Noise Hazard Management: An Investigation of The Connection Between Stress Levels and Noise Level Among Ferry Engine Operators and Ticket Collectors

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Abstract

Noise hazards are a significant concern for workers in the transportation industry, particularly ferry engine operators and ticket collectors, who are frequently exposed to high noise levels during their daily tasks. This study investigates the relationship between noise levels in ferry environments and stress levels among these workers, aiming to provide insights into effective noise hazard management strategies. While noise-induced hearing loss (NIHL) is a well-documented consequence of prolonged exposure to high noise levels. This study adopts a mixed-methods approach to evaluate the connection between noise exposure and stress levels. Quantitative data on noise levels were collected using sound level meters in various ferry operations, with measurements taken at both engine rooms and ticket collection areas during peak and non-peak hours. Stress levels were assessed through validated psychological stress questionnaires and physiological indicators, such as heart rate variability (HRV), among ferry engine operators and ticket collectors. Additionally, qualitative interviews were conducted to capture workers' subjective experiences and coping mechanisms related to noise exposure. The results reveal a strong correlation between noise levels and stress levels, with engine operators experiencing higher stress due to prolonged exposure to noise levels exceeding 90 decibels. Ticket collectors, although less exposed to extreme noise, reported stress linked to intermittent loud sounds combined with customer interactions in high-pressure environments. Based on these findings, the paper recommends a comprehensive noise hazard management framework. Finally, stress management initiatives, such as mindfulness training and wellness programs, are suggested to improve workers' overall resilience respectively.

Keyword: Noise hazards, Stress Management, Ferry transportation, Occupational health and safety

1. Introduction

Noise pollution in the workplace is an issue that often goes unnoticed, despite its significant potential to affect workers' health and well-being s (Kim, 2016). The impact of noise exposure is particularly concerning in environments where the noise levels are consistently high and workers have limited ability to control or reduce their exposure (Wang, Y & et, al 2016). One such

environment is aboard ferries, where ferry engine operators and ticket collectors are routinely exposed to elevated noise levels. While noise is an inherent part of many industrial and transportation settings, the potential link between noise exposure and stress levels remains an underexplored aspect in the context of ferry operations. Ferry operations are characterized by a combination of mechanical noise generated by the engines and other operational sounds from onboard activities. Engine operators, for instance, are exposed to constant noise from the engines, which can be exacerbated by factors such as weather conditions, maintenance schedules, and the size of the ferry. Ticket collectors, while not as directly involved in the mechanical operations, are often exposed to noise from engines and public interactions in crowded, noisy environments such as ferry terminals. Both groups of employees are subject to significant noise exposure, which could potentially influence their stress levels. The need for effective noise hazard management in ferry operations is underscored by the growing awareness of occupational health and safety in industries worldwide. In many countries, labor organizations and regulatory bodies have established guidelines and standards for permissible noise levels in the workplace (Hansen et al. 2002; Jensen et al. 2004). While these regulations help to mitigate the risk of hearing damage, they may not fully address the broader psychological and stress-related consequences of noise exposure. As such, noise hazard management strategies must go beyond compliance with noise limits to incorporate a more holistic approach to workers' overall well-being.

By understanding the connection between noise and stress, this research aims to contribute valuable insights to the field of occupational health and safety, with the ultimate goal of improving the health and productivity of ferry workers and enhancing the overall safety and efficiency of ferry operations accordingly.

1.1 Research Objectives

This research aims to 1) assess the relationship between noise exposure and stress levels among ferry engine operators and ticket collectors. 2) propose effective noise hazard management strategies aimed at reducing stress and improving occupational health and safety.

1.2 Research Methodology

The study will be conducted in both onboard ferry operations and terminal locations to ensure a diverse representation of workers exposed to varying levels of noise. The sample will be drawn from several ferry companies operating in Chao Praya River, Bangkok, Thailand, with an emphasis on gathering data from both high-traffic routes (where noise exposure may be higher) and lower-traffic routes (where noise exposure may be comparatively lower). This will allow the research to explore potential differences in noise exposure and stress levels based on operational context**.** Citeria for participants are as follows: Workers must have at least six months of experience in their respective roles. Participants must have had consistent exposure to noise in the ferry environment. Participants must be over the age of 18 and provide informed consent to participate in the study.

