

## IMPROVING COMMUNICATION WITH FACE MASKS

With the onset of the Covid-19 pandemic, there has been an increase in the use of face masks as well as more people practicing social distancing. As a partner in hearing health care, the hearing care professional (HCP) has a new and important task to consider; namely, how face masks and social distancing may affect speech communication.

The main goal of amplification is to provide audibility for sounds that cannot be heard due to hearing loss. The complexity of listening environments makes that seemingly simple task much more difficult. Whether it is various talkers speaking at softer levels, or competing environmental sounds masking over speech sounds, the hearing aids need to adjust to address these dynamic situations.

Fortunately, over the years, technology has progressed to effectively adapt to environmental sound conditions. Signal detection helps the hearing aids fluidly accommodate various environments. In most situations, the hearing aid wearer can enter an environment and the hearing aid will automatically adjust without the wearer needing to do anything but listen.

In general, the HCP programs the hearing aid for speech intelligibility in a quiet environment. This

provides a baseline for further adjustments for different environments, with the hearing aid favoring speech in those environments. In some cases, the hearing aid wearer may have specific preferences for a unique environment or may have preferences that differ from the automatic adjustments, requiring the HCP to make programming adjustments for specific environments. These adjustments are generally programmed into a dedicated memory in the hearing aid accessible via a push button, remote control, or smart phone app. Some popular dedicated programs are for noisy environments, music, and places of worship, but the HCP and the patient may always decide on other necessary programs.

This article will discuss the effect of face masks on speech communication and outline how to make the sound 'just right' under these new circumstances.

### EFFECTS OF MASKS

Wearing masks can become a communication challenge in two ways. First, masks cover the mouth, restricting any visual speech cues the wearer might receive. Secondly, masks can impact the acoustic properties of the speech signal itself.

The value of visual cues for both those with normal hearing and those with hearing loss is important to consider. For understanding speech, the added visual input is a complement or a reinforcement to the acoustic signal. Lip movements provide cues for awareness of when words and sounds are changing. Additionally, they provide cues to those spoken sounds, in particular the consonant sounds<sup>1</sup>.

Visual cues can help a listener with normal hearing or hearing loss more accurately identify spoken words than just the acoustic or the visual information alone<sup>2</sup>. Dell'Aringa et al<sup>3</sup> reported the addition of lipreading-improved word recognition in quiet for patients with hearing loss both with and without hearing aids. Atcherson et al<sup>4</sup> evaluated speech perception using the Connected Speech Test at 65 dB SPL with a +10 dB Signal to Noise Ratio (SNR). Participants with hearing loss showed significant improvement in accuracy when visual cues were present over a mask condition without visual cues.

Additionally, the introduction of visual cues has been shown to help improve listening performance in noise. Middelweerd and Plomp<sup>5</sup> noted a 4dB improvement in Speech Reception Threshold (SRT 50%) when visual cues were added to audition of speech in noise. When comparing SRTs for a modified SPIN test with and without lipreading, Grange and Culling<sup>6</sup> reported for a 3dB improvement for normal hearing listeners and 5dB for cochlear implant users.

The acoustic impacts of masks can be quite critical as well. Goldin and Weinstein<sup>7</sup> evaluated three types of medical masks: a simple medical mask and two N95 masks. Their findings indicated a high frequency reduction in the 2000-7000 Hz range of 3-4 dB for the simple mask and in the area of 12 dB for the N95 masks (Figure 1). Llamas et al<sup>8</sup> noted a 12 dB decrease in the high frequencies for a surgical mask. Palmiero et al<sup>9</sup> evaluated several personal protective masks (both N95 and general protective types) as part of an occupational health study. Results also showed a decrease in sound levels from 2000 Hz and above measure about 1 dB for the protective face mask to about 6 dB for the N95 on a dB-A octave band scale.

