



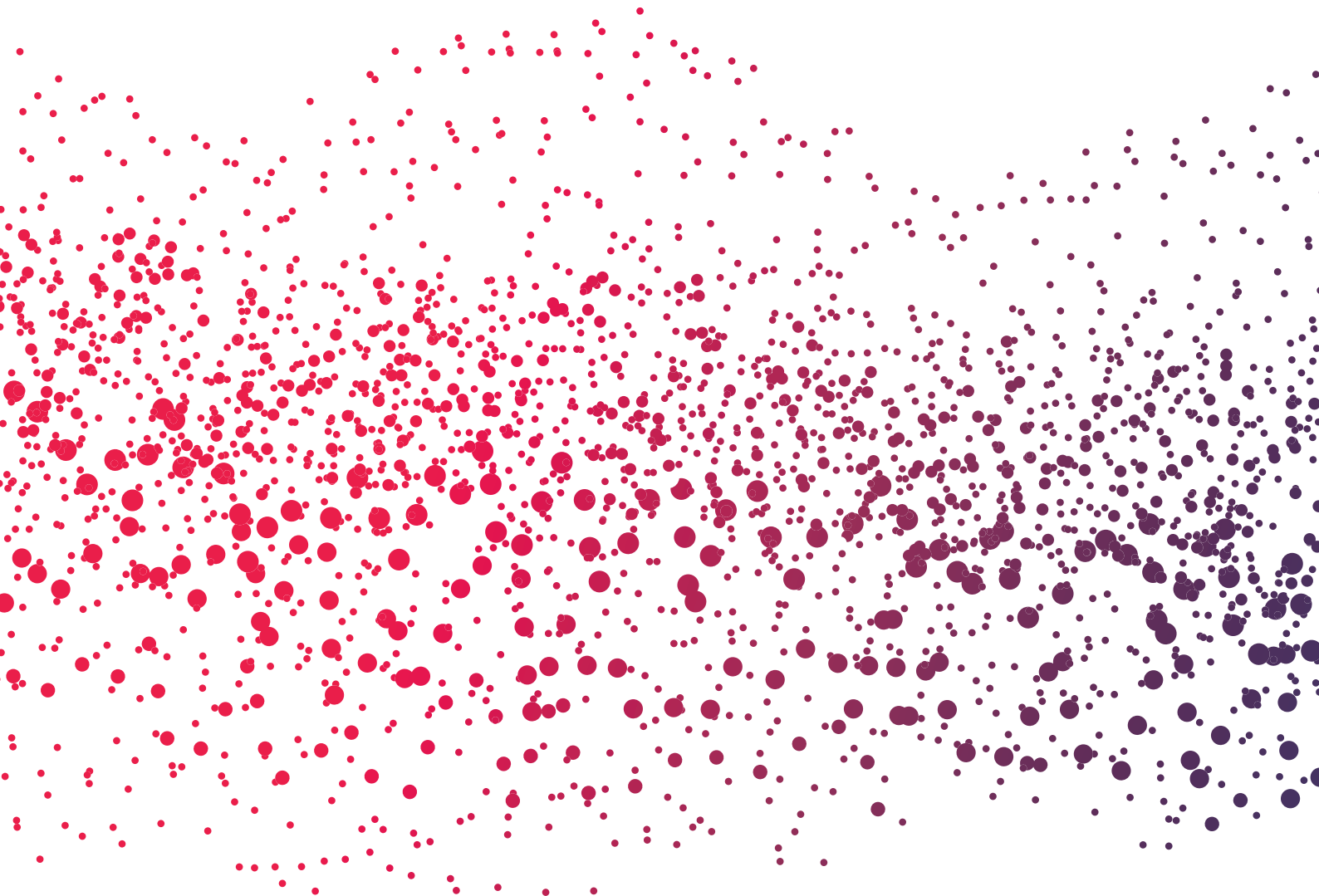
**AMPLIFON CENTRE FOR  
RESEARCH AND STUDIES**



# **CRS** SCIENTIFIC JOURNAL

## Otology & Audiology Article Review

Volume 5  
May 2022



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The WHO Global Standard  
for Safe Listening  
Entertainment Venues

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Understanding patient  
empowerment along  
the audience health journey

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Age-related hearing  
loss, depression and  
auditory amplification

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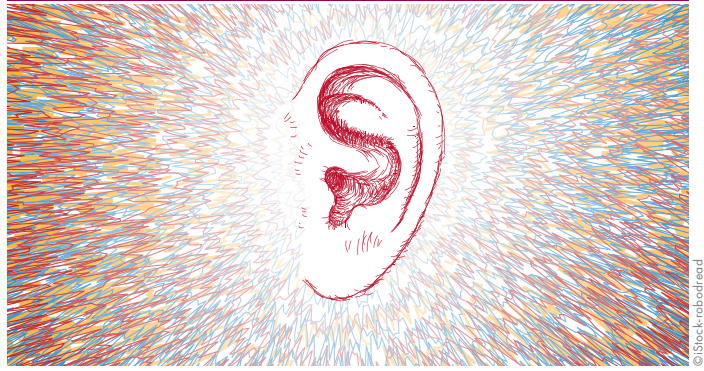
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# EDITORIAL



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**D**ear Reader, the Amplifon Centre for Research and Studies, CRS, houses one of the finest private libraries in the field of audiology and otorhinolaryngology, offering the sector's most important international journals. Every quarter, a team of Amplifon Audiologists from around the globe select the most relevant publications in the field of Otology and Audiology and make a comprehensive review. The Amplifon Centre for Research and Studies coordinates the development of this quarterly review. We are happy to share these new reviews with you. For this issue, our team reviewed 10 interesting articles published in the first quarter of 2022.

Two reviews focus on the new WHO Global Standard for Safe Listening Entertainment Venues, which was launched on March 3, 2022, on the occasion of World Hearing Day and on the safe listening habits and expectations of young people who go to music venues.

Another two reviews discuss patient views and patient empowerment in connection with hearing health and hearing care.

This issue also features reviews on papers discussing the relation between hearing loss and recovery after work, a novel finding on the relation between hearing loss and Parkinson's Disease; and lastly, the impact of hearing loss and amplification on depression.

We then offer reviews on the fact that hearing aid technology needs to be customised to the specific situation and difficulties of clients in order to reduce speech in noise difficulties, and how the use of the IOI-HA questionnaire provides pertinent information on how we can improve the selection and fitting of hearing aids for achieving better outcomes.

Finally, a systematic review of the otorhinolaryngological symptoms in patients with COVID19, which indicates that hearing loss was not found to be a symptom.

