



THE RECORDED FUNCTIONAL LISTENING EVALUATION USING SENTENCES

Purpose of the Functional Listening Evaluation (FLE)

The purpose of the FLE is to determine how listening abilities are affected by noise, distance, and visual access in a student's everyday listening environment. The FLE can also be used as a validation tool to demonstrate the benefits of hearing assistance technology. It is designed to simulate listening ability in situations that are representative of typical classrooms and other settings that cannot readily be replicated in sound booth assessment. Through observation of the administration of the evaluation, the student's teachers, parents, and others may gain appreciation of the effects of adverse listening conditions encountered by the student. When comparing performance without and with the addition of hearing assistance technology such as an FM system, the evaluation results provide evidence of the benefits of the device in enhancing access to the desired input. The FLE format may also be useful in justifying other accommodations, such as sign language or oral interpreting, note-taking, captioning, special seating, and room acoustic modifications. This protocol is based on a listening paradigm suggested by Ying (1990), and by Ross, Bracken, and Maxon (1992).

The Recorded FLE

This recorded version of the FLE is intended to simplify administration by using recorded sentences in quiet and noise. This step eliminates the need for a noise file, adjusting noise and speech loudness levels, and an acoustic hoop for auditory-only conditions. Half of the sentences are recorded in quiet and the other half with a +5 SNR however, this SNR cannot be altered. The Recorded FLE Using Sentences does provide the 15 sentence lists individually in quiet and in noise allowing the examiner to administer the sentence lists recorded in quiet along with an externally generated noise, such as a classroom noise recording, that can be adjusted to a level other than +5 SNR as appropriate.

One advantage to using sentence materials instead of single words as test stimuli is that sentences are more similar to the running speech that a student experiences in the classroom. The recorded FLE contains 15 sentence lists of 10 sentences each that were derived from the 5-word HINT-C (Hearing in Noise Test for Children, 1994, House Ear Institute) sentences which were based on the original Bamford-Kowal-Bench (BKB) sentences (1979). These sentences were designed so that words encountered in the last half of the sentence would not be able to be predicted from the first half of the sentence. Because students are repeating whole sentences rather than single words, phrases or nonsense stimuli they have a greater ability to use their knowledge of the English language within the context of the sentence to improve their performance on connecting words (it/the/are), even if the words were not completely heard. Therefore FLE scores using sentence stimuli are likely to result in higher scores overall. In addition to counting each of the 5 words separately providing a percent score derived from the 50 words in a 10-sentence list, evaluators can count the number of sentences repeated without errors and compare them to those repeated with one or more errors out of 10 total sentences.

Materials Needed

CD with recorded sentences

CD player, ipad, or laptop computer to play CD or downloaded file with USB external speaker to enhance sound quality

Sound Level Meter or SLM App, A weighted scale, to record loudness levels of test presentation

Tape measure to mark off distance between close and far presentations

Environment for Testing

The student's classroom should be utilized during a time when students are not present. If the student has multiple classrooms choose the one where most speaking and listening instruction occurs or where there is concern regarding communication access. If one of the student's classrooms is not available, choose a room that most closely approximates the size, ambient noise level, and floor and wall surfaces of the student's classroom. While performance during actual class sessions would seem ideal, the test process itself may be disruptive to instruction for the rest of the class and therefore may not reflect the true listening conditions encountered by the student throughout the day.

Test Material Considerations

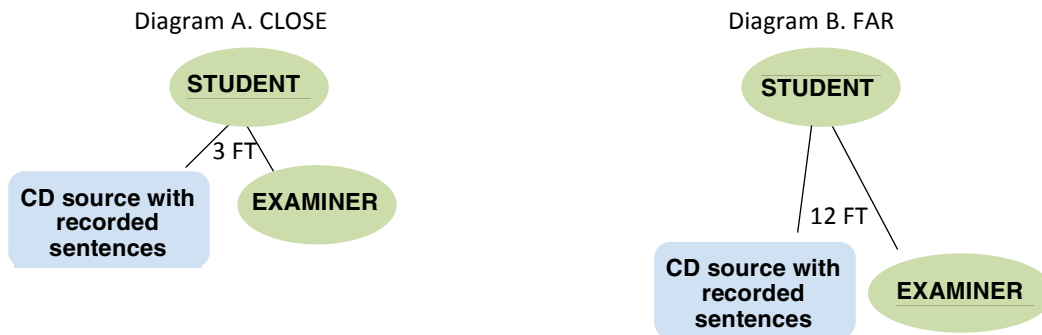
In order to simulate classroom listening ability, the speech evaluation material utilized should be developmentally appropriate and approximate material that is encountered by the student in the classroom. Additionally the stimuli should have sufficient length to reflect reverberation characteristics of the room. The Recorded FLE with Sentences is appropriate C. D. Johnson & K. L. Anderson, 2013; Based on Functional Listening Evaluation by C.D. Johnson & P. Von Almen, 1993. The *Recorded FLE with Sentences* is available from www.successforkidswithhearingloss.com

