

# Enviograms: Bringing Greater Utility to Datalogging

by Mark C. Flynn, PhD

**A new tiny device called the Envirometer has been developed, allowing the collection of information on one's listening environments prior to the selection and use of the hearing aid.**

Recent reports<sup>1,2</sup> have shown the dramatic performance gains that hearing technology has made in the past couple of years. A key challenge to the hearing care professional is how to demonstrate the benefits of this technology to an increasingly educated and informed—but often skeptical—consumer. The development of computerized counseling tools has no doubt helped and facilitated counseling on various hearing care issues (eg, binaural benefit), technology (eg, directional benefit), and practical aspects of hearing instrument selection (eg, hearing aid styles and color options).

Similarly, various “live tools” are increasingly popular for demonstrating the benefits of amplification and how the numerous technologies (eg, directional microphones) provide real-world benefits. While all of these advances are important and have been well received by consumers, it can be argued that these solutions are still too generic; they are not necessarily aimed at the specific, individual benefits afforded for a client's real-world experiences.

Datalogging has furthered our understanding of hearing instrument technology, its applications, and allowed us insights into how clients use their hearing aids.<sup>3</sup> Unfortunately, while the information generated via datalogging is interesting (eg, volume control adjustments), it is often limited in terms of benefit for both the professional and the client.

One recent audiological paradigm shift is the recognition of the important relationship between the client and his/her auditory ecology.<sup>4,5</sup> Gaining detailed knowledge about the client's actual communication environments is perhaps the best way to make datalogging truly useful. Datalogging offers much more than just an automated fine-tuning guide; it represents an insight into the client's world. It is important to recognize that good hearing is as much about the listener's environment—and how important each of these environments is to the listener—as it is about the ability to hear. After all, if a client has purchased the hearing instrument specifically to hear better in one or more situations, he/she will be disappointed with the device if it fails to live up to expectations in these situations.

## **Envirometer: A Tool to Facilitate User Acceptance**

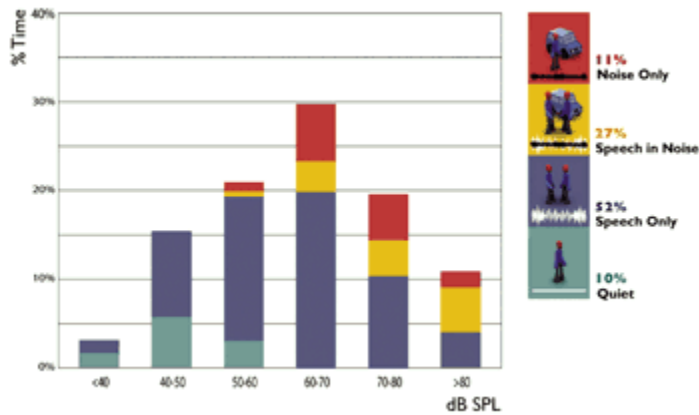
Research from Oticon's Eriksholm Research Center has led to the development of a patented device called the Envirometer. This technology has evolved from the research lab and is now available in two forms. Every Oticon Syncro has an envirometer activated on the digital chip. Also available is a small body-worn Sound Activity Meter (SAM) which is the world's first commercially available envirometer (Figure 1). SAM allows the collection of environment information without the wearing of a hearing instrument. This means that an Envirogram™ can be collected before the hearing instrument has even been fitted. This is especially beneficial for reluctant first-time users, skeptical clients, and those not motivated to upgrade technology levels.



**FIGURE 1.** *The Sound Activity Meter (SAM), a commercially usable, client-worn envirometer (about 3/4-inch in length).*

## **A Tool for Understanding the Client's Acoustic Environments**

The data from the envirometer is presented to the hearing care professional in the form of an Envirogram (Figure 2). Similar to the audiometer providing information about the client's hearing thresholds, the envirometer provides information about the client's range of listening environments. The Envirogram can be viewed either in the Genie fitting software, or integrated as part of the Oticon eCAPS counseling software.



