

## Future Perspectives on Hearing Aid Self-Adjustment

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### ABSTRACT

The complexity required for the auditory rehabilitation of patients leads us through a complex study of the user's needs, an analysis of the diagnostic tests and a long process of results validation. This arduous process involves aspects related to audition, but also involves cognitive factors, which are left in the hands of the professional audiologist, who will be in charge of ensuring that his patient "recovers" his hearing functions and his way of life as well as possible. But we must never lose sight of the fact that the entire rehabilitation process only begins when the audiologist detects the hearing loss. In addition, many people with hearing loss have other comorbidities associated with hearing loss.

However, in recent times the "self-adjustment" of hearing aids is moving towards "automatic" systems. Undoubtedly, the latest technological advances are a great help, but they are not yet able to fully reach the subjectivity of hearing. Because of this, although self-adjustment will not be a reality for all users, it can represent a first contact with auditory amplification and rehabilitation, and that can be a mechanism to push the patient to get specialized help from a professional audiologist.

Self-adjusting devices have proliferated since the United States recently authorized the sale of hearing aids as PSAPs and OTC, with new, more direct sales channels, impacting professionals and manufacturers. The decisive aspect here is whether practitioners and manufacturers will be able to adapt to the new market forms, while their patients are trying to manage these innovations. The conclusion we draw from this article is: We need to adapt, adapt and understand each other's role in this process.

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Received: May 16, 2021; Accepted: May 21, 2021; Published: May 24, 2021

**Key words:** Audiology; Hearing aids; Hearing loss; Cognition; Hearing loss

### Body: Opinion Article

Fifteen years ago, when we started our academic careers at the university, we asked our students if we would reach a point where hearing aids would perform its functions perfectly, to the point the user would fit it himself. The futuristic and suggestive question provoked different opinions because digital technology in hearing aids was beginning to take its first steps towards more sophisticated algorithms, which seemed to be part of a very distant future.

But over the years, research in the area of amplification has helped us understand how stimuli are processed in the cochlea, and certainly the more we learn about this function, the more the algorithms improve, allowing for greater precision in the settings. There is no doubt that technology is advancing to help man, but no matter how accurate and reliable the mathematical instructions of a hearing aid might be, we would still not be able to fully achieve the subjectivity of hearing.

However, with the advent of artificial intelligence, the devices learned to identify the user's preferences in the environments and are now able to adapt themselves to them. Technology

provided not only the possibility for users to self-adjust through applications connected to their hearing aids (previously adjusted by their audiologist), but also developed self-adjusting products, targeting a population with mild and moderate hearing loss; these new products do not require the intervention or follow-up of a specialized professional.



**Figure1:** Hearing aids

So, will the audiologist remain critical to the hearing aid setting process?

To answer this question and draw conclusions, we must first recall the role of the audiologist in the process of indication, selection and fitting of the hearing aid.

In fact, the rehabilitation process begins at the first contact when we identify the real needs of the user. From there we plan our actions regarding the HA model, and other many variables, such as the electroacoustic characteristics and the algorithms best suited to the user's needs. All adjustments are made based on calculations made by the software and selected by the professional. We need to make fine and careful adjustments to provide the best audibility, intelligibility and comfort.

It is not an easy work task, even with all the technology we have in our favor, we face complex issues, especially with higher degrees of hearing loss and/or presence of cochlear lesions, for example. And many times, these issues can only be solved with our experience! After the initial fitting, the device is tested to see if the gain, output and other characteristics are appropriate for each case and then we start the fitting, guidance and validation process. These processes involve aspects related to auditory, but also cognitive factors. And here we find again the "human hand" of the professional with his empathy, experience and sensitivity. Things that can never be replaced.



**Figure 2:** Audiologist & HA

But we must not forget that the entire rehabilitation process only begins when the audiologist identifies the hearing loss. It is the professional who evaluates the hearing function and identifies the loss so the amplification process can begin.