We hope you enjoy this issue of our CRS Scientific Journal

**Mark Laureyns**  
Global International CRS & Medical Scientific  
Research Manager





# THE WHO GLOBAL STANDARD FOR SAFE LISTENING ENTERTAINMENT VENUES



*Chadha S., Wiggings I. et al. World Health Organization*

*Geneva: World Health Organization; 2022.*

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*[https://apps.who.int/iris/handle/10665/352277?](https://apps.who.int/iris/handle/10665/352277?msclkid=2dcec3ecc5ff11ec9f764b754eeea)*

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*By Mark Laureyns – Italy - Belgium*

**This safe listening Standard is designed for all venues and events, where the enjoyment of amplified music is the main reason for attendance.**

The “Global Standard for Safe Listening Venues and Events” was published on March 3, 2022.

The introduction highlights that many countries have regulations for occupational hearing protection, but very few such legal frameworks for protecting the hearing of the audiences in entertainment venues.

The WHO therefore developed this standard in collaboration with a team of experts in the field, in order to enable patrons to enjoy amplified music while reducing the risk of damaging their hearing. The standard is intended for all venues and events whose main purpose of business is the enjoyment of amplified music. Such venues include multiday festivals, small bars in the city, clubs and many more.

This standard is directed at:

- Governments, to promote the development of appropriate legislation or regulations
- Venue and event owners and managers, to promote the voluntary implementation of these recommendations voluntarily
- Others, to raise awareness and promote safe practices.

The report is structured as follows. In the introduction, the report explains how excessive sound exposure leads to hearing damage and how hearing loss can be prevented through safe listening. It then goes on to detail a list of key definitions critical to the topic. After these initial considerations, the report offers an in-depth analysis of each of the six pillars of the standard, which are referred to as “features”:

1. Sound level limit
2. Monitoring the sound level
3. Venue acoustics and sound-system design
4. Personal hearing protection
5. Quiet zones
6. Provision of training and information

The report concludes with a reflection on how governments can adopt and implement the standard. It is complemented by 11 annexes which explore key concepts or facts.

### CRITICAL NOTE:

*The new WHO standard is very important for facilitating the development of regulations and legislation for safe listening venues and events. Governments can use this evidence-based Standard for this purpose and can learn from best practices in other countries in order to facilitate the implementation and adoption of such measures.*

**Feature 1: “Sound level limit – Sound level below 100 dB(A) averaged over 15 minutes (100 dB LAeq, 15min).”**

The report stresses that sound level measurement needs to be continuous, so the sound level reported at any time is based on the levels registered during the preceding 15 minutes. It is a moving-average measurement.

**Feature 2: “Monitoring of the sound level – The sound level has to be actively monitored to ensure compliance with the limit of 100 dB LAeq, 15 min”**

This section focuses on the importance of actively monitoring sound levels so as to ensure compliance with the recommended limit. The report stresses that this requires implementing the recommended procedures, using specific equipment, and the regular calibration of said equipment. The report also details requirements for measurement position and the use of a correction when appropriate.

**Feature 3: “Venue acoustics and sound-system design – Venue acoustics and sound systems should be optimised for safe listening, so far as is reasonably practicable.”**

This feature stresses that sound quality and safe listening can both be achieved by optimized venue acoustics and sound systems, and will result in satisfied audiences. It further details solutions for acoustic treatment, reducing reverberation, avoiding room modes, improving stage

acoustics, selecting the most appropriate loudspeakers and sound system for a uniform distribution of sound, and covers many more aspects.

**Feature 4: “Personal Hearing Protection – Personal hearing protection should be available to audience members at the venue/event.”**

There is ample evidence, as the report highlights, that earplugs are a simple, cost-effective solution for reducing the risk of temporary HL and tinnitus, provided they are used consistently and correctly. Single-use (disposable) foam earplugs, which require a degree of manipulation prior to inserting, can provide good attenuation but may reduce the enjoyment of amplified music, since they attenuate the high frequencies much more than low frequencies. High-fidelity earplugs are designed specifically for listening to music and offer a flat frequency response, with the benefit of offering a more natural sound. In addition, these are more sustainable, since they can be reused for many years. Custom-moulded earplugs are the preferred choice for musicians and sound engineers for comfort and sound quality. However, they require professional ear impressions and are more costly. The Standard stresses that in order to promote safe hearing and protect the hearing of venue-goers, hearing protection should be made available at venues for the audience, either cost free or at an affordable price.

**Feature 5: “Quiet zones –A designated quiet zone or zones will allow audience members to rest their ears from high sound levels.”**

Designated quiet zones need to be provided. They should be safe, i.e. not expose venue-goers to other health hazards (e.g., cigarette smoke); be clearly indicated; accessible to all audience members, for the whole duration of events. The acoustic conditions should be so that audience members can converse without having to raise their voice and the ambient sound level should be kept as far below 70dB LAeq, 15min. as reasonably practicable. When this is not possible, an alternative way to offer respite from high sound levels, is to periodically drop the sound level below 70dB LAeq, 15min. or ensuring that sound levels are kept to a low-to-moderate level in auxiliary areas.

**Feature 6: “Provision of training and information –Appropriate training and information about safe listening is needed and must be provided.”**

Both venue-goers and the venue staff need to be educated and made aware of the fact that the overarching goal of this standard is to “create an environment in which people are empowered to enjoy amplified music while protecting their ears”

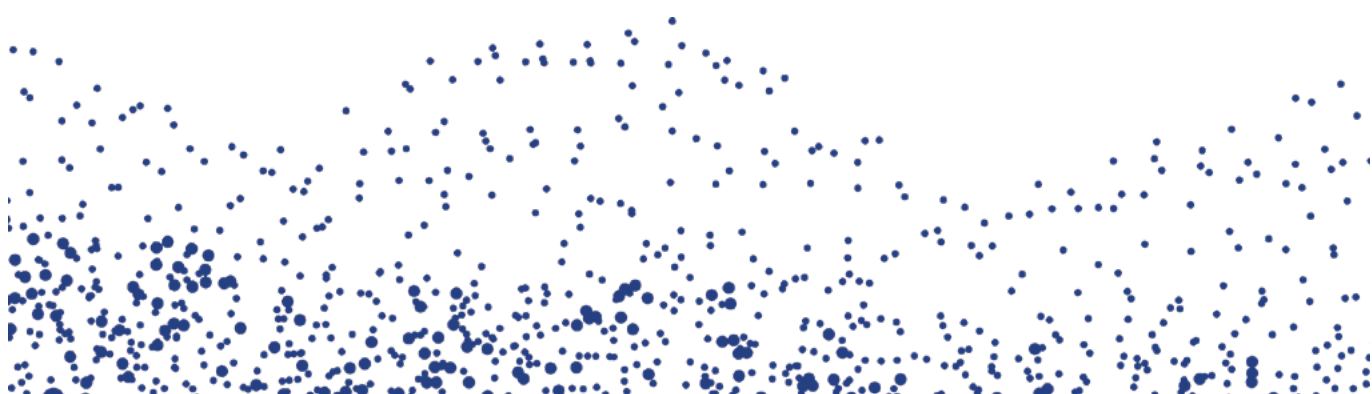
To that end, staff should receive basic training covering the risk of permanent hearing damage resulting from exposure to loud sounds as well as the safe listening measures that are in place at the venue or event. The report further recommends that the staff in charge of monitoring and controlling the sound level should receive more in-depth training.

