Vol. 2, Issue 10 October 2024 ISSN: 2584-0142

ISSN: 2584-0142
PSYCHOPEDIA JOURNALS
International Journal of Interdisciplinary Approaches in Psychology (IJIAP)

Sleep Quality and Fatigue among Airport Ground Staff

Japman Kaur*, **Dr. Pooja Varma****

*Student, Jain (Deemed-to-be) University ** Associate Psychology, Department of Psychology, Jain (Deemed-to-be) University

Abstract

Aim**:* This study examined the relationship between sleep quality and fatigue among the airport ground staff. ***Objective: To assess the relationship between sleep quality and fatigue of the ground staff depending upon their shift timings and number of years of work experience. Individuals who were either pilots, airhost, or air hostess; or who were less than 20 years of age, or had work experience less than 3 years, or had any other mental or medical conditions were excluded from the study. A total of 105 ground staff employees ranging between the age of 20-40 years were a part of the study. The tools used to measure the variables were The Sleep Quality Scale (SQS) by Yi. H Shin and Shin C (2006) with test-retest reliability of .81 and validity of .92 and The Fatigue Assessment Scale (FAS) by Michielsen et al. (2003) and the psychometric properties of the scale was found to be .90 through internal consistency method. ***Results**:* A Pearson correlation coefficient was computed to assess the relationship between sleep quality and fatigue. There was a positive correlation between the two variables ($r = .30$, $p = .002$). ***Conclusion***: Thus, there exists a positiverelationship between sleep quality and fatigue and with the help of one-way ANOVA,

it was revealed that shift timings and number of years of work experience doesn't have any effect on the sleep quality and fatigue levels.

Keywords: *sleep quality, fatigue, shift timings, experience, ground staff.*

Introduction

Sleep is defined as "an active state of unconsciousness produced by the body where the brain is in a relative state of rest and is reactive primarily to internal stimulus." Sleep quality is defined as 'how well you can sleep, basically focusing whether your sleep was restful and restorative or not. To measure one's sleep quality, we can assess by the four dimensions of sleep quality – Sleep Latency(means how long it takes for an individual to fall asleep), Sleep Waking (means how many times does the individual wakes up during the night), Wakefulness (measures how manyminutes the individual spends awake during the night after he/she first goes to sleep) and Sleep Efficiency (means the actual amount of time spent sleeping while in bed). Fatigue can be defined as an individual's state of tiredness and reduced functioning of daily or routine tasks. It can also be seen as a normal, transient response for extreme exhaustion or stress or boredom or maybe due to inadequate sleep, but it may also be an indicative for a disorder. It can be physical, mental or a combination of both and it can affect anyone. The rationale behind choosing this topic was, that there have been plenty of studies done related to this subject matter but not much in Indian context as well as not with this population (that is ground staff). The research question of the study being – "How sleep quality and fatigue affect the airport ground staff?"

A 2023 experimental study by Humaid et al. (2023) which evaluated "The Impact of Fatigue on Workers at Dubai Airport: Experimental Study," were interested to know more about the risks the airport security personnel face daily. The main objective to focus on this sample (i.e., airport security personnel) was that the authors believed that the said group is

responsible for providing protection and security to both the people and the facilities of the airport, so it is important to understand what all risks they face. Data collection was carried out by interviewing ten employees of the Dubai International Airport, among which, nine of them were from the airport security department and the tenth one was from the administrative security department. The results indicated that the sample experiences more fatigue as compared to other employees, and the main factors that contributes in increasing their fatigue are – work shifts, workload, and sleep problems, and because of increased levels of fatigue, they are not able to concentrate properly on their daily tasks and routine jobs, that leads to further risks, errors, longer response time on a task given at hand, etc. it also hampers their productivity levels and performance levels. Thus, the results can be used as an indicator and a reference for the future researchers to look more into this domain and come up with some effective and efficient strategy so that fatigue levels of the airport security personnel can be decreased.

Study by Tamakloe et al. (2022) on "Safety Climate and Psychological Well-Being Among Workers in the Ghanaian Aviation Industry: Does Fatigue matter?" evaluates and assesses the relationship between safety climate and psychological well-being of employees along with observing what mediating role does fatigue plays in it. The research was conducted using a cross-sectional research design method and sampling technique that was used was of convenience sampling method wherein data from 305 operational workers (that is the ground staff) of the Kotoka international airport in Ghana were obtained and analyzed. The results of the research revealed that fatigue partially plays a role in the relationship of safety climate and psychological well-being using the "PROCESS" macro method for bootstrapping techniques. The research further indicated that, the work environment that the workers/ employees create should be safe and healthy, as it helps in lowering the fatigue levels of the workers/ employees and boosts their psychological well-being, thus making the work

Vol. 2, Issue 10 October 2024 ISSN: 2584-0142

environment and work culture more important aspects for any worker/ employee.

