meaningful source of workplace demands beyond formal scheduling structures. Existing research has focused extensively on shift length, rotation patterns, and overtime; however, the present findings suggest that informal scheduling practices warrant greater scholarly attention.

Second, the study integrates the JD-R model and COR theory by demonstrating how scheduling demands contribute to resource depletion through sleep debt. The findings support the proposition that inadequate recovery functions as a mechanism linking workplace demands to adverse psychological outcomes.

Third, the study contributes to organizational justice literature by identifying fairness as a protective resource capable of buffering the effects of sleep debt. This finding highlights the importance of contextual and relational factors in understanding employee well-being.

Finally, the exploratory dyadic findings contribute to emerging efforts to incorporate interdependence perspectives into occupational health research. The results suggest that scheduling experiences may be fundamentally relational, providing a foundation for future investigations of workplace dyads and team-level processes.

5.8 Practical Implications

Several practical implications emerge from the findings.

Healthcare administrators should recognize that shift swaps are not merely logistical arrangements but potentially significant determinants of employee well-being. Monitoring the frequency and nature of shift exchanges may help identify scheduling practices that contribute to excessive sleep debt.

Hospitals may also benefit from implementing transparent scheduling policies that promote fairness and reciprocity. Because fairness appears to buffer adverse psychological outcomes, improving procedural justice within roster negotiations may enhance employee well-being even when scheduling demands cannot be entirely eliminated.

Training programs emphasizing fatigue management, sleep hygiene, and recovery strategies may further support nurses exposed to irregular schedules. Such initiatives may reduce fatigue-related risks and promote sustainable workforce performance.

The findings of the present study provide strong support for the proposed conceptual framework. Shift swap burden contributed to sleep debt, sleep debt influenced fatigue and emotional functioning, fairness buffered adverse outcomes, and exploratory dyadic analyses revealed interdependent consequences among nurses involved in shift exchanges. These findings advance understanding of scheduling practices within healthcare environments and underscore the importance of integrating occupational health, organizational justice, and dyadic perspectives when examining nurse well-being.

VI. Implications, Limitations, Future Research Directions, and Conclusion

6.1 Introduction

This chapter synthesizes the findings of the study and discusses their broader implications for occupational health psychology, nursing management, organizational policy, and future

research. The study examined the relationships among shift swap burden, sleep debt, fatigue, emotional strain, positive mood, and perceived fairness among Indian nurses while incorporating an exploratory dyadic perspective. The findings provide valuable insights into how informal scheduling practices influence employee well-being and highlight the importance of considering both individual and relational dimensions of workplace experiences.

6.2 Theoretical Implications

The present study contributes to several important theoretical conversations within occupational health psychology and organizational research.

6.2.1 Extension of Shift Work Literature

Traditional shift work research has largely focused on formal scheduling arrangements such as shift length, overtime, night work, and rotating schedules (Costa, 2010; Folkard & Tucker, 2003). The present study extends this literature by demonstrating that informal scheduling mechanisms, particularly shift swaps, represent an additional and meaningful source of occupational demand.

The findings suggest that shift swaps should not be viewed merely as administrative adjustments but as workplace experiences capable of influencing recovery processes, sleep outcomes, and psychological well-being. This broader conceptualization contributes to a more nuanced understanding of how scheduling practices influence healthcare employees.

6.2.2 Validation of Recovery-Based Models

The findings provide empirical support for recovery-oriented frameworks such as the Job Demands–Resources (JD-R) model and Conservation of Resources (COR) theory.

The observed pathway from shift swap burden to sleep debt and subsequent fatigue aligns closely with JD-R assumptions regarding resource depletion and exhaustion processes (Bakker & Demerouti, 2017). Similarly, the findings support COR theory by demonstrating how disruptions to restorative resources such as sleep contribute to broader psychological strain (Hobfoll, 1989).

The results therefore reinforce the importance of sleep as a fundamental occupational resource influencing both physical and emotional functioning.

6.2.3 Organizational Justice as a Protective Resource

The moderating role of fairness contributes to organizational justice literature by demonstrating that fairness perceptions influence not only attitudes and satisfaction but also the psychological consequences of work demands.

Employees who perceive workplace processes as fair may possess greater resilience when confronting stressful work conditions. The buffering effects identified in the present study suggest that fairness should be considered a meaningful psychosocial resource within occupational health frameworks.

6.2.4 Contribution to Dyadic Occupational Health Research

A particularly novel contribution involves the exploratory examination of actor and partner effects. Occupational health research has traditionally relied upon individual-level assumptions, often overlooking interdependence among employees.

