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Human resource concerns on sleep quality, perceived stress and performance of working mothers: Evidence from manufacturing firms in Nigeria

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Abstract: This study aimed to fill an information gap by examining the critical human resource issue of sleep quality and perceived stress, which impact the success of working mothers. A survey research design was employed. Purposive sampling was triangulated with snowball technique to select 400 participants. Validated scales (PSQI and PSS-10) were used. Structural equation modelling was used to test hypothesized relationships. Findings showed that mild sleep disturbances ($\beta = .220$; $p\text{-value} < 0.01$), habitual sleep efficiency ($\beta = .176$; $p\text{-value} < 0.01$), moderate sleep disturbances ($\beta = .103$; $p\text{-value} < 0.05$), and the frequency of sleep medication ($\beta = .154$; $p\text{-value} < 0.01$) have positive and significant relationship with consistencies in task performance. The implications are that some specific sleep patterns and coping with small sleep issues can improve performance, and dealing practically with challenges (buffered helplessness) is more important to contextual performance than just feeling competent.

Keywords: Good Sleep Quality; Sleep Onset Latency; Sleep Duration Adequacy; Habitual Sleep Efficiency; Sleep Disturbance Frequency; Buffered Helplessness

1. Introduction

Quality of sleep and stress, which relate to each other, have emerged as significant human resource development issues, especially for working mothers who concurrently handle their professional and domestic responsibilities. These factors assume even bigger proportions for manufacturing sector organizations where job demands are high, and time and shift arrangements may be strictly adhered to. Sleep is no longer considered an action that the human body takes involuntarily, but as a complex recovery mechanism that has positive and significant associations for cognitive, emotional, and sustained work performance (Nelson et al., 2022; Crivello et al., 2019). Based on the Theory of Sleep Quality, dimensions of sleep quality comprise subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, the use of sleep medication, and daytime dysfunction, which can be quantitatively measured through the Pittsburgh Sleep Quality Index (PSQI) (Mollayeva et al., 2016; Ulander et al., 2021). For working mothers, disruptions in all these dimensions of sleep quality may assume significant effects, especially when they accommodate their tasks, extended periods of caregiving, and increased psychosocial pressures, and may impact their performance and adaptability at work (Härdelin et al., 2021; Keskin

et al., 2024).

The relationship between sleep quality and performance is solidly established by the Brain Plastic Theory, which clearly outlines how sleep is crucial for synaptic reorganization and the overall efficiency of the brain for proper learning, focus, and flexibility (Tobaldini et al., 2017; Zhu et al., 2017). An alternative understanding of the relationship is offered by the information consolidation theory by Born and Wilhelm (2012), which explains the role of sleep, specifically slow-wave sleep, in the consolidation of new information in the brain for its integration into the long-term memory store. When the quality of sleep is poor, the consolidation of skills and learning is also compromised, resulting in slow performance, decreased accuracy, and overall adaptive performance (Born & Wilhelm, 2012; Almarzouki et al., 2022). For instance, long sleep latency, reduced amount of sleep, and shallow sleep, which are common in working mothers, are associated with increased errors, reduced productivity, and inflexibility of adapting to an evolving work environment (Deng et al., 2022; Afonso et al., 2022).

Besides sleep quality, perceived stress is an important construct that highlights a significant psychological rubric in the regulation of work performance. As stipulated by Coping Theory, work-related stress is a transactional process resulting from individuals' ratings of environmental demands relative to their anticipated coping resources. Whenever working mothers rate the demands as overwhelming and uncontrollable, stress is thereby defined by helplessness and low self-efficacy constructs (Cohen & Janicki-Deverts, 2012). These stress-related constructs have been well measured by the Cohen Perceived Stress Scale (PSS-10), a universally validated scale that measures the degree to which individuals perceive their lives as unpredictable, uncontrollable, and overwhelming (Taylor, 2015; Lee, 2012). High levels of helplessness can trigger low motivation levels, whereas low self-efficacy will impair the contextual and adaptive performance of the employees (Wach et al., 2021; Kumar et al., 2022).

However, further research suggests a mutually reinforcing relationship to the extent that better sleep quality or reduced stress will act as a buffer while poor quality or stress will worsen emotional states and coping abilities. Research findings on working mothers indicate a consistent trend, namely, this relationship is responsible for a decline in job performance, quality of work, and individual well-being (Khan & Asad, 2021; Nadri et al., 2024; Sadiq et al., 2024). In a manufacturing scenario, tasks performed, contextual contributions such as cooperation and adaptability, and the ability to adapt to production or technological requirements in the workplace would be adversely affected (Deng et al., 2022; Sonnentag, 2018).

For working women in Nigeria, there are other levels of structural and socio-cultural challenges, which include the lack of organizational supporting systems, family demands, and economic difficulties. Although there have been studies conducted within the Nigerian context with regards to stress management, work-family balance, and well-being, little attention has been paid to sleep quality as an integral human resource issue or the specific sleep and stress dimensions that translate into distinct facets of work performance (Ikpeama, 2024; Echebiri et al., 2025). In fact, the differential effects of subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, the use of sleep medication, and daytime dysfunction on task and adaptive performance remain understudied. Similarly, although perceived helplessness and lack of self-efficacy are recognized to be important stress responses, their specific implications for contextual and adaptive performance among working mothers in manufacturing firms are not clearly articulated (Taylor, 2015; Wach et al., 2021).

Applying the Theory of Sleep Quality, Brain Plasticity Theory, Information

Consolidation Theory proposed by Born and Wilhelm (2012), and Coping Theory, the study fills the information gap by examining the critical human resource issue of sleep quality and perceived stress, which impact the success of working mothers in manufacturing firms in Nigeria. With reliable and valid instruments, like the PSQI and Cohen PSS-10, the study investigates the impact of multidimensional sleep quality on task and adaptive performance, and the effects of buffered helplessness and self-efficacy on contextual performance.

2. Literature review

2.1 Theoretical Underpinning

Quality of sleep and stress levels are two core human resource factors that can be linked to the performance of working mothers in manufacturing firms. Brain Plasticity Theory's basic assumption is that sleep plays a vital role in the reorganization of the synapses of the brain to enhance learning and adaptability of the brain (Asuku et al., 2025; Raven et al., 2018; Seibt & Frank, 2019). Sleeping increases the effective learning and adaptability of the human brain; conversely, inefficient sleep inhibits the adaptability of the human brain to respond to enhanced work processing demands. Born & Wilhelm's (2012) information consolidation theory noted that sleep is necessary to consolidate information learned from the work setting and daily work activities. For working mothers in the manufacturing industry, the quality of sleep is usually inefficient and compromises the ability of the human brain to consolidate information learned from the work setting and daily work activities; consequently, the adaptability of the human brain is hampered significantly (Deng et al., 2022; Härdelin et al., 2021; Zhu et al., 2017).

As a complement to the "sleep"-based approaches to the exploration of performance, the "Coping Theory" sheds light on the manner in which perceived stress contributes to the performance of an individual through cognitive appraisal. For example, through experiencing perceived helplessness, working mothers perceive the requirements of their work to be beyond control. Consequently, their levels of motivation to contribute to contextual performance are reduced. Further, through the experience of self-efficacy, working mothers are less able to cope with complex or dynamic task requirements (Ferrari, 2023; Li et al., 2022; Lopez-Garrido, 2023). These approaches provide an understanding of how sleeping patterns and perceived stress nucleus act as integrated HR mechanisms influencing performance among working mothers operating within manufacturing firms in Nigeria.

