# University Student's knowledge towards noise-induced hearing loss caused by nightclub attendance

Original Article


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## Abstract

In the last decades the prevalence of Noise-Induced Hearing Loss (NIHL) in young adults has increased. The legal limit for sound intensity in nightclubs in Portugal is 120dB, which is higher than the safe limit.
We developed a questionnaire to access the frequency of auditory symptoms after nightclub attendance in Portuguese University students, and to explore their knowledge and opinion about NIHL.
The questionnaire was completed by 108 students. There is a high prevalence of auditory symptoms (tinnitus or muffled hearing) after nightclub attendance (78%). The majority of the students (88%) agrees that the levels of sound intensity in nightclubs should be reduced to a safe level that does not causa hearing damage.
These results are highly relevant for Portuguese legislators.
Palavras-chave traduzidas: Noise-Induced Hearing Loss; Young Adult; Public Health Environmental Medicine


## Introduction

Noise-induced hearing loss (NIHL) is the second most common cause of sensorineural hearing loss and affects approximately 5% of the global population.

NIHL has significant physical, psychological, social, and economic consequences for the affected individuals[1]. Its pathophysiology is complex and multifactorial, involving both genetic and environmental components[1].

In recent decades, the prevalence of NIHL among adolescents has significantly increased, from 14.9% in 1988 to 19.5% in 2006[2]. This rise has been strongly associated with the growing exposure to recreational noise in environments such as concerts or nightclubs[3]. Currently, approximately 70% of people between 16 and 30 years of age attend

nightclubs at least once a month, compared to only 30% in the 1980s[9]. In Portugal, the legal limit for sound intensity in nightclubs is 120 dB[10]. However, according to the World Health Organization, exposure to this intensity for as little as 12 seconds can result in irreversible hearing damage[8]. Prolonged exposure to sounds above 70 dB may lead to permanent hearing damage, while sounds exceeding 120 dB can cause immediate damage[11].

This study aimed to investigate the prevalence of NIHL-related symptoms among university students after attending nightclubs and to evaluate their knowledge and opinions regarding the association between NIHL and nightclub attendance.

## Materials and Methods

This study was conducted in accordance with the principles of the Declaration of Helsinki. Data were collected over three days (December 11–13, 2023) from students at the Universidade Nova de Lisboa. Participants were recruited through convenience sampling based on accessibility and willingness to participate.

Students with pre-existing hearing disorders were excluded. A 17-item questionnaire (Appendix 1) was adapted and translated from a tool originally developed by the University of Birmingham Medical School in 2014[5].

The questionnaire was distributed in print format and completed in person. A total of 108 anonymous responses were collected.

Demographic information was recorded, including sex, age, and academic program. Pre-existing hearing disorders were identified using the question "Do you have any known hearing problems?" to help detect additional risk factors for sensorineural hearing loss beyond nightclub attendance.

Given the established association between smoking and NIHL[4], a question with a yes/no response was included to assess the smoking habits of the participants. Nightclub attendance frequency was categorized as: "never," "once a month or less," "once a week," and "twice a week or more," with participants selecting the option that best described their reality. The frequency of symptoms potentially related to NIHL was assessed using four questions: "How often do you experience ringing in your ears after attending a nightclub?", "How often does this ringing persist until the following morning?", "How often do you experience a sensation of ear fullness or hearing loss after attending a nightclub?", and "How often does this sensation persist until the following morning?" Response options for these questions were "always," "often," "rarely," or "never."

Participants' awareness of the relationship between tinnitus and permanent hearing loss was assessed with the question: "Do you think the ringing in your ears after attending a nightclub is related to permanent hearing loss?" To evaluate attitudes toward auditory symptoms, participants were asked: "What do you think about the hearing symptoms you experience after going to a nightclub (ringing, hearing loss)?" Response options included: "It doesn't bother me," "Indifferent," or "It bothers me." To explore participants' perceptions of harmful noise levels, we used a decibel scale based on samples from the Portuguese public service broadcasting organization, RTP (spoken voice, jackhammer, airplane takeoff). Participants were asked to identify the threshold for hearing damage and typical sound levels in nightclubs.

Attitudes toward nightclub sound levels were assessed with the following questions: "If you were informed that noise levels in nightclubs could lead to permanent hearing loss, would this affect your decision to attend?" and "Do you think nightclub noise levels should be limited to volumes that do not cause hearing damage?" Lastly, participants were asked whether they had ever received information about hearing loss from acoustic trauma or about personal hearing protection devices (e.g., earplugs). The data were analyzed using Microsoft Excel® software version 16.72 (IBM, Armonk, NY, USA). Categorical data are expressed as numbers and percentages, while continuous data are presented as mean, standard deviation (SD), and range.