Materials and Methods

A total of 105 participants were studied with the help of snowball sampling method. Inclusion criteria was ground staff employees who oversee various operations such as aircraft fueling suppliers, interior cabin cleaners, baggage, cargo and/ or freight handlers, ramp agents and boarding gate operatives, flight dispatchers, customer service agents, airport shuttle bus drivers, etc. Employees who were either pilots, airhost, or air hostess; or who were less than 20 years of age, or had work experience less than 3 years, or had any other mental or medical conditions were excluded from the study. The responses were conducted in both hybrid mode that is online (with the help of google forms) and offline mode by visiting the Kempe Gowda International Airport, Bengaluru. Informed consent of the participants was taken, and confidentiality of their details was maintained throughout the study. the participants were debriefed before the study, and they were informed about their right to withdraw from the study anytime if they wanted to. The participants provided demographic information including, number of years of experience, shift timings, job role. The participants were then asked to complete a GHQ 12 for initial screening process. The GHQ 12 instrument is used to evaluate and detect general (non-psychotic) mental health problems among the primary setting (Goldberg & Williams, 1988). It is used to rule out any other possibilities of already existing mental health conditions of the participants that is currently interfering with their sleep quality and fatigue levels. It is a self-administered test with 12 items (both positive and negative items) and the individual is asked to answer all the items as honestly as possible. The test is rated on a 4-point Likert scale using a timeframe of "in the last two weeks". The scoring of the test is carried out by assigning a score of '3 for more so than usual', '2 for same as usual', '1 for less so than usual', and '0 for much less than usual' for positive items and a score of '0 for not at all', '1 for no more than usual', '2 for rather more than usual' and '3 for

Vol. 2, Issue 10 October 2024 ISSN: 2584-0142

much more than usual' for negative items. The reliability of the test that was found by the developers is .76 and the validity of the test was found out to be .82. With the help of the screening process, filtering out of the participants was done based on the inclusion and exclusion criteria.

The Fatigue Assessment Scale (FAS) was used for determining the fatigue levels of the participants. It is a 10-item scale that was developed to evaluate various symptoms of chronic fatigue among the subjects (Michielsenet al., 2003). The test measures both physical and mental symptoms of fatigue that helps in giving a more accurate and clearer picture of the fatigue level of the subjects. FAS is a self-report, pencil-paper test and it hardly takes 2 to 5 minutes to complete the test. Each item on the test is answered using a 5-point Likert scale ranging from a score of '1 for never' to '5 for always.' Item number 4 and 10 are reversed-scored and then a total score is obtained for the test. Total scores for the test ranges from 10-50, wherein 10 being the lowest level of fatigue and 50 being the highest level of fatigue. The psychometric properties of the scale through internal consistency method were found out to be as .90.

For assessing the sleep quality of the participants, the Sleep Quality Scale (SQS) was used,developed by Yi. H Shin and Shin C (2006). It is a 28-item pencil-paper test that evaluates the quality of sleep with the help of six dimensions that is – 'Daytime Symptoms,' 'Restoration after Sleep,' 'Problems Initiating Sleep,' 'Problems Maintaining Sleep,' 'Difficulty Waking,' and 'Sleep Satisfaction.' The SQS hardly takes 5 to 10 minutes for administration, and it is a self-report measure. Each item on thetest is answered using a 4-point Likert scale and respondents indicate how frequently they exhibit certain sleep behaviors over a course of a month. The scores given were '0 for few', '1 for sometimes', '2 for often', and '3 for almost always. Scores on items belonging to dimension 2 and dimension 5 were reverse-scored and then a total score was calculated. Total scores for the test can range from 0 to 84,

with higher scores indicating more acute sleep problems of the subjects. The reliability of the test that was found out by the test-retest method was .81 and the validity of the test was found out to be .92.

The data collected via google form were automatically exported to an excel spreadsheet in a de-identified manner. in addition, the data that was collected in offline mode were recorded and added to the spreadsheet. The data in the spreadsheet was then imported to SPSS software (IBM, Version 26) for data analysis. Descriptive statistics, frequency counts, Pearson correlation coefficient and One-Way ANOVA were primarily used to analyze the data.