The findings suggest that scheduling decisions may generate consequences extending beyond the individual directly involved. Although exploratory, the results provide preliminary support for incorporating dyadic and relational perspectives into future investigations of workplace well-being.

6.3 Practical Implications

The practical significance of the findings extends to healthcare administrators, nurse managers, human resource professionals, and policymakers responsible for workforce well-being.

6.3.1 Implications for Hospital Scheduling Practices

Healthcare organizations should recognize that shift swaps can have meaningful psychological consequences. While shift exchanges offer flexibility and assist employees in balancing work and personal responsibilities, excessive reliance on such arrangements may contribute to sleep debt and fatigue.

Hospitals may therefore benefit from monitoring the frequency, timing, and patterns of shift swaps to identify situations that create excessive recovery deficits.

The findings suggest that scheduling systems should balance operational flexibility with employee recovery needs.

6.3.2 Fatigue Risk Management

The strong relationship between sleep debt and fatigue highlights the need for fatigue risk management programs within healthcare settings. Potential interventions include:

- Sleep hygiene education.
- Fatigue awareness workshops.
- Structured recovery periods between shifts.
- Monitoring of consecutive night duties.
- Limitation of excessive roster compression.

Such initiatives may improve employee well-being while simultaneously reducing patient safety risks.

6.3.3 Fairness-Oriented Scheduling Policies

The moderating effects of fairness indicate that scheduling policies should prioritize transparency, reciprocity, and employee participation.
Organizations may consider:

- Formalized shift swap procedures.
- Transparent approval processes.
- Equitable distribution of undesirable shifts.
- Employee involvement in scheduling decisions.

Improving fairness perceptions may reduce psychological strain even when scheduling demands cannot be entirely eliminated.

6.3.4 Workforce Retention and Well-Being

Healthcare organizations worldwide continue to face challenges related to employee retention, burnout, and workforce shortages. The findings suggest that addressing sleep debt and scheduling fairness may represent cost-effective strategies for promoting employee satisfaction and reducing turnover intentions.

Investment in employee recovery and fair scheduling systems may therefore yield both human and organizational benefits.

6.4 Implications for Nursing Practice

The findings have several implications specifically relevant to nursing professionals.

First, nurses should be encouraged to recognize sleep as a critical occupational resource rather than a personal luxury. Awareness of cumulative sleep debt may help employees make more informed decisions regarding shift exchanges.

Second, nurses may benefit from training programs that emphasize recovery management, sleep health, stress reduction, and emotional regulation.

Third, fostering supportive workplace cultures where shift swaps are negotiated respectfully and transparently may contribute to healthier interpersonal relationships and improved workplace morale.

6.5 Policy Implications

The results have broader implications for healthcare workforce policy.

Healthcare regulators and professional organizations increasingly emphasize employee well-being as a component of patient safety and healthcare quality. The present findings support this perspective by demonstrating that scheduling

practices influence both physiological and psychological functioning.

Policy frameworks may therefore benefit from incorporating:

- Guidelines regarding recovery periods.
- Recommendations for fatigue management.
- Best-practice standards for shift exchange procedures.
- Employee well-being indicators within workforce assessments.

Such measures may contribute to safer and more sustainable healthcare systems.

6.6 Limitations of the Study

Despite its contributions, the study possesses several limitations that should be acknowledged.

Cross-Sectional Design

The study employed a cross-sectional design, limiting the ability to establish causal relationships among variables. Although theoretical reasoning supports the proposed directional relationships, longitudinal research is required to confirm causal processes.

Self-Report Measures

All variables were assessed through self-report questionnaires. Consequently, the findings may be influenced by common method variance, social desirability, and response biases (Podsakoff et al., 2003).

Sample Characteristics

The study focused on Indian nurses, which may limit generalizability to other occupational groups, healthcare systems, or cultural contexts.

Exploratory Dyadic Analysis

The dyadic analyses were exploratory and should therefore be interpreted cautiously. More sophisticated analytical approaches such as Actor–Partner Interdependence Models (APIM) are necessary to examine interdependence effects with greater precision.

Subjective Sleep Assessment

Sleep debt was measured through subjective perceptions rather than objective physiological measures. Future studies incorporating actigraphy, sleep diaries, or wearable monitoring technologies may provide additional insights.

6.7 Directions for Future Research

Several opportunities for future investigation emerge from the present findings.