2.2 Hypothesis development

Perceived subjective sleep quality, sleep onset latency, sleep duration adequacy, habitual sleep efficiency, sleep disturbance frequency, sleep medication usage, and daytime functional efficiency are all widely considered to be of prime importance for the performance of tasks. The theory of sleep quality asserts that sleeping is a process of restoration that is vital for the maintenance of attention, memory, and performance of executive processes that are necessary for the performance of tasks effectively (Buysse, 2014). The empirical literature suggests that the performance of tasks is adversely affected by low levels of perceived subjective sleep quality due to low alertness levels, slower reaction times, and lower levels of accuracy. Consequently, such low levels of sleep quality adversely affect job performance (Crivello et al., 2019; Nelson et al., 2022). Similar is the implication of elevated levels of sleep onset latency that are indicative of heightened arousal levels. Such heightened levels of arousal cause lower levels of sleep due to elevated levels of stress that adversely affect the efficiency levels of employees who are required to perform tasks (Gaş et al., 2021).

Further, it has been suggested that durations of adequate sleep also have an

important role to play in the maintenance of vigilance or productivity levels. A lack of proper sleep results in errors due to fatigue, as well as the deterioration of product quality (Hirshkowitz et al., 2015; Deng et al., 2022). A personal habit of efficiency levels regarding sleep is equally important; a lack of efficiency implies a lack of continuity in the memory consolidation process, thereby affecting the regulation of task performances in a non-sustainable manner (McCarter et al., 2022). Sleep disturbances can affect an individual's condition in various ways. Although mild forms of sleep disturbance might have a mild impact on an individual's vigilance, moderate forms have been known to cause a sharp cognitive slowdown (Riethmeister et al., 2018; Wang et al., 2022).

Coping strategies such as the use of sleeping medication help with the initiation of sleep but may leave the individual with a state of sedation the next day that affects the level of cognitive acuity (Cho & Duffy, 2019). Daytime functional efficiency refers to the behavioral representation of the sleep quality dimensions. When employees in an organization struggle with their efficiency in the morning due to states of sleepiness, lack of energy, as well as reduced motivation levels, it becomes difficult for them to execute tasks with the required consistency (Sonnentag, 2018). Hence the hypotheses that:

H1a: Perceived Good Sleep Quality significantly affects consistency of task performance.

H1b: Shorter Sleep Onset Latency significantly affects consistency of task performance.

H1c: Sleep Duration Adequacy significantly affects consistency of task performance.

H1d: Habitual Sleep Efficiency Level significantly affects consistency of task performance.

H1e: Sleep Disturbance Frequency (mild sleep disturbance and moderate sleep disturbance) significantly affects consistency of task performance.

H1f: Sleep Medication Use Frequency significantly affects consistency of task performance.

H1g: Daytime Functional Efficiency significantly affects consistency of task performance.

Adaptive performance is the employees' ability to adapt successfully to unforeseen demands of the tasks and work environment; the quality of the employees' sleep was identified as one of the fundamental resources underlying adaptive performance capacity. Prior research has explicitly confirmed the considerable role of the quality of employees' sleep in the development of adaptive performance capacity of working mothers (Crivello et al., 2019; Nelson et al., 2022). The subjective perceived quality of the employees' sleep is the individuals' subjective evaluation of the sleep's restorative value; it was discovered that it has a positive association with emotional, cognitive, and resilience abilities essential for adapting successfully (Härdelin et al., 2021; Keskin et al., 2024).

Sleep onset latency, which refers to the time it takes to fall asleep, determines adaptive performance depending on whether it affects physiological arousal and cognitive preparedness appropriately; long onset latency is known to interfere with memory consolidation and expose the individual to emotional stress, thereby compromising adaptive performance (Gaş et al., 2021; Born & Wilhelm, 2012). Similarly, adequacy of sleep duration provides enough bed rest for neurocognitive adaptability; thus, inadequate bed rest exposes one to fatigue, cognitive distraction, and a lack of flexibility in adaptability, thereby compromising adaptive performance (Hirshkowitz et al., 2015; Gomez Fonseca & Genzel, 2020). Efficiency of sleep habits, which refers to the rate at which

one sleeps relative to the time spent in bed, as well as the disturbances during sleep, also contribute to adaptability; thus, poor sleep efficiency and moderate disturbances during sleep compromise synaptic plasticity, thereby compromising adaptative performance (McCarter et al., 2022; Riethmeister et al., 2018; Wang et al., 2022). In addition, adaptative performance by employees may be influenced by the use of sleep medication; though such medication promotes adaptative performance, frequent use may, however, expose employees to drowsiness or cognitive impairment, thereby compromising adaptative performance (Cho & Duffy, 2019).

Daytime functional efficiency represents the effect of various dimensions of sleep, including energy levels, being alert, and engaging in tasks, which are crucial factors of adaptive performance. Thus, when these factors are impaired in the daytime, working mothers are less efficient at adapting to new requirements or stressors (Sonnentag, 2018; Deng et al., 2022). These factors related to sleeping contribute to a complex system of interrelated factors of adaptive performance; thus, sleeping becomes an essential human resource issue. We hypothesize that:

H2a: Perceived Good Sleep Quality significantly affects adaptive performance.

H2b: Shorter Sleep Onset Latency significantly affects adaptive performance.

H2c: Sleep Duration Adequacy significantly affects adaptive performance.

H2d: Habitual Sleep Efficiency Level significantly affects adaptive performance.

H2e: Sleep Disturbance Frequency (mild sleep disturbances and moderate sleep disturbances) significantly affects adaptive performance.

H2f: Sleep Medication Use Frequency significantly affects adaptive performance.

H2g: Daytime Functional Efficiency significantly affects adaptive performance.

In line with earlier research, high levels of stress have emerged as a widespread need to be addressed to enhance performance at work, especially among working mothers (Cohen & Janicki-Deverts, 2012; Nadri et al., 2024). Under these conditions, the construct known as “buffered helplessness” has emerged as the most instrumental attribute that motivates and influences performance at the contextual level. In essence, the construct defines an attribute within which the damaging effects of helplessness are effectively addressed. Buffering encompasses support obtained from reliable sources and the ability to apply coping mechanisms to reduce stress and its effects on overall performance at the workplace (Ikpeama, 2024; Khan & Asad, 2021). At the same time, an increased positive perception of self-efficacy—the feeling and belief within an employee that they are in the best position to handle and effectively execute policies and task-related challenges within an organization—has significantly influenced performance at the contextual level (Sonnentag, 2018; Wach et al., 2021). High self-efficacy helps working mothers to look at their stressors as challenges, not barriers, which motivates them to engage in discretionary work behavior, beyond their required tasks (Taylor, 2015; Lee, 2012).

The concept of “buffered helplessness” refers to a working mother’s ability to manage her emotions and stress. Empirical research has pointed out that buffered helplessness and self-efficacy manifest as moderators of the adverse effects of perceived stress on outcomes of performance. For example, mothers who have balanced sleep patterns and receive support from their social environment display reduced stress-induced impairment with greater adaptive behaviors at work, signifying the capacity of psychological resources to produce behavioral capability out of potential risk (Härdelin et al., 2021; Gaş et al., 2021; Kumar et

al., 2022). Furthermore, highly structured approaches toward stress management result in increased self-efficacy and buffered helplessness, ultimately having a positive impact on the quality of contextual performance (Ikpeama, 2024; Wach et al., 2021). Thus, we hypothesized that:

H3a: Buffered helplessness significantly affects contextual performance.

H3b: Enhanced self-efficacy significantly affects contextual performance.

3. Materials and methods

3.1 Research design

The study employed a survey research design. The participants were given the chance to participate in the survey at the most convenient time. This is because the researchers were aware that the participants had work and family responsibilities. Understanding this, we employed both manual forms of sending the questionnaires as well as the use of the internet to deliver the questionnaires. This helped to boost the response rate and accuracy of the data collected from the participants.

