



**HEARING AID RESEARCH LABORATORY
SPEECH INTELLIGIBILITY TESTS**

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Introduction

These audio recordings include two tests of the intelligibility of connected speech. Materials for each test include a calibration noise for setting levels, a set of practice passages, a set of test passages, and some additional passages which vary for the two tests. All speech passages are recorded with the talker on the left channel and a competing babble on the right channel.

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Contents

Speech Intelligibility Rating (SIR) Test

The SIR Test uses subjective estimations of the proportions of words understood to quantify the intelligibility of continuous speech. The user is encouraged to consult Cox and McDaniel (1989) and McDaniel and Cox (1992) about the development and administration of the test and reliability and sensitivity of data from normal-hearing and hearing-impaired listeners. Briefly, in this test, listeners rate the intelligibility of test passages on an equal-appearing interval scale from 0 to 100. A rating of 0 should reflect a situation in which *none* of the words is understood and a score of 100 would represent a situation in which *all* of the words are understood. A facsimile of a suitable rating scale is included with these recordings.

The materials for the SIR Test are contained on tracks 1-31. They comprise a speech-shaped noise for calibration, a set-up passage, 20 test passages, 6 validity passages, and 3 practice passages. These materials were dubbed from decade-old reel-to-reel tape recordings. As a result of deterioration in storage, occasional slight defects can be heard. These are not flaws in the recordings.

Track 1 contains a speech-shaped calibration noise that approximates the long-term spectrum of the talker and the competing babble. If the calibration noises are set to VU meter readings of -5 dB on both channels, both the speech passages and the babble will have peak readings near 0 dB on the VU meter. Note that, on the left channel, the long-term overall level of the calibration noise is one decibel higher than the mean long-term overall level of the test passages. On the right channel, the long-term overall level of the calibration noise is three decibels lower than the mean long-term overall level of the competing babble associated with the test passages.

Track 2 is the set-up passage. It is used to determine an appropriate signal-to-babble ratio (SBR) before the test is administered. A bracketing procedure using 20-second segments of the set-up passage has been suggested as a means for establishing the appropriate SBR for an individual test. To assist the operator in locating segments, the set-up passage contains brief silent intervals at five locations approximately 20 seconds apart. Each segment is indexed.

Tracks 3 through 22 contain the 20 test passages, each approximately 50 seconds in length. Either full or half passages may be used per intelligibility judgment. Each passage is indexed at approximately the mid-point to facilitate access to the second half. In addition, there is a brief lapse in the speech and babble at the indexed location to allow time to manually pause the recording, if desired. It should be noted that the passages are recorded so that the frequent

peaks are at equal levels on a VU meter. This results in some differences among passages when they are measured in terms of overall long-term level. These differences should not be compensated because the test passages are of equal average intelligibility (based on the rating scale) only when administered at these relative levels.

Tracks 23 through 28 comprise the six validity passages. These may be used to determine whether the listener is responding to intelligibility as instructed. The six passages proceed from unintelligible (track 23) to highly intelligible (track 28). Note that the least intelligible passage was recorded backwards as a “catch” passage and should achieve an intelligibility rating near to zero. Listeners whose responses fail to approximate the appropriate rank order for these tracks may be scoring the passages on some basis other than perceived intelligibility and may not be suitable candidates for the SIR test.

Tracks 29 through 31 encompass three passages of approximately equal intelligibility, slightly less intelligible than the test passages. They may be used for practice or reliability testing.

Connected Speech Test (CST)

The CST provides objective quantification of the intelligibility of connected speech. The user is encouraged to consult Cox, Alexander and Gilmore (1987) and Cox, Alexander, Gilmore, and Pusakulich (1988, 1989) about the development and administration of the test and reliability of data from normal-hearing and hearing-impaired listeners. Briefly, the talker (left channel) is a female who produces speech of average intelligibility. The multitalker babble (right channel) can be adjusted to simulate the signal-to-babble ratio (SBR) encountered in everyday listening situations. Each test item is a passage of speech, 9 or 10 sentences in length, about a familiar topic. The listener should be informed of the passage topic. Each passage is repeated one sentence at a time. The passage score is based on the proportion of 25 scoring words correctly repeated. Scores typically are averaged across several test passages to produce a measure of intelligibility for a particular listening condition.

The materials for the CST are contained on tracks 32-81. They comprise a speech-shaped noise for calibration, 48 test passages, 8 practice passages, 16 learning passages, and a track containing babble on both channels. Though the 48 test passages are equally intelligible, on average, for normal-hearing listeners, they have not been found to be equivalent for hearing-impaired listeners. Thus, the test passages are arranged into 24 passage pairs and each pair is contained on a single track. The pairs have been found to be equivalent in average intelligibility for most hearing-impaired listeners.