**FIGURE 2.** Data from the Envirogram demonstrating the information that can be obtained in terms of both a level distribution and also a classification of the types of listening situations.

The system provides the hearing care professional with actual and reliable knowledge about their client's auditory ecology. Decisions can therefore be made on actual data rather than averages or subjective client reports. The ability to systematically map out and display each patient's listening environment is what makes datalogging truly useful.

Information is logged about the communication environments of a client, including the intensity levels and environment characteristics (eg, the amounts of speech-in-quiet vs speech-in-noise situations). Similarly, actual information about how systems such as Multiband Adaptive Directionality and TriState Noise Management have operated in different situations is available (Figure 3). This allows the dispensing professional to immediately see and demonstrate the benefits that Artificial Intelligence provides.<sup>6</sup>



**FIGURE 3.** *The Syncro Activity Analyzer produces Envirograms™ that demonstrate the hearing instrument is able to select between multiple directionality states and choose the best response.*

### **Integrating Envirograms into Your Fittings**

In terms of improving the fitting process, there are four immediate ways in which Envirogram data can be used:

- To demonstrate the benefits of today's hearing instrument technology to the client.
- To involve the client fully in the hearing instrument selection and fitting process.
- To match the hearing instrument technology to the client's actual auditory ecology.
- To highlight if there are any previously unseen issues that may make fitting more challenging for the patient.

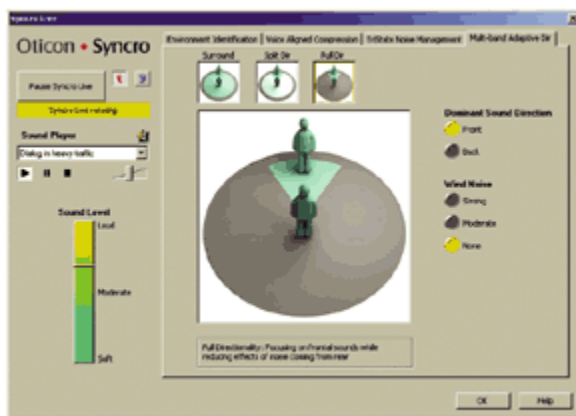
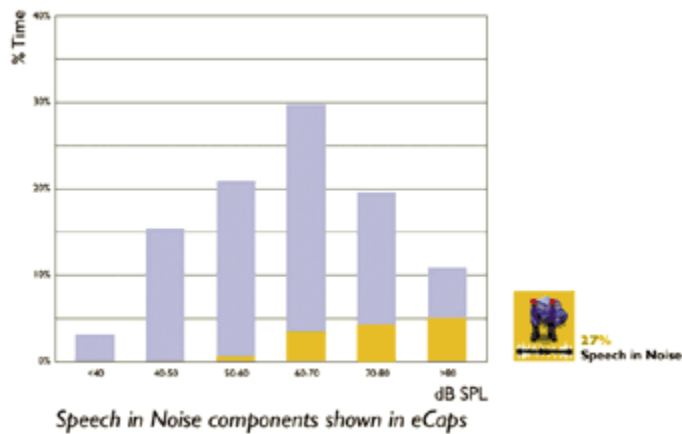
The Envirogram further enables the hearing care professional to understand how a hearing instrument will benefit the client in their actual listening situations. The focus on auditory lifestyle allows the freedom to shift away from discussing the pathological aspects of hearing loss. Focus is now redirected to how the hearing instrument can benefit the client's actual listening environments. The Envirogram illustrates the variety of environments the client encounters and allows discussion of the importance of listening in all these situations—especially those that pose the most difficulty. The use of the client's own listening data facilitates understanding of benefit and allows the client to take ownership of his/her hearing problem. This, in turn, increases the likelihood the patient will accept the recommendations of the dispensing professional, particularly when recommending advanced technology that offers benefits over their existing hearing aids.

More specifically, the client can view how and when various automatic features are activated in different situations. These can be used to demonstrate to clients that these advanced features are actually benefiting them, and to reassure that they experience a wide range of communication situations. Similarly, some clients seek reassurance that their hearing instruments are performing appropriately, and Envirograms are a good way to show them that various listening enhancement features are being engaged properly within the instrument.

