



Rotational Work and Negative Impact on Mental Wellness: A Study on Sleep and Endurance among Oil and Gas Workers

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The impact of mental wellness on the work performance and wellbeing of workers has generated much academic and corporate debates. Most recently, due to some high-profile cases involving the performance and wellness of sports people, conversations around the impact of mental wellness on work performance have dominated public discourse, yet the nature and degree of this impact has not been sufficiently studied and analysed and many questions remain unanswered. Indeed, there has been a growing awareness of the centrality of the role of mental wellness in the productivity of workers, especially in the Oil and Gas industry. Thus, this research sought to investigate how rotational work, its impact on sleep and endurance, affect workers in the Oil and Gas industry, using as methodology a simple random sampling of workers from the Port Harcourt metropolis, in the oil-rich delta area of Nigeria. To obtain data, this research used questionnaires, telephone interviews and cohort discussion session. Questions posed during this research focused on sleep and its perceived effect on endurance. The questionnaires were administered to the

workers from selected international Oil and Gas companies located in Port Harcourt. Findings revealed that both sleep and the circadian cycle were negatively affected and impacting the self-reported well-being and productivity of the workers. From the data collected, 27.5% and 66.2%, which represented a total of 93.7% of the respondents, agreed and strongly agreed that their sleep was affected. 100% of the participants in the cohort session agreed that their sleep was affected. Furthermore, the interview sessions revealed specific details as more than 50% of the interview respondents indicated that the sleep distortion affected them even up to the first week of their time off. 48.8% and 37.5% agreed and strongly agreed to the fact that rotational work had effect on their endurance on site. This represented a total of 86.2% of the participants whose endurance level was affected due to rotational work. Over 60% of the participants in the cohort session admitted to feeling of extreme tiredness towards the end of their rotation period and prior to departure from site. The participants unanimously submitted that shorter rotation would give room for adequate recuperation and make work more productive and enhance the sense of mental wellness for rotational Oil and Gas workers.

Keywords: Mental wellness; rotational work; sleep deprivation; oil and gas industry; work stress; circadian cycle; endurance.

1. INTRODUCTION

Harvard Health Publishing in a publication of Harvard medical school in an article on sleep and mental health stated that sleep deprivation can affect the mental health. In the article, it was stated that 50% to 80% of individuals with psychiatric issues have chronic sleep disorder, and therefore establishes a very strong connection between sleep and mental wellness [1,2,3].

The Oil and Gas sector as any work environment is replete with a lot of stresses. Workers include panel operators in control rooms, well-head operators, mechanics, inspection engineers, and their everyday activities are wide ranging including adjustment of valves, tightening and loosening of bolts, operating from heights. Continuous working around machinery expose workers to noise pollution and extreme change in temperature, for example when compressor emit heat. The nature of stressors are environmental, biological and physical, coupled with several rotations otherwise known as shift. The typical Oil and Gas company shift operation is on 24 hours a day and seven days in a week doing exploitation and exploration of natural resources. Workers engage in long hours daily and for a 28-day onsite and then return home for 28 days. Managing the rotational work system, otherwise known as shift-system, in the critical Sector of Oil & Gas is very important for the welfare of the work force and the overall impact on this sector will be more since the shift-system is same worldwide. Massey [4] reported decrease in incidence of injury with increase in the duration of time into the work rotation, corrected for

exposure, and posited that result was statistically significant for all rotations in first 4 weeks ($P < 0.01$). These and associated concerns constitute important health hazards in that work system.

Niklas Cederström in a recent article on how strong are you? Stated that the mind will quit a lot quicker than the body. Lack of endurance either at work or play is closely linked to the state of the mind [5], the physical stamina derives its energy from the mental strength. [6], (Cederström, 2020).

1.1 Statement of the Problem

Rotational work is considered a risk factor for some health problems in some individuals, rotational workers work in shift which could be day or night twelve straight hours, this implies that the natural circadian rhythms is disrupted, many studies have shown that disruption of the circadian cycle may increase the probability of developing cardiovascular disease, cognitive impairment, diabetes, and obesity, among other conditions [7,8]. Rotational work can also contribute to strain in marital, family, and personal relationships [9]. Endurance is hugely affected by the state of the mind hence the complaints of some Oil and Gas workers are not directly linked to physical exhaustion but mental. [10], (Cederström, 2020).

