

Issue Stories

New Testing and Fitting Technology

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Innovative Clinical Tools in the Modern Era of Audiometry

by **Tricia Mikolai and Amanda Cerka Mroz, AuD**

It may have taken a few years, but PC-based instruments are finally allowing clinicians to enter the modern era of audiometry—without sacrificing time, accuracy, or patient comfort.

In 1995, the first PC-based audiometer set in motion a paradigm shift for clinical audiometry: no more hard-copy test marking, hand-written reports, or manual data entry. However, it is arguable that—despite the benefits of an integrated computer—an unfamiliar interface and a limited control panel cost hearing care professionals more in test time than the automation saved. As a result, there was limited acceptance of the platform.

Now, 15 years later, the Madsen Astera ushers in the next generation of technology that combines the best of PC-based audiometry with the best of traditional audiometry. Put simply, the Madsen Astera is a PC-based audiometer that is accurate *and* fast.

This article was submitted to *HR* by **Tricia Mikolai**, the founder of InkSmith, a business writing resource for the health care industry, and **Amanda Cerka Mroz, AuD**, clinical project liaison at Otometrics North America in charge of creating training materials and providing customer support for the Madsen Astera.

Since the Madsen Astera is essentially a high-speed computer with a traditional audiometer interface, it has nearly unlimited capacity for data storage, calculations, and automated processes. Of all its innovations, one feature in particular saves the most time regardless of patient type or clinician preference: pre-set user tests.

Functionality in Testing and Reporting

Customized test procedures. With traditional audiometers, clinicians set up each test as the hearing evaluation progresses. While this method is familiar, it can hinder standardization of the test battery. For Jacquelyn Georgeson, AuD, who uses the Astera with her students at San Diego State University, the pre-set user tests create a much more efficient workflow. “User tests help us get started faster so that patients aren’t waiting as long to begin,” according to Dr Georgeson. “We have several pre-set tests: one for both air and bone puretones, and one for word recognition—both word and phoneme scoring.”

The ability to create custom user tests shortens the process of moving from one patient to another. The software allows users to create custom tests using any number of testing parameters. Each clinician has the ability to save pre-set tests that meet specific testing requirements, from tests for pediatrics and adults to hearing aid fitting and tinnitus protocols. Once the user test is saved, it takes only seconds to start a new patient session and load the desired user test with the assurance of the same workflow every time.

Interface options and computer mouse. Just like setting up user tests, several interface options allow each clinician to create a testing process that optimizes his or her routine. Individuals can choose to use the audiometer control panel, which is configured exactly like a traditional audiometer or the computer keyboard.

The keyboard is not only useful for alpha-numeric typing but also has extensive single-key shortcuts for

operating the audiometer.

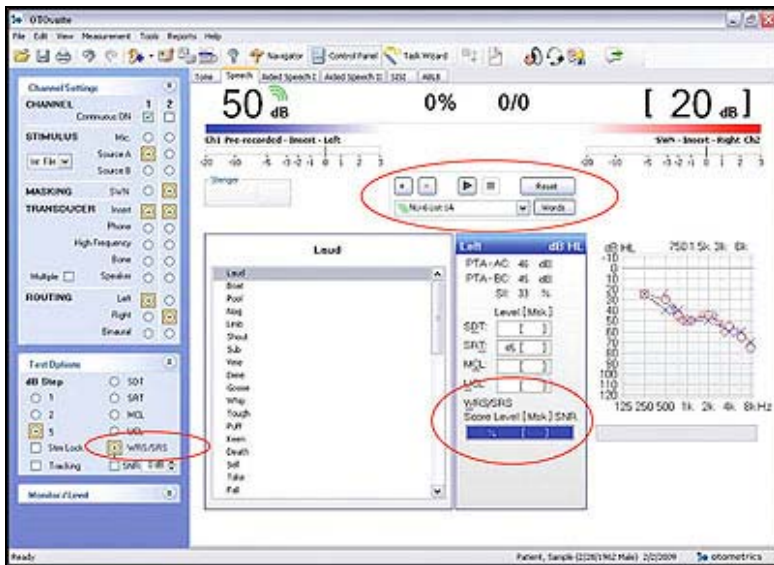


FIGURE 1. The User Test loads the pre-selected test type, word list, scoring, and playing options.

It's the mouse, however, that continues to gain popularity. Almost second-nature now, most people are accustomed to using a mouse to double-click in every computer-related application. With the Astera, it is also beneficial for fast navigation during testing. Patricia Dabrowski, AuD, of the Pennsylvania Ear Institute, points out that testing is more efficient using the mouse to choose words. "We don't just click 'play' and continue through the list; we double-click on words to randomize them for familiarization and then test presentation," says Dabrowski. Especially for those clinicians who like to interact directly with the software on-screen, using the mouse is an intuitive and fast way to conduct testing.

New soundfield testing stimulus. Besides making test time more efficient, the Astera has incorporated new automated features that improve test accuracy. One of the most ground-breaking is a new stimulus in soundfield testing called Frequency-Specific Hearing Assessment noise, or FRESH™ noise. With traditional audiometers, warble tone is the clinical stimulus for soundfield testing. This often presents a challenge when testing a pediatric patient who begins to lose interest in the testing procedure. The common solution is to change the stimulus—most often to narrow-band noise. However, narrow-band noise is calibrated in effective masking level and has a shallow filter slope (12 dB/octave), which can lead to an overestimation of the patient's behavioral threshold. FRESH noise is a second soundfield stimulus option that has a steep filter slope (100 dB/octave slope) and is calibrated in hearing threshold level, just like a warble tone.

