



## PREFACE

### How to Use This Workbook

#### BACKGROUND

The original Hearing Aid Test Box and Probe Microphone workbooks were created as part of the Amplification 2 course at the University of Pittsburgh. Students who contributed to the Hearing Aid Test Box workbook in 2007 included A. Antoline, N. Beninati, K. Burkardt, G. Genna, W. Hurley, D. Jedlicka, A. Lao, D. Russell, M. Vargo, and R. Weyman. In 2009, students of a new class contributed to the Probe Microphone workbook and included E. Becker, J. Cosey, L. Diethorn, K. Faunce, J. Fruit, J. Kisiday, H. Li-Korotky, K. Monahan, S. Morningstar, M. Mueller, R. Mulla, A. Ripipi, K. Rorabaugh, J. Shalles, S. Sohns, N. Stark, H. Taslov, M. Ulep, C. Variava, R. Williams, and L. Zitelli. The workbooks were updated in 2011, 2019, and most recently for this publication in 2024. The original workbooks used the Verifit 1 (Audioscan) equipment. Dr. Lindsey Jorgensen and her students, Michelle Novak and Emily Paris, updated the workbooks to be compatible with the Verifit 2 equipment in 2017 and updated in 2019. With the discontinuation of the Verifit 1 equipment, the material presented in this publication uses the Verifit 2 (v.4.16.6) protocols and screen

shots in the examples. The material in this workbook, however, is not dependent on the equipment that you use; we just had to select equipment to provide examples of procedures and data. You should be able to apply all this material to whatever equipment you happen to use. You will need to consult the manufacturer's equipment manual to know how to run the tests, but the motivation for the tests and the interpretation of the data will be the same regardless of equipment used.

Dr. Jorgensen has dedicated a significant amount of her time to support clinical audiologists who are dedicated to adopting best practices in their work related to provision of hearing aids. To this end, she has offered a hands-on session at the American Academy of Audiology's annual conference since 2016. Dr. Jorgensen continues to offer this every year. Manufacturers of all the hearing aid test box and probe microphone systems supply equipment so participants can practice measurements and interpretation of data with the equipment they use in their clinics. Please consider taking advantage of this offering for even more support in adopting these measurements in your clinic to support individualized patient care.

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## THE GOAL OF PUBLISHING THIS WORKBOOK

### **The Workbooks Are Not Meant to**

These workbooks **are not meant to take the place** of the excellent textbooks that cover the science behind these topics, or the terrific resources provided by the manufacturers of hearing aid measurement equipment that support the measurements we are discussing. As mentioned earlier, we are using the Verifit 2 (Audioscan) in all our examples because that is the equipment we use in our educational and clinical programs at the University of Pittsburgh and UPMC. Audioscan provides outstanding educational material on their website (<https://www.audioscan.com/en/library/verifit2-product-knowledge/>). You can find the current user guide if you are using Audioscan equipment. You will want to refer to this as you complete the activities if anything is not clear or if the equipment/software has been updated and you need to review the process for a specific test. In addition, you will find a tutorial for every possible test you might want to do. If you are using different equipment, find the manufacturer's website and you will find the support you need to complete the tests outlined in the workbooks. In addition, you can find excellent lectures regarding the verification of hearing aid fittings on [www.AudiologyOnline.com](http://www.AudiologyOnline.com) that will support your learning.

Although ANSI standard tests are described in the workbook, it is well worth obtaining the latest version of the American National Standard Specification of Hearing Aid Characteristics (ANSI S3.22) for your reference. You can obtain a copy from <https://webstore.ansi.org/>.

### **The Workbooks Are Meant to**

Although there are excellent resources available to help you understand why verification of hearing aid fitting is important and there are resources to help you understand how to run the various tests, what we found lacking as we interacted with students and practicing clinicians was an understanding of the motivation to do the various tests and guidance on how to select the test that would help you address your patient's

concern. In addition, there was a lack of real-world examples that allowed practice with how to interpret and use the data that you measure with the various tests. This led to the design of this workbook, which leads with either clinician goals (e.g., "How do I verify that my patient's directional microphones are working?) or patient questions/complaints (e.g., "My battery doesn't last as long as it used to."). In this way, the learner, whether a student or a clinician, can apply these tests to actual clinical situations and then work with the resulting data to make clinical decisions (e.g., Is this something I can fix in the clinic or does this device need to go out for repair?).