3.2 Population and Sampling

The target study population comprised working mothers who were employed within various professions in manufacturing firms within the country, Nigeria. The study identified the working mother as having competing responsibilities, which can impact performance outcomes, stress levels, and the quality of sleep (Härdelin et al., 2021; Nadri et al., 2024). Purposive sampling was used as the sampling strategy in the quantitative study, where the study attracted 400 participants who met the requirements of the study. The requirements were that the participant had to be a mother, had to be employed on a full-time basis in the manufacturing firms in the country, and had to have the responsibilities of nurturing at least a child. The purposive samples ensured that the sample attracted participants who had firsthand knowledge of the impact of sleep, stress levels, and resultant performance outcomes. To access more participants, the quantitative study employed snowballing as a sampling strategy, which ensured the expansion of the target sample to access the hard-to-reach populations in the country. The hard-to-reach populations of the quantitative study comprised working mothers within the manufacturing firms in Nigeria who might not have had the opportunities to participate in the quantitative study.

3.3 Description of Instrument

A standard and structured questionnaire was designed to capture data on all study variables, which were sleep quality, perceived stress, stress management constructs, and performance outcomes. These questionnaires have been enhanced by integrated and validated scales: the PSQI, used to assess the dimensions of sleep quality; and the PSS, which is a measure of perceived stress adapted in this study for the particular context of working mothers (Mollayeva et al., 2016; Cohen & Janicki-Deverts, 2012; Taylor, 2015). Additional items were developed to evaluate performance outcomes, including consistency of task performance, adaptive performance, and contextual performance. **Table 1** depicts how the measurement breakdown and explanation of the variables are carried out.

The initial invitation to the selected manufacturing companies led to liaison with the human resource departments to assist in securing participants who would match the inclusion criteria for the study, a full-time working mother with responsibility for at least one child. This ensured participants for the sampling frame from relevant experiences.

Table 1. Description of instrument

Variables	Sub-variables	Explanation
Sleep Quality	Subjective sleep quality	The single item of PSQI was expanded to 3 items having considered the prefix 'perceived'.
	Sleep onset latency	The 2-items for sleep onset latency were considered.
	Sleep Duration Adequacy	Sleep duration was extended to 3-items, considering the research interest on its adequacy.
	Habitual Sleep Efficiency Level	The 3-items for habitual sleep efficiency level were used for measurement.
	Sleep Disturbance	For the sleep disturbance frequency, 3-items were adapted to measure mild sleep disturbances as well as moderate sleep disturbances.
	Sleep Medication Use Frequency	Considering the use frequency of sleep medication, 3-items were considered.
	Daytime Functional Efficiency	The 2-items for daytime functional efficiency were adapted.
Perceived Stress	Buffered Helplessness	3-items were adapted to measure buffered helplessness.
	Enhanced Self-efficacy	3-items were adapted to measure enhanced self-efficacy.
Performance	Consistency of Task Performance	3-items were generated based on literature review.
	Adaptive Performance	3-items were generated based on literature review.
	Contextual Performance	3-items were generated based on literature review.

3.4 Reliability and validity

To establish the reliability and validity of the research instrument, tried-and-tested measures were employed such that revalidation was done. Research studies conducted in the past proved the reliability and construct validity of the scale on diverse samples such as working adults and mothers (Cohen & Janicki-Deverts, 2012; Lee, 2012; Taylor, 2015). Furthermore, the addition of measuring items enabled the researchers of this study to revalidate the instrument. Construct validity was confirmed by conceptualizing the variables through clear guidelines emanating from past literature. Moreover, through using multiple indirect measures of the constructs under investigation, the researcher was able to establish good representation of the constructs employed. Reliability of the instrument was determined using Cronbach's Alpha Coefficient on all the constructs. The coefficient is satisfactory if equal to or above 0.70 (Hair et al., 2010); hence, the reliability of the instrument is proven. **Table 2** shows the results on the instrument's reliability and validity.

Table 2. Constructs' reliability and validity

Indicator Variable	Loading	AVE	CR	CA(α)
PSQ1	0.821	0.608248667	0.779902985	0.725
PSQ2	0.753			
PSQ3	0.764			
SSL1	0.744	0.585666	0.765288181	0.721
SSL2	0.786			
SDA1	0.845			
SDA2	0.813	0.647836667	0.804883014	0.754
SDA3	0.754			
HSE1	0.712			
HSE2	0.814	0.568454667	0.753959327	0.718
HSE3	0.732			
MSD1	0.767			
MSD2	0.769	0.56125	0.749166203	0.728
MSD3	0.71			

Continued table:

Indicator Variable	Loading	AVE	CR	CA(α)
MSS1	0.728	0.563838	0.75089147	0.714
MSS2	0.751			
MSS3	0.773			
SMF1	0.748	0.642486667	0.80155266	0.749
SMF2	0.834			
SMF3	0.82			
DFE1	0.781	0.6594625	0.812072965	0.795
DFE2	0.842			
BHS1	0.732			
BHS2	0.781	0.602793667	0.776397879	0.756
BHS3	0.814			
ESE1	0.823			
ESE2	0.782	0.653751	0.8085487	0.785
ESE3	0.82			
CTP1	0.753			
CTP2	0.785	0.568654333	0.754091727	0.715
CTP3	0.723			
ATP1	0.739			
ATP2	0.84	0.602248667	0.77604682	0.734
ATP3	0.745			
CNP1	0.759			
CNP2	0.831	0.628146	0.792556623	0.764
CNP3	0.786			

To examine whether common method variance existed, Harman's Single Factor Test was applied through principal component analysis (PCA). All the measuring variables were entered into the analysis without rotation. **Table 3** indicates that six factors (with eigenvalue > 1.00) explained 74.892% of total variation in the data set. Significantly, the first factor contributed only 18.941% to total variation in the data set. This means that the responses were distributed across different dimensions, and not being driven by a single common source. The KMO value of 0.525 indicates adequate sampling adequacy, while Bartlett's Test of Sphericity was significant ($\chi^2 = 933.473$, p-value < 0.01), showing that the data were suitable for factor analysis.

Table 3. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.273	18.941	18.941	2.273	18.941	18.941
2	1.985	16.545	35.486	1.985	16.545	35.486
3	1.359	11.325	46.811	1.359	11.325	46.811
4	1.194	9.952	56.763	1.194	9.952	56.763
5	1.100	9.163	65.926	1.100	9.163	65.926
6	1.076	8.965	74.892	1.076	8.965	74.892
7	.937	7.808	82.699			
8	.753	6.273	88.972			
9	.637	5.305	94.278			
10	.500	4.163	98.441			

Continued table:

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
11	.177	1.471	99.912			
12	.011	.088	100.000			

Note: $KMO = 0.525$; Bartlett's Test (Chi-Square = 933.473; $df = 66$; $P\text{-value} = 0.01$).

The scree plot (in **Figure. 1**) additionally validates the results presented in **Table 3**. This is because there was a slow reduction in eigenvalues (with an elbow around the third factor), as opposed to a very sharp reduction after the first factor followed by a level-off. Had there been much common method variance (CMV), only one major factor would be seen. Thus, **Table 3** & **Figure 1** show that common method bias was not a serious threat to the validity of the study results

