



COGNIZANCE OF SEAFARERS ON SHIP ABOUT NOISE, HEARING LOSS & HPDs

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ABSTRACT

Noise has been identified as a threat to the environment that adversely impacts human health, and noise exposure in maritime transport is extremely high. Noise is an ever-present challenge to seafarers, and prolonged exposure to it damages their hearing. **Aim:** This study aims to analyze the awareness of noise, hearing loss, and hearing protection devices (HPDs) among seafarers. **Method:** The study included 40 seafarers in total, 20 participants in each group- engine crew and deck crew, within the age range of 27-65 years. The participants had at least five years of experience in the merchant navy with a noise exposure of a minimum of 8 hours per day. A questionnaire was developed in English in which questions were selected from a variety of web- based questionnaires and were administered and analyzed. **Results & Conclusion:** The result of the questionnaire indicates that both groups' perceptions of noise, hearing loss, and hearing protection devices are similar in terms of knowledge and attitude. Both groups in the current study acknowledged that prolonged work hours and loud noises could cause a permanent irreversible threshold shift.

KEYWORDS : Seafarers, Noise induced hearing loss, Noise exposure, HPD

INTRODUCTION

Noise-induced hearing loss, which is typically referred to as hearing loss caused by continuous exposure to loud noise, is one of the main occupational hazards that workers encounter. NIHL has significant negative effects on patients' physical, emotional, social, and financial well-being as well as on societal levels.^[1] Globally, an estimated 1.3 billion individuals have noise-induced hearing loss, with occupational noise exposure accounting for 16% of adult cases of hearing loss that is catastrophic. It is a condition for which there is no reliable cure.^[2]

Transport-related activities have dramatically risen recently as a result of globalization, increasing wealth, and freedom of mobility. The maritime industry has responded to increasing demand by offering flexible operations and employing new ship types outfitted with cutting-edge materials, technology, and propulsion systems. Services have also been expanded to other geographic regions, including places near major cities. Of course, such services have drawbacks in addition to their advantages, such as noise pollution. An undesirable noise level may impact crew members' performance, which could result in human error, which is thought to be the primary cause of the majority of maritime accidents. Noise-related risks have a significant impact on workplace health and safety, and noise at work can result in temporary or permanent hearing loss.^[3]

The maritime backdrop is distinct. The physical and mental demands of the seafarers' profession have been deemed high. Noise is one of the most important issues with seafarers' working conditions. Measured noise levels are highest in the engine rooms, followed by the levels on deck.^[4] On board, the engine department is in charge of the ship's propulsion, the generation of electrical power, and maintenance and repair of various technical equipment. The fundamental engine used for ship propulsion is the main unit of equipment in the engine room. To assist the operation of the main engine, the engine room also comes equipped with auxiliary machinery and a workshop for maintenance and repair chores. The engine control room (ECR), which is located adjacent to the engine room, is where the equipment is operated and monitored.^[5] Consequently, the engine department's working environment is highly demanding.

The engine crew usually comprises officers and ratings. Officers include the chief engineer who oversees the entire

engine department, the second engineer schedules and coordinates the work; the third engineer bears primary responsibility for the engine room operation. The ratings' primary responsibilities are maintenance and repairs; they include motorman and repairman. The engine ratings mostly work in the engine room, the engine officers work in both the engine control room and the engine room.^[6] The deck officer is part of the deck department and his/her duty is to navigate the ship safely from one place to another. They are also responsible for maneuvering and communications between ship and shore. The Captain, Chief Officer, 2nd Officer, 3rd Officer, Safety Officer and Security Officer make up the deck crew.^[5]

Numerous investigations have been conducted to examine the associations between occupational noise exposure, relative hearing loss, and the likelihood of occupational accidents. The authors concluded that exposure to noise at work increases the risk of workplace accidents.^[6,7] The International Maritime Organization (IMO) adopted the Convention for the Safety of Life at Sea (SOLAS) in 2012, which included a requirement for noise reduction by both adequate ship construction and personal protection equipment for seafarers following The Code on noise levels on board ships.^[8] The Code was created to offer global guidelines for noise protection and resources to support "hearing-saving" environments on board ships.^[9] Despite these rules, the level of noise on ships frequently exceeds the limits set by Directive 2003/10/EC.^[10] Multiple studies confirm that workers in engine rooms are still exposed to dangerous noise levels, which are above 85dB(A).^[11-13]