1.2 Aims and Objectives

This study aims to evaluate the impact of rotational work on sleep and endurance of Oil and Gas workers in Port Harcourt metropolis.

2. METHODOLOGY

Randomly selected International Oil and Gas companies within the Niger delta region of Nigeria whose workers resides within Port Harcourt metropolis were recruited for the study. Design was simple random sampling.

2.1 Inclusion and Exclusion

2.1.1 Inclusion

1. Adults within working age based on the laws of Nigeria (18 to 60 years)
2. No known mental illnesses.
3. No debilitating physical illness.

2.1.2 Exclusion

1. Adults working outside International Oil and Gas companies
2. Mentally ill People.
3. Medically unfit adults

2.2 Instrumentation

Schedule for Clinical Assessment of Neuropsychiatry (SCAN) was used to develop questions in line with the checklists that defines different areas of mental wellness. Validation of the study instrument was done by test-retest method. The instruments for the determination of psychological and social disorders are questionnaires, phone interviews and cohort Session.

2.3 Questionnaire, Research and Cohort Sessions as a Research Instrument

2.3.1. Questionnaires

Google form application was used for the questions and sent to the target population through their emails and WhatsApp application, this option was used against the traditional paper distribution because of the convenience and due to the COVID-19 trend of avoiding crowd and social distancing. This option proved to be more effective since the results are automatically sent to a specific google mail created for the research.

2.3.2. Interview session

The interviewees were called on phone and explanation made on the research, its purpose and the fact that the process will be recorded for

analysis. One-on-one phone interview was utilized with the data extracted and analyzed.

2.3.3 Cohort session

A cover letter was written by the researcher introducing herself and her research subject with an appeal that they will be invited to a cohort session as in Mason [11], this was sent to the various WhatsApp group that the target population belong to e.g. (PENGASSAN, NUPENG, NISafetyE) and some individual mobile phone numbers. A zoom invitation was eventually sent out to these groups and individuals stating date and time. The meeting was anchored by the researcher where an ice breaking session bothering on mental health was discussed. A series of questions were asked, with chats from participants as seen in the message chat box. These chat responses were extracted and analyzed.

2.4 Sample Size

Taro Yamane formula (Yamane, 1973) is used to determine the sample size of this research. Calculation formula of Taro Yamane is presented as follows:

Where n = sample size required

N = number of people in the population

e = acceptable sampling error (%)

Substitute numbers in formula:

$$n = \frac{n}{1 + N(e)^2}$$

$$n = 92$$

With the sample size of 92 and response of 80, we have a response rate of 86.9%.

2.5 Sample Size Determination for Qualitative Interviews

Structured telephone interviews were conducted with rotational workers from selected International Oil and Gas companies. All the participants were informed beforehand and were assured that the discussion and its outcome is strictly for academic purposes and their identities were not required. The interviews were conducted via telephone only. This is because it was more convenient and effective. Interviews were carried out until no new relevant information were obtained; all interviews were recorded. The interview sessions ranged from nine minutes to twenty minutes. Sample notes were taken immediately after each interview. The sample

size used for the interviews was selected using some guiding principles.

Saturation as defined by Glaser and Strauss (1967) in these terms, “The criterion for judging when to stop sampling the different groups pertinent to a category is the category’s theoretical saturation. Saturation means that no additional data are being found whereby the sociologist can develop properties of the category. As he sees similar instances repeatedly, the researcher becomes empirically confident that a category is saturated”. The guiding principle used in selecting the sample size for the interview is called saturation.

Saturation is commonly used to indicate that, the data have been collected up to a point that more data will not give any new information related to the research, so further data collection are unnecessary. In this research after twelve interviews, the repetitiveness was observed, However the researcher continued till the fifteen (15) structured interviews before drawing the curtain.

3. RESULTS AND DISCUSSION

3.1 Demographics

Table 1 is in response to the questionnaire question on age range 76.2% fall within the age range of 31 to 40 years while, 21.2% fall within 41 to 50 years and 2.5% within 51 to 60 years.

Table 2 shows the gender distribution of the respondents, 96.2% of the workers are male, 1.2% are female and 2.5% did not select any gender.

