



Functional Listening Evaluation (FLE)

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How it works

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 format of the FLE 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).

Materials needed

- CD player, ipad, ipod, or laptop computer to play noise source
- Sound Level Meter or SLM App – use A weighted scale
- Classroom noise source (.wav sound file or CD; classroom noise or multitalker is recommended)
- Word/Phrase/Sentence Lists for test stimuli
- Tape measure
- Acoustic Hoop

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.

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. Record this as the "far" distance on the Summary and Interpretation Form. When setting up for the close conditions, measure the 3 foot distance from the student's ear to the examiner's mouth.

Close: Noise and examiner are 3 feet in front of the student (see Diagram A).

Far: Noise remains 3 feet in front of the student; the examiner moves back to the pre-determined distance (12 to 15 feet in this example) from the student (see Diagram B).

Diagram A – Close

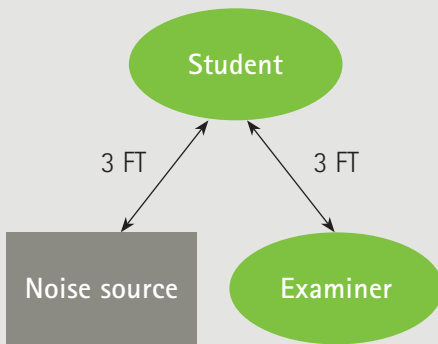
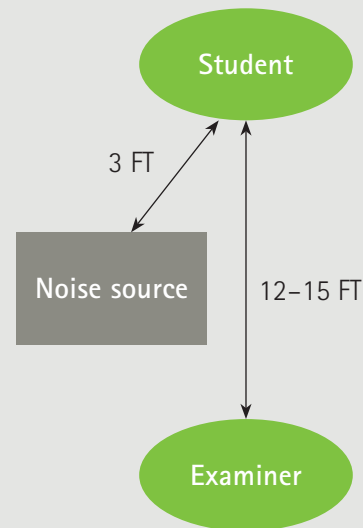


Diagram B – Far



Types of evaluation materials

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. Consideration should also be given to both familiar and new material that a student may encounter. Individuals will usually perform better with familiar material than with stimuli containing unfamiliar vocabulary. Students with unilateral and mild hearing losses tend to perform well under all conditions due to the audibility and inherent redundancy in phrase and sentence material utilizing familiar vocabulary. Nonsense phrases have been constructed to increase listening difficulty.

Age, language competency, and memory abilities of the individual should also be considered when determining the test stimuli. In selecting word, phrase or sentence materials, consider whether the vocabulary and syntax are appropriate for the student's language level. For students with poor speech intelligibility, as well as young children, it may be necessary to use materials that incorporate picture-pointing responses. If closed-set materials are utilized, performance can be expected to be better than with open-set materials. Once the type of stimuli is determined, it must remain constant throughout the assessment so that the variables manipulated are noise, distance, and visual input. Report the material used on the Summary and Interpretation Form.

Common materials include are listed below. In many of these materials there will not be sufficient lists for the entire protocol (8 lists are needed). If it is necessary to use a list twice, select the lists that were more difficult for the student

in order to reduce familiarity with the material. The Common Children's Phrases and the Children's Nonsense Phrases, included with this protocol, each contain eight lists of twenty phrases and provide the option of phrase or word scoring.

Sentence materials:	BLAIR sentences SPIN sentences (older students) PSI sentences	WIPI sentences BKB sentences HINT-C sentences
Phrase materials:	Common children's phrases	Children's nonsense phrases
Word lists:	PB-K	NU-6
Picture – Closed set:	WIPI	NU-CHIPS

The Recorded Functional Listening Evaluation Using Sentences (Johnson & Anderson, 2013) is available on CD from www.successforkidswithhearingloss.com. This version utilizes 5-word HINT-C (Hearing in Noise Test for Children) sentences that were based on the original Bamford-Kowal-Bench (BKB) sentences (1979). Half of the sentences are

recorded in quiet and the other half with a +5 SNR (speech-to-noise ratio) and follow the condition presentation order of the FLE. This version simplifies presentation of the FLE by eliminating the need for a noise file and adjusting noise and speech sound levels; however the SNR cannot be altered. Additional instructions are provided with the CD.