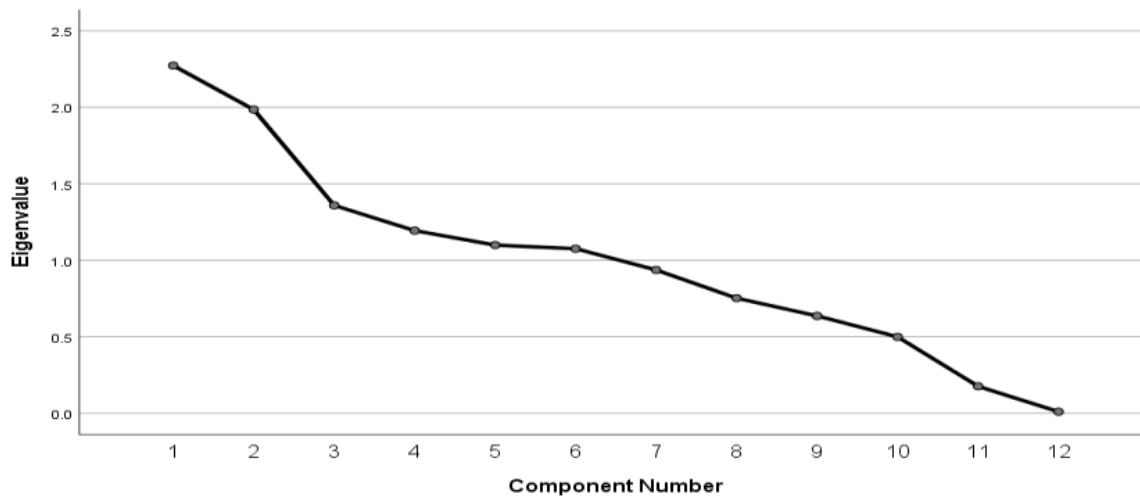


Figure 1. Scree Plot

Table 4 shows the discriminant validity of the constructs using the Fornell-Larcker criterion. The composite reliability value for each of the constructs is higher than their correlations. For instance, for PSQ (0.780), SSL (0.765), SDA (0.805), HSE (0.754), MSD (0.749), MSS (0.751), SMF (0.802), DFE (0.812), BHS (0.776), ESE (0.809), CTP (0.754), ATP (0.776), and CNP (0.793) are all higher than their correlation. It would be reasonable to believe that the measurement instruments are distinct and assess the unique phenomenon.

Table 4. Discriminant Validity

	PSQ	SSL	SDA	HSE	MSD	MSS	SMF	DFE	BHS	ESE	CTP	ATP	CNP
PSQ	.780	.048	.133	.032	.052	.050	.031	.007	.436	.079	.073	.058	.006
SSL	.048	.765	.066	.038	.051	.029	.241	.031	.030	.445	.026	.006	.029
SDA	.133	.066	.805	.000	.063	.444	.027	.099	.124	.046	.064	-.072	.038
HSE	.032	.038	.000	.754	.093	.090	.296	.175	.093	.004	.244	.120	.097
MSD	.052	.051	.063	.093	.749	.066	.115	.519	.014	.122	.016	-.060	.071
MSS	.050	.029	.444	.090	.066	.751	.032	.100	.048	.008	.044	-.019	.024
SMF	.031	.241	.027	.296	.115	.032	.802	.152	.022	.219	.155	.085	.070
DFE	.007	.031	.099	.175	.519	.100	.152	.812	.016	.027	.055	-.012	.040
BHS	.436	.030	.124	.093	.014	.048	.022	.016	.776	.041	.074	.088	.018
ESE	.079	.445	.046	.004	.122	.008	.219	.027	.041	.809	.011	.028	.017

Continued table:

	PSQ	SSL	SDA	HSE	MSD	MSS	SMF	DFE	BHS	ESE	CTP	ATP	CNP
CTP	.073	.026	.064	.244**	.016	.044	.155	.055	.074	.011	.754	.502	.011
ATP	.058	.006	.072	.120	.060	.019	.085	.012	.088	.028	.502	.776	.120
CNP	.006	.029	.038	.097	.071	.024	.070	.040	.018	.017	.011	.120	.793

Source: IBM

3.5 Method of data analysis

For conducting data analysis, structural equation modelling was used to test the hypothesized relationships simultaneously. This was based on the capabilities of the model estimation method, which is similar to an empirical method used in similar studies. Before structural analysis, however, a measurement model was first evaluated to affirm its fitness through Confirmatory Factor Analysis (CFA). In this case, factor loadings were scrutinized to affirm values greater than or equal to 0.50 as reasonable for factor representation. Discriminant validity was tested using the Fornell-Larcker criterion. The study tested for common method bias to support the validity of the instrument. To achieve this, Harman's Single Factor Test was applied through principal component analysis (PCA). Model fitting was confirmed through different 'goodness-of-fit' measures. This aligns with guidelines by structural equation modelling. For this analysis, Chi-square values and degrees of freedom were considered, which are highly influenced by sample size. To overcome this issue, further fit ratios were used, such as Comparative Fit Index (CFI) and Tucker Lewis Index (TLI), where results should be equal to or more than 0.90 to indicate acceptable fit, and equal to or more than 0.95 to indicate good fit, respectively.

The use of the Root Mean Square Error of Approximation (RMSEA) was done to test the model parsimony, with the acceptable fit results being equal to or less than 0.08 and the results being equal to or less than 0.06 for the close fit. After meeting acceptable model fit criteria, a structural model was conducted to test the defined relationships between any two constructs. The path coefficients, critical ratios, and standardized regression weights were used to measure statistical significance.

3.6 Ethical considerations

Ethics were considered during the survey to protect the participants and to ensure that the quality of the data obtained from the research was not affected negatively. Participation in the study was entirely voluntary, and all the individuals took part in the research through informed consent before the collection of data. Participants were informed about the purposes of the research and told that their responses would only be utilized for academic research. Their privacy and confidentiality were also guaranteed in that no individual information about the identity of the participants was used in the study. The participants were also informed about their right to withdraw at any point within the research process. Finally, all precautions were taken to guarantee the safety of the participants against any kind of harm from the research process especially the type of questions being asked.

4. Results and discussion

4.1 Results

Table 5 below indicates the demographic characteristics of the working mothers who participated in the study. From the age distribution, most of the working mothers were aged between 23 and 32 years, with the highest number, i.e., 28% , falling within the range of 28-32 years. Notably, there were only a few

working mothers aged over 38 years, indicating that most working mothers in the manufacturing sector were young.

In terms of level of education, the majority of respondents have OND/equivalent (44.5%); this is followed by MBA/M.Sc (27.25%) and HND/B.Sc (22.25%). Based on the work experience, results show that participants have worked for 1-3 years (40%), but a larger percentage also reported having an experience of 4-6 years (30.75%). This suggests that most of the participants may be trying to adjust to the demands of work alongside their roles as mothers. A smaller number of participants reported having more than 10 years of work experience.

Table 5. Demographics of Participants (Source: Field survey, 2025)

Demography	Frequency	Percent
Age		
18 –22 years	85	21.25
23 –27 years	103	25.75
28 –32 years	112	28
33 –37 years	63	15.75
> 38years	37	9.25
Education level		
OND/Equivalence	178	44.5
HND/B.Sc	89	22.25
MBA/M.Sc	109	27.25
PhD	24	6
Experience		
< 1 year	56	14
1 –3 years	160	40
4 –6 years	123	30.75
7 –9 years	45	11.25
> 10 years	16	4

Figure 2 shows the path analysis of the relationship among the latent variables. It shows that the relationship among all the variables is estimated below 0.5. The result is more elaborate in the table.

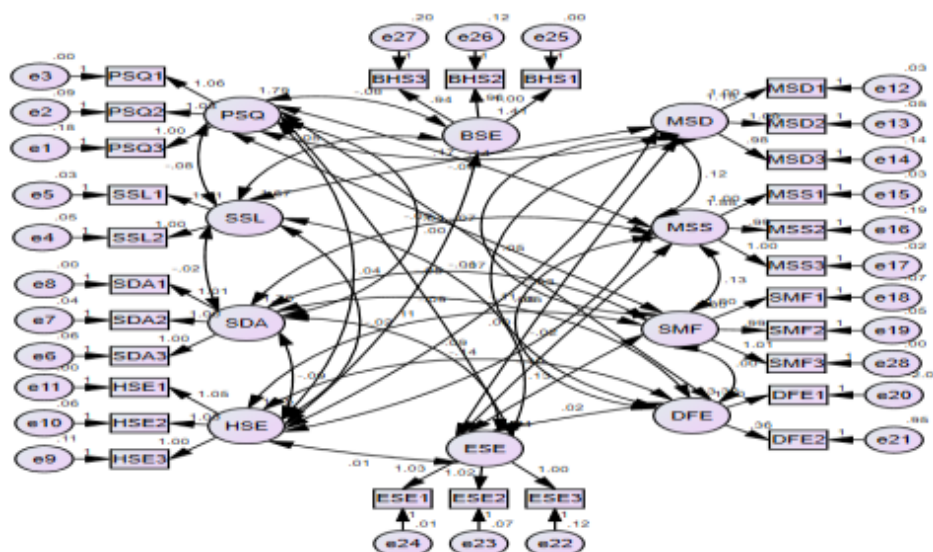


Figure 2. Path analysis of latent variables

Table 6 indicates that most of these relationships, as expected, are very weak and statistically not significant ($p > 0.05$), signifying that there is no issue concerning the covariances among these latent variables dealing with sleep quality, stress, and working mothers' efficient functioning. There is a significant positive relationship between SSL and MSD (Estimate = 0.170, C.R. = 2.399, $p = 0.016$). HSE was significantly negatively related to DFE (Estimate = -0.142, C.R. = -2.548, $p = 0.011$), implying that working efficiently during nighttime hours does not, in any way, directly translate to better functioning during the daytime, because of work pressures as well as child care demands. The significant, though marginal, positive relationship between MSD and MSS just signifies the evolution of sleep-related problems.