Table 1. Observed age range for participants

Ages	Frequency of responses	Percentages of responses
31 – 40	61	76.2
41 – 50	17	21.2
51 – 60	2	2.5
Total	80	100.0

Table 2. Gender distribution in the study

Gender	Frequency of responses	Percentages of responses
Female	1	1.2
Male	77	96.2
Not listed	2	2.5
Total	80	100.0

Table 3 shows the marital status of the Oil and Gas workers, 93.8% of the Oil and Gas workers were married or have domestic partnership, 2.5% were single, 2.5% were divorced while 1.2% were widowed.

3.2 Effects of Rotational work on the Sleep of Oil and Gas Workers

With regards to the effect rotational work has on the sleep of Oil and Gas workers, 27.5% and 66.2% agreed and strongly agreed that their sleep is affected by their work on site. A 3.8% strongly disagreed and disagreed respectively that their sleep is affected at home (Table 4); 32.5% were neutral but 58.8% agreed that their sleep is affected while 1.2% strongly agreed to that. Regarding the effects their work has on their sleep on arrival to work, 28.8% and 48.8% agreed and strongly agreed that their sleep is affected on arrival, 18.8% were neutral while 1.2% strongly disagreed that their sleep is affected when they arrive at work. All categories have their median and mode as 5; median of 5 means that more than half of the responses in all category strongly belief that their sleep were affected by their work while the mode being 5 means that most responses in all categories answered strongly agreed that their work has effect on their sleep.

3.3 Rotational Work has no influence on the Sleep of Oil and Gas Workers in Port Harcourt

Table 5 is a summary of the test on the effect rotational work has on sleep of rotational Oil and Gas workers.

Table 3. Marital status of respondents

Marital Status	Frequency of responses	Percentages of responses
Single, never married	2	2.5
Married or Domestic Partnership	75	93.8
Widower/Widowed	1	1.2
Divorced	2	2.5
Total	80	100.0

Table 4. Effect of Rotational Work on the Sleep of rotational workers

	Strongly Disagree (SD)	Disagree (D)	Neutral (N)	Agree (A)	Strongly Agree (SA)	No response	Median	Mode
Does rotational work affect the sleep of Oil and Gas workers on site?	1 (1.2%)	1 (1.2%)	2 (2.5%)	22 (27.5%)	53 (66.2%)	1 (1.2%)	5.00	5
Does rotational work affect the sleep of Oil and Gas workers at home?	3 (3.8%)	3 (3.8%)	26 (32.5%)	47 (58.8%)	1 (1.2%)	1 (1.2%)	5.00	5
Does rotational work affect the sleep of Oil and Gas workers on arrival?	1 (1.2%)	1 (1.2%)	15 (18.8%)	23 (28.8%)	39 (48.8%)	1 (1.2%)	5.00	5
Does rotational work affect the sleep of Oil and Gas workers during departure?	2 (2.5%)	4 (5.0%)	17 (21.2%)	20 (25.0%)	36 (45.0%)	1 (1.2%)	5.00	5

Table 5. Test of Hypothesis Sleep

	Pearson Chi-Square value	P-value
Does rotational work affect the sleep of Oil and Gas workers during departure?	33.550	.000**
Does rotational work affect the sleep of Oil and Gas workers on arrival?	37.892	.000**
Does rotational work affect the sleep of Oil and Gas workers at home?	24.964	.002**
Does rotational work affect the sleep of Oil and Gas workers on site?	40.253	.000**

Footnote: *** significant at 1% ** significant at 5% * significant at 10%

The result of the test of hypothesis on the effect rotational work has on the sleep of Oil and Gas workers for each of the variables is significant at 5%. We reject the null hypothesis of no relationship here. This means that relationship exists between rotational work and sleep of Oil and Gas workers.

With regards to the effect rotational work has on sleep among Oil and Gas workers, majority of the workers suggest that their sleep is affected by the nature of their job whether they are at home, on site, on arrival or departing. The test hypothesis is significant for all four (Namely effects at home, prior to departure to site, on site and on arrival to site), the null hypothesis of no relationship between Rotational Work and the Sleep of Oil and Gas Workers is rejected for all. This implies that there is strong evidence to conclude that the sleep of workers is highly affected by their job. This is in agreement with the answers given in the interview section where the interviewees said that they have irregular sleep patterns due to their work and the cohort session where everyone in the group unanimously answered yes to if rotational work affects their sleep pattern. Many similar studies also reached same conclusion (Simoes et al., 2010; Imes & Chasens, 2019; Kang et al., 2017; Khan et al., 2011; Folkard & Tucker, 2003).

