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Research Paper

Evaluating Awareness and Perceived Effectiveness of Fatigue Coping Mechanisms Among Commercial Aircrew in Nigeria

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Abstract
Background: *Fatigue remains a pervasive challenge in commercial aviation, with significant implications for flight safety, crew performance, and operational reliability. Therefore, this study investigatedthe level of awareness and perception of effectiveness of fatigue coping mechanisms employed during flight operations among commercial aircrew in Nigeria, with the goal of identifying gaps and informing strategies for improved fatigue management in the aviation industry.*
Method: *This study adopted a descriptive cross-sectional research design. The population of the study consisted of pilots, flight engineers and cabin crew with the relevant professional licenses that work with local commercial airlines and are actively involved in flying duties in both the long and short haul categories. The sample size of this study comprised 190 participants and validated semi structured, self-rating and self-administered questionnaire developed by Airbus in collaboration with a French university was adapted for qualitative data collection. The analysis of data was done using the Epi info statistical software package version 3.5.1(2008). The results are presented in the form of tables to facilitate interpretation.*
Results: *Finding showed that there were a strong awareness and utilization of fatigue coping mechanisms among aircrew and majority of respondents rated crew/work-rest scheduling as a very effective fatigue coping mechanism, making it the most positively perceived strategy. This reflects the aviation industry's long-standing emphasis on structured rest periods to mitigate fatigue, particularly within Fatigue Risk Management Systems (FRMS).*
Conclusions*: The study concluded that aircrew demonstrated strong awareness and utilization of fatigue coping mechanisms, particularly structured rest strategies such as crew work-rest scheduling and controlled rest breaks. These methods are widely recognized and positively perceived for their effectiveness in mitigating fatigue. While behavioral strategies like movement and activity breaks are moderately known, pharmacological and environmental interventions remain underutilized and less trusted.*
Recommendations: *This study recommended amongst others that Targeted training programs should be developed to educate aircrew on the full range of fatigue mitigation techniques, including their safe and regulated use.*

Keywords: ***Fatigue coping mechanisms, aircrew awareness, perceived effectiveness, commercial aviation***

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I. Introduction

The aviation industry operates on a continuous 24-hour cycle to meet global operational demands. This around-the-clock requirement places considerable physiological and psychological pressure on aircrew members engaged in both long-haul and short-haul operations (Fisher, 2006). In Nigeria, the aviation sector has demonstrated consistent growth despite prevailing economic challenges. According to the Federal Airports Authority of Nigeria (FAAN), domestic passenger traffic increased from 3,093,000 in 1998 to 4,618,000 in 2000, reaching 6,242,000 in 2004 and surging to 10,993,647 by 2008 (Fisher, 2006). More recent data from the 2024 Nigerian Aviation Outlook confirms this upward trend, with passenger volumes rebounding post-pandemic and infrastructure expansion underway to accommodate rising demand.

This sustained growth necessitates the continuous availability of aircrew to support 24-hour operations, which presents significant challenges to human physiology and has critical safety implications. While aviation

technology and operational capabilities have advanced markedly over the decades, human physiological limitations have remained relatively static. Pilots and other crew members continue to perform essential roles under increasingly demanding conditions, often leading to elevated levels of fatigue (McKellar, 2009). Fatigue, characterized by reduced alertness, impaired decision-making, and slower reaction times, compromises both safety and performance.

Recent studies and safety audits underscore the severity of aircrew fatigue as a persistent and underreported threat to aviation safety. The U.S. National Transportation Safety Board (NTSB) reported in 2007 that fatigue was a contributing factor in at least 10 major airline accidents between 1993 and 2007, resulting in 260 fatalities. More recent assessments suggest that this figure may underestimate the true scope of the problem. A 2024 industry-wide survey conducted by the European Cockpit Association found that over 65% of long-haul pilots and 52% of short-haul pilots reported experiencing fatigue during flight operations, with many citing diminished concentration and alertness.

In the Nigerian context, the 2025 LBS Aviation Sector Report highlights that while the industry is poised for expansion, concerns about crew welfare and fatigue management remain inadequately addressed. The report warns that without systemic interventionssuch as improved scheduling practices, mandatory rest periods, and fatigue risk management systemsthe sector may face increased safety risks.