## Results

We obtained 108 anonymous responses to the questionnaire. The average age of the participants was 21.4 years (SD 2.26). Among them, 72% (n = 78) were women and 43% (n = 46) were medical students. Eighteen (17%) participants were excluded because they reported never having attended nightclubs. None of the remaining participants reported pre-existing hearing problems.

Among the assessed students, 78% (n = 84) reported experiencing tinnitus after attending a nightclub (Table 1), and 53% (n = 57) described a sensation of ear fullness or hearing loss.

Additionally, 41% (n = 44) reported always or frequently experiencing hearing-related symptoms after attending a nightclub, and 42% (n = 45) indicated that these symptoms persisted until the next day.

Only 41% (n = 44) participants were aware of the association between tinnitus following noise exposure and permanent hearing loss. Interestingly, this awareness was higher among students from non-medical programs (55%) than among medical students (23%) (Table 2).

**Table 1**
Frequency of tinnitus after nightclub attendance

**How often do you experience ringing in your ears after attending a nightclub?**

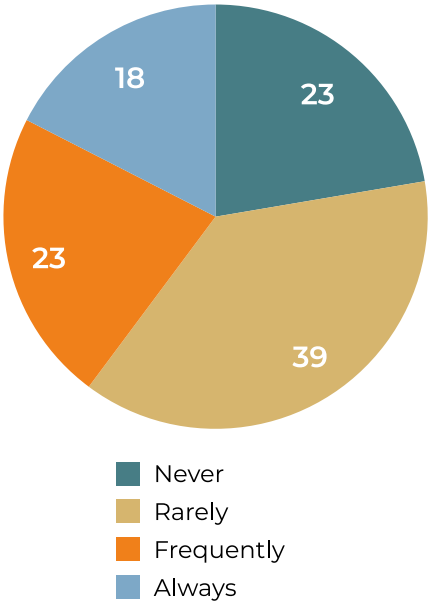
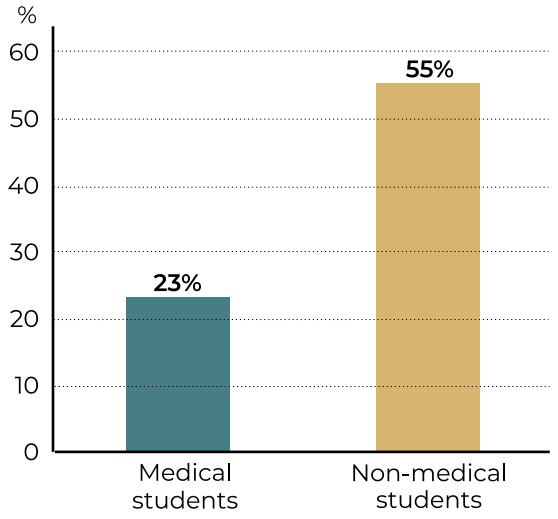



**Table 2**
Awareness of the association between tinnitus and hearing loss among medical and non-medical students




Most participants (57%) expressed concern about hearing-related symptoms following nightclub attendance.

Nearly all participants (96%) perceived typical nightclub sound levels as exceeding the threshold for hearing damage.

Furthermore, 57% participants reported that awareness about the association between nightclub sound levels and permanent hearing loss would influence their decision to attend, and 88% (n = 95) believed that sound levels in nightclubs should be limited to prevent hearing damage (Table 3).

Regarding prior education on the topic, 81% (n = 87) respondents had never received information on NIHL or use of earplugs.

## Discussion

The findings of this study indicate that a significant proportion of university students experienced NIHL-associated symptoms after attending nightclubs, with symptoms persisting until the next day in approximately 50% of participants.

These results are consistent with those of other European studies. A survey conducted among university students in England found that 88% had experienced NIHL-related symptoms after attending nightclubs[5].