Venue-goers should receive information on safe listening, either printed on tickets, e-tickets, or via a QR code directing to a reliable source of information. It is also recommended to clearly label the venue/event as a “safe listening” venue/event, when a competent authority has certified that they are compliant with the Standard.

**Adoption and implementation of the WHO Standard for Safe Listening Venues and Events.**

How can governments create legislation or regulation based on this standard? How can owners and managers of entertainment venues and events implement this standard on a voluntary basis? How can industry associations, music schools and other institutions with education or training programmes on acoustics, sound engineering, and sound level management create modules and content for safe listening?

The standard offers a total of 11 annexes: “A taxonomy of music venues”; “Application of the WHO Noise Guidelines for the European Region to the sound level limit”; “Spectrum of live sound and types of sound level measurements”; “The importance of calibration”; “Location of sound level measurement”; “Procedure for determining the required correction for sound measurement”; “Suitable reverberation times for amplified music and acoustic treatment”; “Low-frequency acoustic issues”; “Sound distribution for safe listening”; “Sound levels close to loudspeakers”; and “Reducing on-stage sound levels” •





# ATTITUDES TOWARDS SAFE LISTENING MEASURES IN ENTERTAINMENT

## VENUES: RESULTS FROM AN INTERNATIONAL SURVEY AMONG YOUNG VENUE-GOERS



*Diviani N., Chadha S., Arunda MO., et al.*  
*International Journal of Environmental Research and Public Health (2021): 18(23), 12860.*  
*By Mark Laureyns – Italy - Belgium*

The results of the survey support the importance of addressing the issue of safe listening in public venues, highlighting the need for standards to be developed and which can serve as a foundation for the development of government-led initiatives and regulations.

In the context of the development of safer standards for safe recreational listening, this paper set out to identify modifiable factors which can promote or hinder safer listening practices. A total of 2,264 young venue-goers, aged between 16 and 35 years old, were recruited online through the social media channels of the World Health Organisation in 2020. They were invited to complete an online questionnaire, based on the Health Belief Model (Rosenstock 1974).

The questionnaire, focused on the following five aspects: (i) socio-demographics; (ii) how much they visit specific venues; (iii) experience with loud music in public venues; (iv) knowledge, attitudes, and beliefs about hearing loss and preventive measures; and (v) willingness to change behaviour.

### The results:

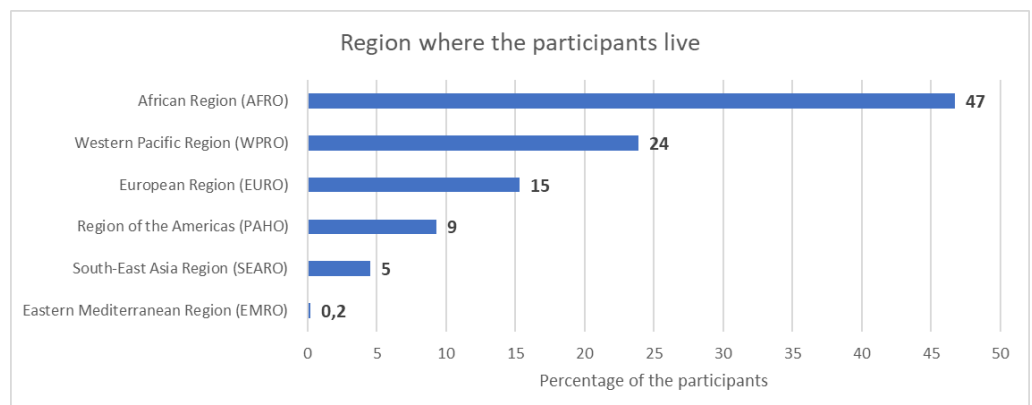
#### (i) Socio-demographics.

The majority of respondents were female (65%), the mean age was 24 years old, most had a college (37%) or high school (25%) degree. The participants were recruited from around the globe, but the majority lived in the African (47%), Western Pacific (24%) and European (15%) region. (See graph 1)

(ii) How much they visit specific venues, like bars, clubs, festivals, concert halls, or gyms.

### CRITICAL NOTE:

*This survey was conducted on a large sample of young people, who fall in the target group for which the new WHO Global Standard for Safe Listening Venues and Events was developed. The fact that the article is published in open access and that the original questionnaire used for the survey is also available for further studies is very positive and in line with the desire to raise awareness and educate on these issues. This publication is a great support for guiding communication strategies for promoting the safe listening preventive actions set out in the WHO Standard. It is unfortunate, however, that the authors did not publish all the details of this survey as an annex, since they clearly have many more results than are available in this article.*



Graph 1: Percentage of respondents, coming from the 6 different WHO world regions.

The largest group (47%) replied several times per year; 24% responded every day; and 15% replied once a week. (See graph 2)

(iii) The experience with loud music in public venues and the preventive measures they adopt.

The music level in Disco's and Clubs was rated too high, but for Gyms, the rating was perceived to be correct. The preventive measures that were taken at least once were most frequently "searching for a quieter area" (91%), followed by "leaving the venue" (82%), "ask to reduce the volume" (44%), and "using hearing protection" (39%). (See graph 3)

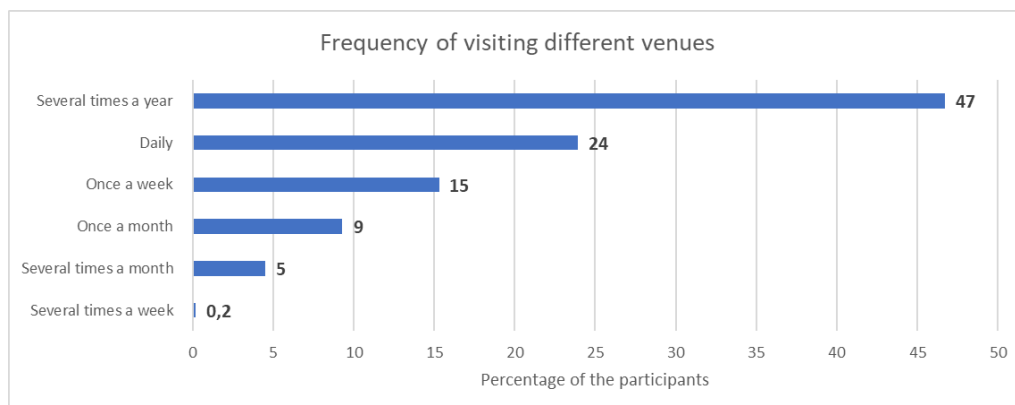
(iv) Knowledge, Attitudes, and Beliefs about hearing loss and preventive measures.

**Knowledge:** 81% of respondents answered that the statement "Listening to sounds above 80 decibels over a period of time can cause permanent damage to your hearing" was true.