As pilot fatigue continues to be one of the most significant and preventable contributors to aviation incidents, it shows that despite technological advancements, the human element remains central to aviation safety. Addressing fatigue through evidence-based policies and proactive oversight is essential to sustaining growth and ensuring the safety of air transport operations.

II. Aim and Objectives of the Study

This study aim was to investigate the level of awareness and perception of effectiveness of fatigue coping mechanisms employed during flight operations among commercial aircrew in Nigeria, with the goal of identifying gaps and informing strategies for improved fatigue management in the aviation industry, hence the specific objectives of the study were:

1. To assess the awareness of fatigue coping mechanisms in use during flight operations among aircrew in the commercial aviation industry in Nigeria.
2. To assess aircrew perception of the effectiveness of fatigue coping mechanisms in use during flight operations.

III. Materials and Methods

Adopting a descriptive cross-sectional research design, this study was carried out in the Murtala Muhammed international airport (MMIA) Lagos. It involved local Airlines operating both domestic and international flights who also use MMIA as their hub. Murtala Muhammed International Airport (MMIA) is located in Ikeja, Lagos State, Nigeria, and is the major airport serving the city of Lagos, southwestern Nigeria and the entire nation. The population of the study consisted of individuals who are pilots, flight engineers and cabin crew with the relevant professional licenses that work with local commercial airlines and are actively involved in flying duties in both the long and short haul categories. There are over 250 registered aircrew in this category (NCAA, 2011). The inclusion criteria encompass aviation professionals actively engaged in the local industry. Eligible participants include licensed pilots who have been in active service within the past six months, expatriate pilots holding Nigerian licenses and working locally, and helicopter pilots employed by airlines offering helicopter charter services. Additionally, licensed cabin crew members and licensed flight engineers are also included. The exclusion criteria eliminate certain categories of aviation professionals from participation. These include military or combat pilots, expatriate pilots employed by foreign airlines that operate flights into Nigeria, and pilots serving in the presidential air fleet. Also excluded are pilots of privately owned small aircraft, Nigerian pilots working for airlines based outside the country, and those affiliated with local airlines that are not yet fully operational. The sample size of this study comprised 190 participants. In view of the high non response rates in self-administered questionnaire surveys and the relatively small size of the total study population, all consented subjects were studied. Consequently, no sampling will be carried out. A validated semi structured, self-rating and self-administered questionnaire developed by Airbus in collaboration with a French university was adapted for qualitative data collection(Lee, 1998; Bourgeois-bougrine, et al. 2003).The questionnaire measures for responses to 10 items related to Physical fatigue and 10 items for mental fatigue thus allowing for a rating of fatigue levels among aircrew (Lee, 1998; Bourgeois-bougrine, et al. 2003). In addition, key informant interviews were conducted and the chief operations officers of the various airlines were interviewed with a view to acquiring better insight into demands of duty and rest scheduling for aircrew. The head of the NCAA responsible for ensuring compliance with regulations and standards in the industry was also interviewed to ascertain levels of compliance by the airlines and enforcement efforts by the agency. The entire

study was carried out over a six-month period with data collection spanning over 4 months. The instrument was pretested on 15 military transport pilots of the Nigerian Air Force Mobility command's 201 Heavy Airlift Group, Lagos. The pretest was carried out to assess the readability, ease of understanding and to assess the completion time of the questionnaire. Adjustments were made accordingly to improve ease of understanding for aspects of the questionnaire that required corrections. The questionnaires were administered in the privacy of the crew rooms of the various airlines within the vicinity of both the local and international airports. Aircrew passing through the crew rooms before and after flights as well as those coming to their airline offices to attend to various administrative concerns were approached to fill the questionnaire. One in-house administrative staff in each of the airlines was recruited to assist with questionnaire administration and collection. (Access for research assistants from outside the industry could not be guaranteed by the airlines in view of the prevailing security challenges in the country). The questionnaires were unmarked and returned in sealed unmarked envelopes. They were retrieved immediately they were filled. For willing participants who are unable to answer the questionnaire immediately, marked boxes with slit holes were provided in the crew rooms for their convenience. The boxes were be emptied daily by the in-house research assistants over the duration of the study. Where necessary, the research assistants followed up on aircrew in their airlines to enhance the collection of filled instruments.