Even though there are regulations on noise levels in ships, seafarers are frequently subjected to it. Engine crews are the personnel who experience the greatest impact among them. There is a paucity of literature that addresses how cognizant seafarers are of noise, hearing loss, and HPD, which indicates there is a need for more education on effective hearing protection. The study aims to analyze the awareness of noise, hearing loss, and HPD among seafarers. Also, to determine the knowledge and attitude of noise, hearing loss and HPD among engine crew and deck department. The study highlights the importance of education on the harmfulness of noise on board and about good hearing protection.

METHOD:

Subjects:

Participants were recruited via e-mail. An e-mail requesting participation was sent along with a link to the survey. All the subjects were provided with verbal and written information about the study. Ethical committee clearance was obtained for the study on 14th August 2023. Informed consent was taken from all enrolled subjects, maintaining their confidentiality and privacy. The study was carried out on two groups of seafarers: 1) Engine crew and 2) Deck crew. Two groups of participants (n = 40) with twenty participants in each group, within the age range of 27–65 years participated in the study. All the individuals were involved in their respective professions for at least 5 years with a noise exposure of a minimum of 8 hours per day.

Materials & Procedure:

A 22-item questionnaire was created with two sections: knowledge and attitude, each with eleven questions. The questionnaire was developed in English with questions selected from a) Modified Youth Attitude to Noise Scale (YANS) (Widen, Holmes, & Erlandsson, 2006)^[14], b) the Modified Beliefs about Hearing Protection And Hearing Loss Scale (BAHPHL) (Gilles et al., 2013; Stephenson & Merry, 1999; Svensson, Morata, Nylen, Krieg, & Johnson, 2004)^[15–17], and from various questionnaires available on the internet. The questionnaire thus formed in English was validated by 2 researchers and 3 senior Audiologists. The final questionnaire prepared was administered to two groups. Participants were asked to read the questions carefully and circle the appropriate rating on a 5-point rating scale (Likert scale). All of the participants were informed about each rating choice. Any clarifications requested by the participants were provided by the researcher.

RESULTS:

The study consisted of 40 individuals with a mean age of 34.5 years. The data obtained from the two groups were analyzed to determine the level of knowledge about noise, hearing loss and HPD and their attitude towards the same. The findings are detailed in the sections that follow.

Table 1: Comparison Of Knowledge, Attitude Between Engineers And Deck

	Departments	Mean	S.D.	"t"	p value
Knowledge	Engineer	69.6	6.2	0.68	0.502
	Deck	68.2	6.4		
Attitude	Engineer	62.1	9.9	-0.91	0.369
	Deck	65.0	9.9		
Total	Engineer	131.7	11.7	-0.36	0.723
	Deck	133.2	14.8		

("t" = Independent sample "t" test)

The Independent sample "t" test was used to compare knowledge and attitude between Engineers and Deck which revealed no notable difference in knowledge (p 0.502), or attitude (p 0.502) between the two groups.

Table 2: Correlation Between Knowledge And Attitude Irrespective Of Departments

	Pearson correlation coefficient ("r")	p value
Knowledge and attitude	0.293	0.066
Knowledge and total score	0.696	< 0.001*
Attitude and total score	0.891	< 0.001*

(* Significant)

The Pearson correlation coefficient was used to find the correlation between knowledge and attitude irrespective of department. There was a positive correlation between knowledge and the total score as well as attitude and the total score. (Table 2.)

Table 3: Correlation Between Knowledge And Attitude Within The Departments

	Engineer		Deck	
	"r"	p value	"r"	p value
Knowledge and attitude	0	0.997	0.617	0.004*
Knowledge and total score	0.528	0.017*	0.849	< 0.001*
Attitude and total score	0.848	< 0.001*	0.940	< 0.001*

("r" = Pearson correlation coefficient; * Significant)

Pearson correlation coefficient also revealed a positive correlation between knowledge and the total score as well as attitude and the total score within the departments (Table 3.)