3.4 Effects of Rotational work on the Endurance among Oil and Gas Workers

Table 6 answers the question of the effect of rotational work on endurance of Oil and Gas workers. It was clearly seen that 48.8% and 37.5% agreed and strongly agreed to the fact that rotational work has effect on their endurance on site; a median of 4 says that over half of the respondents agreed and strongly agreed to this category while a mode of 4 means that more of the responses belong to the category of agreed 45.0% and 23.8% agreed and strongly agreed that their endurance is affected during departure; 46.2% and 26.2% agreed and strongly agreed that their endurance are affected at home while 17.5% were neutral; 48.8% and 27.5% agreed and strongly agreed that their endurance are affected on arrival while 13.8% are neutral, 3.8% and 6.2% disagreed and strongly disagreed that their endurance is affected respectively. All the categories have median of 4 which means that over half belief that their work affects their endurance whether on site, at home, during departure or on arrival; and a mode of 4 suggests that more of the response belongs to the category of agreed. The frequencies, median and mode all arrive at the same conclusion that rotational work affect the endurance of workers.

Table 6. Effect of Rotational Work on the Endurance of rotational workers

	Strongly Disagree (SD)	Disagree (D)	Neutral (N)	Agree (A)	Strongly Agree (SA)	No response	Median	Mode
Does rotational work affect the endurance of Oil and Gas workers on site?	3 (3.8%)	2 (2.5%)	6 (7.5%)	39 (48.8%)	30 (37.5%)	0 (0%)	4.00	4
Does rotational work affect the endurance of Oil and Gas workers at home?	2 (2.5%)	6 (7.5%)	14 (17.5%)	37 (46.2%)	21 (26.2%)	0 (0%)	4.00	4
Does rotational work affect	5 (6.2%)	3 (3.8%)	11 (13.8%)	39 (48.8%)	22 (27.5%)	0	4.00	4

	Strongly Disagree (SD)	Disagree (D)	Neutral (N)	Agree (A)	Strongly Agree (SA)	No response	Median	Mode
the endurance of Oil and Gas workers on arrival?						(0%)		
Does rotational work affect the endurance of Oil and Gas workers during departure?	6 (7.5%)	7 (8.8%)	12 (15.0%)	36 (45.0%)	19 (23.8)	0 (0%)	4.00	4

3.5 Rotational Work and the Endurance of Oil and Gas Workers in Port Harcourt

The result shows effect of rotational work on the endurance among Oil and Gas workers. It is clearly seen that 48.8% and 37.5% agree and strongly agree to the fact rotational work has effect on their endurance on site; 45.0% and 23.8% agree and strongly agree that their endurance is affected during departure; 46.2% and 26.2% agree and strongly agree that their endurance are affected at home while 17.5% are neutral; 48.8% and 27.5% agree and strongly agree that their endurance are affected on arrival while 13.8% are neutral, 3.8% and 6.2% disagree and strongly disagree that their endurance is affected respectively.

4. CONCLUSION

This research work has so far examined the relationship of rotational work and mental wellness specifically sleep and endurance among Oil and Gas workers from selected International Oil and Gas industry. It is no longer in doubt that rotational work has impact on the mental wellness of workers both in their lives and productivity. From the research carried out, it clearly shows that distortion of the circadian cycle affects both physical and mental wellbeing of rotational Oil and Gas workers. Moreover, sleep deprivation causes depression and general dissatisfaction with life which effects are an indicative of the mental health state of a worker. Sleep plays an important part in the recuperation

of the body. Thus, a deprivation or lack of it has a great impact on the mental wellness of workers especially in the Oil and Gas industry where much energy is expected and is performance driven. A strong relationship between endurance and mental wellness has been established in the cause of this study. Again, it was observed from this research that rotational work can also be one of the many reasons that contributes to strain in family, marital, career and personal relationships. This has not only affected workers and their mental wellbeing, but the society at large.

5. RECOMMENDATIONS

Overall, from the tools utilized in this work, it is important to note that shorter rotation period at work is recommended and helpful to give room for recuperation. This will make life more bearable for the rotational Oil and Gas workers. Not only does it give room for healing and recovery of the workers and their mental wellbeing, but also impact on their performance and productivity at work. The economic gain of the industry to the family and Society at large cannot be overemphasized However policies to reduce time at work will be beneficial to the mental health of workers and productive to the industry.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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