Results

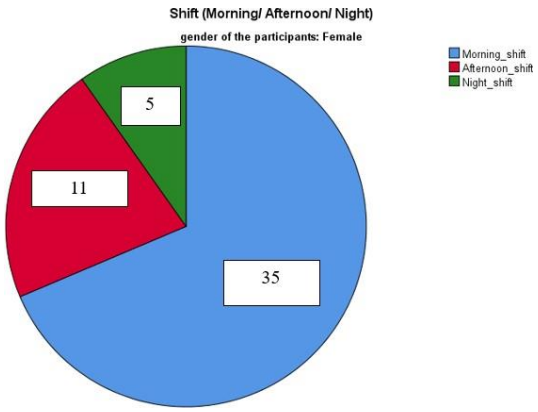
Demographics

A total of 51 (48.6%) female employees and a totalof 54 (51.4%) male employees were a part of the study ranging between the age of 20-40 years. The statistical summary of all the sociodemographic details collected form the participants is represented with the help of Table 1.

Table 1. *A statistical summary of the Demographic details ofthe participants*

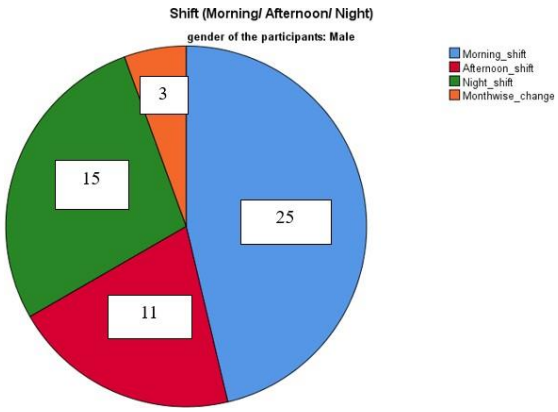
Demographic details		Frequency	Valid percent
Gender	Female	51	48.6
	Male	54	51.4
	Mean	1.5143	
	Std. deviation	.50219	
Age	Less than 30	93	88.6
	30 and above	12	11.4
	Mean age	1.1143	
	Std. deviation of age	.31968	
Years of experience of the ground staff employees	3 years	34	32.4
	4 years	52	49.5
	5 years	14	13.3
	6 years	3	2.9
	7 years	1	1.0
	8 years	1	1.0
	Mean	1.9333	
	Std. deviation	.90157	
Shift timings of the ground staff employees	Morning shift	60	57.1
	Afternoon shift	22	21.0
	Night shift	20	19.0
	Month wise change in shift	3	2.9
	Mean	1.6762	
	Std. deviation	.88247	

Figure 1. *Pie chart representing the shift timings of theFemale employees*



Through the help of the Figure 1, we can understand that 35% of the female employees are working in the morning shift, 11% are working in the afternoon shift and 5% in the night shift.

Figure 2. *Pie chart representing the shift timings of the Maleemployees*

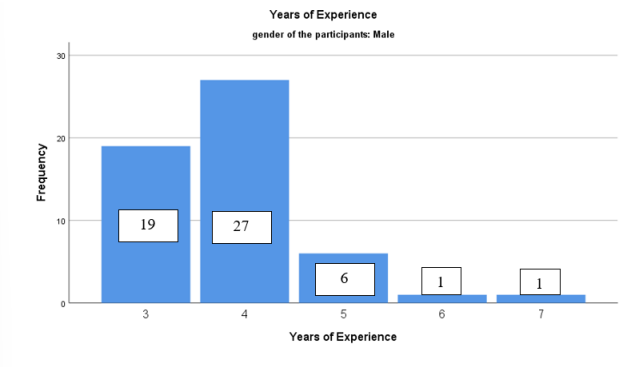


Through the help of the Figure 2, we can understand that 25% of the male employees are working in the morning shift, 11% are working in the afternoon shift, 15% in the night shift and 3% is month-wise change in the shift.

Figure 3. *Bar graph representing years of experience of theFemale employees*

Through the help of the Figure 3, we can understand that 15% of the female employees have been working for 3 years, 25% for 4 years, 8% for 5 years, 2% for 6 years and 1% for 8 years.