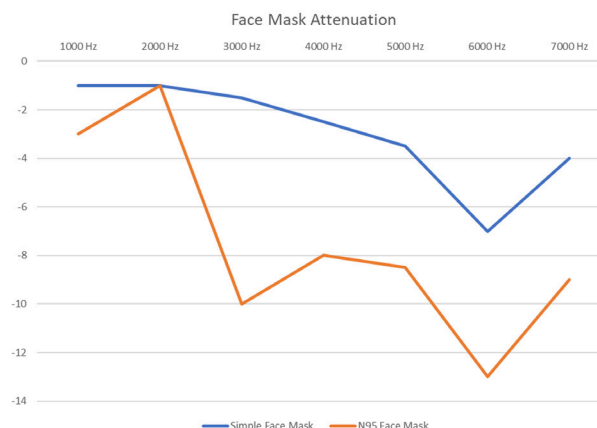


Figure 1. Face mask attenuation shown in dB by frequency for a simple face mask and an N95 face mask (adapted from Goldin, Weinstein, and Shiman, 2020).

When considering the impact of lost visual cues as well as the high frequency decrease of the speech signal, it is clear that communication will be impacted. Simply using Killion and Mueller's Count the Dots Audiogram<sup>10</sup> to represent the types of decreases in high frequency audibility created from mask usage reveals that someone with normal hearing could easily experience about a 30% decrease in audibility. This could translate in some cases into a 10% decrease in intelligibility on the Speech Intelligibility Index (SII)<sup>11</sup> in a quiet condition. With the addition of background noise, the SNR will increase, only to be exacerbated by the lack of visual cues. Even for people with normal hearing or hearing loss with appropriate amplification, a new degree of hearing loss will be introduced.

Compounding these challenges with face masks, it is also important to note that social distancing recommendations advise keeping at least 6 feet (2 meters) from others. Before social distancing, many conversations happened at a 3-foot (1 meter) distance. Doubling that distance decreases the intensity of the already reduced speech signal received by the listener. Ultimately, an already challenging communication situation becomes even more difficult.

#### HOW CAN THE HEARING CARE PROFESSIONAL HELP?

At first it may seem daunting to consider new challenges that can be perceived as an additional

hearing loss. However, knowing the effects of masks and distance allows us to introduce solutions.

The first step is to counsel the patient on the impact of face masks on communication. There will most likely be many instances where communication will be challenged with face masks. By eliminating some of the mystery behind the mask with knowledge, the wearer can be more cognizant of communication strategies.

Addressing these issues requires consideration of the environment and good communication guidelines:

1. Always face the one you are talking to.
2. Communicate where there is good lighting. Make sure light falls on your face so your face is not in a shadow. This will also facilitate eye contact.
3. Consider an approved clear face shield to maximize lip/face cues.
4. Sit close to each other, within the required safety limits.
5. Never have a dialogue about important matters while walking side by side.
6. Use Clear Speech techniques: Speak slightly slowly and clearly and insert occasional pauses into your speech. Do not shout or over-articulate.
7. Rephrase your questions or input rather than repeating the same words.
8. Minimize environmental noise.
9. Have information ready in written form to minimize communication errors.

These strategies will be helpful in all situations where a person with a hearing aid interacts with people with face masks.

Understanding that the hearing aid wearer is receiving a reduction in high frequency information from a given speaker, it is also possible to adapt the amplification to this particular situation. Programming the hearing instruments for a “Mask” situation is a viable solution to address the modified speech signal to make it audible. This solution can also be achieved via remote programming without the patient needing to visit the office. Additionally, utilizing the video option alleviates the need of donning a face mask for a clinical visit, thus eliminating one of the potential challenges of an in-office visit.

#### **SUMMARY**

Hearing loss can be challenging in a variety of situations. The use of masks as well as increased distancing while talking is a unique challenge that can be very frustrating for people with normal hearing and especially for those with hearing loss. Hearing aid technology is constantly being enhanced to help wearers manage the most difficult listening situations. Widex hearing aids offer flexibility for both the HCP and the user to apply dedicated strategies to help optimize sound experience in order to maximize audibility and speech intelligibility in these situations.

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