At a more detailed level, our clinical experiences suggest the following process to be beneficial for the client in showing how hearing technology can work to enhance their lifestyles:

1. Collect the Envirogram using Oticon SAM or Syncro.
2. Discuss the environments that the client is typically listening in, focusing on those situations that pose the greatest difficulty.
3. Discuss how the various features (eg, Multiband Adaptive Directionality and TriState Noise Management) operate in the client's actual listening situations.
4. Using the hearing instrument connected to Syncro Live, reinforce to the client how the system provides real-life benefits in these situations.

Figure 4 shows an example, whereby the client has expressed difficulty listening in a noisy environment. The dispensing professional reads the Envirogram from Oticon SAM and, referring to the environmental data collected, discusses each of the various listening situations. Finding out that listening to colleagues on the subway is an especially difficult situation, a sound sample is selected that approximates this listening situation. The hearing instrument is then connected to Syncro Live so that the client views how technology, such as a directional microphone, automatically engages during this situation. This type of counseling tool allows for a greater amount of focused discussion regarding the benefits of the hearing aid technology.



**FIGURE 4.** Representation of the Envirogram indicating the speech in noise situation with the actual display from Syncro Live showing that, in this situation, the hearing instrument would be in directional mode to provide the best possible speech-over-noise ratio (SpNR).

An Envirogram assists in the fitting process through highlighting aspects of a client's experiences that may lead to fitting difficulties or in reaching their full potential with the hearing instrument. For instance, we have confirmed the anecdotal observation that a number of new users avoid certain auditory environments. This suggests that, during the hearing instrument fitting process, extra counseling is required to encourage the client to reconsider difficult listening situations and "give them another try." Similarly, it is crucial to determine whether the client's auditory ecology following fitting is consistent with the client's chosen lifestyle or if this is aversion due to difficulty with hearing which will be resolved with the wearing of premium hearing instruments. In this situation, comparison of the pre-fitting SAM Envirogram with the post-fitting Syncro Envirogram proves useful.

The Envirogram, as measured by the envirometer in SAM, has the capacity to assist the pre-fitting counseling and selection of a hearing instrument. It is designed to allow the dispensing professional a unique insight into the way a hearing instrument operates for the client in their day-to-day life. Similarly, both the hearing care professional and the patient can examine how the hearing instrument operates and the potential benefits provided before it is actually worn. This enables the patient to gain a greater sense of awareness about the fitting process and the benefits that can be achieved with today's latest hearing aid technology.

### **Incorporating Envirograms in the Fitting Process**

Envirograms are designed to be used in virtually every aspect of the current hearing instrument fitting

process. It should be remembered that they do not require an increase in fitting time. Working with our clients, we have found the following specific occasions that Envirograms provide benefit.

**Instrument selection.** You can use the Envirogram in the selection and comparison between products. For example, the patient can directly see how systems are driven by the listening enhancement features, providing real benefit for them in challenging listening situations.

**Preparing for the fitting.** At the initial appointment, the audiogram and impressions are often taken. Traditionally, there has been little for the client to do before the earmolds or ITEs return from the lab. Oticon SAM provides a unique opportunity for the client to wear SAM in their daily life before they obtain the hearing aid. In this way, the client is fully engaged and committed to the hearing instrument fitting process immediately from the outset. In essence, they are becoming attuned to their listening situations along with the SAM device. When they return for the actual fitting, the dispensing professional has valuable information about his/her auditory ecology which, in turn, provides a better understanding of how the hearing aid may benefit the client.

**During the fitting.** You can use the results shown on the Envirogram to explain your recommendations. It can be advantageous to discuss specific instrument features at this point, detailing how they address the client's various listening environments.