Interviews were conducted with eight key stakeholders in the aviation industry, including the Director General of the NCAA, the Director of Licensing, the General Manager of Aero Medical Standards, Chief Pilots of registered airlines, and aircrew representatives from each airline. Two tailored interview protocols were developed to address the distinct roles of aircrew and regulatory personnel, ensuring consistency and enhancing the reliability of the findings. Prior to each interview, participants were thoroughly briefed on the purpose, their selection rationale, and the expected duration. Written informed consent was obtained, along with permission to take notes and use a tape recorder. All participants were assured of confidentiality, with no names or organizational identifiers used during data transcription and review. The analysis of data obtained from this survey was done using the Epi info statistical software package version 3.5.1(2008). The data generated from the study was be presented in form of tables, pie charts, and bar charts. The comparism of the variables was done using chi-square (X2) test and fischers exact test. Level of significance was taken at $p < 0.05$. In the analysis of the results of the in-depth interviews, the information collected from the various participants was compared. Common themes and patterns were established from the report and used as the basis for discussing the results. Where necessary, quotes from the respondents were included to give credence to the results. On grounds of confidentiality, efforts were made to ensure that respondents were not identifiable from their quotes. The interview records were transcribed within 24hours of the conduct of an interview. Ethical approval was obtained from the Ethical and Research Committee of the Lagos University Teaching Hospital. The NCAA and FAAN were informed of the study as well as the chief operating officers of the various registered airlines. The respondents were assured of the highest level of confidentiality on information given and individual names or names of their respective airlines would not be required. Respondents were informed of their right to opt out of the study at any point they choose to if they so desired.

IV. Results and Findings

Table 1: Respondents' Awareness and Utilization of Fatigue Coping Mechanisms

Variable	Frequency (n=190)	Percent
Coping Mechanism Awareness		
On board sleep	28	14.7
Cockpit naps	35	18.4
Controlled rest breaks	131	68.9
Crew work rest/scheduling	162	85.3
Alertness enhancing compounds	23	12.2
Activity break	78	41.3
Move around in seat	81	42.9
Others	3	1.6
Had cause to Utilize Coping mechanism	**(n = 189)**	
Yes	133	70.4
No	56	29.6

In this table, the awareness and utilization of fatigue coping mechanisms by respondents' is shown. Majority of respondents appear to be familiar with crew work rest scheduling (85.3%), followed by controlled rest breaks (68.9%). Another 42.9% are familiar with moving around in their seats while 41.3% are aware of activity breaks. The coping mechanism with the lowest awareness among aircrew is the use of alertness enhancing compounds (12.2%). Of all the respondents,70.4% have had cause to utilize coping mechanisms while the remaining 29.6% have not.

Table 2: Respondents' Perception of Effectiveness of Coping Mechanism

	Perception of effectiveness of Coping Mechanism					
Coping Mechanism Used before	**Never Used (%)**	**Not Effective (%)**	**Slightly (%)**	**Moderately (%)**	**Very Effective (%)**	**Total**
On board sleep	176(92)	1(0.5)	4(2.1)	5(2.6)	4(2.1)	190(100)
Cockpit naps	164(86.3)	3(1.6)	10(5.3)	8(4.2)	5(2.6)	190(100)
Controlled rest breaks	79(41.8)	2(1.1)	28(14.8)	62(32.8)	18(9.5)	189(100)
Crew work rest/scheduling	40(21.3)	0(0.0)	17(9.0)	63(33.5)	68(36.2)	188(100)
Alertness enhancing compounds	171(90.0)	1(0.5)	7(3.7)	7(3.7)	4(2.1)	190(100)
Activity break	102(54.0)	2(1.1)	47(24.9)	27(14.3)	11(5.8)	189(100)
Move around in seat	96(50.5)	21(11.1)	47(24.8)	19(10.0)	7(3.7)	190(100)
Listening to music/Radio	143(75.3)	16(8.4)	24(12.6)	5(2.6)	2(1.1)	190(100)
Exposure to cold air	138(72.6)	17(8.9)	21(11.1)	9(4.7)	5(2.6)	190(100)
Bright light	130(68.4)	21(11.1)	26(13.7)	8(4.2)	5(2.6)	190(100)

Table 2 highlights respondents' perception of the effectiveness of fatigue coping mechanisms. 36.2% found crew /work rest scheduling to be a very effective method of coping with fatigue while another 9.5% felt that controlled rest breaks are also very effective. 11.1% didn't find use of bright lights and moving around in seat to be effective. 92% had never used on board sleeps before and 90% had never used alertness enhancing compounds.