Table 6. Covariances of latent variables

			Estimate	S.E.	C.R.	P
PSQ	< - >	SSL	-.082	.087	-.943	.346
PSQ	< - >	SDA	.038	.088	.431	.666
PSQ	< - >	HSE	.043	.072	.594	.552
PSQ	< - >	ESE	-.049	.088	-.560	.576
PSQ	< - >	BSE	-.082	.079	-1.041	.298
PSQ	< - >	MSD	-.085	.072	-1.177	.239
PSQ	< - >	MSS	.138	.084	1.657	.098
PSQ	< - >	SMF	.001	.084	.007	.995
PSQ	< - >	DFE	.048	.050	.945	.345
SSL	< - >	SDA	-.016	.085	-.182	.856
SSL	< - >	HSE	-.022	.068	-.326	.745
SSL	< - >	ESE	-.111	.086	-1.283	.199
SSL	< - >	BSE	-.054	.077	-.701	.483
SSL	< - >	MSD	.170	.071	2.399	.016
SDA	< - >	MSS	-.091	.083	-1.108	.268
SDA	< - >	SMF	-.014	.084	-.172	.863
SDA	< - >	DFE	.062	.051	1.219	.223
SDA	< - >	ESE	-.089	.088	-1.009	.313
HSE	< - >	ESE	.007	.071	.094	.925
HSE	< - >	BSE	-.087	.062	-1.391	.164
HSE	< - >	MSD	-.051	.058	-.880	.379
HSE	< - >	MSS	-.098	.067	-1.468	.142
HSE	< - >	SMF	.111	.068	1.631	.103
HSE	< - >	DFE	-.142	.056	-2.548	.011
SDA	< - >	HSE	-.085	.071	-1.197	.231
MSD	< - >	ESE	-.030	.071	-.422	.673
MSS	< - >	ESE	-.023	.082	-.281	.779
SMF	< - >	ESE	.127	.084	1.522	.128
DFE	< - >	ESE	.018	.048	.369	.712
SMF	< - >	DFE	.004	.046	.089	.929
MSS	< - >	DFE	.003	.045	.059	.953
MSD	< - >	DFE	.068	.043	1.564	.118
MSS	< - >	SMF	.130	.079	1.647	.100
MSD	< - >	SMF	-.070	.068	-1.023	.306
MSD	< - >	MSS	.122	.067	1.818	.069

Source: Amos-IBM 25

As indicated in **Table 7**, the goodness of fit of the default model when compared to both the saturated and independence models suggests that the default model fits the data well. The CMIN/DF of 1.641 suggests that the model fits well within an acceptable range, thus showing that the model is good and not forced. The low RMR of .046 indicates that the discrepancies between the model and data are minimized. The high GFI of .916 and AGFI of .892 indicate that the model fits perfectly. The evaluation of the fitting indices of the baseline compares the NFI, IFI, TLI, and CFI to 1.000, showing that the fitted model was excellent. The RMSEA value of .040 with a high PCLOSE of .997 indicated that the model error was very minimal and fitted the population well. Also, AIC and ECVI values for the default model were far below those of the independence model, indicating that the default model was better and efficient. The results thus confirmed that the model was suitable to explain the relationships among sleep quality, perceived stress, and performance of working mothers in manufacturing firms in Nigeria.

Table 7. Model Fit

Fit Indices	Model	Default Model	Saturated Model	Independence Model
CMIN	NPAR	91	406	28
	CMIN	516.971	.000	20641.921
	DF	315	0	378
	P	.000		.000
	CMIN/DF	1.641		54.608
RMR, GFI	RMR	.046	.000	.400
	GFI	.916	1.000	.360
	AGFI	.892		.313
	PGFI	.711		.336
Baseline Comparisons	NFI (Delta1)	.975	1.000	.000
	RFI (rho1)	.970		.000
	IFI (Delta2)	.990	1.000	.000
	TLI (rho2)	.988	1.000	.000
	CFI	.990	1.000	.000
Parsimony-Adjusted Measures	PRATIO	.833	.000	1.000
	PNFI	.812	.000	.000
	PCFI	.825	.000	.000
	NCP	201.971	.000	20263.921
NCP	LO 90	143.515	.000	19796.612
	HI 90	268.329	.000	20737.546
	FMIN	1.296	.000	51.734
	F0	.506	.000	50.787
	LO 90	.360	.000	49.616
FMIN	HI 90	.673	.000	51.974
	RMSEA	.040		.367
	LO 90	.034		.362
	HI 90	.046		.371
	PCLOSE	.997		.000
AIC	AIC	698.971	812.000	20697.921
	BCC	713.236	875.643	20702.310
	BIC	1062.194	2432.535	20809.682
	CAIC	1153.194	2838.535	20837.682
ECVI	ECVI	1.752	2.035	51.874
	LO 90	1.605	2.035	50.703

Continued table:

Fit Indices	Model	Default Model	Saturated Model	Independence Model
	HI 90	1.918	2.035	53.062
	MECVI	1.788	2.195	51.885

Source: Amos-IBM 25

Figure 3 shows that mild sleep disturbances, habitual sleep efficiency, moderate sleep disturbances, and sleep medication use all have positive paths to consistency of task performance. The results show that sleep duration adequacy, shorter sleep onset latency, and perceived subjective sleep quality have positive paths. Daytime functional efficiency has a negative path. The path results are substantiated in Table 6.



Figure 3. Path analysis on sleep and consistency of task performance

Source: Amos-IBM 25

As indicated in **Table 8** above, it is evident that CTP significantly associate with MSD ($\beta = .220$, $SE = .051$, $CR = 4.294$, $p\text{-value} < .001$), HSE ($\beta = .176$, $SE = .051$, $CR = 3.453$, $p\text{-value} < .001$), MSS ($\beta = .103$, $SE = .044$, $CR = 2.336$, $p\text{-value} = .020$), as well as by SMF ($\beta = .154$, $SE = .043$, $CR = 3.559$, $p\text{-value} < .001$). This means that 22% mean change in MSD will lead to proportional change in CTP; 17.6% mean change in HSE will bring about the same change in CTP; 10.3% mean change in MSS will result to about 10.3% change in CTP; and 15.4% mean change in SMF will lead to proportional change in CTP. The results show that SDA ($\beta = .073$, $SE = .041$, $CR = 1.768$, $p\text{-value} = .077$), ESL ($\beta = .070$, $SE = .043$, $CR = 1.642$, $p\text{-value} = .101$), PSQ ($\beta = .069$, $SE = .041$, $CR = 1.682$, $p\text{-value} = .093$), and DFE ($\beta = -.047$, $SE = .054$, $CR = -.865$, $p\text{-value} = .387$) have no significant effect on CTP.