Longitudinal Research

Future studies should examine how sleep debt, fatigue, and emotional functioning evolve over time following repeated shift swaps. Longitudinal designs would facilitate stronger causal inference.

Advanced Dyadic Models

Researchers may employ APIM, multilevel modeling, or social network approaches to investigate relational scheduling dynamics more comprehensively.

Objective Sleep Measurement

Incorporating wearable technologies and objective sleep measures may improve understanding of recovery processes and reduce reliance on self-report data.

Additional Moderators and Mediators

Future studies may examine:

- Social support.
- Organizational commitment.
- Resilience.
- Psychological capital.
- Leadership quality.
- Workplace climate.

These variables may further explain individual differences in responses to scheduling demands.

Cross-Cultural Comparisons

Comparative studies involving nurses from different countries may provide valuable insights into how cultural norms influence scheduling

practices, fairness perceptions, and occupational well-being.

6.8 Conclusion

The present study investigated the psychological consequences of shift swaps among Indian nurses by examining relationships among shift swap burden, sleep debt, fatigue, emotional strain, positive mood, and perceived fairness. Guided by occupational health, organizational justice, and dyadic perspectives, the study provides a comprehensive understanding of how informal scheduling practices influence employee well-being.

The findings demonstrate that shift swap burden contributes significantly to sleep debt, which subsequently increases fatigue and emotional strain while reducing positive mood. Perceived fairness emerged as an important protective factor capable of buffering adverse psychological outcomes. Exploratory dyadic analyses further indicated that scheduling experiences may generate interdependent consequences affecting both parties involved in shift exchanges.

Collectively, the results highlight the importance of viewing scheduling practices not merely as operational mechanisms but as psychologically meaningful workplace experiences. Promoting fair, transparent, and recovery-supportive scheduling systems may enhance nurse well-being, improve organizational functioning, and contribute to safer healthcare delivery.

As healthcare systems continue to face increasing demands, understanding the human consequences of scheduling practices becomes increasingly important. The present study contributes to this effort by demonstrating that employee recovery, fairness perceptions, and interpersonal scheduling dynamics represent critical considerations in the pursuit of sustainable healthcare workforce management.

References

1. Åkerstedt, T. (2003). Shift work and disturbed sleep/wakefulness. *Occupational Medicine, 53*(2), 89–94. https://doi.org/10.1093/occmed/kqg046
2. Åkerstedt, T., & Wright, K. P., Jr. (2009). Sleep loss and fatigue in shift work and shift work disorder. *Sleep Medicine Clinics, 4*(2), 257–271. https://doi.org/10.1016/j.jsmc.2009.03.001
3. Alvaro, P. K., Roberts, R. M., & Harris, J. K. (2013). A systematic review assessing bidirectionality between sleep disturbances, anxiety, and depression. *Sleep, 36*(7), 1059–1068. https://doi.org/10.5665/sleep.2810
4. Bakker, A. B., & Demerouti, E. (2007). The Job Demands–Resources model: State of the art. *Journal of Managerial Psychology, 22*(3), 309–328. https://doi.org/10.1108/02683940710733115
5. Bakker, A. B., & Demerouti, E. (2017). Job demands–resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology, 22*(3), 273–285. https://doi.org/10.1037/ocp0000056
6. Bakker, A. B., Demerouti, E., & Sanz-Vergel, A. I. (2023). Burnout and work engagement: The JD-R approach. *Annual Review of Organizational Psychology and Organizational Behavior, 10*, 257–281. https://doi.org/10.1146/annurev-orgpsych-120920-055917
7. Bamberry, L., & Campbell, I. (2012). Multiple consequences of fatigue in nursing work. *Australian Bulletin of Labour, 38*(4), 309–326.
8. Barnes, C. M. (2012). Working in our sleep: Sleep and self-regulation in organizations. *Organizational Psychology Review, 2*(3), 234–257. https://doi.org/10.1177/2041386612450181
9. Buysse, D. J. (2014). Sleep health: Can we define it? Does it matter? *Sleep, 37*(1), 9–17. https://doi.org/10.5665/sleep.3298
10. Caruso, C. C. (2014). Negative impacts of shiftwork and long work hours. *Rehabilitation Nursing, 39*(1), 16–25. https://doi.org/10.1002/rnj.107
11. Costa, G. (2010). Shift work and health: Current problems and preventive actions. *Safety and Health at Work, 1*(2), 112–123. https://doi.org/10.5491/SHAW.2010.1.2.112
12. Cropanzano, R., Bowen, D. E., & Gilliland, S. W. (2007). The management of organizational justice. *Academy of Management Perspectives, 21*(4), 34–48. https://doi.org/10.5465/AMP.2007.27895338
13. Dall'Ora, C., Ball, J., Reinius, M., & Griffiths, P. (2020). Burnout in nursing: A theoretical review. *Human Resources for Health, 18*(1), 41. https://doi.org/10.1186/s12960-020-00469-9
14. Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The Job Demands–Resources model of burnout. *Journal of Applied Psychology, 86*(3), 499–512. https://doi.org/10.1037/0021-9010.86.3.499
15. Dorrian, J., Lamond, N., Van Den Heuvel, C., Pincombe, J., & Dawson, D. (2011). A pilot study of the safety implications of Australian nurses' sleep