**Figure 1**
RTP Portugal sound intensity scale presented in the questionnaire

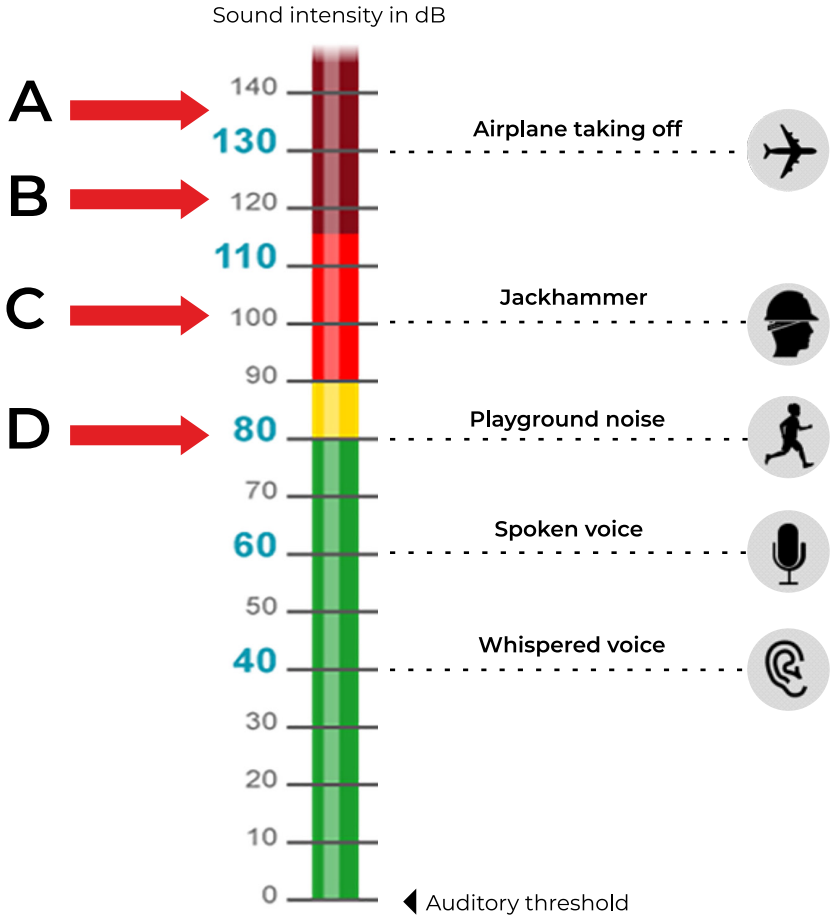
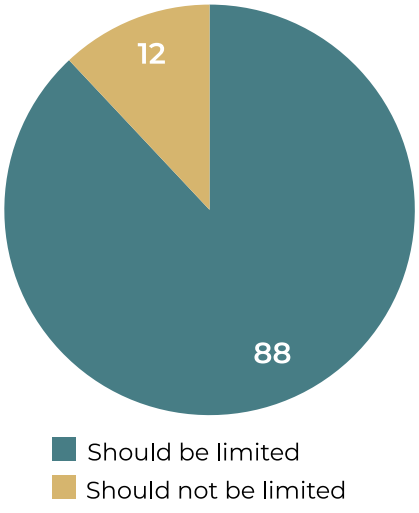



**Table 3**
Percentage of participants who agreed that sound intensity should be limited to safe levels in nightclubs




Moreover, nearly 50% of the participants reported experiencing such symptoms always or frequently. Given the established association between tinnitus, sensation of ear fullness, and development of irreversible hearing loss[6], our findings highlight a potentially significant public health concern related to sound exposure in nightclubs among university students.

Our conclusions are consistent with those of studies conducted in countries such as England and Australia[6,7], where nightclubs were identified as the primary source of acoustic trauma among young adults.

In our sample, less than half of the students were aware of the association between tinnitus after noise exposure and permanent hearing loss. Only one in five reported having previously received any information on NIHL. These findings suggest a lack of awareness

about potential noise-induced auditory damage, particularly in nightlife settings. Surprisingly, this lack of awareness was more prevalent among medical students.

This educational gap is consistent with the findings of other European studies, where 70% of university students were unaware of the association between noise exposure and permanent hearing loss and 87% had never received information about NIHL[5].

Most participants expressed concern about hearing symptoms after nightclub attendance, and more than half indicated that knowing about the risks would affect their decision to attend. Additionally, 88% supported limiting sound levels in nightclubs to prevent hearing damage. These data are consistent with those of other European studies showing that most young adults support reducing the sound intensity in nightclubs to safe levels[5].

The results suggest that students' recreational noise exposure habits could be modified through targeted educational campaigns on the associated risks. Furthermore, this population may be more receptive to stricter sound level regulation in nightclubs, which may not affect their attendance. These data may encourage Portuguese legislators to support law changes aimed at reducing previously established limits on sound levels in nightclubs.

The main limitation of this study is the use of a questionnaire that has not been validated in European Portuguese. Additional limitations include the sample, which predominantly comprised women and medical students, potentially limiting the generalization of the findings. Furthermore, the students who agreed to participate may represent a population already concerned about hearing loss, possibly influencing the observed levels of awareness regarding the experienced symptoms and support for sound level limitations in nightclubs. Nevertheless, this is the first study to assess the perceptions and attitudes of Portuguese university students toward the hearing risks associated with recreational noise exposure. It may serve as a foundation for more comprehensive future research and decision-making regarding auditory health policies.