Presentation levels

The conditions of close/far and auditory/auditory-visual are presented in quiet (4 presentations) and then in noise (4 presentations) to achieve the eight conditions. Speech-to-noise ratio levels (SNR) should be based upon the auditory environments encountered by the students in their classrooms. Sound level measurements of classroom discourse and activity may be necessary to determine these levels. For this example, the levels will achieve values resulting in a +5 dB speech advantage in the close conditions and a -5dB speech-to-noise ratio in the far conditions (12-15ft). Levels will vary slightly depending upon the acoustics of the room and consistency of the examiner's voicing of the stimuli. Measure and record the classroom ambient noise level (unoccupied), approximate teacher or talker levels, and noise levels as directed on the scoring form.

Speech: Calibrate the examiner's voice at a distance of 3 feet from the listener (close condition). Ask the student to hold the SLM to their ear and the examiner to talk measuring the examiner's voice with the sound level meter so that speech averages 65dBA SPL at the listener's ear. Once that level is measured, check the SPL level when the sound level meter is held one foot from the examiner's mouth (being careful to keep the voice level the same) so that the examiner can hold the sound level meter to monitor his/her voice for all conditions to verify that the proper speech level is maintained. The level at 1 foot from the examiner will be approximately 3 dBA SPL greater than at the listener's ear for close conditions.

Noise: Locate the noise source 3 feet from the student and adjust the volume of the noise source (classroom/multitalker noise) using a sound level meter, so that the noise averages 60 dBA SPL at the student's ear. This yields a +5 speech-to-noise ratio level.

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 remote microphone hearing assistance technology, the examiner should repeat the far conditions to demonstrate the benefits of the technology.

Eight phrase, sentence or word lists should be presented in the 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 examiner may choose to alter the order for other reasons however.

1. Auditory-Visual: Close Quiet
2. Auditory: Close Quiet
3. Auditory-Visual: Close Noise

4. Auditory: Close Noise
5. Auditory-Visual: Far Noise
6. Auditory: Far Noise
7. Auditory: Far Quiet
8. Auditory-Visual: Far Quiet

When presenting the FLE via live voice, the examiner should present the speech materials at a normal speaking rate. Instruct the student to repeat the speech stimuli or point to the appropriate picture, as indicated by the material used. Repeat far conditions (9-12) to validate benefit of hearing assistance technology. Test administration takes approximately 30 minutes, including set up. For the auditory conditions it is recommended that the examiner use an acoustically transparent hoop over his/her face or instruct the student to look down during these conditions as placing a hand or paper in front of the talker's mouth will change the acoustic characteristics of the speech sounds.

Scoring

Scoring should be completed using the established procedures for the selected test material. Scoring may be made on total phrase/sentence correct (recommended) or by number of words correct. In some situations it is useful to have another person (such as the classroom teacher) score

the speech test materials. All scores should be reported in percent correct in the Scorebox on the Summary and Interpretation Form. 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. This auto-calculating form will transfer the percentage correct scores from the scorebox to the appropriate box in the interpretation matrix. Individual scores are automatically summed and averaged to determine the overall effect of each condition. 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 eliminated 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 can 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 them understand the student's listening abilities and communication access 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 Functional Listening Evaluation – Summary & interpretation form

Student name

Date of birth

Home language

School

Grade

Teacher/parent

Hearing care professional

Examiner

Date

Current hearing technology

Usage

consistent

inconsistent

Audiometric results

Hearing sensitivity

Pure Tone Ave: Right Ear dBHL
 Left Ear dBHL

Word recognition

Right Ear % @ dBHL
 Left Ear % @ dBHL

Sound field

Aided Unaided
 Quiet % @ dBHL
 Noise % @ dBHL @ SNR

Functional Listening Evaluation conditions

Amplification

- None
- Hearing aid(s)
- Cochlear implant(s)
- Bone-conduction device

Hearing assistance technology

- Personal FM
- Classroom
- Other

Classroom noise level

Unoccupied: dBA SPL
 Occupied: dBA SPL

Assessment material:

Distance at far conditions: ft

Noise stimulus: Multitalker
 Classroom
 Other

Speech level @ listener's ear: dBA SPL
 @ 1 ft from examiner: dBA SPL

Noise level @ listener's ear: dBA SPL

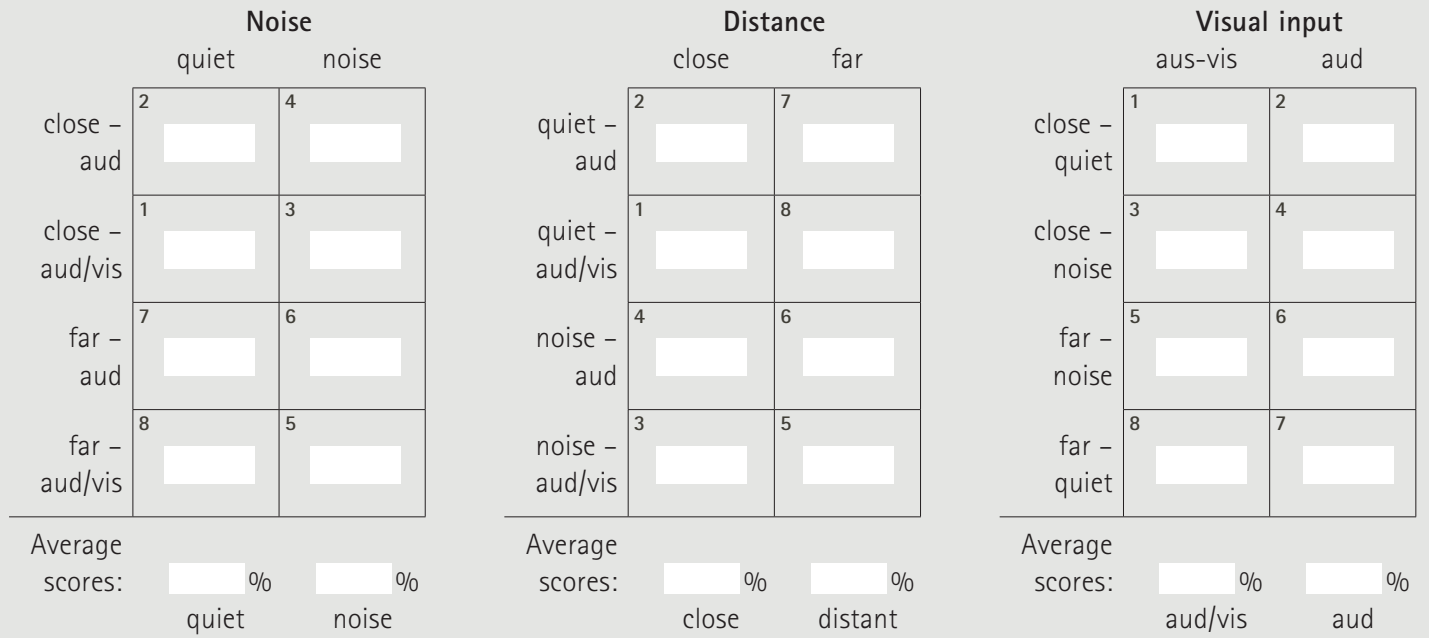
Approximate speech-to-noise levels: close dB SPL
 far dB SPL

Modifications in protocol:

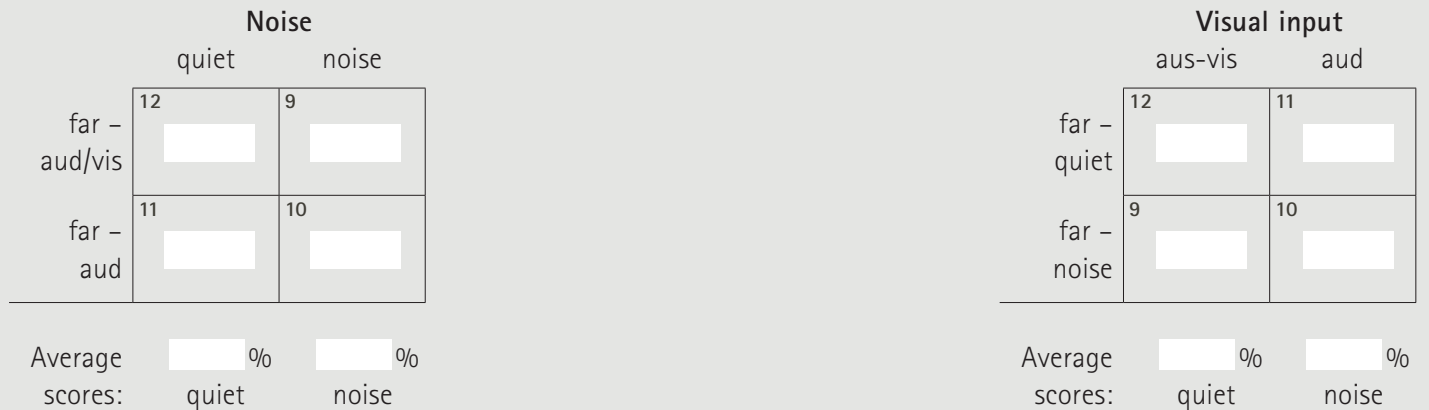
Functional listening scorebox

	close/quiet	close/noise	far/quiet	far/noise
auditory-visual	1 <input type="text"/>	3 <input type="text"/>	8 <input type="text"/>	5 <input type="text"/>
			12 <input type="text"/>	9 <input type="text"/>
auditory	2 <input type="text"/>	4 <input type="text"/>	7 <input type="text"/>	6 <input type="text"/>
			11 <input type="text"/>	10 <input type="text"/>

Interpretation matrix



With hearing assistance technology:



Interpretation and recommendations



Appendix

Common children's phrases¹

List 1

Condition:

1. He fell down.
2. Clean this up.
3. It's not for you.
4. Can you see me?
5. Can I play now?
6. Look over there.
7. It's lunch time.
8. Can you help me?
9. Close your eyes.
10. Let me have it.
11. Clean up the mess.
12. Hold this toy.
13. Bring it here.
14. Who is missing?
15. Take my hand.
16. Ring the bell.
17. Let me have it.
18. You can't make me.
19. Can I have some?
20. Go right now.

Phrase score

/ 20 = %

Word score

/ 69 = %

List 2

Condition:

1. Can I go play?
2. Who is that?
3. Can we go?
4. Have a nice day.
5. What's the matter?
6. What's going on?
7. How are you?
8. Can you play?
9. I don't want to.
10. It's snowing outside.
11. That is neat.
12. No way man.
13. Leave me alone.
14. Do I have to?
15. Where's the crayons?
16. Why can't I go?
17. I want that.
18. That's cool.
19. When can I?
20. No way.

Phrase score

/ 20 = %

Word score

/ 63 = %

List 3

Condition:

1. See you later.
2. Got to go now.
3. Let me have it.
4. I'm tired.
5. That's awesome.
6. Way to go.
7. That's tough.
8. Turn the light off.
9. Stop that now.
10. Guess what?
11. Do you want to play?
12. Give it over.
13. Can we be friends?
14. She did it.
15. Do you know what?
16. You can't do that.
17. Watch this.
18. Tie my shoe.
19. What's up?
20. I can't find it.

Phrase score

/ 20 = %

Word score

/ 63 = %

List 4

Condition:

1. Can I watch TV?
2. Where is it?
3. Let's go play.
4. I don't feel good.
5. Can we draw?
6. I want to.
7. Like my picture?
8. Can I go too?
9. Can we play that?
10. I want that toy.
11. Where are we going?
12. Where's my shoe?
13. Leave me alone.
14. Can we stop?
15. I want some.
16. That one is mine.
17. I get the front.
18. It was my turn.
19. Did you see mine?
20. Let's stop there.

Phrase score

/ 20 = %

Word score

/ 70 = %

Scoring

The phrase method is usually preferred because it yields performance more similar to classroom listening. Which ever one is selected, use the same method for all conditions.