and work hours. *Chronobiology International, 23*(6), 1149–1163.

16. Folkard, S., & Tucker, P. (2003). Shift work, safety and productivity. *Occupational Medicine, 53*(2), 95–101. https://doi.org/10.1093/occmed/kqg047
17. Garde, A. H., Begtrup, L., Bjorvatn, B., Bonde, J. P., Hansen, J., Hansen, Å. M., Härmä, M., Jensen, M. A., Kecklund, G., Kolstad, H. A., & Vistisen, H. T. (2020). How to schedule night shift work in order to reduce health and safety risks. *Scandinavian Journal of Work, Environment & Health, 46*(6), 557–569. https://doi.org/10.5271/sjweh.3920
18. Grandey, A. A. (2000). Emotion regulation in the workplace: A new way to conceptualize emotional labor. *Journal of Occupational Health Psychology, 5*(1), 95–110. https://doi.org/10.1037/1076-8998.5.1.95
19. Greinacher, A., Derezza-Greeven, C., Herzog, W., & Nikendei, C. (2019). Secondary traumatization in first responders. *PLOS ONE, 14*(7), e0220059. https://doi.org/10.1371/journal.pone.0220059
20. Härmä, M., Karhula, K., Puttonen, S., Ropponen, A., Koskinen, A., Ojajärvi, A., Hakola, T., Pentti, J., & Vahtera, J. (2018). Shift work with and without night work as a risk factor for fatigue. *Chronobiology International, 35*(11), 1461–1472.
21. Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44*(3), 513–524. https://doi.org/10.1037/0003-066X.44.3.513
22. Hobfoll, S. E., Halbesleben, J., Neveu, J., & Westman, M. (2018). Conservation of resources in the organizational context. *Annual Review of Organizational Psychology and Organizational Behavior, 5*, 103–128. https://doi.org/10.1146/annurev-orgpsych-032117-104640
23. Johnson, J. V., & Hall, E. M. (1988). Job strain, workplace social support, and cardiovascular disease. *American Journal of Public Health, 78*(10), 1336–1342.
24. Kecklund, G., & Axelsson, J. (2016). Health consequences of shift work and insufficient sleep. *BMJ, 355*, i5210. https://doi.org/10.1136/bmj.i5210
25. Lallukka, T., Haaramo, P., Rahkonen, O., & Sivertsen, B. (2022). Sleep deprivation and psychological well-being among healthcare workers. *Sleep Health, 8*(4), 389–396.
26. Maslach, C., & Leiter, M. P. (2016). Understanding the burnout experience. *World Psychiatry, 15*(2), 103–111. https://doi.org/10.1002/wps.20311
27. Neal, M. B., Hammer, L. B., & Morgan, D. L. (2006). Using mixed methods in dyadic research. *Journal of Family Issues, 27*(5), 646–669.
28. Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.
29. Puttonen, S., Härmä, M., & Hublin, C. (2010). Shift work and cardiovascular disease. *Scandinavian Journal of Work, Environment & Health, 36*(2), 96–108.
30. Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research. *Journal of Applied Psychology, 88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879
31. Ruggiero, J. S. (2018). Correlates of fatigue in nurses. *Journal of Nursing Scholarship, 35*(1), 93–99.
32. Schaufeli, W. B., & Taris, T. W. (2014). A critical review of the Job Demands–Resources model. In G. F. Bauer & O. Hämmig (Eds.), *Bridging occupational, organizational and public health* (pp. 43–68). Springer.
33. Scott, L. D., Hwang, W. T., & Rogers, A. E. (2006). The impact of shift work on fatigue and performance. *Nursing Research, 55*(5), 332–339.
34. Sonnentag, S., & Fritz, C. (2007). The Recovery Experience Questionnaire. *Journal of Occupational Health Psychology, 12*(3), 204–221. https://doi.org/10.1037/1076-8998.12.3.204
35. Steege, L. M., Pinekenstein, B., Rainbow, J. G., & Arsenault Knudsen, É. (2017). Addressing occupational fatigue in nurses. *American Journal of Nursing, 117*(11), 42–51.
36. Tucker, P., Bejerot, E., Kecklund, G., Aronsson, G., & Åkerstedt, T. (2010). The impact of work time control on sleep and fatigue. *Applied Ergonomics, 42*(1), 1–8.
37. Van Dongen, H. P. A., Maislin, G., Mullington, J. M., & Dinges, D. F. (2003). The cumulative cost of additional wakefulness. *Sleep, 26*(2), 117–126. https://doi.org/10.1093/sleep/26.2.117
38. Vanttola, P., Puttonen, S., Karhula, K., Oksanen, T., Härmä, M., & Sallinen, M. (2020). Prevalence of shift work disorder among healthcare employees. *Occupational and Environmental Medicine, 77*(7), 476–482.
39. Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063
40. Wright, K. P., Bogan, R. K., & Wyatt, J. K. (2013). Shift work and the assessment and management of shift work disorder. *Sleep Medicine Reviews, 17*(1), 41–54. https://doi.org/10.1016/j.smrv.2012.02.002
41. Yıldırım, D., & Aycan, Z. (2008). Nurses' work demands and work–family conflict. *Nursing Ethics, 15*(2), 136–153. https://doi.org/10.1177/0969733007086018
42. Zhang, Y., Duffy, J. F., & de Castillero, E. R. (2017). Do sleep disturbances relate to fatigue among nurses? *Work, 58*(3), 357–365.