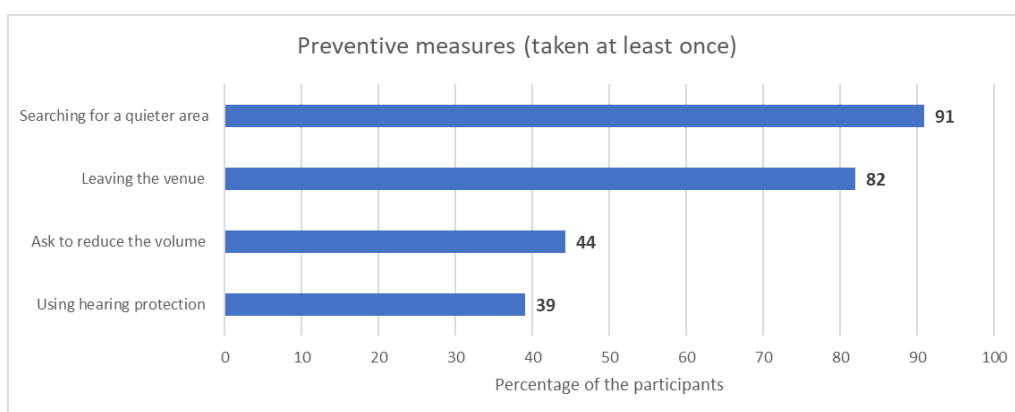
**Attitudes:** most participants were favourable to the introduction of quiet zones. However, there was no consensus on the distribution of hearing protection.

**Beliefs:** most participants agreed on the preventive measures, except for the use of hearing protection, where they saw many inconveniences.

- "Should entertainment venues be free to decide at which level to play music?": 53% did not agree.
- "I would appreciate having a place within the entertainment venue, where I can rest my ears": 82% agreed.
- "I do not see the need of having a 'Quiet Zone' and entertainment venue": 78% do not agree.
- "Using earplugs does not interfere with my enjoyment of music": 52% did not agree
- "I think that earplugs are uncomfortable": 49% agreed.
- "I wouldn't mind having to pay for hearing protection": 50% did not agree.



**Graph 2:** The frequency with which the respondents visit the different venues (bars, clubs, festivals, concert halls, or gyms).



**Graph 3:** The percentage of the respondents taking at least one of the four preventive measures.

(v) Willingness to Change Behaviour

A total of 61% of respondents expressed at least some intention of changing their listening behaviours.

(vi) Predictors of Attitudes towards Preventive Measures.

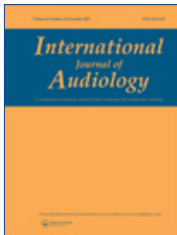
A positive attitude toward preventive measures was related to participants:

- who stated that they perceive the sound level in clubs as too loud
- who had experienced tinnitus more frequently
- who perceived themselves more at risk
- who were more willing to change

The authors conclude that these results support the fact that the issue of safe listening in public venues is a concern for venue-goers, and highlights the need for standards to be developed which can serve as a foundation for the development of government-led initiatives and regulations. These results also shed light on the factors that need to be taken into account for introducing and communicating on the subject of preventive measures. •



# UNDERSTANDING PATIENT EMPOWERMENT ALONG THE AUDIENCE HEALTH JOURNEY



*Gotowiec S., Larsson J.,  
Incerti, P., et al.*  
*International Journal of Audiology*  
*(2022): 61(2), 148–58.*  
*By Cathérine Boiteux – France*

**This paper evaluates the main factors which influence patient empowerment, from awareness to the post-fitting period.**

Many studies have demonstrated the positive impact of patient empowerment on chronic patients' health, particularly in relation to the management and outcomes of their chronic conditions. This aspect, however, has not yet been studied specifically for hearing health or for hearing aid (HA) wearers. The authors reviewed existing literature in the field of patient empowerment in chronic diseases and the factors which motivate patients in their care pathway. Based on the findings from this review, they carried out semi-structured interviews with 18 patients based in two locations, Sweden and Australia (thereby controlling cultural bias), with a mean age of 72 years, all in primary care. Because the study population only included first-time HA wearers, there was a lack of representation of severe to profound hearing loss. Consequently, the findings cannot be generalised to all forms of hearing impairment.

This study focused on describing five selected dimensions of empowerment through guided interviews that were recorded and then analysed. Those dimensions were: knowledge; participation; control; skills and strategies; and self-efficacy. What findings are relevant for our practice?

**Knowledge:** overall respondents reported that the information provided by their audiologist was complete and satisfactory. They admitted they do not always retain all the information provided to them. However, this does not seem to impact the empowerment process. The information gathered before the contact with the audiologist is mainly on the internet or from friends (HA users).

**Skills and strategies:** respondents often implemented pre-fitting strategies consciously or unconsciously, by adjusting to the situation, e.g. lip-reading, position in a group, etc. Post-fitting strategies are learned with the audiologist and are routine.

**Participation:** respondents perceived a lack of ability to participate during appointments as their audiologist is the

## CRITICAL NOTE:

*This study provides an interesting approach to the concept of patient empowerment applied to hearing healthcare. The adaptation of the concept of patient empowerment provided by the authors, initially developed for chronic conditions, offers interesting insight into the management of hearing loss, the hearing health care pathway and hearing aid rehabilitation, and the positive impact such considerations could have on our practice.*

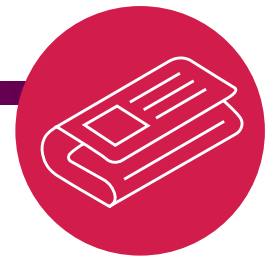
only one directing the adjustments and the fitting. Participation in social life was more active. Furthermore, they report that the initiative of taking care of their hearing health was motivated by several factors: advertising; entourage; free screening, etc.

**Self-efficacy:** participants reported feeling confident and develop a growing self-confidence during the fitting process.

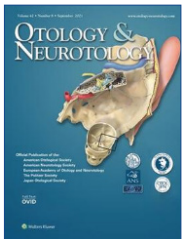
**Control:** control covers the handling of challenges and the power to influence outcomes. This feeling varied greatly among participants, with control manifested in the pre and post-fitting period as compensatory strategies or mastery of the hearing aid.

In addition to these five dimensions, the authors highlighted an additional theme which emerged during the interviews: acceptance. This, as reported by respondents, is mainly related to the ageing process.