Phrase: exact repetition of each phrase is required; enter the number of correct phrases (the percent correct is automatically calculated).

Word: circle incorrect word responses and subtract from total number of words; enter number of correct words (the percent is automatically calculated).

¹ Phrase lists have been matched for length and for comprehension difficulty using the Flesch Reading Ease Index.

List 5
Condition:

1. Why can't I?
2. Do we have to?
3. Soccer is cool.
4. Can I open it?
5. Pick a team.
6. Where's my shoe?
7. How come?
8. I get to go.
9. Stop it now.
10. School was fun.
11. We played outside.
12. I know a song.
13. Can you do that?
14. Come in my house.
15. I don't know.
16. It's time for art.
17. Make my day.
18. I am hungry.
19. Go for it.
20. Why not?

Phrase score
 / 20 = %

Word score
 / 65 = %

List 6
Condition:

1. Know what Mom?
2. I'm sick.
3. Where's my present?
4. Give me that.
5. I didn't do it.
6. Put your shoes on.
7. That's so cool.
8. Who is it?
9. He threw it.
10. What time is it?
11. He tripped me.
12. Let's play Nintendo.
13. It's time for lunch.
14. Want to ride bikes?
15. This is dumb.
16. It's my turn.
17. I wrecked my bike.
18. Watch out.
19. My tooth is loose.
20. I want money.

Phrase score
 / 20 = %

Word score
 / 65 = %

List 7
Condition:

1. I broke my arm.
2. My lunch is gone.
3. Is it recess?
4. Do I have to?
5. Stay off the hill.
6. Don't worry.
7. That's my sweater.
8. My dog is gone.
9. I want an A.
10. Buy me that book.
11. I hate spinach.
12. I don't feel good.
13. You can't make me.
14. That's my phone.
15. Get that off.
16. Change the channel.
17. What a ride.
18. It's mine now.
19. Finders keepers.
20. Get off my bed.

Phrase score
 / 20 = %

Word score
 / 68 = %

List 8
Condition:

1. I bit the dust.
2. He kept it.
3. That song is sad.
4. He poked by eye.
5. I like candy.
6. Get the ball.
7. He kicked me.
8. Why can't I?
9. No thank you.
10. Where's the ball?
11. I don't know.
12. You know what?
13. My homework is late.
14. I hate that.
15. I don't get it.
16. Don't mess with me.
17. Keep your hands off.
18. That's my steak.
19. Let's get pizza.
20. I skinned my knee.

Phrase score
 / 20 = %

Word score
 / 68 = %

Scoring

The phrase method is usually preferred because it yields performance more similar to classroom listening. Which ever one is selected, use the same method for all conditions.

Phrase: exact repetition of each phrase is required; enter the number of correct phrases (the percent correct is automatically calculated).

Word: circle incorrect word responses and subtract from total number of words; enter number of correct words (the percent is automatically calculated).

Children's nonsense phrases

List 1

Condition:

1. Down fell he boat.
2. Up this clean floor.
3. You table not.
4. Me you see can.
5. Now play I go.
6. There over look.
7. Lunch not time do.
8. Help you can me.
9. Eyes yours on blue
10. Have me let ball.
11. Mess up the clean.
12. Toy hold this now.
13. It here bring me.
14. Missing who done.
15. Hand my take go.
16. The ring bell not.
17. Have it let me.
18. Can make me you.
19. Now go right house.
20. Have some can I.

Phrase score

/ 20 = %

Word score

/ 77 = %

List 2

Condition:

1. Play go can I.
2. That is who stop.
3. Go we can draw.
4. Day nice have down.
5. Matter the what.
6. Going on what.
7. Snowing you are.
8. Play you here can.
9. I do want not to.
10. Outside it is.
11. Neat that ahead.
12. Man no become.
13. Alone me leave.
14. Do have I to
15. Crayons the where.
16. Can go why I.
17. Want I come book.
18. Cool that on hope.
19. I when can here.
20. Way no ball count.