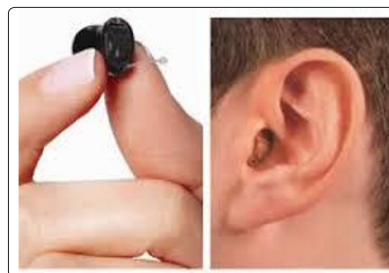
Increasingly our involvement is becoming more and more important as we assess not only ability, but also impaired auditory skills. We have the science and knowledge to detect cognitive changes resulting from hearing loss to any degree and the knowledge of how much auditory stimulation through the use of amplification is able to reverse this situation, even in cases of mild and moderate hearing losses [1].

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Self-adjustment will not be a reality for all users, but many will be comfortable with this possibility - perhaps this is the first form of amplification that will prompt you in the future to seek custom tuning by specialized professionals!

If, on the one hand, there is a tendency and a certain rejection at the beginning, on the other hand, the situation pushes us to think more and more about our role in this process.

The care in audiological evaluation, the trend towards a deeper investigation of the hearing condition combined with more and more perfected research tests, shows us that we are on a path of valorization and improvement of our services. In addition, we must not forget that many people with hearing loss have other comorbidities associated with hearing loss, such as tinnitus, balance, memory and cognition disorders. Therefore, more than ever, we must focus on our knowledge by studying and improving our professional skills in order to be able to offer an increasingly unique, human and fundamental service.



**Figure 3:** Ear & HA

Who would be the users of this technology?

If we think about traditional hearing aid users today, we find that the vast majority are over 65 years old, who are resistant to digital tasks, insecure about new technologies and have difficulty understanding applications and configuring their own cell phone. These users will certainly encounter barriers related to this new technology in hearing aids and will need the help of their family members to do so. But we must not forget that there are several generations who will reach this age in the future who surely will cope better with technological innovations of any kind. And this current generation, or even younger, may already be experiencing a mild or moderate degree of hearing loss. And they are already more prepared for this evolution.

Speaking of self-adjusting devices, they were initially created for developing countries where most people did not have access to specialized professionals to fit hearing aids. It was later discovered that these models could be absorbed by markets in other countries. This was evident when the United States recently authorized the over-the-counter sale of hearing aids such as PSAPs (Personal Sound Amplification Products) and OTCs (Over the Counter) aimed at the public with mild to moderate hearing loss. The fact that these products are being sold in stores such as opticians, and as medical and orthopedic products, in addition to online sales through reputable platforms such as Amazon, for example, has impacted the entire community of hearing health professionals and manufacturers. The reaction from manufacturers quickly turned into products that met this demand, certainly predicting that this new product would reach everyone and very soon.

In July 2019, "The Hearing Review" magazine published on the eve of the regulatory change for hearing aid distribution in the U.S., The MarkeTrak10 survey. This survey, sponsored by hearing aid manufacturers and providers in the U.S., helps to understand the market of hearing aid users and potential candidates for this new type of hearing aid [2]. According to the survey, it is not yet clear whether consumers will navigate this new modality on their own. But here's a question about whether they are prepared for this new reality. The fact is that the advent of the new amplifiers, coupled with the ability for users to adjust them, either amplifiers or hearing aids, is impacting all segments of this market.



**Figure 4:** DTC

Will the professionals be able to adapt to the new products, the new prices and the new way of delivering the devices? What about the manufacturers? Will they adapt to the new products to avoid a market crash? Is there harmony between these types of amplifiers? Will the users be able to handle these technological innovations?

### **Conclusions**

The inquiries do not stop. This shows that the future is always unknown. But we can plan for it and prepare for it. As human beings, we have the ability to adapt to new realities. But one thing seems very clear. As the market evolves, new functions will emerge. For some years now, we have been living moments of unimaginable advances, such as those related to health monitoring and the call center to users synchronously through applications. All these tools pose challenges for hearing health professionals and users themselves, who also face difficulties in dealing with technology. But we must not forget that the generations of users who are getting older every day will know how to cope better and better with this news, as they will be the ones who will benefit the most. We need to adapt, adapt and understand each other's role in this process.

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