Table 8. Regression weights on sleep and consistency of task performance

			Estimate	S.E.	C.R.	P
CTP	<—	MSD	.220	.051	4.294	***
CTP	<—	DFE	-.047	.054	-.865	.387

Continued table:

			Estimate	S.E.	C.R.	P
CTP	<—	HSE	.176	.051	3.453	***
CTP	<—	SDA	.073	.041	1.768	.077
CTP	<—	SSL	.070	.043	1.642	.101
CTP	<—	PSQ	.069	.041	1.682	.093
CTP	<—	MSS	.103	.044	2.336	.020
CTP	<—	SMF	.154	.043	3.559	***

Source: Amos-IBM 25

Figure 4 shows that working mothers who maintain MSD, HSE, MSS, and SMF are more likely to perform their assigned duties consistently. The path diagram shows that those who maintain SDA, ESL, PSQ, and DFE are unlikely to perform their assigned duties consistently.

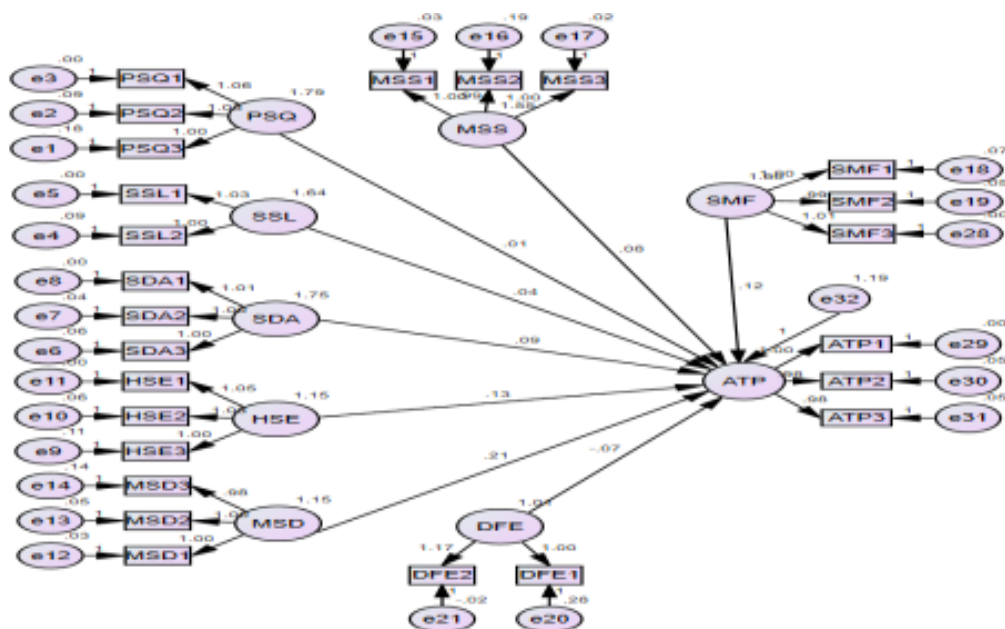


Figure 4. Path analysis on sleep and adaptive performance

Source: Amos-IBM 25

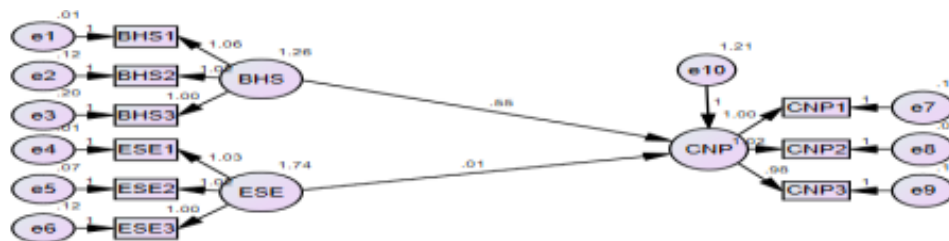
Table 9 explains how different sleep factors relate to ATP. MSD has a positive and significant relationship with ATP (estimate = .214, SE = .051, CR = 4.181, p-value < .001), meaning that 21.4% unit change in MSD will bring about proportional change in ATP. DFE does not have a significant relationship with ATP (estimate = -.074, SE = .054, CR = -1.366, p-value = .172). HSE has a significant positive relationship with ATP (estimate = .135, SE = .051, CR = 2.652, p-value = .008). This means that 13.5% mean change in HSE will result to the same mean change in ATP. SDA also has a positive and significant relationship with ATP (estimate = .091, SE = .041, CR = 2.207, p-value = .027). This implies that when SDA changes by 9.1%, ATP is bound to change correspondingly by 9.1%. The result shows that SSL does not have significant relationship with ATP (estimate = .038, SE = .043, CR = .902, p-value = .367). PSQ has no significant relationship with ATP (estimate = .007, SE = .041, CR = .169, p-value = .866). MSS has no significant relationship with ATP (estimate = .081, SE = .044, CR = 1.844, p-value = .065). The result shows that SMF has a positive and significant relationship with ATP (estimate = .118, SE = .043, CR = 2.722, p-value = .006). This also means that 11.8% change in SMF will lead to proportional change in ATP.

Table 9. Regression weights on sleep and adaptive performance

			Estimate	S.E.	C.R.	P
ATP	<—	MSD	.214	.051	4.181	***
ATP	<—	DFE	-.074	.054	-1.366	.172
ATP	<—	HSE	.135	.051	2.652	.008
ATP	<—	SDA	.091	.041	2.207	.027
ATP	<—	SSL	.038	.043	.902	.367
ATP	<—	PSQ	.007	.041	.169	.866
ATP	<—	MSS	.081	.044	1.844	.065
ATP	<—	SMF	.118	.043	2.722	.006

Source: Amos-IBM 25

The path analysis (in **Figure 5**) shows that buffered helplessness has a strong positive effect on contextual performance. Enhanced self-efficacy has a very small positive effect.

**Figure 5.** Path analysis on stress and contextual performance

Source: Amos-IBM 25

Table 10 shows that BHS has a significant relationship with CNP ($\beta = .549$, $SE = .051$, $CR = 10.688$, $p\text{-value} < .001$). This means that 54.9% increase in the levels of buffered helplessness will bring about proportional increase in the level of contextual performance. ESE has no significant relationship with CNP ($\beta = .014$, $SE = .042$, $CR = .333$, $p\text{-value} = .739$).

Table 10. Regression weights on stress and contextual performance

			Estimate	S.E.	C.R.	P
CNP	<—	ESE	.014	.042	.333	.739
CNP	<—	BHS	.549	.051	10.688	***

Source: Amos-IBM 25

Table 11 shows the decision or remarks on the hypotheses tested. Perceived good sleep quality, sleep onset latency, sleep duration adequacy, and daytime functional efficiency had no significant relationship with consistent task performance, indicating that hypotheses (H1a, H1b, H1c & H1g) were rejected. Habitual sleep efficiency, mild sleep disturbance, moderate sleep disturbance, and sleep medication use did have significant relationship with consistency of task performance, indicating that hypotheses (H1d, H1e & H1f) were accepted. Mild sleep disturbance had the highest relationship with consistent task performance ($\beta = .220$), followed by habitual sleep efficiency ($\beta = .176$) and sleep medication use ($\beta = .154$). Thus, these factors related to sleep have a stronger relationship with employee's consistent performance of their tasks than factors related to the general feeling of sleep quality.

In relation to adaptive performance, sleep duration adequacy, habitual sleep efficiency, mild sleep disturbance, and sleep medication use had significant relationship with adaptive performance. Thus, hypotheses (H2c, H2d, H2e & H2f) were accepted. For H2e, mild sleep disturbance had significant relationship with adaptive performance, but moderate sleep disturbance does not have significant relationship with adaptive performance.

However, sleep variables related to perceived sleep quality, sleep onset latency, moderate sleep disturbance, and daytime functional efficiency did not have a significant relationship with adaptive performance. As such, hypotheses (H2a, H2b & H2g) were rejected. Buffered helplessness had the strongest and significant relationship with contextual performance ($\beta = .549$), and H3a was accepted. Additionally, enhanced self-efficacy did not have a significant relationship with contextual performance, and H3b was rejected.