Phrase score

/ 20 = %

Word score

/ 73 = %

List 3

Condition:

1. You later see.
2. Now to go got.
3. It have me let.
4. Tired am I.
5. Awesome that is.
6. Go way to here.
7. Tough is that now.
8. Off light the turn.
9. Now that stop from.
10. What guess you home.
11. Play to want you do.
12. Over it give.
13. Friends be we can.
14. It did she go.
15. What know you do.
16. That do can you.
17. Watch no this go.
18. Shoe my fix now
19. Up what is tie.
20. It find cannot.

Phrase score

/ 20 = %

Word score

/ 76 = %

List 4

Condition:

1. TV watch can.
2. Book is it where.
3. Play to let go.
4. Good feel not do.
5. Draw we can here.
6. Food to want dog.
7. Picture my like.
8. To go I can.
9. That play we hope.
10. Toy that want I.
11. Going we are.
12. Shoe my is where.
13. Alone me leave.
14. Stop we can now.
15. Some want I tell.
16. Mine is one that.
17. Front the get back.
18. Turn my was now.
19. Mine see you did.
20. There stop let is.

Phrase score

/ 20 = %

Word score

/ 76 = %

Scoring

The phrase method is usually preferred because it yields performance more similar to classroom listening. Which ever one is selected, use the same method for all conditions.

Phrase: exact repetition of each phrase is required; enter the number of correct phrases (the percent correct is automatically calculated).

Word: circle incorrect word responses and subtract from total number of words; enter number of correct words (the percent is automatically calculated).

List 5Condition:

1. I not can why.
2. To have we do.
3. Cool is soccer.
4. It open I can.
5. Team a pick you.
6. Shoe my is where.
7. Come how to here.
8. Go to get it.
9. Now it stop pen.
10. Day fun was school.
11. Outside play we.
12. Song to know I.
13. That do you can.
14. House my in come.
15. Know I do not.
16. Art for time is.
17. Day my make go.
18. Hungry am I here.
19. It for go home.
20. Not is why eat.

Phrase score

 / 20 = %

Word score

 / 79 = %**List 6**Condition:

1. Mom what know me.
2. Sick am I here.
3. Present my where.
4. That me give book.
5. Paper It do.
6. On shoe you put.
7. Cool so that is.
8. It is who gone.
9. Threw he become.
10. It is time what.
11. Me tripped he.
12. Game play us for.
13. Lunch for time is.
14. Bike ride to want.
15. Dumb is this for.
16. Turn my come is.
17. Bike my wreck here.
18. Out is watch go.
19. Loose is my gum.
20. Money want I.

Phrase score

 / 20 = %

Word score

 / 78 = %**List 7**Condition:

1. Arm my broke I.
2. Gone is lunch my.
3. Recess it is.
4. To have I do.
5. Hill the off stay.
6. Worry not do.
7. Sweater that is.
8. Gone is dog my.
9. Boat want go now.
10. Book that me buy.
11. Spinach like me.
12. Good feel not do.
13. Me make not can.
14. Phone my is that.
15. Off that get here.
16. Channel the eat.
17. Ride a what to.
18. Now mine is it.
19. Keep the find key.
20. Bed my off get.

Phrase score

 / 20 = %

Word score

 / 76 = %**List 8**Condition:

1. Dust the bit I.
2. It kept he gone.
3. Sad is song that.
4. Eye by poke here.
5. Candy like I done.
6. Ball the get gone.
7. Me kicked he for.
8. I not can why.
9. You thank no see.
10. Ball that where on.
11. Know not do lunch.
12. What know you for?
13. Late is work home
14. That hate to do.
15. It get not done.
16. Me with mess not.
17. Off hands your keep.
18. Steak my is that.
19. Pizza get let.
20. Knee my hurt now.

Phrase score

 / 20 = %

Word score

 / 79 = %**Scoring**

The phrase method is usually preferred because it yields performance more similar to classroom listening. Which ever one is selected, use the same method for all conditions.

Phrase: exact repetition of each phrase is required; enter the number of correct phrases (the percent correct is automatically calculated).

Word: circle incorrect word responses and subtract from total number of words; enter number of correct words (the percent is automatically calculated).