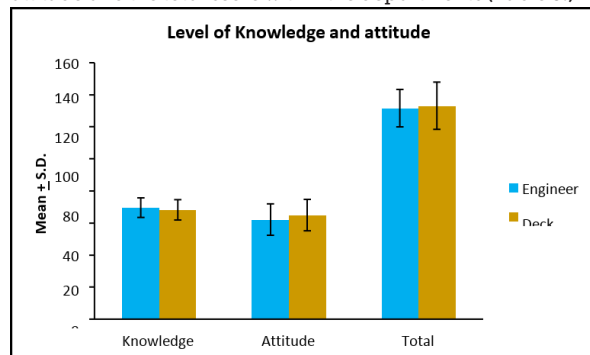


Fig: 1 Comparison Of Knowledge And Attitude Within Department

DISCUSSION

Seafarers work in extremely demanding environments, and increased noise causes a serious risk to their health. The combination of cognitively demanding tasks and noise is stressful and can have physiological as well as psychological effects which might even pose a health risk.^[18] Several studies have calculated the rate at which noise contributes to accidents and found that noise exposure or noise-induced hearing loss accounts for 12.2% of work-related accidents.^[19] The study aimed to analyze the knowledge and attitude of the crew on noise, its effect on hearing and its prevention. The study's findings indicate that the engineering and deck crew generally possess the same level of knowledge and attitude. Although the score for attitude of the deck crew is better, the engineering crew on board has a higher level of knowledge on noise, hearing loss, and HPD. The work in the engine room demands more, than the deck due to excessive noise levels. The completed questionnaire revealed that nearly all seafarers consider noise on board to be a serious issue in maritime transportation. They are aware that the extended noise exposure might have negative effects on their health, especially their hearing. Both groups' responses toward the use of HPD are inconsistent. During the interview, it was noted that all the respondents were using simple ear muffs and ear plugs to protect their hearing. The engine crew also stated that they often remove their HPDs when they face communication demands. This result correlates with the study done by Turan et al., (2011) which indicates the need for the use of sophisticated HPDs.

The results of the current study indicate that both groups have the same knowledge and attitude regarding noise, hearing loss, and HPDs. The study reveals that the engine crew has a higher score in knowledge and the deck crew in attitude. The scores reveal that the two groups have a good understanding of noise and hearing loss. Even so, some of the respondents harbor negative attitudes toward the use of HPD. Both groups were aware that prolonged work hours in the presence of loud noises could create an irreversible threshold shift.

CONCLUSION

This study reveals that engine crew members are subjected to

high levels of noise and that wearing sophisticated ear protection devices is essential. If this isn't feasible, the crew can switch work shifts to reduce their noise exposure. To safeguard seafarers from the risks associated with exposure to dangerous noise levels, it is imperative to estimate the daily exposure level before actually exposing them to the noise.

^[11] Additionally, they were conscious of the fact that if they lost their hearing, they would be unable to continue serving in the merchant marine, which is their livelihood. Each company has its safety training programs, which address using HPDs and being aware of noise. Even after that, a few of the subjects still express disapproval of HPDs and prefer their comfort over safety. Thus, our research emphasizes the significance of a comprehensive program for raising awareness and training as well as the requirement for using a more sophisticated HPD. Subsequent research endeavors could potentially incorporate a more extensive sample size in their audiometric evaluation.