## Conclusion

This study suggests that symptoms associated with NIHL are common among Portuguese university students following nightclub attendance and that there are significant gaps in their education regarding the risks of recreational noise exposure. Most participants supported legal limits for sound intensity in nightclubs. Public awareness campaigns and legislative advocacy may be promising strategies for promoting auditory health in this population.

### Conflict of Interests

The authors declare that they have no conflict of interest regarding this article.

### Data Confidentiality

The authors declare that they followed the protocols of their work in publishing patient data.

### Human and animal protection

The authors declare that the procedures followed are in accordance with the regulations established by the directors of the Commission for Clinical Research and Ethics and in accordance with the Declaration of Helsinki of the World Medical Association.

### Privacy policy, informed consent and Ethics committee authorization

The authors declare that they have obtained signed consent from the participants and that they have local ethical approval to carry out this work.

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### Scientific data availability

There are no publicly available datasets related to this work.

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## Discotecas e Trauma Auditivo em Estudantes Universitários

**Idade:** **Curso Universitário:**

**Qual o seu sexo?**

Masculino Feminino Prefiro não dizer

**Fuma regularmente?**

Sim Não

**Tem algum problema de audição conhecido?**

Sim Não

**Com que frequência vai a discotecas?**

Nunca 1x por mês ou menos 1x por semana 2x ou mais por semana

**Com que frequência tem zumbidos nos ouvidos após uma ida a uma discoteca?**

Sempre Frequentemente Raramente Nunca

**Com que frequência este zumbido persiste até à manhã do dia seguinte?**

Sempre Frequentemente Raramente Nunca

**Com que frequência tem sensação de ouvidos tapados ou de perda auditiva após uma ida a uma discoteca?**

Sempre Frequentemente Raramente Nunca

**Com que frequência esta perda auditiva ou sensação de ouvidos tapados persiste até à manhã seguinte?**

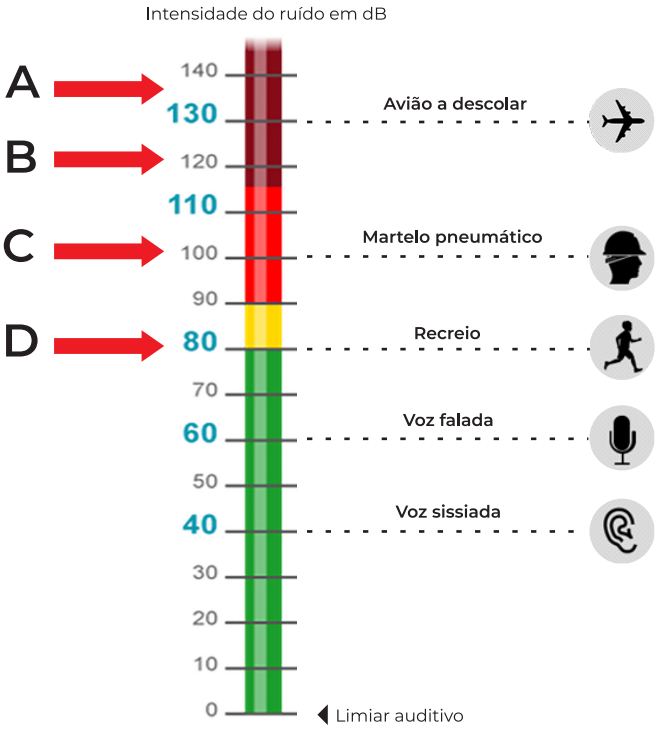
Sempre Frequentemente Raramente Nunca

**Acha que o zumbido nos seus ouvidos após uma ida a uma discoteca está relacionado com perda auditiva permanente?**

Sim Não

**O que pensa em relação aos sintomas auditivos que experiencia após uma ida a uma discoteca (zumbido, perda auditiva)?**

Não me preocupa Indiferente Preocupa-me




**Neste gráfico de representação de intensidade sonora em decibéis onde pensa estar o limiar para o dano auditivo?**

A ☐ B ☐ C ☐ D ☐

**Neste gráfico de representação de intensidade sonora em decibéis onde pensa estar o nível habitual de intensidade sonora das discotecas?**

A ☐ B ☐ C ☐ D ☐

**Se lhe fosse dito que os níveis de intensidade sonora em discotecas podem levar a perda auditiva permanente isto afetaria a sua decisão de as frequentar?**

Sim ☐ Não ☐

**Acha que os níveis de intensidade sonora nas discotecas deveriam ser limitados a um volume que não cause dano?**

Sim ☐ Não ☐

**Alguma vez recebeu informação sobre perda auditiva causada por trauma acústico ou lhe foi recomendado usar tampões auriculares?**

Sim ☐ Não ☐