Figure 4. *Bar graph representing years of experience of the Male employees*



Through the help of the Figure 4, we can understand that 19% of the male employees have been working for 3 years, 27% for 4 years, 6% for 5 years, 1% for 6 years and 1% for 7 years.

Table 2. *Age and number of years of work experience*

Years of experience	Age	Frequency	Valid percent
3	**Less than 30**	29	31.2
	31 and above	5	41.7
4	**Less than 30**	45	48.4
	31 and above	7	58.3
5	**Less than 30**	14	15.1
6	**Less than 30**	3	3.2
7	**Less than 30**	1	1.1
8	**Less than 30**	1	1.1

Table 2 represents the number of employees who are in the age range of 20 to 40 years along with their number of years of work experience.

Table 3. *Age and Interpretation of Fatigue Assessment Scores (FAS)*

Age	Interpretation of fatigue assessment scale (FAS)	Frequency	Valid percent
Less than 30	Normal level of fatigue	2	2.2
	Substantial level of fatigue	84	90.3
	Extreme level of fatigue	7	7.5
31 and above	Substantial level of fatigue	12	100

Table 3 represents the number of employees who are in the age range of 20 to 40

years of age along with their interpretations of Fatigue Assessment Scores (FAS).

Table 4. *Mean, Standard Deviation and Pearson Correlationfor Sleep Quality and Fatigue*

Variables	M	SD	1	2
1. Sleep quality	43.01	8.75	1	.301**
2. Fatigue	28.60	3.58	.301**	1

Note: N = 105. M and SD are used to represent mean and standard deviation respectively.

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4 represents the correlation between sleep quality and fatigue using Pearson correlation. It is observed that there is a significant difference between the two variables.

Table 5. *One-way Analysis of Variance of Sleep Quality inGround Staff by Shift Timings*

Source	df	SS	MS	F	P
Between groups	3	193.54	64.51	.83	.47
Withing groups	101	7776.41	76.99		
Total	104	7969.96			

Note: N = 105

Table 5 represents a one-way ANOVA was performed to compare the effect of shift timings on sleep quality. It is observed that there was no statistically significant difference between shift timings and sleep quality.

Table 6. *One-way Analysis of variance of Fatigue in GroundStaff by Shift Timings*

Source	df	SS	MS	F	p
Between groups	3	12.55	4.18	.31	.81
Within groups	101	1326.44	13.13		
Total	104	1338.99			

Note: N = 105

Table 6 represents a one-way ANOVA was performed to compare the effects of shift timings on fatigue. Itis observed that there was no statistically significant difference between shift timings and fatigue.

Table 7. *One-way Analysis of Variance of Sleep Quality in Ground Staff by Experience*

Source	df	SS	MS	F	p
Between groups	5	196.73	39.34	.50	.77
Within groups	99	7773.22	78.51		
Total	104	7969.96			

Note: N = 105

Table 7 represents a one-way ANOVA was performed to compare the effects of numbers of years of experience on sleep quality. It is observed that there was no statistically significant difference between experience and sleep quality.

Table 8. *One-way Analysis of Variance of Fatigue in Ground Staff by Experience*

Source	df	SS	MS	F	p
Between groups	5	67.49	13.49	1.05	.39
Within groups	99	1271.49	12.84		
Total	104	1338.99			

Note: N = 105.

Table 8 represents a one-way ANOVA was performed to compare the effects of numbers of years of experience on fatigue. It is observed that there was no statistically significant difference between experience and fatigue.

Discussion

The researchers examined the relationship between sleep quality and fatigue based on the shift timings and number of years of work experience of the ground staff employees. This sample included ground staff employees working in various airlines at various job roles ranging between the age of 20 to 40 years. Sleep is defined as “an active state of unconsciousness produced by the body where the brain is in a relative state of rest and is reactive primarily to internal stimulus”. Fatigue is a key cause of sleep deprivation, and fatigue has a significant impact on flight safety. Lethargy, heightened anger, and poor focus

Vol. 2, Issue 10 October 2024 ISSN: 2584-0142

might result from not getting enough sleep. Most people have experienced these symptoms, but despite their knowledge, many nevertheless work with a sleep deficit and endanger others. Fatigue, on the other hand, is understood as physical and/ or mental exhaustion that goes beyond regular tiredness. The inability of an individual to use one's muscles as forcefully as one would like to be known as physical exhaustion. Loss of sleep or physical activity are the two main causes of physical weariness. Mental exhaustion frequently follows physical exhaustion. A general decline in attention span and the capacity to do difficult or even very easy tasks with the usual efficiency are signs of mental tiredness, which includes sleepiness. For pilots and Air TrafficController Officer (ATCOs), who frequently must work early in the morning or late at night, mental weariness is a major worry because it frequently stems from losing or interrupting the normal sleep cycle. The circadian cycles of the body are innately linked to sleep habits. Circadian rhythmscan be disrupted by shift schedules and time zone changes, making it challenging for crew members or ground staff or pilots working early shifts or long-haul routes through multiple time zones to get enough rest before reporting for duty.