V. Discussion of Findings

The result addressing research question one revealed a strong awareness and utilization of fatigue coping mechanisms among aircrew, with 85.3% familiar with crew work-rest scheduling and 68.9% aware of controlled rest breaks. These two strategies are widely recognized in aviation safety protocols and fatigue risk management systems. Their popularity reflects industry emphasis on structured rest periods to mitigate circadian disruption and sleep debt. Moderate awareness was observed for moving around in seats (42.9%) and activity breaks (41.3%), which are simple but effective behavioral strategies to maintain alertness and reduce physical strain during long flights. These findings are consistent with the study by Morris et al. (2020), which found that physical movement and scheduled activity breaks help sustain performance during extended duty periods.

The lowest awareness (12.2%) was recorded for alertness-enhancing compounds, such as caffeine or other stimulants. This suggests a cautious approach among aircrew toward pharmacological interventions, possibly due to regulatory constraints or concerns about side effects. Importantly, 70.4% of respondents reported having used at least one coping mechanism, indicating proactive engagement with fatigue management. The remaining 29.6% who had not used any strategies may represent a gap in training, access, or perceived need. This utilization rate supports findings Sharma, (2024), which emphasized the importance of awareness and accessibility in promoting effective fatigue mitigation.

Findings on research question two revealed that 36.2% of respondents rated crew/work-rest scheduling as a very effective fatigue coping mechanism, making it the most positively perceived strategy. This reflects the aviation industry's long-standing emphasis on structured rest periods to mitigate fatigue, particularly within Fatigue Risk Management Systems (FRMS). Similarly, 9.5% of respondents found controlled rest breaks to be very effective, reinforcing the value of planned in-flight rest opportunities in maintaining alertness and performance. In contrast, 11.1% of respondents did not find environmental or physical strategies such as the use of bright lights or moving around in seats effective. This suggests that while these methods may offer temporary relief, they are not perceived as sufficient for managing deeper levels of fatigue. This perception is consistent with findings from Morris et al. (2020), who noted that while physical activity and environmental adjustments can help, they are often secondary to rest-based strategies in terms of effectiveness. The data also shows very low utilization of pharmacological aids, with 92% of respondents never having used onboard sleep facilities and 90% never having used alertness-enhancing compounds. This indicates a general reluctance or lack of access to these methods, possibly due to regulatory restrictions, safety concerns, or limited awareness. These findings suggest that while aircrew are aware of multiple fatigue coping strategies, they overwhelmingly favor those that involve structured rest and recovery. The limited use of pharmacological or environmental methods highlights the need for further education and policy clarity on their safe and effective application.

VI. Conclusion

This study concluded that aircrew demonstrated strong awareness and utilization of fatigue coping mechanisms, particularly structured rest strategies such as crew work-rest scheduling and controlled rest breaks. These methods are widely recognized and positively perceived for their effectiveness in mitigating fatigue. While behavioral strategies like movement and activity breaks are moderately known, pharmacological and environmental interventions remain underutilized and less trusted. The findings highlighted a clear preference

for rest-based approaches and suggested that further education and policy development are needed to enhance understanding and safe application of alternative coping methods. Overall, the results reinforce the importance of accessible, well-structured fatigue management systems in aviation.

Recommendations

Based on the findings and conclusion of this study, the following recommendations were proffered:

1. Targeted training programs should be developed to educate aircrew on the full range of fatigue mitigation techniques, including their safe and regulated use.
2. Airlines and regulatory bodies should evaluate operational guidelines to ensure that safe, evidence-based fatigue coping mechanisms are not only permitted but also practically accessible to crew members during duty periods.

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