for children who have language skills equaling grade 1 (ages 6-7) and higher. Students with unilateral and mild hearing losses tend to perform well under all conditions due to the audibility and inherent redundancy in sentence material utilizing familiar vocabulary. When more challenging material is needed, the live version of the FLE should be used with the Nonsense Phrases that accompany that protocol.

Physical Set-up of Test Environment

Due to room size and instructional style variations, the occupied classroom should be observed to determine maximum listening distances. When setting up for the close conditions, measure the distance from the student’s ear to the examiner’s mouth. Record the far and close condition distances on the Summary and Interpretation Form.

- Close: CD source and examiner are 3 feet in front of the student (Diagram A).
- Far: CD source remains in front of the student; the student is moved back to the pre-determined distance (12 feet in this example) from the CD source and examiner. (Diagram B).



Presentation Level

The Recorded FLE with Sentences is presented in quiet (4 presentations) and in noise (4 presentations at + 5dB S/N) to achieve the total of eight conditions. The initial close/quiet presentation level should be adjusted to a comfortable ‘teacher loudness’ level for the student. The volume must remain in the same setting throughout the remaining sentence presentations. Measure and record the dBA SPL volume level on the Summary and Interpretation Form.

Presentation Protocol

The FLE should be conducted in the student’s typical hearing mode. If hearing aids or cochlear implants are usually worn at school, they should also be worn during the evaluation. When this evaluation is used as a validation tool to demonstrate improvement in listening ability with FM or other hearing assistance technology, the examiner should repeat the far conditions to demonstrate the benefits of the technology.

In order to obtain information regarding speech reading benefit, the sentence presentations in the auditory-visual conditions must be mouthed by the evaluator in sync with the audio recording. It is necessary that the evaluator remain next to the CD source during these presentations so that the auditory and visual inputs are aligned.

The sentences should be presented in the condition order indicated by the numbers on the scoring matrix. This order balances for difficulty across conditions so that the final task is the easiest of the far conditions. The Recorded FLE Using Sentences presents lists 1-8 in the following order. Lists 9-12 are presented in noise and lists 13-15 are presented in quiet. The Recorded FLE Using Sentences also has all 15 sentence lists recorded individually in quiet and in noise if the examiner will not be using the recommended presentation order or if a noise level other than +5 SNR is desired.

- | | | | | | |
|---------------------|-------|-------|---------------------|-----|-------|
| 1. Auditory-Visual: | Close | Quiet | 5. Auditory-Visual: | Far | Noise |
| 2. Auditory: | Close | Quiet | 6. Auditory: | Far | Noise |
| 3. Auditory-Visual: | Close | Noise | 7. Auditory: | Far | Quiet |
| 4. Auditory: | Close | Noise | 8. Auditory-Visual: | Far | Quiet |

Instruct the student to repeat each sentence. Repeat far conditions (9-12) to validate benefit of hearing assistance technology. It is often useful to have another person (such as the classroom teacher) assist the evaluator by scoring the sentences to gain a better understanding of the listening challenges presented by the adverse conditions. Test administration takes approximately 30 minutes, including set up.

Scoring

Scoring is completed by counting each of the 5 words separately providing a percent score derived from the 50 words in a 10-sentence list. Alternatively, evaluators can count the number of sentences repeated without errors and compare them to those repeated with one or more errors out of 10 total sentences. The Recorded FLE Using Sentences response form can be completed manually or by computer. The computer-filled version will populate a self-calculating Summary and Interpretation Form. All scores should be reported in percent correct in the Scorebox. Hearing assistance technology scores should be entered in the boxes labeled 9-12 for the far conditions repeated.

Variations in Protocol

This protocol is based on the listening situation of a typical classroom. For an individual student, it may be useful to modify this protocol to account for variations in the level and source of noise, classroom size, teacher's voice, typical listening distances for the student, or other factors. In order to accommodate these variations placement of the noise source, level of noise, distance from the student in the far condition, and order of presentation may be adjusted. Be sure to note these modifications on the test form.