Our findings indicated a positive correlation between sleep quality and fatigue in the sample. The findings of the current research are supported with the study done by Humaid et al. (2023) as the results revealed that ground staff experience more fatigue as compared to other employees and the main factors in contributing their fatigue levels are – work shift, workload, sleep problems, etc. and because of which they are unable to concentrate on their daily tasks and routine work, that leads to further risks, errors, longer response time on a given task and hampers their productivity and efficiency level.The results of the present finding were also in agreement with the findings of Bendak and Rashid (2020) as their results revealed that the risk associated with fatigue significantly rises when the workday is longer than 16 hours, when the pre-duty sleep period is shorter than 6 hours, and when the workday falls between the

Vol. 2, Issue 10 October 2024 ISSN: 2584-0142

crew's regular sleeping hours. It was also discovered that not all areas of this risk had been exhaustively examined. At the end, suggestions are made for additional research to investigate ways to reduce this danger.

Another finding of the present study indicates that there is no significant difference between sleep quality and shift timings. The results were complementary to Shochat et al., (2019) findings as they concluded that crew members who worked in the 12-hour day shift reported lower burnout levels, improved sleep quality levels and less daytime sleepiness as compared to those who worked in the night shift.As per Table 1, it is observed that a total of 60 (57.1%) employees are working in the morning shift and because of which they can relax and rest properly.

The present study found out that there would be no significant difference between fatigue and shift timings. The results were complementary to the study done by Santos et al., (2019) which evaluated on stresses, pressure and fatigue thatis experienced by the aircraft maintenance personnel and the results indicated that only because of extreme workload, the aircraft maintenance personnel would feel exhausted, and their fatigue levels would increase, and no major role did shift timings played in it.

Another finding of the present study indicates that would be no significant difference between sleep quality and experience. As per Table 1, it was observed that majority of the employees have 4 years of work experience that is 52 (49.5%) so they can rest properly after their shift ends and are well rested to do their work the next day.

The present study found out that there would be no significant difference between fatigue and experience. The findings of the current study were supported by the study done by Torres et al., (2016), on evaluating and assessing the relationship between fatigue and workload among the aircraft de-icing technicians based in their age, seniority, truck type and

Vol. 2, Issue 10 October 2024 ISSN: 2584-0142

work shift. The results are related to my study as it was concluded that there a significant age difference in the perceived level of fatigue among the younger workers with a smaller number of work experience rather than the older workers (refer table 2 and 3).

The present study was concluded as it was observed that there exists a positive correlation between sleep quality and fatigue with the help of Pearson correlation method ($r = .301$, $p = 0.01$). It was also observed that shift timings and the number of years of work experience do not have a statistically significant difference on sleep quality and fatigue.

There may be some possible limitations in this study, the first is at the time of data collection, the participants were not able to answers the questions as honestly as possible because of the security and privacy reasons of the respected airlines. The second limitation concerns the limitation of no qualitative interview done with the participants because of security reasons. Implications of the study are – more studies can be done related to this subject matter by keeping this study as a base so that new intervention program or a strategy can be formed and implemented by various airlines. Further research and studies should focus on conducting more qualitative interviews and longitudinal research on the ground staff population as it will help in the data collection process.

Additional findings

There were some additional findings that was observed in the present study, that is the Fatigue Assessment Scale (FAS) had 2 dimensions – Physical Fatigue and Mental Fatigue and the Sleep Quality Scale (SQS) had 6 dimensions – Daytime Dysfunction, Restoration after Sleep, Problems Initiating and Maintaining Sleep, Difficulty Waking Up and Overall Sleep Satisfaction. So, Pearson correlation was performed to find out dimension wise correlation. The results revealed that when the level of physical fatigue was higher of an individual, then the employee will face problems with initiating and maintaining sleep as

well as difficulty getting out of the bed (see Table 9). It was also observed that when the level of mental fatigue is higher, then the problems faced by the employee will be daytime dysfunction, decreased feelings of restoration after sleep, problems initiating and maintaining sleep, difficulty waking up and overall sleep satisfaction (see Table 10).