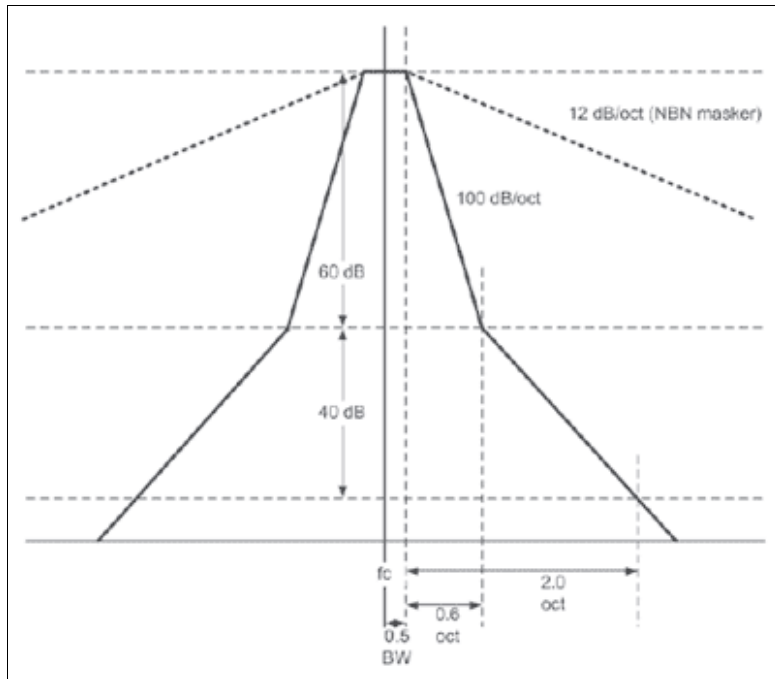


FIGURE 2. The filter for the FRESH noise stimulus is much narrower than the filter for the Narrow Band Noise masker.

Erica Friedland, AuD, of Nova Southeastern University has been using FRESH™ noise for several months. “FRESH noise helps us obtain more accurate thresholds in contrast to narrow-band noise, which isn’t designed for threshold search purposes,” says Dr Friedland. “FRESH noise also seems to get our patients’ attention better than narrow-band noise. Any kind of tool that we can use to get accurate and fast test results with young or developmentally challenged children is highly beneficial.” With FRESH™ noise, the puretone and warble tone stimuli have a frequency-specific companion that can keep the patient’s attention without sacrificing accuracy.

Unique pediatric test option. Pediatric patients present specific testing challenges for traditional audiometers. Clinicians find ways to make these audiometers fit the situation (eg, using a portable audiometer for conditioned play tasks), but the Astera’s Talk-to-Assistant headset is an alternative that facilitates success in these testing situations. The Talk-to-Assistant headset, which is integrated into the hardware, allows one examiner to be with the patient in the booth while another clinician uses the Astera on the other side. When testing babies, for example, the clinician wearing the headset can be next to the patient while the other delivers instructions and operates the instrument. The ability for clear communication between the two clinicians removes any guesswork regarding a patient’s response.

Reducing the need for masking in tests. The Astera offers another “assistant” that is designed to minimize patient fatigue by eliminating unnecessary masking during tone audiometry. The Masking Assistant uses built-in inter-aural attenuation values, specific to the selected transducer and frequency, to indicate when masking is necessary. A threshold that requires masking will start blinking on the audiogram.



FIGURE 3. The Madsen Astera is designed to combine the best of two worlds: traditional stand-alone audiometers and the newer PC-based systems.

Erin Burns, AuD, of Lamar University has seen her workflow improve because of this tool. “With the flashing indicator for masking, I don’t have to split my concentration,” says Dr Burns. “Not having to keep track of the difference between thresholds saves time, and testing is not as stressful when I’m working with patients who are getting tired. Keeping them on track takes my concentration so the Masking Assistant gives me one less thing to worry about.” Using the Masking Assistant to reduce the amount of time spent masking is beneficial to the patient, the clinician, and the accuracy of the test.

Enhanced data management. At the end of the testing session, regardless of how accurate the test itself was, traditional audiometry still presents several challenges that PC-based audiometry has overcome. Because of the Astera’s OTOsuite software, test data does not have to be transferred manually from the scoring sheet to an electronic file. Data is stored on the computer with the touch of a button, which eliminates one potential source of human error. Equally important, this saved data can be electronically transferred to NOAH or an electronic medical record database—another transfer point that is a potential source of human error.

PC-based instruments are finally allowing clinicians to enter the modern era of audiometry without sacrificing time, accuracy, or patient comfort. It can be a slow process to adopt new technology when traditional instruments still work very well. However, as patient populations become more diverse—demographically and diagnostically—only PC-based software is flexible enough to customize a test to a patient type with a simple click. It is also because of PC-based software that time-saving features can be added to the instruments with one goal in mind: serving the patient better without impeding the clinician.

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