In 2020, Dr. Zitelli and colleagues completed an American Academy of Audiology member survey exploring use of real-ear probe microphone measures and barriers encountered in their use.<sup>1</sup> Although the survey results were encouraging with many clinicians reporting that they routinely used these measures to verify the audibility of hearing aid fittings, individuals who did not use reported among other barriers a lack of training in their graduate programs or simply a lack of comfort with these measures and the ability to incorporate them into their hearing aid fitting appointments. It is certainly our hope that these workbooks might at least partially meet the needs of these individuals as they move toward best practices in hearing aid fitting. In addition, the presentation of case-based problems throughout the workbook will highlight the many uses of the hearing aid test box and real-ear probe microphone systems beyond audibility verification.

Each section and chapter provides an introduction and, in some cases, a detailed tutorial on a specific topic where we have found there is often misunderstanding or lack of knowledge. These tutorials are focused and help the learner move forward with the workbook and understand why they are doing the tests and how the information supports patient care. As mentioned previously, this is not a complete treatment of the material and does not replace the use of an excellent textbook. These workbooks are meant for practicing clinicians who are honing their knowledge and skills and for students who are developing their skills and knowledge related to evidence-based hearing aid fitting.

We hope the questions posed in each section of the workbook will make you think about how you can best support your patients through evidence-based practice. We strongly recommend that you move through this workbook from beginning to end in the order presented. In many cases, the material and procedures build upon earlier activities. Once you have completed the workbook, we hope this will become a resource that you can go back to and find exactly what you need depending on the clinical situation you are tackling at any given time.

**A NOTE TO EDUCATORS**

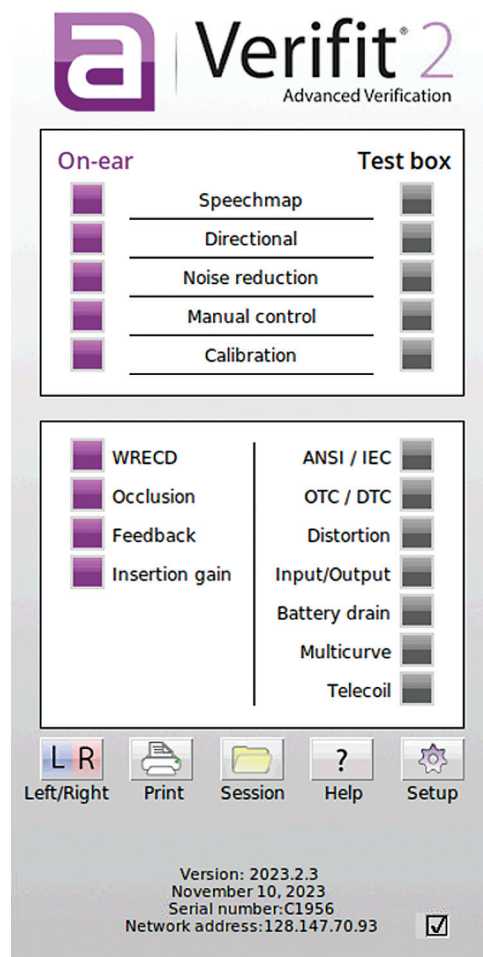
At the University of Pittsburgh and University of South Dakota, we have our first-year students complete these workbooks as part of the Amplification 1 course. They have a clinical procedure lab that helps them become comfortable with the equipment, but they complete the workbooks on their own so they can focus on their learning and explore the equipment, hearing devices, and interpretation of data without time constraints. Students complete the assignments and turn in the images of the measurements along with answers to the questions posed in the activities throughout the workbook. We provide a file folder (a binder with zippered pockets works well, too) dedicated to each section of the workbook with the materials that will be needed (e.g., specific hearing aid[s], insert earphones, hearing protection). We have found that it is easiest to use hearing aids that use disposable batteries (necessary for the Battery Drain Test and easier for the students so no one needs to remember to charge the hearing aids for the next group). We ask each student to keep their probe tube, hearing aid dome, insert earphone, and hearing protection to be used across activities to reduce waste and budget for materials. Needed materials are listed for every activity. In this way, we know the response of the hearing aids being measured and can have some control over the activity.