REFERENCES

1. Natarajan N, Batts S, Stankovic KM. Noise-induced hearing loss. *Journal of Clinical Medicine*. 2023; 12(6):2347. doi:10.3390/jcm12062347
2. Chen K-H, Su S-B, Chen K-T. An overview of occupational noise-induced hearing loss among workers: Epidemiology, pathogenesis, and preventive measures. *Environmental Health and Preventive Medicine*. 2020; 25(1). doi:10.1186/s12199-020-00906-0
3. Lundh M, Lützhöft M, Rydstedt L, Dahlman J. Working conditions in the engine department – a qualitative study among engine room personnel on board Swedish merchantships. *Applied Ergonomics*. 2011;42(2):384–90. doi:10.1016/j.apergo.2010.08.009
4. Tu M, Jepsen JR. Hypertension among Danish seafarers. *International Maritime Health*. 2016; 67(4):196–204. doi:10.5603/imh.2016.0037
5. Messina, M. Job Satisfaction Among Deck Officers. 2018; [Internet]. [Cited 2023 Dec 12]. Available from: https://www.theseus.fi/bitstream/handle/10024/140951/Messina_Michelaangelo.pdf?sequence=1
6. Choi S-W, Peek-Asa C, Sprince NL, Rautiainen RH, Donham KJ. Hearing loss as a risk factor for agricultural injuries. *American Journal of Industrial Medicine*. 2005;48(4):293–301. doi:10.1002/ajim.20214
7. Girard SA, Picard M, Davis AC, Simard M, Larocque R, Leroux T, et al. Multiple work-related accidents: Tracing the role of hearing status and noise exposure. *Occupational and Environmental Medicine*. 2009;66(5):319–24. doi:10.1136/oem.2007.037713
8. Resolution MSC.338(91) – adoption of amendments to the International Convention for the Safety of Life at sea, 1974, as amended – (adopted on 30 November 2012) [Internet]. [cited 2023 Dec 12]. Available from: <https://imorules.com/MSCRESC.338.91.html>
9. Bernardini M, Fredianelli L, Fidecaro F, Gagliardi P, Nastasi M, Licitra G. Noise assessment of small vessels for Action Planning in canal cities. *Environments*. 2019;6(3):31. doi:10.3390/environments6030031
10. European Commission. Minimum Health and Safety Requirements Regarding the Exposure of Workers to the Risks Arising from Physical Agents (Noise), Directive 2003/10/EC; 2021 Feb 15; Available from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003L0010&from=EN>
11. Nikolic A, Nikolic E. Controlling risk due to noise on ferry boat. *PROMET - Traffic & Transportation*. 2013;25(4):387–94. doi:10.7307/ptt.v25i4.305
12. Borelli D., Schenone C. Seafarers' week exposure to tonal noise components. 23rd International Congress on Sound and Vibration, Athens; 2016 July 10-14; Greece
13. Oldenburg M, Felten C, Hedtmann J, Jensen H-J. Physical influences on seafarers are different during their voyage episodes of Port Stay, River Passage and sea passage: A maritime field study. *PLOS ONE*. 2020;15(4). doi:10.1371/journal.pone.0231309
14. Widén SE, Holmes AE, Erlandsson SI. Reported hearing protection use in young adults from Sweden and the USA: Effects of attitude and gender. *International Journal of Audiology*. 2006;45(5):273–80. doi:10.1080/14992020500485676
15. Gilles A, Van Hal G, De Ridder D, Wouters K, Van de Heyning P. Epidemiology of noise-induced tinnitus and the attitudes and beliefs towards noise and hearing protection in adolescents. *PLoS ONE*. 2013;8(7). doi:10.1371/journal.pone.0070297
16. Stephenson, M.R., & Merry, C.J. A comparison and contrast of workers vs. health and safety professionals' attitudes and beliefs about preventing occupational hearing loss. NIOSH poster presented at the National Hearing Conservation Association Annual Conference; 1999 Feb 25-27; Atlanta
17. Svensson EB, Morata TC, Nylen P, Krieg EF, Johnson A-C. Beliefs and attitudes among Swedish workers regarding the risk of hearing loss. *International Journal of Audiology*. 2004;43(10):585–93. doi:10.1080/14992020400050075
18. P; MS. The joint effect of industrial noise exposure and job complexity on all-cause mortality - the CORDIS study [Internet]. U.S. National Library of Medicine; [cited 2023 Dec 12]. Available from: <https://pubmed.ncbi.nlm.nih.gov/12537838/>
19. Picard M, Girard SA, Simard M, Larocque R, Leroux T, Turcotte F. Association of work-related accidents with noise exposure in the workplace and noise-induced hearing loss based on the experience of some 240,000 person-years of observation. *Accident Analysis & Prevention*. 2008;40(5):1644–52. doi:10.1016/j.aap.2008.05.013
20. Turan O, Helvacioğlu IH, Insel M, Khalid H, Kurt RE. Crew noise exposure on board ships and Comparative Study of applicable standards. *Ships and Offshore Structures*. 2011;6(4):323–38. doi:10.1080/17445302.2010.514716