Table 9. *Dimension wise Pearson Correlation*

Dimensions	1	2	3	4
1. Physical Fatigue	1	.328**	.273**	.272**
2. Problems initiating sleep	.328**	1	.487**	.496**
3. Problems maintaining sleep	.273**	.487**	1	.329**
4. Difficulty waking up	.272**	.496**	.329**	1

Note: N = 105

**. Correlation is significant at the 0.01 level (2-tailed).

Table 9 represents the dimension wise correlation done between physical fatigue dimension and dimensions of problems initiating sleep, problems maintaining sleep and difficulty waking up. It is observed that there exists a positive relationship between the dimensions.

Table 10. *Dimension wise Pearson Correlation*

Dimensions	1	2	3	4	5	6	7
1. Mental fatigue	1	.330**	-.407**	.430**	.423**	-.390**	.369**
2. Daytime dysfunction	.330**	1	.009	.486**	.458**	-.055	.516**
3. Restoration after sleep	-.407**	.009	1	-.116	-.128	.215*	-.083
4. Problems initiating sleep	.430**	.486**	-.116	1	.487**	-.125	.496**
5. Problems maintaining sleep	.423**	.458**	-.128	.487**	1	-.063	.329**
6. Sleep satisfaction	-.390**	-.055	.215*	-.125	-.063	1	-.183
7. Difficulty waking up	.369**	.516**	-.083	.496**	.329**	-.183	1

Note: N = 105. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Vol. 2, Issue 10 October 2024 ISSN: 2584-0142

Table 10 represents the dimension wise correlation done between mental fatigue dimension and dimensions of daytime dysfunction, restoration after sleep, problems initiating sleep, problems maintaining sleep, overall sleep satisfaction and difficulty waking up. It is observed that there exists a positive relationship between the dimensions.

Acknowledgement

I would sincerely like to thank The Department of Psychology, JAIN (Deemed-to-be University) for giving me an opportunity to carry out my research. This research would not have been possible without the help and support of my research guide Dr. Pooja Varma, Associate Professor Psychology, Jain University, Department of Psychology, JAIN(Deemed-to-be-University). I also express my gratitude to my family for providing constant support and encouragement to finish my study. I thank my batchmates and friends who have constantly guided and helped me finish this study. I am deeply grateful to every participant who willingly participated in this study.

References

Asadi, H., Mott, J. H., & Yu, D. (2019). Risk Factors for Musculoskeletal Injuries among Airport Customer Service Employees. Proceedings of the Human Factors and Ergonomics Society . . . Annual Meeting. https://doi.org/10.1177/1071181319631368

Barhum, L. (2021, March 11). What Is Fatigue? Verywell Health. https://www.verywellhealth.com/fatigue-symptoms-causes-diagnos is-and-treatment-4768481

Benson, & Yvette, T. (2020). An investigation of the practices used in airline crew scheduling and their impact on the physical and mental health of airline crew [UT Electronic Theses and Dissertation]. University of Texas.

Bures, Machova, Altunpinar, M., Andrea, Ali (Ed.). (2018). Effect of Shift Work on Health and Performance of the Workers – Comparison Between Turkey and the Czech Republic: Vol. (AISC,volume 821). https://link.springer.com/chapter/10.1007/978-3-319-96080-7_20

Caldwell, J. C. (2012b). Crew Schedules, Sleep Deprivation, and Aviation Performance. *Current Directions in Psychological Science, 21*(2), 85–89. https://doi.org/10.1177/0963721411435842

Chang, Y. K., Yang, H., & Hsu, W. L. (2019). Effects of work shifts on fatigue levels of air traffic controllers. *Journal of Air Transport Management, 76, 1–9* https://doi.org/10.1016/j.jairtraman.2019.01.013

Department of Health & Human Services. (n.d.). Fatigue. Better Health Channel. https://www.betterhealth.vic.gov.au/health/conditionsandtreatment s/fatigue

Fogaça, L. B., Henriqson, E., & Lando, F. (2022). Airline Disruption Management: A Naturalistic Decision-Making Perspective in an Operational Control Centre. *Journal of Cognitive Engineering and Decision Making,Volume16*(Issue1). https://journals.sagepub.com/doi/abs/10.1177/15553434211061024?journalCode=edma