There are specific suggestions for educators in some of the activities to make the activity more manageable for students who are less familiar with hearing aids at this stage in their education. Educators will notice that many of the axes are not labeled on the Verifit graphs. Although we understand that there is only so

much room on the screen, as teachers of students new to this material, it can be very frustrating not to have this information. Because of this, you will want to take some time to orient students and make sure they can navigate their way to understanding what is being displayed on the graph (e.g., output vs. gain).

**A FEW ITEMS THAT WILL HELP YOU WITH THE WORKBOOK ACROSS SECTIONS/CHAPTERS**

There are a few items that we explain below that will assist you in every chapter. These are not repeated throughout the workbook, but rather offered here to support all of the activities.



**Figure 1** Verifit 2 home screen to make test selections.

## ACCESSING THE VERIFIT HOME MENU TO MAKE TEST SELECTIONS

The Verifit 2 is operated with a USB mouse or a keyboard to select menu items, to enter data, and to operate the tests. When the Verifit powers up, you will see the home menu (see Figure 1) for accessing all tests and functions. To see the home menu at any time to select tests, right click the mouse.

## CAPTURING GRAPHS/TABLES OF YOUR RESULTS

If you are an educator using these workbooks, you may want students to capture the images from the measurements they have recorded so that you can verify that they have completed assignments correctly. In some of the activities, the data from the measurements are used to respond to questions and the original measurements will be needed to check on the student responses. You can capture a graph from the screen in one of the following three ways.

1. Insert a USB storage drive into the back of the display unit. Right click the mouse and select **Setup**. Select the **Printing** tab. Make sure printing is enabled, change the output to **File**, store to **USB**, and select the format you prefer (PDF, PNG, GIF). Click the green checkmark to save your settings. Right click the mouse to bring up the main menu and select **Print** to save the file to the USB drive.
2. Use the Audioscan Remote Console application to display your screen on a PC. Use the Snipping tool (or something similar) to copy your graph and paste elsewhere. Note that this option requires the Verifit 2 to be connected to the internet.
3. The display also can be captured with a smartphone camera and the picture can be downloaded for use.

## READY TO START

The test box can be a powerful tool for pre-setting hearing aids for pediatric patients or any patient who is unlikely to sit quietly for an extended period of time, verifying features that have been selected for your patient, and troubleshooting a variety of

problems that may arise with hearing aids over time. The real-ear probe microphone system provides the most efficient, accurate way to verify that an audible signal has been provided to your patient across frequency and input level as a function of their hearing loss and ear canal acoustics. Audibility is the primary treatment for hearing loss. In addition, this equipment allows you to verify the signal processing and features that you have determined are needed by your patient to meet their communication goals. You are the expert and this equipment is a tool that supports your ability to individualize treatment for your patients. Without an understanding and educated use of these tools with the ability to interpret the data you garner from the tests, you are not able to provide an evidence-based approach to hearing aid fitting. If that is the case, your patient might as well follow a self-care pathway and navigate the hearing aid fitting on their own. You are the expert and your patients come to you with the expectation that you will use all tools reasonably available to you to support their hearing care journey. The test box and real-ear probe microphone system are tools that every audiologist would be expected to have in their practice; these are fundamental to providing hearing care.

Bottom line, if a device produces sound, amplifies sound, or attenuates sound, you can measure it. These tools are incredibly powerful, and we hope this workbook helps you unleash the power and supports the important patient care you provide.

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## CONFLICT OF INTEREST

None declared.

## REFERENCE

1. Zitelli L, Jedlicka D, Scaglione T, Cody L, Reitz A, Palmer C. The Results are in: 2020 Member survey of the use of real-ear probe microphone measurements. *Audiology Today Online Feature*. 2021; July/August 2021 Issue. Accessed April 9, 2024 at: [www.audiology.org](http://www.audiology.org)