By way of conclusion, the authors developed the following proposal concerning empowerment throughout the hearing health care process: "Empowerment along the hearing health journey is the process through which individuals with hearing-related challenges acquire and use knowledge, skills, and strategies, and increase self-efficacy, participation, and the feeling of control of their hearing health care, hearing solutions, and everyday lives." •



# AWARENESS, PERCEPTIONS, AND LITERACY SURROUNDING HEARING LOSS AND HEARING REHABILITATION AMONG THE ADULT POPULATION IN THE UNITED STATES



*Carlson ML., Nassiri AM., Marinelli JP, et al.*  
*Otolology & Neurotology (2022): 43(3), e323.*  
 By Tali Bar-Moshe – Israel

**The study results emphasised the extent to which adults lack awareness and understanding of HL diagnosis, effects, management and rehabilitation benefits. The study also sheds light on the issue of the low referral rate to hearing screening by primary care physicians.**

Hearing loss (HL) is one of the most common chronic conditions among the elderly population. Despite HL greatly affecting communication as well as many aspects of daily life and quality of life, it remains underdiagnosed and inadequately rehabilitated. The researchers highlighted a number of factors influencing low usage of hearing aids (HAs) and cochlear implants (CIs) by adults: poor awareness of the effects of untreated HL among healthcare professionals as well as the general population; lack of regular hearing screening for adults; lack of knowledge regarding rehabilitation candidacy and risks versus benefits; lack of accessibility to healthcare specialists in underserved populations and remote areas.

The aim of this study was to explore adults' awareness, perceptions and literacy regarding HL. A total of 1,250 adults, aged between 50 and 80, answered an online quantitative questionnaire that was sent to a sample of American adults. Of these, 500 reported having at least moderate HL and using HAs; the remaining 750 had not been diagnosed with HL and were not using HAs.

The authors highlighted the following findings:

- Understanding of the definition of HL – most of the respondents (79%) did not know or were not sure what qualifies as normal hearing
- Prioritising HL among a closed list of health conditions – HL was ranked third from last
- Likelihood of addressing various health conditions over the next year – HL only 27% (most of whom belonged to the HL group) responded they would “very likely” get a hearing test
- Last hearing test – the majority of participants without HL answered “longer than 10 years ago”; the majority of participants with HL responded “in the last 6 months”

## CRITICAL NOTE:

*HL is a very common chronic health condition. Despite not being life threatening, it has significant impacts on adults' quality of life of which the public and primary healthcare providers are generally not sufficiently aware. HL should be diagnosed and treated with rehabilitation solutions that can improve patients' quality of life and participation. Healthcare systems, professional associations, scholars and researchers as well as all of us, as audiologists, should promote and increase awareness about this important health condition and existing rehabilitation solutions among other healthcare professionals as well as the general population.*

- Reasons for not having HAs – the two most common reasons put forward by respondents were: not being aware of suffering from HL (47%); and that their healthcare provider had not suggested undergoing a hearing test (30%).
- Associations between HL and other health and social conditions – the main associations listed by participants were: links with depression (23%); employability (22%); and falls (18%)
- Impact of HL – the main impacts listed by respondents were: personal safety (69%); quality of life (63%); and overall health (59%).

The study results emphasised the extent to which adults lack awareness and understanding of HL diagnosis, effects, management and rehabilitation benefits. The study also sheds light on the issue of the low referral rate to hearing screening by primary care physicians. These factors can go some way to explaining the low prevalence of hearing rehabilitation solutions usage such as HAs and CIs among adults. •





# THE LONGITUDINAL RELATIONSHIP BETWEEN SPEECH RECOGNITION IN NOISE, NEED FOR RECOVERY AFTER WORK, JOB DEMAND, AND JOB CONTROL OVER A PERIOD OF 5 YEARS



van Leeuwen LM., Goderie T.,  
van Wier MF, et al.

*Ear and Hearing* (2022): 43(2),  
659–68.

By Thomas Tedeschi – United States

**This longitudinal study showed a significant association between five-year worsening in speech recognition in noise and an increase in need for recovery after work over the same time period. The study also provides evidence that early detection of a worsening in speech recognition in noise in employees might be useful as an indication of an increase in need for recovery after work.**

This five-year longitudinal study showed a significant association between a decline in speech recognition in noise and the increased need for recovery time for those individuals who are in a working environment and suffer hearing loss (HL). The study also suggests that hearing and speech discrimination testing in noise is recommended on a regular basis for the early detection of potential declines in speech understanding. This would be an extremely valuable counselling tool for employees as an indication of an increase in need for recovery after work.

Research has demonstrated that individuals with HL experience higher mental distress and fatigue when the recovery time after work is not adequate. It has also been identified that prolonged lack of adequate recovery time manifests in an increased sick leave rate and eventual early retirement.

The purpose of this study was to ascertain whether there was a relationship between hearing in noise and recovery time after the workday. Recovery time was not defined by a specific time period in the study, but it was categorised as the time it took for an individual to recover from the pressure and fatigue from the concentration it takes to hear in noise environments. The researchers evaluated this cycle of work–fatigue–and recovery over a five-year time span.

The subject pool of the study was drawn from the Netherlands Longitudinal Study on Hearing (NL-SH), Nachttegaal et al. (2009). NL-SH has noted that poorer speech recognition

#### CRITICAL NOTE:

*There are several areas where research should be directed in order for these findings to be applicable by and beneficial to practitioners. More definitive information is required as to the scope of the notion of recovery: does this mean a more relaxed listening environment? Is conversational listening at home or with friends considered a recovery environment? Also, what is the optimal recovery period needed? These are questions that require more precise defining for advancing the work of practitioners and the awareness and comfort of the hearing-impaired.*

in noise has been associated with an increased need for recovery after work<sup>1</sup>. This would indicate that a decline in speech recognition in noise could be associated with or linked to work related issues such as poor performance due to strain and fatigue.

The researchers posited the following three hypotheses:<sup>2</sup>.

1. Is a five-year change in speech recognition in noise associated with a change in need for recovery after work in employees over that same five -year period?
2. Is a five -year change in speech recognition in noise associated with a change in job demand and job control in employees over that same five -year period?

1 Nachttegaal, J., Kuik, D. J., Anema, J. R., Goverts, S. T., Festen, J. M., Kramer, S. E. (2009). Hearing status, need for recovery after work, and psychosocial work characteristics: Results from an internet-based national survey on hearing. *Int J Audiol*, 48, 684–691.

2 Lisette M. van Leeuwen, Thadé Goderie, Marieke F. van Wier, Birgit I. Lissenberg-Witte, Ulrike Lemke, and Sophia E. Kramer (2021). The Longitudinal Relationship Between Speech Recognition in Noise, Need for Recovery After Work, Job Demand, and Job Control Over a Period of 5 Years. *EAR & HEARING*, VOL. 43, NO. 2, 659–668.

3. What is the effect of hearing solution uptake in the five-year period on change in these outcomes over that same five-year period in employees with hearing impairment eligible for hearing solutions?

The scale utilized for the measurement of recovery was the Need for Recovery subscale of the Experience and Evaluation of Work.

**Results:**

Hypothesis 1: a statistical significance was noted with the length of recovery over a five-year period, based on the Need for Recovery subscale.

Hypothesis 2: no statistical significance was found between individuals speech recognition and a change in work patterns.