**Follow-up and fine-tuning.** Once the client has started wearing hearing instruments, you can view the actual Envirogram collected by the Syncro hearing aid. It can be examined directly in the Activity Analyzer section of the Genie fitting software. The Envirogram can be used to identify potential areas of concern or to reinforce to the client that they are wearing the hearing instrument correctly and that the automatic systems are working as designed. In this way, Envirograms provide an insight into the benefits that the signal processing (Artificial Intelligence) provides.

**Ongoing improvement.** Each time the client visits your practice, you can monitor and look for any changes in their auditory ecology. This is useful for identifying any problems and making improvements.

### **For Which Patients?**

Over the past year, our researchers have been collecting Envirogram experiences and talking with hearing care professionals as to how one might maximize the use of the Envirogram data. We have found that the resulting Envirogram allows better insight into the client's world and listening situations. The common theme has been that dispensing professionals appreciate the ability to use this information to demonstrate how the latest hearing aid technology can help to solve individual listening problems. It has also been noted how important it is to be working with real individual data rather than general data derived from a large "normal" population of hearing aid users.

Although Envirograms can be used with every client, we have heard that they provide significant benefit for the following patient populations:

**The reluctant potential new user and the customer in denial.** If a new user is reluctant to take the step of a hearing instrument trial, they may at least be ready to evaluate their listening environments. We know that many people with hearing loss initially blame their listening environments (eg, "spouse talks too softly," "family gatherings are too loud," etc), so they may be motivated to gain confirmation of this. Through discussion with the dispensing professional, they can evaluate the real-world benefits that a premium hearing instrument provides. This effectively shifts the conversation away from the need for hearing loss compensation to the benefits provided by today's most advanced hearing technologies. In other words, the issue of hearing loss (which may be seen by the client as an indictment that they are "getting old") becomes moot when faced with a system that allows them to hear in all these troublesome listening situations.

**Low-to-medium motivation, but ready to purchase.** If the client has decided to purchase a hearing instrument, but is not highly motivated, you can consider using SAM to increase their involvement in the process between the time of taking the impression and the fitting.

A current hearing aid user who is motivated to try new technology. Envirograms help you demonstrate to the current hearing aid user the benefits of owning the best instrument available. They will probably be looking for better performance in noise, and SAM can help you objectively show them how today's premium technology will provide even greater benefits.

A current user who is not very motivated to try new technology. If a client is clinging to outdated hearing aids, but is willing to take the step of comparing yesterday's and today's technology, the Envirogram provides them with this step. The Envirogram shows how advanced features will help them in their actual communication situations.

A reluctant spouse or family member. Sometimes family members, caregivers, or friends can unintentionally obstruct the rehabilitation process. It may be useful for the spouse to actually wear SAM—especially if the client is using a trial instrument. In this way, both the spouse and client can be actively involved in the decision-making process.

### **Conclusion**

No longer does the hearing care professional need to be in the dark about the use and performance of a hearing instrument in the real world. By using the Envirogram, the dispensing professional gains insight into how the hearing aid works for the patient in two crucial ways. First, through the use of the SAM, the client's real-world communication environment is evaluated. This provides the practitioner with crucial information about the way in which the hearing instrument benefits the client. Similarly, it allows the hearing-impaired person to understand the benefits of premium digital hearing instruments using data that is based on their lives. Second, during the fitting process, the envirometer is integrated into the Syncro hearing instrument so that environmental data (not just usage data) is available. This allows comparison and evaluation of the data to further facilitate the benefits of the technology actually received by the client.

The use of technology described in this article further facilitates the movement away from reliance on generalized data and averages to the ability to examine real-world data. This ensures that the person with a hearing impairment is actually viewed as an individual within the hearing aid fitting process. Therefore, datalogging moves from being a "nice-to-have" accessory to being an integral component of every customized, individual, prescriptive hearing instrument fitting.

*This article was submitted to HR by Mark C. Flynn, PhD, director of product concept definition at Oticon A/S, Smørum, Denmark. Correspondence can be addressed to HR or Mark C. Flynn, PhD, Oticon A/S, Kongebakken 9, Smørum, DK 5000, Denmark; email: [mcf@oticon.dk](mailto:mcf@oticon.dk).*

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