Table 11. Hypotheses results and decisions

Hypothesis	Statement	Results	Decision
H1a	Perceived Good Sleep Quality significantly affects consistency of task performance.	($\beta = .069$; p-value > 0.05)	Reject
H1b	Shorter Sleep Onset Latency significantly affects consistency of task performance.	($\beta = .070$; p-value > 0.05)	Reject
H1c	Sleep Duration Adequacy positively affects consistency of task performance.	($\beta = .073$; p-value > 0.05)	Reject
H1d:	Habitual Sleep Efficiency Level significantly affects consistency of task performance.	($\beta = .176$; p-value < 0.01)	Accept
H1e	Mild sleep disturbance significantly affects consistency of task performance.	($\beta = .220$; p-value < 0.01)	Accept
	Moderate sleep disturbance significantly affects consistency of task performance.	($\beta = .103$; p-value < 0.05)	Accept
H1f	Sleep Medication Use Frequency significantly affects consistency of task performance.	($\beta = .154$; p-value < 0.01)	Accept
H1g	Daytime Functional Efficiency significantly affects consistency of task performance.	($\beta = -.047$; p-value > 0.05)	Reject
H2a	Perceived Good Sleep Quality significantly affects adaptive performance.	($\beta = .007$; p-value > 0.05)	Reject
H2b	Shorter Sleep Onset Latency significantly affects adaptive performance.	($\beta = .038$; p-value > 0.05)	Reject
H2c	Sleep Duration Adequacy significantly affects adaptive performance.	($\beta = .091$; p-value < 0.05)	Accept
H2d	Habitual Sleep Efficiency Level significantly affects adaptive performance.	($\beta = .135$; p-value < 0.01)	Accept
H2e	Mild sleep disturbance significantly affects adaptive performance.	($\beta = .214$; p-value < 0.01)	Accept
	Moderate sleep disturbance significantly affects adaptive performance.	($\beta = .081$; p-value > 0.05)	Reject
H2f	Sleep Medication Use Frequency significantly affects adaptive performance.	($\beta = .118$; p-value < 0.01)	Accept
H2g	Daytime Functional Efficiency significantly affects adaptive performance.	($\beta = -.074$; p-value > 0.05)	Reject
H3a	Buffered helplessness significantly affects contextual performance.	($\beta = .549$; p-value < 0.01)	Accept
H3b	Enhanced self-efficacy significantly affects contextual performance.	($\beta = .014$; p-value > 0.05)	Reject

4.2 Discussion

Findings showed that mild sleep disturbances, habitual sleep efficiency, moderate sleep disturbances, and the frequency of sleep medication have positive and significant effects on the consistencies in task performance. This implies that minor differences within patterns of sleep and efficiency may promote steady performance among working mothers. However, the study revealed non-significant positive effects regarding the adequacy of sleep durations, shorter onset latencies, and subjective sleep qualities on the consistency of task performance. This suggests that although these elements may promote task performance, the elements are insufficiently influential to be recognized as significant factors. Alternatively, daytime functional efficiency revealed a non-significant negative effect as a function of task performance consistencies among working mothers. This means that increased functional activity within daylight does not inevitably promote consistencies within task performance. This study builds on previous research identifying that elements concerning sleep disturbances and efficiencies may promote cognitive and task performance (Pengo et al., 2018; Nadri et al., 2024; Deng et al., 2022). This study adds to previous research illustrating minor disturbances concerning sleep patterns may promote positive cognitive responses due to heightened states of alertness (Born & Wilhelm, 2012), or heightened focus (Raven et al., 2018). Moreover, the observed findings of the study also support Bandura's theory of self-efficacy, wherein it was found that individuals can maintain consistency in their performance, even when they are subjected to stress, only if they believe and have trust in their ability to cope with the same (Lopez-Garrido, 2023; Li et al., 2022). Similar to previous studies conducted regarding working mothers, it was observed that addressing mild sleep problems and utilizing habitual approaches for efficient sleeping were crucial factors for ensuring consistency in task performance, rather than the individual sleeping hours or the ability to function effectively throughout the day (Härdelin et al., 2021; Ikpeama, 2024; Sadiq et al., 2024).

The findings show that the adaptive performance of working mothers depends primarily on sleep efficiency, sleep duration, minor sleep disturbances, and the use of sleep medication, while the other factors such as perceived sleep quality, short sleep onset, and day-time functioning contribute to the adaptive performance of working mothers to a lesser extent. This indicates that the mother who sleeps well, sleeps efficiently, and possibly has minor sleep problems has no difficulty adapting to changes in work demands and performance. The Brain Plasticity Theory indicates that the brain changes, adapts, and improves connections through sleep; these connections increase learning, coping, and adapting, especially for the brain (Raven et al., 2018; Seibt & Frank, 2019; Asuku et al., 2025). This indicates that the mother who sleeps well and efficiently and has minor sleep problems is able to easily adapt and cope with changes and demands at work, as her brain has adapted well. Mild sleep problems may be seen as stressors to the brain, which helps it cope through adaptation, as indicated by plasticity theory which argues that moderate levels of stress or challenges improve brain resilience and coping. Information Consolidation Theory also supports the findings obtained, as the consolidation of brain material from day-to-day experiences is facilitated during sleep (Born & Wilhelm, 2012; Raven et al., 2018). Hence, successful hours of sleep and efficiency will assist working mothers in consolidating problem-thinking approaches and memories to enhance performance. However, factors such as a mother's perceived amount of sleep or short sleep onset may not offer a sufficient amount of memory consolidation and plasticity or adaptability potential in the adjustment of performance. Previous research findings indicate that working mothers encounter sleeping imbalances and stress conditions, which may

impact adaptability potential if sleeping conditions are poor (Härdelin et al., 2021; Pengo et al., 2018; Nadri et al., 2024). The findings are consistent with these theories, indicating that effective sleeping conditions as well as poor sleeping factors offer no impact on adaptability potential in the brains of working mothers (Deng et al., 2022; Gupta & Pandey, 2025; Khan & Asad, 2021).

Findings indicate that buffered helplessness has a very strong positive influence on contextual performance. This therefore means that with increased levels of buffered helplessness, individuals are likely to deliver well in their working environment. Surprisingly, this may mean that challenges or feelings of helplessness, when dealt with or “cushioned,” result in increasing one’s motivation to adapt and act more effectively in accordance with Bandura’s self-efficacy theory, which states that people’s belief in their capabilities helps them in approaching tasks and challenges (Lopez-Garrido, 2023; Ferrari, 2023; Li et al., 2022). Conversely, increased self-efficacy has only an insignificant positive impact in this study; thus, it does not strongly influence contextual performance. This perhaps means that belief in one’s abilities alone is not sufficient, and this needs to be grounded in experience or a coping mechanism. From literature, stress, sleep, and work-life balance were found to have effects on how individuals perform, particularly on working mothers, where stress and lack of sleep can affect performance when not well managed (Cohen & Janicki-Deverts, 2012; Nadri et al., 2024; Härdelin et al., 2021; Deng et al., 2022). Consistent with the view that the ability to cope or adapt to small challenges or stress, such as in the case of buffered helplessness, can enable an individual to better adapt or perform well, whereas merely having the belief in one’s ability or capacity, in the absence of such challenges, might not have any significant effect in real-life situations (Gupta & Pandey, 2025; Ikpeama, 2024).

5. Conclusion

The study concludes that not all aspects of sleeping have a significant effect on work performance. More specifically, habitual sleep efficiency, mild disturbances in sleeping, moderate disturbances in sleeping, and the use of sleeping medication positively impact the consistence of performance in work tasks, while perceived quality of sleeping, sleeping onset latency, adequacy of sleeping duration, and functional efficiency during the day fail to. As far as adaptive performance is concerned, sleeping duration adequacy, habitual sleeping efficiency, mild disturbances in sleeping, and the use of sleeping medication have an impact, while the rest fail to. In terms of contextual performance, buffered helplessness significantly improves performance, whereas enhanced self-efficacy has no influence. The implications here are that some specific sleep patterns and coping with small sleep issues can improve performance, and dealing practically with challenges (buffered helplessness) is more important to contextual performance than just feeling competent.