Hypothesis 3: since there were no statistically significant changes between speech recognition in noise and work demands over the five-year study period, the researchers

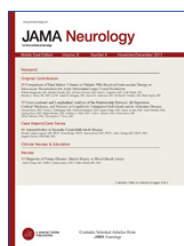
decided they did not need to study the effect the introduction of hearing remediation strategies would provide.

The study results confirmed that there is indeed a relationship between speech recognition in noise and a need for recovery over a five-year time period. The results further highlight the critical need for recovery after work for individuals with hearing impairment. This study highlights the importance of continually evaluating the hearing in noise ability of individuals with HL who are in the work force.

Hearing solutions and counselling may also be required to assist individuals with impaired hearing in the workplace to better understand and assist in the management and recovery after they have completed their workday. This recovery time, the authors stress, will provide benefit for the mental, emotional, and physical wellbeing of the hearing impaired individual. •



# ASSESSMENT OF RISK FACTORS AND EARLY PRESENTATIONS OF PARKINSON DISEASE IN PRIMARY CARE IN A DIVERSE UK



*Simonet C., Bestwick J., Jitlal M., et al.*  
*JAMA Neurology (2022): 79(4), 359–69.*  
*By Veronica Hoffman – Italy – New Zealand*

**This paper establishes a novel association between hearing loss and Parkinson’s Disease.**

Parkinson’s Disease (PD) is the second most common neurodegenerative disorder after Alzheimer’s. To date most studies on PD have been conducted among wealthier Northern European populations. The study under review set out to address this gap, by focusing on a UK-based, ethnically-diverse population characterised by high levels of socioeconomic deprivation but universal access to healthcare, in order to explore the co-morbidities and pre-diagnostic symptoms of PD. Matched analysis from the East London NHS database of 1,055 individuals with a diagnosis of PD and 10,550 controls looked into a range of 24 exposure variables, at the time periods of <2 years; 2 to <5 years; 5-10 years prior to PD diagnosis. For control subjects a dummy date of PD diagnosis was assigned

**CRITICAL NOTE:**

*To date, most studies on PD have included patients from Northern European ancestry, with higher level incomes. It is important and beneficial to have studies explore a more diverse range of ethnic backgrounds with higher levels of socioeconomic deprivation.*

based on the median age of 69 years (added to Disturbance Observer (DOB) of control).

Tremor was identified as the most common manifestation, found in 25% of PD patients, presenting within two years prior to diagnosis, sometimes even up to 10 years prior, which seems to indicate that this is, in fact, an early feature of PD

yet to be diagnosed. Memory problems were the next most common symptom, found up to five years prior to diagnosis. Interestingly this study found a novel association with hearing loss (HL) up to five years prior to diagnosis. Lastly, the authors provided further evidence to support an association between PD and epilepsy.

The authors stress the importance of primary healthcare practitioners (PHP) being aware of the wide range of PD comorbidities highlighted in this study. In order to ensure a timely PD diagnosis, PHPs should question their patients about non-motor symptoms (e.g. constipation, depression, erectile dysfunction), refer to movement disorder services where appropriate, be aware of memory problems and treatment-

resistant shoulder pain as possible indicators of PD and seek out further objective assessments in areas of sensory deficits such as HL if PD is suspected.

The study found no association between ethnic group or index of multiple deprivations and the likelihood of PD, suggesting they may not be risk factors. This contrasts with Dementia, where ethnic and socioeconomic factors have shown to be associated.

There is currently no significant clinical advantage in early diagnosis of PD due to a lack of therapies for slowing down or reversing symptoms. However, it is interesting that a novel association between HL and PD was found in this study which warrants further research. •



## AGE-RELATED HEARING LOSS, DEPRESSION AND AUDITORY AMPLIFICATION: A RANDOMIZED CLINICAL TRIAL



*Marques T., Marques FD. & Miguéis A.*

*European Archives of Oto-Rhino-Laryngology (2022): 279(3), 1317–21.*

*By Thomas Zacharia – Australia*

**The study revealed a significantly higher relation between hearing loss and depressive symptoms even after controlling sociodemographic factors. The paper sheds light on the positive impact HAs can have on depressive symptoms after just one month of usage. Within six months of HA use, the depressive symptoms were significantly lower.**

Ageing is known to be the leading cause of hearing loss (HL) among the elderly population, referred to as age related hearing loss (ARHL). This specific form of HL is caused by damage to hair cells in the basilar membrane and is progressive in nature. Several studies have identified a correlation between increased HL and depressive symptoms among the elderly population, which is believed to be due to lack of social interaction and subsequent social withdrawal due to the inability to hear. Studies have shown that aural rehabilitation with the use of hearing aids (HAs) can improve social interaction and speech perception, and, in turn, reduce anxiety and depressive symptoms among this population. This study was carried out to examine the association between ARHL and depressive symptoms using pure tone audiometry (PTA) and the Portuguese version of the Geriatric Depression Scale (GDS) and to verify the impact of aural

### CRITICAL NOTE:

*Increased HL can increase depressive symptoms in the elderly population due to social isolation and loneliness. This study highlights that with appropriate aural rehabilitation, depressive symptoms can be lowered significantly. It is important for hearing professionals to explain this to clients during counselling.*

rehabilitation on depression using the GDS at baseline over a four-week period. A total of 79 patients over the age of 65 with moderate sensorineural hearing loss (SNHL) were initially recruited for this study. After screening, 11 were excluded for dementia, and a further seven, as they already used HAs, leaving a total of 61 subjects. Hearing was assessed by PTA, tympanometry, word recognition score (WRS); depression was measured by means of the GDS.

The population was divided into two subgroups. Receiver in the ear HAs were fitted binaurally for 32 participants and were adjusted to their specific HL, and an average six-hour daily use was expected. The remaining 29 participants were assigned to the control group, and no HAs were prescribed. The study revealed a significantly higher relation between HL and depressive symptoms, even after controlling sociodemographic factors. Both social isolation and loneliness are reported to be the main factors causing depressive symptoms in individuals who do not wear HAs. Factors, such as social interaction, increased self-motivation, self-esteem, and self-confidence along with improved

neuroplasticity which reflects auditory training in working memory, improved depressive symptoms after the usage of HAs. Depressive symptoms were more prevalent in the control group that did not use HAs for the same four-week period. This demonstrates the positive impact HAs can have on depressive symptoms after just one month of usage. Boi R, Racca L, Cavallero A et al (2012) found in a comparable study, that within six months of HA use, the depressive symptoms were significantly lower. (Boi R, Racca L, Cavallero A et al (2012) Hearing loss and depressive symptoms in elderly patients. *Geriatr Gerontol Int* 12:440–445.) •



## HEARING AID TECHNOLOGY SETTINGS AND SPEECH-IN-NOISE DIFFICULTIES



*Davidson A., Marrone N. & Souza P.*  
*American Journal of Audiology*  
*(2022): 31(1), 21–31.*  
*By Frederic Debruycker – Belgium*

**This study emphasises the importance of a proper analysis (Speech In Noise capacity) of the specific situation/difficulties of hearing impaired person in order to make the most appropriate adjustments.**

Hearing-aid (HA) fitting recommendations are generally clear regarding the gain to be achieved. However, few guidelines focus on the more advanced features offered by such devices. The present study deals specifically with intelligibility in noise (SIN).

