

## The Effect of Acoustic Filters in Reducing Noise Levels in Different Dental Settings

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### Abstract

**Background:** High-frequency noise from dental equipment has caused concerns of hearing loss among dental personnel. However, literature publishing on reducing noise levels in dental settings are limited.

**Aim:** The study is conducted to determine the level of noise and its sources in the clinical work area and to measure the effect of acoustic filters in reducing these noise levels.

**Methods:** The test subjects have been given the acoustic filters to use them while working for minimum of 30 minutes and filling a questionnaire in two sheets before and after wearing the acoustic filters.

**Results:** Most of the participants 73.8% (n = 59) reported that they feel annoyed by the noise generated from the equipment present in their working area. Exactly 53.8% (n = 43) found it difficult to communicate with other people because of the noise in their working area. 57.5% (n = 46) indicated that they lose concentration while working in a relatively noisy work environment.

**Conclusion:** It can be concluded from the results that further studies are needed for this type of occupational hazard and the yielded results should be considered as a pilot study. Future researchers are advised to include medical and other health sciences personnel into the sample to generate a better representation of the targeted population.

**Keywords:** *Acoustic Filters; Noise Levels; Dental Settings*

### Introduction

Noise is the most unwanted element in the clinical practice. The intensity of noise is measured in decibels (dB). Daily exposure for 8 hours to noise levels equal or above 85 (dB) is associated with permanent hearing loss [1,2]. Noise is becoming a pervasive occupational health concern for patients as well as for practicing dentists. It can have both non-auditory and auditory effects [3,4]. There are many sources of the noise in dental clinic that may be harmful to the hearing by the time such as handpieces, high-volume suction, ultrasonic instruments, vibrators and mixing devices such as amalgamators [5]. The purpose of using the Acoustic Filters is for preventing hearing loss and reducing the noise for dental practice staff. New earplugs have been developed to offer a perceptually undisturbed listening experience at safe exposure levels. At first these earplugs were custom-made devices but currently a wide range of ready-made earplugs is available in different designs, styles, and price categories. Acoustic Filters are often used by people who are exposed to a relatively loud work environment like construction workers, musicians and technicians operating loud machinery [6]. The objective of this research is to measure the effect of acoustic filters in reducing these noise levels.

**Methods**

The study protocol was granted Ethical Committee approval from Qassim University, College of Dentistry in Al-Qassim Province, Saudi Arabia. The study sample consisted of 80 dental personnel including dentists, dental interns, dental students, assistants and technicians selected at random. All the dental team members in the age group from 22 - 55 years old were included. Members suffering from Unilateral/Bilateral hearing loss were excluded. There are many types of acoustic filters available in the market. The Acoustic filters used in this study are stock ready made In-Ear filters and are of a passive type (Shown in figure 1). The device is an EPA certified product with a passive NRR Rating of 12dB (Figure 2). A questionnaire has been constructed consisting of 2 pages. The test subject was required to answer page 1 of the questionnaire prior to wearing the device and page 2 after using it for a minimum of 30 minutes. The data collected will be analyzed using IBM® SPSS® Statistics v24.0. Frequencies and McNemar test will be used for this study.



Figure 1

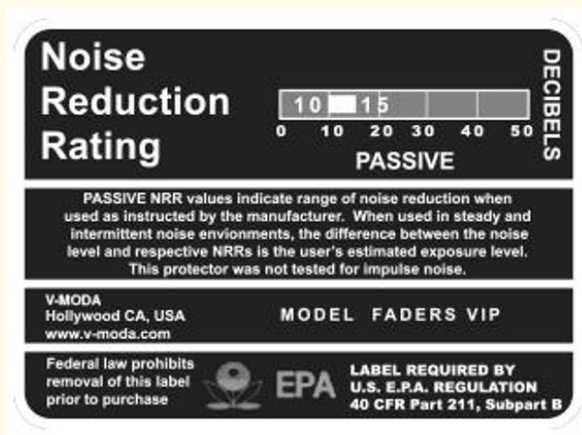


Figure 2

**Results**

The sample consisted of eighty test subjects that have participated in this study (n = 80). The majority of the sample 40% (n = 32) were dental students and 25% (n = 20) are dentists. In addition, 20% (n = 16) were laboratory technicians and 15% (n = 12) dental assistants. Most of the participants 73.8% (n = 59) reported that they feel annoyed by the noise generated from the equipment present in their working area. Exactly 53.8% (n = 43) found it somewhat difficult to communicate with other people because of the noise in their working area. 57.5% (n = 46) indicated that they occasionally lose concentration while working in a relatively noisy work environment. A minority of 11.3% (n = 9) have been using earphones to listen to audio entertainment while working so they don't get annoyed by the noise present around them. Surprisingly, all participants reported that they do not use any form of ear-protection to isolate the noise generated from their equipment.

Participant Group	Number of Subjects
Dental Student	32
Dentist	20
Laboratory Technician	16
Dental Assistant	12
Total	80

### Discussion

The dentists/dental students and assistants in the clinic were subjected to a relatively lower level of noise exposure than laboratory technicians. Even though noise from laboratory equipment registered higher sound pressure levels, Noise Spectral Analysis showed that noise at the higher frequencies in dental clinics was of major concern [7]. The study was designed so that we have feedback from test subjects before and after using the acoustic filter regarding their annoyance, communication difficulties and concentration. The data collected have been tested using McNemar statistical test which is used on paired nominal data at a confidence level of ninety five percent. When testing for data regarding the annoyance, the p-value for McNemar test was higher than ( $p = 0.05$ ). Thus, we accept the null hypothesis and say that there's no statistically significant difference in the effect of using the in-ear acoustic filters regarding noise annoyance. The test result on communication data scored a p-value of one (which is way higher than  $p = 0.05$ ) that will not allow us to conclude that a statistically significant difference exists in the effect of using the in-ear acoustic filters regarding interpersonal communication. The concentration related data gave us a p-value of more than  $p = 0.05$  concluding that here's also no statistically significant difference in the effect of using the in-ear acoustic filters regarding operator concentration.

### Conclusion

Within the limitations of the study it can be concluded that the sample size needs to be increased in order to generate a representation of the target population. Further studies are advised to include other Medical and health science personnel into the sample. This study was conducted to pave the way of future researchers regarding the subject of dental occupational hazards. Finally, many everyday activities in the clinic and dental laboratory generate noise that may cause hearing loss, irritation or general psychological discomfort. Awareness and reasonable care would allow most of dental personnel to maintain their hearing throughout their life.

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