Interpretation Matrix

The Interpretation Matrix analyzes the effects of noise, distance, and visual input. It is completed by transferring the scores from the Scorebox to the same numbered box in the interpretation matrix. Individual scores are summed and averaged to determine the overall effect of each condition. The computer-filled version populates and calculates the interpretation matrix automatically. Although scores may be affected by different speakers, rate of speaking, attention of the listener, or status of amplification, comparisons are valid as long as these variables are kept constant throughout the evaluation.

When validating hearing assistance technology, the target for desired performance is the score from box 1 (for auditory visual) or box 2 (auditory only) of the Scorebox. In other words, the effects of noise and distance can be considered minimized when the performance with the technology matches the individual's best performance in quiet, or at least reduced, if the performance is improved. This information may be used as evidence to justify technology and other accommodations that may be beneficial for the student. The findings should be discussed with the student, his/her parents, and teachers to help understand the student's listening abilities and communication accommodations options. A summary of the Interpretation Matrix and appropriate recommendations should be written on the scoring form.

References

- Johnson, C.D. (2012). Common Children's Phrases, Children's Nonsense Phrases, In *Educational Audiology Handbook* (2nd Ed.) (150-153). Clifton Park, NY: Delmar Cengage Learning.
- Johnson, C.D. (2013). *Functional Listening Evaluation*. Available from www.ADEvantage.com
- Johnson, C.D. & VonAlmen, P. (1993). The Functional Listening Evaluation. In *Educational Audiology Handbook*, (336-339). Johnson, Benson, & Seaton (1997). San Diego: Singular Publishing Group, Inc.
- Ross, M., Brackett, D. & Maxon, A. (1991). Communication Assessment. In *Assessment and management of mainstreamed hearing-impaired children* (113-127). Austin, Tx: Pro-Ed.
- Ying, E. (1990). Speech and Language Assessment: Communication Evaluation. In M. Ross (Ed.), *Hearing-impaired children in the mainstream* (45-60). Parkton, MD: York Press.

THE RECORDED FUNCTIONAL LISTENING EVALUATION USING SENTENCES: SUMMARY & INTERPRETATION FORM

Name: _____ Date: _____ Evaluator: _____ Grade: _____

Directions: The sentence worksheet is ordered to coincide with the presentation order of the conditions in the Scorebox. Lists 9-12 can be used to retest the far conditions with FM or other hearing assistance technology. Present close conditions at 3 feet and far conditions at 10-12 feet from the speaker of the recorded test source. Adjust the presentation level to a comfortable 'teacher loudness' level for the student in the close/quiet condition. Record this level below and do not change the volume for the remaining conditions. To conduct the auditory-visual conditions, the evaluator will need to mouth the sentences in sync with the audio recording. Begin with the practice sentences on page 2 of the sentence worksheet. Scores from the sentence worksheet will autocalculate and populate this worksheet.

AUDIOMETRIC RESULTS

Hearing Sensitivity: Pure Tone Ave: Right Ear ___dB Left Ear ___dB
 Word Recognition: Right Ear ___% @ ___dBHL Left Ear ___% @ ___dBHL
 Sound Field: Aided Unaided
 Quiet ___% @ ___dBHL
 Noise ___% @ ___dBHL @ ___S/N

FUNCTIONAL LISTENING EVALUATION CONDITIONS

Amplification: None Hearing Aid(s) Cochlear Implant(s)
 Bone- conduction device
 Hearing Assistance Technology: Personal FM Classroom Other _____
 Distance at far condition: ___ft; Distance at close condition: ___ft
 Test loudness @ listener's ear: ___dBA SPL
 Modifications in protocol:

FUNCTIONAL LISTENING SCOREBOX

	close/quiet	close/noise	far/quiet	far/noise
auditory-visual	1	3	8	5
			12	9
auditory	2	4	7	6
			11	10

INTERPRETATION MATRIX

	Noise	
	quiet	noise
close-aud	2	4
close-aud/vis	1	3
far-aud	7	6
far-aud/vis	8	5

	Distance	
	close	far
quiet-aud	2	7
quiet-aud/vis	1	8
noise-aud	4	6
noise-aud/vis	3	5

	Visual Input	
	aud-vis	aud
close-quiet	1	2
close-noise	3	4
far-noise	5	6
far-quiet	8	7

Average scores: _____% _____%
 quiet noise close far _____% _____%
 aud/vis aud

With Hearing Assistance Technology:

	Noise	
	quiet	noise
far-aud/vis	12	9
far-aud	11	10

	Visual Input	
	aud-vis	aud
far-quiet	12	11
far-noise	9	10

Average scores: _____% _____%
 quiet noise aud/vis aud

INTERPRETATION AND RECOMMENDATION