Because “difficulty in understanding in noise” is not specific enough a complaint to determine the appropriate adjustments and fittings, it is necessary to use some standardisation through the use of speech-in-noise tests.

In order to relate difficulties in noise to the use of certain features (type of directionality, use of noise reducer, etc.), the following data were collected from a sample of 107 users (average experience = 3.7 years)

- QuickSIN test score
- The use of directionality:
  - Omnidirectional
  - Fixed directional
  - Adaptive directional (automatic switching of polar plots, automatic switching omni / directional)
- The use or not of an accessory (remote microphone)
- The activation or not of a noise reducer

### CRITICAL NOTE:

*This study emphasises the importance of a proper analysis (SPIN capacity) of the hearing impaired person’s situation/difficulties in order to make the most appropriate adjustments.*

*The study does not take into account the possible other reasons that could have led to the selected features and that would not be directly related to the results of intelligibility in noise.*

*Unfortunately, all types of noise reducers are considered the same way. It would have been interesting to observe if a more effective level of reduction was activated in the case of greater difficulties (if the technology of the device allowed it). There is no mention of Pinna directionality, a technology that has become a standard in recent years.*

The QuickSIN result measures the level of difficulty based on the number of repeated key words, considering different S/N levels.

- < 3 dB SNR = normal/near normal
- 3-7 dB SNR = mild difficulties
- 7-15 dB SNR = moderate difficulties
- > 15dB SNR = great difficulties

For scores of 7 or more, QuickSIN recommend the systematic use of directionality.

For the purposes of the study, these data were collected post-fitting, at the time of the study.

**Directionality.**

Existing guidelines recommend that the more significant the level of difficulty in noise, the more gain is offered by directional microphones (or even remote microphones for extreme difficulties). However, the data collected showed that this logic was not always applied.

The most common choices that were made in line with this logic were:

- Omni for mild difficulties
- Fixed for moderate difficulties
- Fixed for severe difficulties
- Adaptive for mild difficulties
- Adaptive for severe difficulties

Other choices have a statistically negative impact on this logic, such as:

- A lack of selection for:
  - Omni by near to normal difficulties
- A fairly common choice for:
  - Omni by severe difficulties

**Digital noise reduction**

Although the use of digital noise reduction cannot demonstrate an improvement in intelligibility in noise, it may contribute to additional comfort in such situations.

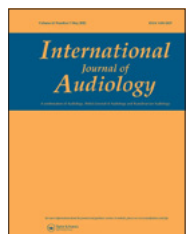
Considering the variety of systems encountered in the sample due to the variety of manufacturers and models, the analysis of the function was only noted by active noise reduction or not. This study highlights that there is a tendency to use the noise reducer less for subjects with more significant difficulties in noise.

**Remote microphone.**

Here too, the additional technology cannot be associated with the degree of difficulty in noise as might be expected. However, the study does stress that the sample tested does not match the target population for such microphones. •



# PREDICTION OF SUCCESSFUL HEARING AID TREATMENT IN FIRST-TIME AND EXPERIENCED HEARING AID USERS: USING THE INTERNATIONAL OUTCOME INVENTORY FOR HEARING AIDS



*Houmøller SS., Wolff A., Möller S., et al.*  
*International Journal of Audiology*  
*(2022): 61(2), 119–29.*  
*By Sofie Peeters – Belgium*

**Based on the improved level of satisfaction of experienced users when renewing hearing aids, there is a significant increase in the mean IOI-HA score, indicating that HA effectiveness improved when receiving new hearing aids. The factor 2 scores also increased from baseline to follow-up resulting in fewer residual limitations after being fitted with new HAs.**

This study, which is part of the Better hEARing Rehabilitation project (BEAR), sets out to understand which factors could possibly affect the International Outcome Inventory for Hearing Aids (IOI-HA) scores, and secondly, to examine whether the scores of experienced users (> 4 years of HA experience)

improve after renewing their HAs, and to estimate the overall HA effectiveness using the IOI-HA. To that end, 1961 patients with hearing loss (HL) underwent a hearing examination, a hearing aid-fitting and then completed the IOI-HA. Clinical parameters – such as: degree of HL, word recognition

**CRITICAL NOTE:**

It is not surprising that experienced users are on average older and therefore have more severe HL as this condition affected by age. Experienced users also displayed higher motivation and higher HA usage time, which could be explained by having a more severe HL and so a higher need for the benefit provided by HAs. Consequently, the differences in Factor 1 scores, which are better in the experienced HA users group, could be explained by their having a more severe HL and therefore a greater benefit from their HAs. In contrast, Factor 2 scores indicate that having a more severe HL results in more residual limitations. Altogether, these findings suggest

that several factors must be taken into account for successful HA rehabilitation. It is only logical to consider that the degree of motivation and actual HA usage time are important. However, these findings highlight that special attention should be given to highly-motivated patients with considerable HL, experienced female HA users or patients with poor word recognition scores or asymmetrical HL, as these patients could benefit from additional counselling in order to understand the benefits and limitations of HA fitting. As tinnitus negatively impacts the perceived HA outcome, patients with tinnitus may also need special attention. One of the advantages of this study is the large study population, which

makes for sound conclusions. Nevertheless, some limitations still apply. For instance, patients who are less motivated for HA fitting or less satisfied with their HAs might not respond to or complete the questionnaires. The mean follow-up time was 73d (SD 34) and some studies suggest that a follow-up period of three months should be respected. Also, additional tests, such as speech in noise or ANL, could provide a better view on the auditory functionalities of patients. The findings of this study also raise new questions, namely, can ANL scores, which are related to HA usage time and predicting the success of HA fitting, be related to IOH-HA scores?

scores (WRS), self-reported tinnitus using the THI questionnaire, HA configuration (unilateral or bilateral fitting), motivation for HA treatment, HA usage time, gender and age – were obtained and compared with IOI-HA scores. In addition, the IOI-HA scores for first-time and experienced HA users were compared, next to the improvements after renewing their hearing aids. The IOI-HA consists of the following parts: the use of HAs

(Use); the perceived benefits (Ben); Residual activity limitation (RAL); Satisfaction (Sat); Residual participation restriction (RPR); Impact on others (Ioth); and Change in quality of life (QoL). These parts were divided into two subscales as show in Table 1.