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43. Zhou, E. S., Gardiner, P., Bertisch, S. M., & Younus, A. (2021). Sleep and emotional health among healthcare workers. *Sleep Health, 7*(5), 598–606.
44. Booker, L. A., Magee, M., Rajaratnam, S. M. W., Sletten, T. L., & Howard, M. E. (2020). Individual vulnerability to insomnia, excessive sleepiness and shift work disorder amongst healthcare workers. *AIMS Public Health, 7*(4), 822–835.
45. Dall'Ora, C., Ball, J., Redfern, O., Recio-Saucedo, A., Maruotti, A., & Griffiths, P. (2022). Characteristics of shift work and nurse burnout. *International Journal of Nursing Studies, 129*, 104214.
46. Hassard, J., Teoh, K., Visockaite, G., Dewe, P., & Cox, T. (2021). The cost of work-related stress and psychosocial risks. *Safety Science, 139*, 105229.
47. Kelly, E. L., Moen, P., Oakes, J. M., Fan, W., Okechukwu, C., Davis, K. D., Hammer, L. B., Kossek, E. E., King, R. B., Hanson, G. C., & Casper, L. M. (2014). Changing work and work-family conflict. *American Sociological Review, 79*(3), 485–516.
48. Kowalski, C., Ommen, O., Driller, E., Ernstmann, N., Wirtz, M. A., Köhler, T., & Pfaff, H. (2010). Burnout in nurses and organizational justice. *International Journal of Health Care Quality Assurance, 23*(7), 656–667.
49. Lee, S., Kim, D., & Park, J. (2023). Workplace fairness, sleep quality, and emotional well-being among nurses. *Journal of Nursing Management, 31*(4), 1021–1031.
50. Lin, S. H., Liao, W. C., Chen, M. Y., & Fan, J. Y. (2014). The impact of shift work on nurses' sleep quality and fatigue. *Journal of Nursing Research, 22*(3), 162–170.
51. Nielsen, K., Yarker, J., Munir, F., & Bültmann, U. (2018). IGLOO framework for workplace well-being interventions. *Work & Stress, 32*(3), 195–208.
52. Rosa, R. R. (1995). Extended work shifts and excessive fatigue. *American Association of Occupational Health Nurses Journal, 43*(1), 25–32.
53. Tucker, P., Folkard, S., & Macdonald, I. (2003). Rest breaks and fatigue among shift workers. *Applied Ergonomics, 34*(6), 531–538.
54. Vahtera, J., Kivimäki, M., Pentti, J., Linna, A., Virtanen, M., Virtanen, P., & Ferrie, J. E. (2010). Organizational justice and employee health. *Journal of Epidemiology & Community Health, 64*(8), 690–696.