2. Literature Review

Increasingly, today's ferry crew members tend to be employed on a temporary basis – although among the minority of seafarers from more economically developed countries permanent employment is still conceivable – and are likely to be placed onboard different ships or even onboard ships operated by different shipping companies. As a consequence, seafarers' periods of work may occur on a regular basis (for permanently employed seafarers) or on an ad hoc basis for those seafarers who experience temporary employment. The durations of these prolonged periods of intense labour at sea vary greatly – from one week to nine months or more – and are dependent on numerous factors, such as the seafarer's nationality and which crewing agency recruited the individual. Consequently, it is not uncommon to find two ticket collectors onboard the same ship, working in the same rank, to have tours of duty of completely different durations. During tours of duty seafarers work long hours each day they are onboard. For example, in one study the average weekly working hours of participants was between 67 and 70 hours and the majority of participants reported working every day of the week (Jensen et al. 2006). More often than not these working hours are arranged in shift patterns – owing to the fact that the shipping industry is 24 hour 365 days a year industry and ships navigate and load cargo regardless of the time of the day or the day of the year. Many ferry crew members such as ticket collectors work split shifts and it is not unusual for ferry crew members such as ticket collectors to work patterns of 4 hours on/8 hours off or 6 hours on/6 hours off. It is thus unsurprising that literature (Smith et al. 2006) suggests fatigue to be prevalent among the seafaring labour force. In addition, literature pertaining to injuries in the offshore oil and gas installation industry identified relationships between injury severity and the number of consecutive days an individual had been on the offshore installation (Parkes and Swash 1999). Research specific to the ferry ticket collector's industry similarly indicates a relationship between the frequency of ferry ticket collectors s' injuries and the number of elapsed days onboard (Hansen et al. 2002; Jensen et al. 2004).

There is substantial literature on the effects of noise on worker performance and well-being, especially in industries such as manufacturing, aviation, and construction, where workers are regularly exposed to loud environments. However, fewer studies have focused specifically on ferry operations, a sector where workers are exposed to constant, high-level noise in close proximity to powerful machinery and, in some cases, large crowds. Previous studies have largely concentrated on measuring noise levels and their direct impact on hearing loss. Fewer have explored the less obvious psychological impacts of noise exposure, particularly in the context of stress. In 2023, there were 618 deaths during the working day or commuting, increasing in 1.8% the results of the previous year, which is why the Labor Commission at that time presented a non-legislative proposal that includes measures to reduce work-related accidents. The text states that "practically one-third of deaths were caused by a heart attack or stroke," a factor that is cited as "the main cause of death at work." In addition, unions refer to "stress and work pressure have a high impact on this type of death," a cause that "remains the great forgotten in prevention plans." Article 157 of the Consolidated Text of the General Social Security Act defines occupational disease as "that contracted as a result of work performed for others in the activities specified in the table approved by the implementing and development provisions of this Act, and that is caused by the action of the elements or substances indicated in said table for each occupational disease. In such provisions, the procedure to be followed for the inclusion in said table of new occupational diseases that are deemed necessary shall be established. This procedure shall include, in any case, as a compulsory procedure, the report of the Ministry of Health, Social Services and Equality." The above refers to cases of work accidents in general, and therefore, it is applicable to the maritime sector.

3. Research Results

This paper seeks to investigate this relationship and provide recommendations for effective noise hazard management strategies. Physical work stressors were positively associated with only one of five fatigue subscales: lack of energy. Higher levels of demands were related to more lack of energy, lack of motivation, physical exertion and sleepiness, while more control was related to lesser lack of energy, lack of motivation and sleepiness. No demand-control interaction was found. Effects of demand and control were partly mediated by sleep satisfaction.

The survey results show that 95.32% of respondents have not taken sick leave due to stress, this figure is far from the data that indicate that, in 2018, the 30% of sick leave in Thailand was caused by stress and anxiety. On the other hand, Figure 1 shows the duration of sick leave due to stress, with sick leave of more than 15 days to one month being the most common among those who did take sick leave due to stress (45.45%), followed by sick leave from three months to one year (27.27%).

4. Research Conclusion

The purpose of this paper is twofold: first, to assess the relationship between noise exposure and stress levels among ferry engine operators and ticket collectors, and second, to propose effective strategies for managing noise hazards in this unique work environment. This paper explore how ferry operators and ticket collectors can benefit from noise management interventions that focus not only on reducing sound levels but also on supporting mental health and stress reduction. In conclusion, effective occupational health and safety practices are crucial for protecting ferry workers from the harmful effects of noise exposure. Addressing both the physical and psychological risks associated with noise can enhance worker safety, improve performance, and foster a more supportive and sustainable work environment. By implementing comprehensive noise hazard management strategies, ferry operators can not only protect the health of their employees but also enhance the overall safety and success of ferry operations.

5. Recommendation

One effective strategy is the implementation of engineering controls to reduce the source of noise. In ferry operations, noise reduction measures could include modifying or upgrading engine systems to minimize noise output, incorporating soundproofing materials in engine rooms and other noisy areas, and ensuring that machinery is regularly maintained to avoid excessive noise from wear and tear. Additionally, placing noise barriers and acoustically treating workspaces could help limit workers' exposure to harmful noise levels.

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