Humaid MA, Ismail NB & Mohammed R. a. Siam (Ed.). (2023). The Impact of Fatigue on Workers at Dubai Airport: Experimental Study: Vol. LNNS,volume 620. https://link.springer.com/chapter/10.1007/978-3-031-26953-0_40

Malandri, C., Mantecchini, L., & Reis, V. (2019). Aircraft turnaround and industrial actions: How ground handlers' strikes affect airport airside operational efficiency. *Journal of Air Transport Management, 78*, 23–32. https://doi.org/10.1016/j.jairtraman.2019.04.007

MS Butola, YS Dahiya, BK Rao. (2020). Assessment of fatigue in personnel during sustained operations using 'SOAP' – Sustained Operational Assessment Profile. *Indian Journal of Aerospace Medicine, 64* (1); 2–7. https://doi.org/10.25259/IJASM_38_2020

Santos, L., & Melício, R. (2019). Stress, Pressure and Fatigue on Aircraft Maintenance Personal. *International Review of Aerospace Engineering, 12*(1), 35. https://doi.org/10.15866/irease.v12i1.14860

SEVER, H. (2023). A Demographic Research on Compassion Fatigue and Job Satisfaction Levels of Aviation Employees. *Journal of Aviation, Volume 7*–29-38(Issue 1). https://dergipark.org.tr/en/pub/jav/issue/75970/1177750

Shochat, T., Hadish-Shogan, S., Yosipof, M. B., Recanati, A., & Tzischinsky, O. (2019). Burnout, Sleep, and Sleepiness during Day and Night Shifts in Transition from 8- to 12-Hour Shift Rosters among Airline Ground Crew Managers. *Clocks & Sleep, 1*(2), 226–239. https://doi.org/10.3390/clockssleep1020020

Sleep: Theory, Function and Physiology. (n.d.). Physiopedia. https://www.physio-pedia.com/Sleep:_Theory,_Function_and_Phy siology

Sricharoenpramong, S. (2018). Service quality improvement of ground staff at Don Mueang International Airport. Kasetsart *Journal of Social Sciences, 39*(1), 15–21. https://doi.org/10.1016/j.kjss.2017.12.001

Szabo, S., Pilat, M., Mako, S., Korba, P., Cicvakova, M., & Kmec, Ľ. (2021). Increasing the Efficiency of Aircraft Ground Handling—A Case Study. *Aerospace, 9*(1), 2. https://doi.org/10.3390/aerospace9010002

T. (2020, November 1). What Is Sleep Quality? - National Sleep Foundation. National Sleep Foundation. https://www.thensf.org/what-is-sleep-quality/

Tamakloe, S. A., Amponsah-Tawiah, K., & Mensah, J. T. (2022). Safety Climate and Psychological Well-Being Among Workers in the Ghanaian Aviation Industry: Does

Fatigue Matter? Occupational Health Science. https://doi.org/10.1007/s41542-022-00110-2

Torres, Y. C., Nadeau, S., & Morency, F. (2016). Study of fatigue and workload among aircraft de-icing technicians. *Occupational Ergonomics, 13*(2), 79–90. https://doi.org/10.3233/oer-160240

Tripathy NK. (2018). A Questionnaire Study on Work-rest Schedule and Fatigue Among Aircraft Maintenance Personnel. *Indian Journal of AerospaceMedicine*. https://indjaerospacemed.com/a-questionnaire-study-on-work-rest- schedule-and-fatigue-among-aircraft-maintenance-personnel/

Van Den Berg, M. J., Signal, T. L., & Gander, P. H. (2020). Fatigue risk management for cabin crew: the importance of company support and sufficient rest for work-life balance—a qualitative study. *Industrial Health, 58*(1), 2–14. https://doi.org/10.2486/indhealth.2018-0233

Wang, T. C., & Liu, C. (2014). Optimal Work Shift Scheduling with Fatigue Minimization and Day Off Preferences. Mathematical Problems in Engineering, 2014, 1–8. https://doi.org/10.1155/2014/751563

Is Sleep Important? (n.d.). Psychology Today. https://www.psychologytoday.com/us/basics/sleep

Zhu, S., Sun, H., & Guo, X. (2022). Cooperative scheduling optimization for ground-handling vehicles by considering flights' uncertainty. Computers & Industrial Engineering, 169, 108092. https://doi.org/10.1016/j.cie.2022.108092