Based on the findings, organizations should motivate employees to have good sleeping habits since this enhances natural sleep efficiency, which positively influences performance. Organizations could offer health programs focused on the safe administration of sleeping pills when necessary, as this reduces potential performance problems. For contextual performance, leaders should foster environments that empower employees to overcome performance challenges, as buffered helplessness had a strong positive effect. Training could be conducted to include problem management as opposed to self-confidence enhancement, as this increases contextual performance. This is based on the fact that improved self-efficacy does not necessarily have a significant impact on contextual performance.

5.1 Managerial Implications

The findings of this study have clear implications for HR managers. For example, human resource managers should take into consideration sleep-related issues faced by working mothers. From the findings, habitual sleep efficiency, mild sleep disturbance, moderate sleep disturbance, sleep medication use, and sleep duration adequacy have an effect on employee performance. HR departments can encourage their employees to have good sleep habits by designing flexible shift arrangements. In addition, the strong effect of buffered helplessness on contextual performance implies that employees who can cope can also perform well in the workplace. Therefore, managers can provide a supportive work environment and counseling support to their employees. Managers can also encourage employees to support each other in order to help working mothers to cope with their responsibilities and still perform well in their places of work. Meanwhile, it is important to state that causal directions cannot be inferred—it is possible that better performance leads to better sleep/stress, not only the reverse.

Manufacturing firms could adopt a flexible work shift system. This can enable working mothers to specify the times during which they would like to work based on their sleep patterns and family responsibilities. The consistency and adaptability of performance can be enhanced through stable shifts that will minimize any disruptions in their sleeping patterns. Moreover, firms can organize stress management seminars where working mothers can learn about problem-solving skills, particularly those associated with buffered helplessness. This will include problem-solving techniques such as identifying the controllable components of a situation, breaking down the problems into small parts, task prioritization, and seeking assistance.

5.2 Theoretical Implications

The study provides support for the theories used. The findings revealed that some sleep factors, such as habitual sleep efficiency, sleep duration adequacy, mild sleep disturbance, moderate sleep disturbance, and sleep medication, have significant effects on task performance and adaptive performance. This study supports the Brain Plasticity Theory and Information Consolidation Theory, which explain that sleep enables the brain to adjust, store information, and facilitate work performance. The findings revealed that buffered helplessness has a strong positive effect on contextual performance, supporting the Coping Theory. Some sleep factors, such as perceived sleep quality, sleep onset latency, daytime functional efficiency, and enhanced self-efficacy, were found to have no significant effects. This study, therefore, contributes new knowledge about the performance of working mothers in manufacturing firms, as it reveals that only some parts of sleep and stress explain performance.

5.3 Limitations and Future Research

This study has some limitations that could be addressed in future studies. Firstly, this study has been conducted among working mothers in manufacturing industries in Nigeria. As a result, this study may not fully represent other working mothers in other industries or in other countries. Future studies could extend their scope to other industries, for instance, service, health, or education industries. Secondly, this study has been conducted focusing on selected factors that affect sleep and stress. Future studies could extend their scope to other factors that may influence the performance of working mothers. For instance, future studies could extend their scope to include work schedules, family support, childcare, and others. Lastly, future studies could extend their scope to include other people, for instance, working fathers or non-parents, to fully understand how sleep and stress influence employee performance.

Author contributions: Conceptualization, EMO, GWO and ATN; methodology,

EMO, GWO, OAO and ATN ; formal analysis, ATN; Data curation, original draft, EMO, GWO, OAO and ATN; Review and editing, SSA, NIE, OJE, EEE and DJA; supervision, EMO and ATN; project administration, ATN and EMO. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest: The authors declare no conflict of interest.

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Appendix

Variables	Sub-variables	Items	
Sleep Quality	Subjective sleep quality	I feel that my sleep quality is satisfactory.	0 = Very poor, 1 = Fairly poor, 2 = Fairly good, 3 = Very good
		I am happy with the sleep quality that I get regularly.	0 = Very poor, 1 = Fairly poor, 2 = Fairly good, 3 = Very good
		I feel that my sleep quality is quite refreshing.	0 = Very poor, 1 = Fairly poor, 2 = Fairly good, 3 = Very good
	Sleep onset latency	During the past month, how long (in minutes) has it usually taken you to fall asleep each night?	0 = 15 minutes or less 1 = 16–30 minutes 2 = 31–60 minutes 3 = More than 60 minutes.
		During the past month, how often have you had trouble sleeping because you could not get to sleep within 30 minutes?	0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week
	Sleep Duration Adequacy	I usually get enough hours of sleep at night.	1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
		The amount of sleep I get is sufficient for my daily activities.	1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
		I believe my sleep duration allows me to function effectively during the day.	1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
	Habitual Sleep Efficiency Level	I sleep for most of the time I spend in bed.	1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
		I usually fall asleep and remain asleep for a large part of the night.	1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
		I consider my usual sleep pattern to be efficient.	1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
	Sleep Disturbance	During the past month, how often did you wake up once during the night but were able to go back to sleep quickly?	0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week
		During the past month, how often did you have light sleep but still managed to sleep through most of the night?	0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week
		During the past month, how often did you experience short sleep breaks that did not fully disturb your night sleep?	0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week
		During the past month, how often did you wake up more than once during the night and find it hard to sleep again?	0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week
		During the past month, how often did you stay awake for a long time after waking up in the middle of the night?	0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week
		During the past month, how often was your sleep broken several times in a night?	0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week
	Sleep Medication Use Frequency	During the past month, how often did you take medicine to help you fall asleep?	0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week
		During the past month, how often did you use sleep medication to help you stay asleep through the night?	0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week
		During the past month, how often did you rely on sleep medicine to improve your sleep quality?	0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week
	Daytime Functional Efficiency	During the past month, how often did you feel able to do your daily work well after sleep?	0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week

Continued table:

Variables	Sub-variables	Items
Perceived Stress	Buffered Helplessness	During the past month, how often did you feel tired during the day because you did not sleep well? 0 = Not during the past month 1 = Less than once a week 2 = Once or twice a week 3 = Three or more times a week
		During the past month, how often did you control important things in your life? 0 = Never 1 = Almost never 2 = Sometimes 3 = Fairly often 4 = Very often
		During the past month, how often did you feel that problems were not too difficult to handle? 0 = Never 1 = Almost never 2 = Sometimes 3 = Fairly often 4 = Very often
	Enhanced Self-efficacy	During the past month, how often were you able to manage your situation (stress) well? 0 = Never 1 = Almost never 2 = Sometimes 3 = Fairly often 4 = Very often
		During the past month, how often did you feel confident in handling your daily problems? 0 = Never 1 = Almost never 2 = Sometimes 3 = Fairly often 4 = Very often
		During the past month, how often did you feel able to control your stress when problems came up? 0 = Never 1 = Almost never 2 = Sometimes 3 = Fairly often 4 = Very often
Performance	Consistency of Task Performance	During the past month, how often did you feel capable of managing difficult situations well? 0 = Never 1 = Almost never 2 = Sometimes 3 = Fairly often 4 = Very often
		I keep a steady level of work output across my working hours. 1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
		I complete my assigned tasks at a regular and stable pace. 1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
	Adaptive Performance	My work performance does not change too much from day to day. 1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
		I adjust quickly when my work tasks or duties change. 1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
		I can handle new or unexpected work demands without much difficulty. 1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
	Contextual Performance	I change my work approach when the work situation requires it. 1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
		I help my co-workers when they need support. 1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
		I follow workplace rules and procedures even when no one is watching. 1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.
		I do extra tasks that are not part of my formal job when needed. 1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree.