OTOsuite™

OTOsuite and the QuickSIN™ Module

User Guide

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otometrics

Table of Contents

1   Introduction

The OTOsuite QuickSIN™ module is designed to integrate the QuickSIN™ Speech In Noise test from Etymotic Research Inc. as part of the OTOsuite software.

The purpose of the QuickSIN™ test is to test a person's ability to hear speech in a noisy environment.

The QuickSIN™ test should be used on all adult patients as part of the audiometric test battery.

The test represents a realistic simulation of a social gathering in which the listener may "tune out" the target talker and "tune in" one or more of the background talkers.

Each QuickSIN™ list takes approximately one minute to administer and score.

1.1   Intended use

The OTOsuite QuickSIN™ module is intended for use in connection with audiometric testing performed by audiologists, hearing aid dispensers, ENT doctors and other trained personnel.

1.2   System overview

The OTOsuite QuickSIN™ module

- Testing in OTOsuite is supported by the MADSEN Astera and the AURICAL Aud audiometers.
- OTOsuite with the QuickSIN™ module is supplied on the OTOsuite Installation disk.
- The QuickSIN™ speech material is supplied on a separate disk.

1.3   About this manual

This is your guide to using the OTOsuite QuickSIN™ module.

We strongly recommend that you read through the screen descriptions in this manual before you use the OTOsuite QuickSIN™ module for the first time.

> **Note •** *If you are using the OTOsuite QuickSIN™ module with Noah, we recommend that you are familiar with the screens and functions provided in Noah.*

1.3.1   Safety

This manual contains information and warnings which must be followed to ensure the safe performance of the OTOsuite QuickSIN™ module.

> **Warning •** *Local government rules and regulations, if applicable, should be followed at all times.*

Safety information is stated where it is relevant, and general safety aspects are described in OTOsuite QuickSIN™ module safety ► 16.

1.4 Typographical conventions

The use of Warning, Caution and Note

For safety reasons and appropriate use of the device and/or software, the manual contains **Warnings**, **Cautions** and **Notes**. These headings are used as follows:

> *Warning • Indicates that there is risk of death or serious injury to the user or patient.*

> *Caution • Indicates that there is a risk of injury to the user or patient or risk of damage to data or the device.*

> *Note • Indicates that you should take special notice.*

1.4.1 Navigating this manual

Menus, icons and functions to select are shown in bold type, as for instance in:

 Click the **Set options** icon on the toolbar or select **Tools > Options...**

2 Unpacking and Installing

2.1 Unpacking

1. Inspect the package and its contents for possible visual damage.
2. Check with the packing list to make sure that you have received all necessary parts and accessories. If your package is incomplete, contact your supplier.

2.2 Installation

For instructions on installing OTOsuite, see the OTOsuiteInstallation Guide which is inserted in the OTOsuite Installation box, and the OTOsuite documentation.

Whether you install OTOsuiteor the QuickSIN™ speech material first is of no consequence.

1. Install OTOsuite.
2. Install the QuickSIN™ speech material supplied on a separate disk.

3 QuickSIN™ Testing

3.1 Quick start

1. Select the desired test lists in the player.

2. Present the test with earphones or in a sound field, with the **Channel 1/Stimulus channel** set to 70 dB HL. For patients with PTA hearing losses greater than 45 dB HL, set the **Channel 1/Stimulus channel** to a level that by the patient is judged as "Loud but OK."

3. Instruct the patient to repeat the sentences spoken by the target (female) talker.

4. When you test in a sound field, instruct the patient hold the talkback microphone close enough so that responses are clearly audible to the tester.

5. Score the five key words underlined in each sentence by clicking the words on the screen. To score all words in the sentence click the button **All Correct** or right-click on the sentence and select **All Correct**.

6. When the test is completed, the resulting SNR Loss is automatically calculated as SNR Loss = 25.5 - Total Correct.

   The SNR Loss is presented in the results table together with test number, test ear, Number of included lists and transducer type.

   An interpretation is also presented according to the below categories. You can replace the automatic interpretation by typing a comment of your choice.

SNR Loss	Degree of SNR Loss	Expected improvement with directional microphone
0-3 dB	Normal/Near normal	May hear better than normals hear in noise.
3-7 dB	Mild SNR loss	May hear almost as well as normals hear in noise.
7-15 dB	Moderate SNR loss	Directional microphones help. Consider array microphone.
> 15 dB	Severe SNR loss	Maximum SNR improvement is needed. Consider FM system.

3.2 Navigation

For general information about navigating in the test screen, see also the OTOsuite User Manual.

The main screen consists of

- a **Scoring Counter** at the top of the screen,
- a **Player Panel** for selecting speech lists and controlling the test,
- a **List View** for viewing and scoring in the selected lists during presentation,
- a **Result Table** for viewing the total SNR loss and details related to the specific lists.

3.2.1 The Scoring Counter

0/0   List 0/0

During playback and scoring, the **Scoring Counter** at the top of the screen shows
- the number of words scored correctly of the total number of words in a sentence
- the list currently being presented of the total number of lists in the test.

3.2.2 The Player Panel

The **Player Panel** is a group of buttons enabling you to control the test. You can select lists for the test, and you can play, pause, resume, and stop the test.

Player Panel	
▶	• **Play** During play-back: – the **List View** shows only the speech lists that have been selected for the current test. – you can click on any sentence to jump freely in the selected speech lists. – the **Play** button is replaced by a **Pause** button.
‖	• **Pause** Pauses the presentation of a sentence, for instance if you wish to change the score of a word. Pausing does not terminate the test and does not calculate the final SNR Loss. When you press **Play** again to resume the test, the sentence is repeated from its beginning.
■	• **Stop** Terminates the test. The final SNR Loss is calculated for all the completed speech lists of the test.
• **Store & Reset** Terminates the test. An SNR Loss result is calculated from all the completed lists of that test.	
• **Reset** Terminates the test without storing any results.	
• **List selection** drop-down list Click to expand the **List View** for selecting the speech lists to be included in the test. Alternatively, select speech lists in the **Options** dialog and set up user tests using specific speech lists.	
• **Continuous Playback** If the checkbox is checked, the selected lists are presented without pausing between the sentences.	

3.2.3 The List View
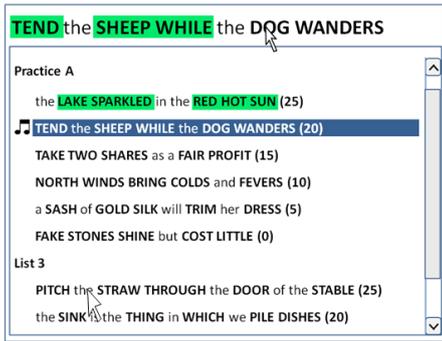
When you have selected speech lists for the test, the **List View** shows the selected lists.

Each sentence in a list has five key words that can be scored as **Correct** or **Incorrect**.

Words that can be scored are displayed in **BOLD TYPE**.

The sentence being presented is shown at the top of the list. This is where you score correctly repeated words by clicking on them.

- When you score a word as **Correct**, it is highlighted in green.

- When you score a word as **Incorrect**, it is highlighted in grey.

Speech Lists

- **Practice Lists** (available for MADSEN Astera and AURICAL Aud)

  For practicing the test flow so that the client is familiar with the procedure before the actual test starts. Results from **Practice Lists** are not included in the scoring.

- **Standard Lists** (available for MADSEN Astera and AURICAL Aud)

  Each of the twelve **Standard Lists** has six sentences, one sentence at each signal-to-noise ratio (SNR) of 25, 20, 15, 10, 5, and 0 dB. These SNRs encompass the range of normal to severely impaired hearing performance in noise.

  Speech and babble are presented through the same channel, i.e. from one speaker usually placed in front of the patient.

  If you test standard lists with masking, it is not possible to select separated lists.

- **Separated Lists** (available for MADSEN Astera)

  If you are testing with MADSEN Astera, select **Separate Speech - Noise** in the Control Panel to define that speech and babble are presented from separate channels, with speech coming from the front speaker and babble from the rear speaker. This is particularly suited for checking hearing instruments with directional microphones.

During play-back

An icon to the left of the sentence that is being presented shows the status.

    Indicates that the list is being presented.

    Indicates that the list is paused.

    Indicates that the list is stopped.

Scoring

Five key words can be scored in each sentence. The key words to be scored are shown in **BOLD** type.

One point is given for each key word repeated correctly. The number of words repeated correctly for each sentence is shown in the scoring counter at the top of the screen and, when the results have been calculated, in the **Result** table. The total of correctly repeated words is calculated for the list.

> **Note** • *For greater accuracy, two or more lists should be averaged*

3.2.4   The Results table

During review (when the Player is in idle mode), the **List View** shows all lists that have been included in calculating any SNR loss in the **Results** table.

Results Table	
Test	If needed, right-click and select **Delete Test** to delete the entire test row.
Ear	Shows which ear was tested.
SNR Loss	When the test is completed, the calculated result averages the SNR Loss scores based on the selected lists that are presented to the patient.
Lists	Shows the lists that were completed in the test.
Category/Comments	Shows a default comment. *Editing the text* You can overwrite the standard test comment with a note of your own. If you wish to retrieve the original comment, right-click the test and select **Insert default text**.

3.3   Preparing for QuickSIN™ testing

3.3.1   Preparing the test environment

1. Prepare the setup of the test environment to accommodate the type of QuickSIN™ test you wish to perform.

    –   **Standard lists**

        Standard lists can be presented either through earphones or sound field loudspeakers.

If you present **standard** lists through sound field loudspeakers, make sure that the front speaker is placed correctly in front of the seat where the patient is to be placed.

– **Separated lists**

Separated lists can only be presented through sound field loudspeakers.

If you present **separated** lists, make sure that both front and back speaker are placed correctly in relation to the seat where the patient is to be placed.

– **Testing through sound field loudspeakers**

Make sure that the patient and talk back microphones are placed as closely together as possible in order to hear the patient response through the recorded babble.

Alternatively, you can pause the playback between sentences in order to better hear the patient response.

See Testing with separated lists ▶ 12.

### 3.3.2   Preparing OTOsuite

1. Click on the **QuickSIN** tab in the **Audiometry** module.

    – If the **QuickSIN** tab is not shown, enable viewing the **QuickSIN** tab in the **Configuration Wizard**.

2. Click the **List Selection** button to expand the list of sentences, and enable the sentences you wish to include in the test.

    It is recommended that you use several lists because the calculated result averages the SNR Loss scores based on the selected lists that are presented to the patient.

    Alternatively, you can select the speech lists in the **Options** dialog and set up user tests using specific speech lists.
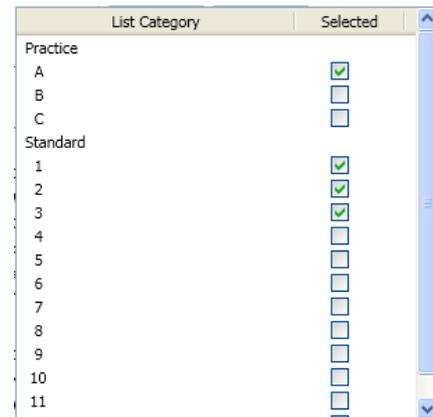
3. Present the test through earphones or in a sound field with the attenuator set to 70 dB HL. For subjects with PTA hearing losses greater than 45 dB HL, set the attenuator to a level that is "Loud, but OK".

4. Test monaurally or binaurally. Insert earphones (EAR 3A or EAR 5A) are recommended for monaural testing; their high interaural attenuation typically makes masking of the non-test ear unnecessary.

3.3.3   Preparing the patient

You can use the practice lists to familiarize the patient with the test protocol or to determine the "Loud, but OK" presentation level for persons with hearing loss of 50 dB HL and greater.

1. Instruct the patient to repeat the sentences that are presented during the test.

Test instructions

"Imagine that you are at a party. There will be a woman talking and several other talkers in the background. The woman's voice is easy to hear at first, because her voice is louder than the others. Repeat each sentence the woman says. The background talkers will gradually become louder, making it difficult to understand the woman's voice, but please guess and repeat as much of each sentence as possible."

- **Testing through sound field loudspeakers**

  Make sure that the patient and talk back microphones are placed as closely together as possible in order to hear the patient response through the recorded babble.

  Alternatively, you can pause the playback between sentences in order to better hear the patient response.

Setting the presentation level

1. Set the presentation level.

   You can use the practice lists to determine the correct presentation level. These lists are not equivalent to the test lists, and do not reliably predict SNR loss.

   - For pure tone average (PTA) less than 45 dB HL, set the attenuator dial to 70 dB HL.
   - For pure tone average (PTA) of 50 dB HL or greater, set the attenuator dial to a level that is judged to be "Loud, but OK."

   The sound should be perceived as loud, but not uncomfortably loud. (See Appendixes ► 17.)

Practice lists

1. Click **Play** on a practice list to familiarize the patient with the task.

2. Use the **Pause** button between sentences if the patient responds slowly or disable **Continuous Playback** in the player. This will allow you to present each sentence manually using the **Play** button.

3.4 Performing the QuickSIN™ test

Before you start testing, make sure that you are well prepared. Good preparation is important in order to perform a Quick-SIN™ test as quickly and efficiently as possible. See the following sections:

- Preparing for QuickSIN™ testing ► 9, where you make sure that the test environment accommodates the type of test you wish to perform.
- Preparing OTOsuite ► 10, where you prepare OTOsuite before you spend time on preparing the patient.
- Preparing the patient ► 10, where you familiarize the patient and set the presentation level of the test.

3.4.1 Performing the QuickSIN™ test

1. When you have run one or more practice lists in order to familiarize the patient with the test and to set the presentation level, proceed with one of the test lists.

2. When a sentence is presented, click the words that are scored correctly. The scored words are highlighted in green.
   - If you have scored a word incorrectly, pause the test and right-click on the word to toggle the score.
   - When the entire sentence has been presented, you can click the button **All Correct** or right-click on the sentence and select **All Correct** to score all words in the sentence.

3. Click the **Play** button to resume the test.

4. When the test is completed, click **Stop** to terminate the test. The **SNR Loss** is calculated based on the lists that were presented and is shown in the **Result Table**.

   If the test is stopped before all lists have been scored, a result will be calculated from all completed lists up to that point.

   SNR Loss is calculated for each list by using the formula: SNR Loss = 25.5 − Total Correct.

   For greater accuracy, two or more lists should be averaged (see Reliability (statistics made useful) ► 15 and Comparison between two conditions ► 16).

3.5 Testing with separated lists

The purpose of testing with separated lists is to provide a quick way to verify the effectiveness of hearing instruments that have switchable directional microphones.

3.5.1 Test procedure for separated lists

If the loudspeakers are located at +45° and -45°, test each ear separately.

1. Position the patient in the sound booth so that speech is presented from in front at 45°and babble from behind at approximately 135°.

2. Direct the speech (Channel 1) to the loudspeaker at 45° and direct the babble (Channel 2) to the loudspeaker at 135°.

> **Note •** *There are two possible "45 degree" orientations for the patient. The desired orientation places the instrumented ear between the loudspeakers. When the other ear is tested, the patient will need to be rotated to face the opposite wall and the speech and babble switched to the opposite speakers.*
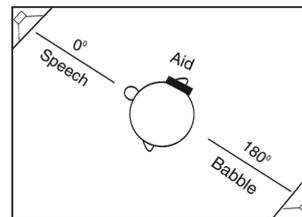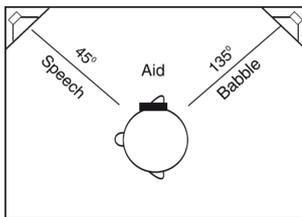
3. If the loudspeakers are located at 0° and 180°, you can test each ear separately or both ears together. Position the patient in the sound booth so that speech is presented from in front at 0° and babble from behind at 180°.

Using the separated lists, two types of demonstrations are possible:

Subjective

1. Have the patient set the hearing instrument/s to OMNI.

2. Adjust the speech to 50 dB HL (65 dB SPL conversational speech level)and pause the playback. When the test is paused you can double click sentences in order to play them.

3. Select a sentence with a noise level where the patient reports that it just prevents understanding the speech.

4. Repeat playing the sentence and have the patient switch back and forth between OMNI and Directional positions on the hearing instrument/s.

   The improved intelligibility in the directional mode should be obvious.

Objective

1. Set the dial for both channels to 50 dB HL.

2. Score each list as before to obtain SNR Loss.

3. Test in OMNI and Directional. A minimum of three lists in each condition (six total) is required for a valid comparison to an accuracy of 1.5 dB at the 80% confidence level (see Comparison between two conditions ► 16).

4. If you find a difference greater than 4 dB with one list in each condition, you have already reached the 95% confidence level.

4 QuickSIN™ - Description of the Test

4.1 The purpose of QuickSIN™ testing

The primary complaint of hearing-impaired persons is difficulty hearing in background noise. The measurement of SNR loss (signal-to-noise ratio loss) is important because it is not possible to reliably predict a person's understanding of speech in a noisy environment based on the pure tone audiogram (Killion & Niquette, 2000).

The QuickSIN™ test was developed to:

- Provide a one-minute estimate of SNR Loss

- Provide a quick way for clinicians to quantify a patient's ability to hear in noise

- Determine if extended high frequency emphasis improves or degrades understanding of speech in noise

- Assist professionals in choosing appropriate amplification and other assistive technologies

- Demonstrate that hearing instruments with directional microphones improve speech intelligibility in noise

- Provide a large number of equivalent test lists for use in clinical and research work

- Provide information useful in counseling patients regarding realistic expectations

4.1.1 The QuickSIN™ methodology

A list of six sentences with five key words per sentence is presented in four-talker babble noise. The sentences are presented at pre-recorded signal-to-noise ratios which decrease in 5-dB steps from 25 (very easy) to 0 (extremely difficult). The SNRs used are: 25, 20, 15, 10, 5 and 0, encompassing normal to severely impaired performance in noise.

4.1.2 What is SNR Loss?

We are interested in the patient's performance in noise compared to normal-hearing persons' performance in noise. We consider this difference in performance the SNR Loss.

Similar to the definition of pure tone hearing loss, SNR Loss is defined as the dB increase in signal-to-noise ratio required by a hearing-impaired person to understand speech in noise, compared to someone with normal hearing. A normal-hearing person requires about +2 dB signal-to-noise ratio (speech louder than the background noise by 2 dB) to identify 50% of key words in sentences on the QuickSIN™ test. The value of SNR Loss is derived from the SNR-50 (signal-to-noise ratio for 50% correct) score. A hearing-impaired person who requires speech to be 8 dB higher than the noise to achieve a 50% correct score would have a 6 dB SNR Loss.

SNR LOSS: 8 dB - 2dB= 6dB
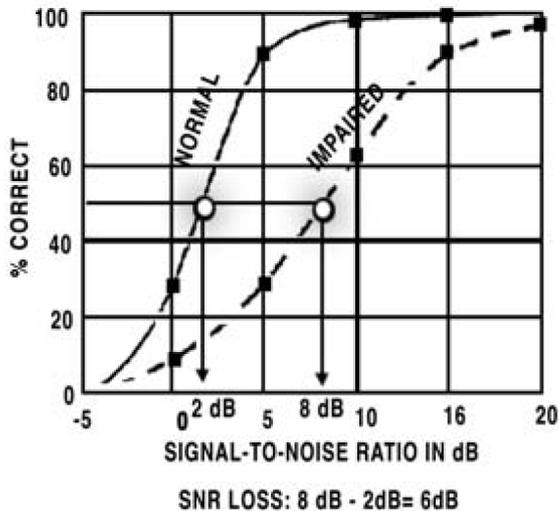
Different tests will give different values of SNR-50 for the same patient. We have found that changing from a female to male talker and using easier sentences decreases the normal SNR-50 by 5 dB from +2 to –3 dB, even though the babble noise is identical in both tests. Similarly, when continuous speech-spectrum noise is used, the reported SNR will differ by about 7 dB between computed rms calibration and traditional frequent-peak VU-meter readings (Ludvigsen and Killion, 1997). We've chosen to report QuickSIN™ scores in SNR Loss because it is substantially independent of calibration and test material. Calibration and/or test material differences that affect the SNR-50 values equally for normal and hearing-impaired subjects will cancel out in the SNR Loss calculation.

4.1.3   The QuickSIN™ material

The QuickSIN™ test contains lists of sentences in noise (4-talker babble) that can be used to determine SNR Loss (signal-to-noise ratio loss).

There are three types of lists:

- 12 standard equivalent lists, for basic SNR Loss testing

- 3 practice lists (not equivalent to lists 1-12), for practice only

- 12 lists with speech on channel 1 and constant-level babble on channel 2 (separated), to demonstrate directional microphone effectiveness

4.2   Where does the number 25.5 come from?

First we need to explain where the number 27.5 comes from. Following the Tillman-Olsen (1973) recommended method for obtaining spondee thresholds, we have a simple method for estimating SNR-50 using nothing more than the total number of words correct.

In the Tillman-Olsen method, two spondees are presented at each level, starting at a level where all spondees are repeated correctly and decreasing in two dB steps until no responses are obtained for several words. The starting level plus 1 dB, minus the total number of spondees repeated correctly, is the spondee threshold. The simple arithmetic comes from the use of 2 dB steps and 2 words per step. If the audiometer only has 5 dB steps, the corresponding method would use 5 words per step and take the starting level plus 2.5 dB (half of the step size, just as in the case of 2 dB steps), minus the total number of spondees repeated correctly.

The QuickSIN™ test has five words per step and 5 dB per step. Our highest SNR is 25 dB so we take 25 + 2.5 = 27.5 minus the total number of words repeated correctly. This gives what we call SNR-50, the signal-to-noise ratio required for the patient to repeat 50% of the words correctly. For example, if someone repeats all the words correctly down to 15 dB SNR and then misses everything beyond that point, they gave 15 correct responses (five each at 25, 20, and 15 dB SNR). Since they scored 100% correct at 15 dB SNR and 0% correct at 10 dB SNR, their SNR-50 would be about 12.5 dB, halfway between 15 and 10. This is the value given by the formula 27.5 - 15 = 12.5 dB.

4.2.1 The formula for SNR Loss

Since SNR-50 for normal-hearing persons is 2 dB, we subtract 2 dB to derive the formula for a patient's SNR LOSS: 25.5 − (Total words correct in 6 sentences)

SNR loss	= SNR-50 − 2 dB
	= 27.5 − (total words correct) − 2 dB
	= 25.5 − (total words correct)

4.3 Separated speech & noise channels

Separated Lists contain the 12 standard QuickSIN™ lists recorded with the speech and noise on two separate channels (target speech on channel one and 4-talker babble on channel two).

4.3.1 Directional comparisons

A complete measurement of a directional hearing instrument requires extensive laboratory facilities, but a good demonstration of the ability of directional hearing instruments to reject sound from the sides and rear can be obtained in a standard test booth with loudspeakers located in the corners (at +45° and -45° or 0° and 180° azimuth).

It is important to remember that any test conducted in a sound booth will not precisely reflect results in the real world. By design, sound booths have minimal reverberation, and testing is conducted using a limited number of loudspeakers (usually two) that are in fixed locations. In this setup, it is possible that the location of the speakers may interact with the null of the directional microphone(s). Therefore, these measures should not be used to assess effectiveness of one directional microphone design vs. another (where differences are usually small) but rather as a general measure comparing OMNI to Directional, to verify that the directional microphones are working and providing directivity (rejection of sound from the sides and rear).

4.4 Reliability (statistics made useful)

A QuickSIN™ score obtained in one minute from a single list is accurate to about 1.8 dB at the 80% confidence level. By "about" we mean that 80% of the time (four times out of five) the "true" score (obtained from many lists) will be within 1.8 dB of the single-list test score. Statisticians would say we have "an 80% confidence level" that the true QuickSIN™ score will be within + 1.8 dB of the measured score. To put these numbers in perspective, a typical clinical threshold is accurate to about 5 dB at the 80% confidence level. In other words, one time out of five a threshold can be expected to be 5 dB or more above or below the recorded value. An 80% confidence level is normally adequate for clinical testing, where the results of any one test are used in context with other factors. In the case of a test of SNR Loss, for example, the clinician will already have formed an idea of the patient's communication difficulty from conversations with the patient. A 95% confidence level is common for research reporting, where a reduced risk of error is normally required.Using a statistical criterion that gives a 95% confidence level reduces the probability of error to one time in twenty. The following table shows the number of lists required for a given accuracy for confidence levels of 80%, 90% and 95%.

Number of lists	1	2	3	4	5	6	7	8	9
95% C.I. ±, in dB	2.7	1.9	1.6	1.4	1.2	1.1	1.0	1.0	0.9
90% C.I. ±, in dB	2.2	1.6	1.3	1.1	1.0	0.9	0.8	0.8	0.7
80% C.I. ±, in dB	1.8	1.3	1.0	0.9	0.8	0.7	0.7	0.6	0.6

The numbers in the table are based on the rms average standard deviation of 1.4 dB in SNR found for the hearing-impaired subjects included in the Beta-site testing. This figure comes from two numbers: a) the 1.3 standard deviation derived from the combined individual test-retest scores, and b) the across-list standard deviation of 0.6 dB. If only normal-hearing subjects are used, the appropriate standard deviation drops from 1.4 dB to 1.25 dB. A standard deviation of 1.4 dB is slightly better than the standard deviation which would have been expected based on the original SIN Test. That standard deviation of 0.7 dB, multiplied by the square root of five, would predict a standard deviation of 1.6 dB for the QuickSIN™ test which uses only one sentence at each level compared to five sentences at each level on the SIN Test. The more careful preselection of sentences used in the QuickSIN™ test may have contributed to the slightly better result.

4.5   Comparison between two conditions

Averaging the results of several QuickSIN™ lists improves the reliability compared to a single list. This is particularly important when QuickSIN™ lists are used to compare two conditions, often two hearing instruments or hearing instrument adjustments. In this case, the real differences may not be large. The following table gives the number of lists required for the comparison between two conditions at an 80%, 90% or 95% confidence level. For a critical difference of 1.9 dB, for example, four lists are required for each condition at the 95% level. For a critical difference of 1.4 dB at the 95% confidence level, eight lists are required for each condition. For a simple example, one list in each condition with the assumed standard deviation of 1.4 dB gives a 95% confidence level of 1.96 x 1.41 x 1.4 = 3.9 dB. To improve from 80% to 95% confidence level at a given criterion requires an approximate doubling of test time. Example: Two lists in each condition gives a 1.8 dB critical difference at the 80% confidence level; four lists in each condition provide 1.9 dB at the 95% confidence level, and five lists in each condition provide 1.7 dB at the 95% confidence level.

Lists per condition	1	2	3	4	5	6	7	8	9
95% C.D. ±, in dB	3.9	2.7	2.2	1.9	1.7	1.6	1.5	1.4	1.3
90% C.D. ±, in dB	3.2	2.2	1.8	1.6	1.4	1.3	1.2	1.1	1.1
80% C.D. ±, in dB	2.5	1.8	1.5	1.3	1.1	1.0	1.0	0.9	0.8

5   OTOsuite QuickSIN™ module safety

This Guide contains information and warnings, which must be followed to ensure the safe use of the OTOsuite QuickSIN™ module. Local government rules and regulations, if applicable, should also be followed at all times.

When the OTOsuite QuickSIN™ module is used in conjunction with a test device, make sure that all information and warnings in the user documentation of the test device are followed.

For safety specifics concerning test modules and test devices, see the specific manuals.

5.1 Symbols used

CE xxxx	Complies with Medical Devices Directive 93/42/EEC.
⚠️	Used in error message dialogs if software program fails. See the detailed information in the dialog box.

5.2 Manufacturer

GN Otometrics A/S

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Denmark

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📠 +45 45 75 55 59

www.otometrics.com

5.2.1 Responsibility of the manufacturer

The manufacturer is to be considered responsible for effects on safety, reliability, and performance of the equipment only if:

- All assembly operations, extensions, re-adjustments, modifications or repairs are carried out by the equipment manufacturer or personnel authorized by the manufacturer.
- The electrical installation to which the equipment is connected complies with EN/IEC requirements.
- The equipment is used in accordance with the instructions for use.

The manufacturer reserves the right to disclaim all responsibility for the operating safety, reliability and performance of equipment serviced or repaired by other parties.

6 Appendixes

6.1 Categories of loudness

7. Uncomfortably Loud

6. Loud, But OK

5. Comfortable, But Slightly Loud

4. Comfortable

3. Comfortable, But Slightly Soft

2. Soft

1. Very Soft

Valente and Van Vliet (1997)

6.2   Technical Note - Crosstalk

In the separated lists the target speech and the babble are recorded on separate channels, but a small amount of inter-channel crosstalk (-65 dB) exists in the original recording. Under normal conditions this is not audible, but during silent periods on the sentence channel, a faint babble can sometimes be heard in the background. This does not affect normal usage of these lists.

6.3   References

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