Parameter	Differences between first-time and experienced HA users
Degree of hearing loss	Mild HL was the most frequent type of HL among first time users; among experienced users it was moderate HL (probably due to the higher age of the experienced group)
Self-reported tinnitus (THI)	No significant difference
HA configuration	97% of the experienced and 95% of the first time users were bilaterally fitted with HA.
Motivation for HA treatment	Experienced users reported higher motivation rates than first-time users.
HA usage time (datalogging)	Experienced users used their HAs 3h more a day than first-time users. Usage time increases for both groups as the degree of HL increases. Given the degree of HL was higher in the experienced group, the higher usage time could be affected by the higher need of wearing the HAs in the experienced group.
Gender	In the experienced group, 40% were women; in the first-time users group, women accounted for 44%.
Age	On average, first-time users were 1.8 years younger than experienced users.

Factor 1 Me and my HAs – Benefits with HAs	Factor 2 Me and the rest of the world – Residual limitations after HA fitting
The use of HAs The perceived benefits Satisfaction Change in quality of life	Residual activity limitation Residual participation restriction Impact on others

**Table 1:** Subscales IOI-HA

Table 2 shows the parameters significantly affecting Factor 1 and 2 scores of IOI-HA.

Parameter	Factor 1	Factor 2
Degree of hearing loss	The degree of HL most strongly and positively affected Factor 1 in both groups of HA users (probably due to the higher need for HAs of patients with moderate HL than patients with mild HL). Experienced users with asymmetrical HL reported higher benefits than those with symmetrical HL.	The degree of HL most strongly and negatively affected Factor 2 in both groups of HA users.  Fist-time users with asymmetric HL reported more residual limitations than those with symmetrical HL.
Self-reported tinnitus (THI)	Both first-time and experienced users with tinnitus reported significantly more limitations.	

Parameter	Factor 1	Factor 2
<b>Motivation for HA treatment</b>	<b>The motivation for HA treatment positively affected HA benefits in first-time users.</b> For experienced users, who are in general more motivated towards HA treatment, improvement is limited.	<b>Motivation showed to have a negative effect, mostly in experienced users,</b> on residual limitations (due to too high expectations of HA fitting?).
<b>HA usage time (datalogging)</b>	<b>Reported HA benefit increases when the HAs are being used more.</b>	<b>Fewer residual limitations were reported</b> in both the experienced and the first-time users group <b>when HA usage time increases.</b>
<b>Sex</b>	<b>Experienced female users reported less HA benefit</b> than males (strong effect).	<b>Experienced female users reported significantly more limitations</b> than male users, suggesting this difference could be related to women being more socially active or to women having higher expectations.
<b>Age</b>	<b>Age had a small (not significant) positive effect on HA benefit in first-time users.</b>	

### Conclusions

Looking at the improved level of satisfaction of the experienced users when renewing HAs, there is a significant increase in the mean IOI-HA score indicating that HA effectiveness improved when receiving new HAs. The Factor 2 scores also increased from baseline to follow-up, resulting in

fewer residual limitations after being fitted with new HAs. Further research is necessary on this topic in order to obtain general conclusions.

Mean total IOI-HA scores indicate a high level of HA effectiveness for first-time users and experienced users alike. •



## PREVALENCE AND PROGNOSIS OF OTORHINOLARYNGOLOGICAL SYMPTOMS IN PATIENTS WITH COVID-19: A SYSTEMATIC REVIEW AND META-ANALYSIS



*Qiu J., Yang X., Liu L., et al.*  
*European Archives of Oto-Rhino-Laryngology (2022): 279(1), 49–60.*  
*By Yanic Windels – Belgium*

**This systematic review and meta-analysis evaluates the prevalence and prognosis of otorhinolaryngological symptoms in patients diagnosed with the COVID-19 virus.**

COVID-19 was first reported in China in the city of Wuhan. A new coronavirus strain (SARS-CoV-2) was spreading with a high infection rate, and represented a global threat. This new strain uses the respiratory tract as a primarily way to spread. The most common symptoms include fatigue, a dry cough and fever, similar to upper respiratory tract infections.

### CRITICAL NOTE:

*In this systematic review and meta-analysis, no hearing problems were noted. It is possible that this was considered a symptom of COVID-19 but the prevalence was possibly too small to include in this research. The authors failed to establish a comparison with other diseases with similar otorhinolaryngological symptoms, and whether the presence of shortness of breath and sputum production might also be a warning sign for otorhinolaryngologists regarding the prognosis of the disease.*

The most common first symptoms are olfactory or taste dysfunctions (up to 34 to 59%); at a more advanced stage, patients can also experience pneumonia manifestations. The researchers wanted to develop a reference point in order to help otorhinolaryngologists better diagnose and treat patients with COVID-19.

**Search criteria:**

- Keywords: “COVID-19” and “signs and symptoms” combined with Boolean operators; complemented by screening the list of references
- Databases: PubMed; Embase; Web of Science; and Google Scholar
- Period: date of establishment to August 19, 2020.
- Language: English

**Data extraction:**

- Two reviewers with experience and a third party when differences were noted
- PRISMA guidelines on systematic reviews

**Exclusion:**

- reviews, editorials, preprint, and small cases ( $\leq 10$  cases)

**Synthesis and analysis:**

- A meta-analysis was conducted to find the prevalence rate of otorhinolaryngological symptoms.
- A subgroup analysis was conducted to evaluate whether the severity impacted the results.

**Results:**

This yielded a total of 54 studies, covering 16,478 patients, all of whom were adults.

The top three otorhinolaryngological symptoms in the pooled prevalence are: olfactory dysfunction (47%); sneezing (27%); and nasal congestion (22%).

Other symptoms analysed were: nasal congestion (19%); sore throat (16%); rhinorrhea (14%); shortness of breath (12%); and dizziness (9%).

In the category of severely ill patients, the amount of patients with sputum production was increased. They also discovered a greater prevalence of shortness of breath in patients who were severely ill.

Rhinorrhea was similar in the pooled rate. There was no significant difference in patients with or without nasal congestion, a sore throat or dizziness.

No significant difference between severe and non-severely ill patients was found for sputum production, sore throat, rhinorrhea or nasal congestion. However, a difference was established in the shortness of breath.

**Discussion**

Otorhinolaryngological symptoms are very common in patients with COVID-19. It seems that the more severely ill a patient gets, the more likely they are to experience shortness of breath. In addition, people with sputum production or shortness of breath are more likely to develop complications, which results in a more severe prognosis. The incidence of otorhinolaryngological symptoms exceed those of digestive symptoms, such as diarrhea and nausea. The cause of the olfactory dysfunction has not yet been identified. Some studies have considered the possibility of the virus entering the epithelial cells, it has also been posited that the virus destroys the olfactory nerve epithelium. In animal experiments, it has been demonstrated that the virus can affect the olfactory neurons.

The authors highlight the importance of taking swabs in the nasopharynx or oropharynx because this is the central location of the virus, and is the primary source of transmission of the infection.

Sneezing and sputum production were the most common ways to transmit the disease.

Shortness of breath and sputum production are key in predicting the severity of the disease. This needs to be taken into consideration in order to decrease the likelihood of progressing towards a more severe stage of the disease. •