In the original video laser disk recording of the CST, the test passages were produced at a conversational rate with natural timing between sentences. In addition, the original recording includes a video display of the passage topic word (before the passage is delivered) and shows the head and shoulders of the talker, if desired. In these recordings, the audio portion has been dubbed from the video laser disc. During the dubbing process, brief silent intervals were inserted between sentences so that the test could be presented manually, if desired. A complete script of the test, practice, and learning passages, with scoring words highlighted, is provided with these recordings. This script can be copied for use in manual scoring.

Tracks 32 through 55 comprise the 24 pairs of test passages. Each pair is contained on one track and each sentence is indexed. Note that “lung”, “calendar”, and “lizard” (tracks 34, 46, and 48) have only nine sentences. All of the other test passages have ten sentences. Also note

that the first word of track 52, index 1 (“eye”) is partly inaudible. This occurred in original mastering and is not a flaw on this recording.

Tracks 56 through 63 contain the eight practice passages. Each track includes one passage and each sentence is indexed. These passages are similar in structure and content to the test passage but have slightly poorer reliability. When the practice passage is novel to the listener, the scores should be reasonably close to performance on the test passages. Practice passage may be used to select an appropriate SBR for testing or to acclimate the listener to the task.

Tracks 64 through 79 include the 16 learning passages. Each track includes one passage and each sentence is indexed. The learning passages are also similar in structure to the test and practice passages but with relatively poor reliability. They are used primarily to familiarize the listener with the CST and the characteristics of the talker. Scores on these passages are not necessarily predictive of the listener’s performance on the test passages. Note that the final sentence of the last learning passage (“kidney”, track 79) was not recorded on the video laser disc due to space limitations and, therefore, does not appear with these recordings.

Track 80 is the calibration noises for the CST test. These calibration noises are different from those on the video laser disc. The calibration noises for these recordings were created by filtering random noise so that the long-term level in each 1/3-octave band is essentially the same as that in the corresponding test materials. On the left channel, the calibration noise has the same 1/3-octave band spectrum and level as the talker (the RMS difference between talker and calibration noise from 200 Hz to 10 kHz is 0.66 dB). On the right channel, the calibration noise has the same 1/3-octave band spectrum and level as the multitalker babble (the RMS difference between babble and calibration noise from 200 Hz to 10 kHz is 0.53 dB). Note that this relationship between test materials and calibration noise was computed over the entire corpus of test materials. For any individual sentence or passage, there will probably be differences between the spectrum of the calibration noise and that of the test materials.

If the calibration noises on track 80 are set to readings of -5 dB (left channel) and -4 dB (right channel), both the test passages and the babble will have peak readings near 0 dB on the UV meter.

Track 81 contains several minutes of CST babble on both channels. Material on the left channel is uncorrelated with that on the right channel. Levels on both channels are the same as for the right channel on tracks 32 through 79. Excerpts from this track may be used if it is desired to present uncorrelated babble from additional loudspeakers as a competing message.

References

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Track Listing

Track	Index	Title	Time (sec)	Remarks
1.	1	Speech shaped noise	84	SIR test calibration
2.	1-6	Television	132	SIR set-up passage
3.	1-2	Dove	50	SIR test passage
4.	1-2	Umbrella	50	SIR test passage
5.	1-2	Cabbage	50	SIR test passage
6.	1-2	Elm	52	SIR test passage
7.	1-2	Goose	49	SIR test passage
8.	1-2	Zebra	48	SIR test passage
9.	1-2	Lion	50	SIR test passage
10.	1-2	Oyster	53	SIR test passage
11.	1-2	Dinosaur	51	SIR test passage
12.	1-2	Crow	51	SIR test passage
13.	1-2	Guitar	50	SIR test passage
14.	1-2	Leopard	54	SIR test passage
15.	1-2	Grass	50	SIR test passage
16.	1-2	Egg	53	SIR test passage
17.	1-2	Dictionary	48	SIR test passage
18.	1-2	Dice	49	SIR test passage
19.	1-2	Nails	43	SIR test passage
20.	1-2	Cactus	48	SIR test passage
21.	1-2	Ear	46	SIR test passage
22.	1-2	Kangaroo	48	SIR test passage
23.	1-2	Wheat (backwards)	50	SIR validity passage #1
24.	1-2	Vegetable	51	SIR validity passage #2
25.	1-2	Lettuce	48	SIR validity passage #3
26.	1-2	Glove	46	SIR validity passage #4
27.	1-2	Carrot	46	SIR validity passage #5
28.	1-2	Watch	47	SIR validity passage #6
29.	1-2	Duck	53	SIR practice passage
30.	1-2	Cotton	51	SIR practice passage
31.	1-2	Lemon	49	SIR practice passage
32.	1-10	Window	36	CST test pair 1(1)
	11-20	Glove	34	CST test pair 1(2)
33.	1-10	Umbrella	33	CST test pair 2(1)
	11-20	Giraffe	33	CST test pair 2(2)
34.	1-9	Lung	28	CST test pair 3(1)

	10-19	Dove	31	CST test pair 3(2)
35.	1-10	Carrot	32	CST test pair 4(1)
	11-20	Grass	32	CST test pair 4(2)
36.	1-10	Nail	30	CST test pair 5(1)
	11-20	Woodpecker	31	CST test pair 5(2)
37.	1-10	Owl	31	CST test pair 6(1)
	11-20	Vegetable	32	CST test pair 6(2)
38.	1-10	Lemon	32	CST test pair 7(1)
	11-20	Violin	33	CST test pair 7(2)
39.	1-10	Wheat	33	CST test pair 8(1)
	11-20	Ice	34	CST test pair 8(2)
40.	1-10	Donkey	34	CST test pair 9(1)
	11-20	Guitar	32	CST test pair 9(2)
41.	1-10	Envelope	32	CST test pair 10(1)
	11-20	Grasshopper	33	CST test pair 10(2)
42.	1-10	Lettuce	33	CST test pair 11(1)
	11-20	Dictionary	35	CST test pair 11(2)
43.	1-10	Lawn	32	CST test pair 12(1)
	11-20	Cactus	34	CST test pair 12(2)
44.	1-10	Cabbage	32	CST test pair 13(1)
	11-20	Gold	33	CST test pair 13(2)
45.	1-10	Weed	35	CST test pair 14(1)
	11-20	Chimney	32	CST test pair 14(2)
46.	1-10	Lead	32	CST test pair 15(1)
	11-19	Calendar	28	CST test pair 15(2)
47.	1-10	Lion	33	CST test pair 16(1)
	11-20	Zebra	32	CST test pair 16(2)
48.	1-9	Lizard	32	CST test pair 17(1)
	10-19	Wolf	34	CST test pair 17(2)
49.	1-10	Orange	30	CST test pair 18(1)
	11-20	Oyster	30	CST test pair 18(2)
50.	1-10	Dice	33	CST test pair 19(1)
	11-20	Eagle	33	CST test pair 19(2)
51.	1-10	Ear	34	CST test pair 20(1)
	11-20	Liver	35	CST test pair 20(2)
52.	1-10	Leopard	32	CST test pair 21(1)
	11-20	Eye	31	CST test pair 21(2)
53.	1-10	Zipper	31	CST test pair 22(1)
	11-20	Egg	32	CST test pair 22(2)
54.	1-10	Clock	33	CST test pair 23(1)
	11-20	Kangaroo	33	CST test pair 23(2)
55.	1-10	Carmel	34	CST test pair 24(1)
	11-20	Goose	30	CST test pair 24(2)
56.	1-10	Lake	32	CST practice passage
57.	1-10	Knife	32	CST practice passage
58.	1-10	Crow	30	CST practice passage
59.	1-10	Kite	33	CST practice passage
60.	1-10	Glue	33	CST practice passage
61.	1-10	Door	31	CST practice passage

62.	1-10	Grape	29	CST practice passage
63.	1-10	Lime	31	CST practice passage
64.	1-10	Watch	32	CST learning passage
65.	1-9	Nose	32	CST learning passage
66.	1-10	Leaves	34	CST learning passage
67.	1-10	Cotton	34	CST learning passage
68.	1-10	Duck	32	CST learning passage
69.	1-10	Water	33	CST learning passage
70.	1-10	Onion	32	CST learning passage
71.	1-10	Oak	31	CST learning passage
72.	1-10	Diamond	32	CST learning passage
73.	1-9	Leg	29	CST learning passage
74.	1-8	Elm	25	CST learning passage
75.	1-10	Gorilla	31	CST learning passage
76.	1-10	Dandelion	32	CST learning passage
77.	1-10	Dinosaur	34	CST learning passage
78.	1-10	Ocean	33	CST learning passage
79.	1-9	Kidney	29	CST learning passage
80.	1	CST shaped noise	313	CST test calibration
81.	1	CST babble	302	Uncorrelated CST babble