Improving Speech Recognition and Auditory Behaviors with FM Systems in Children with ASD and ADHD

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Auditory Processing Characteristics

ASD

- Parent surveys (Tomcheck & Dunn, 2007):
  - 60-80%: distractible, dysfunction in noisy places, unresponsive or poor attention to auditory stimuli
- Auditory filtering (Ashburner et al., 2008):
  - Most significant predictor of educational performance
- Poorer speech recognition in noise by 2 to 3.5 dB than peers (Alcantara et al., 2004)
- Significantly poorer auditory attention (Corbett & Constantine, 2006)

ADHD

- Same parent survey (Tomcheck & Dunn, 2007):
  - Significant auditory deficits for filtering and sensitivity
- Significant lower composite scores on the SCAN (Gomez & Condon, 1999)
- Same test of auditory attention: significantly lower performance than typical group (Corbett & Constantine, 2006)

Reason for Deficits

- Exact physiological cause unknown
- Likely related to coexisting disabilities:
  - Language disorders
  - Learning disabilities
  - Intelligence level
  - Poor inhibitory control (modulating sensory stimuli)
  - Attention deficits
- Evidence showing abnormal physiological encoding of auditory stimuli in quiet and noise from brainstem to the cortex (Barry et al, 2002; Russo et al., 2009)

Prevalence

- 1 in 110 children in the US have Autism Spectrum Disorder (ASD)
- 9.5% of school-aged children have ADHD
- Both disorders have increased rapidly over the past several years
- Many of these children need special education support
  - 87% of children with ASD require special ed

Study Objective

Examine the efficacy and classroom effectiveness of personal FM systems for children with ASD and ADHD

Study Participants

- Eleven, 9 to 12 year-old children at a private school for children with special needs:
  - 7 with Autism Spectrum Disorders (ASD)
    - 2 had APD; 1 had anxiety disorder; 2 had ADHD
  - 4 with Attention-Deficit Hyperactivity Disorders (ADHD)
    - 2 had APD; 1 had SLI
- Eleven, age-matched peers only included in speech recognition measure

Methods & Procedures

- **Prior to study:** *Teacher completed 2 questionnaires*
  - S.I.F.T.E.R. – Screening Instrument for Targeting Educational Risk
    - Scale to rate child's academics, attention, communication, class participation, & school behavior as compared to peers
  - C.H.A.P.S – Children's Auditory Performance Scale
    - Scale to rate auditory-listening behaviors in quiet, noise, ideal, multiple inputs, auditory memory, & auditory attention as compared to peers

- **Prior to**
  - Week
    - Day
    - Day
    - Day
    - Day
    - Day

    signa

ng story

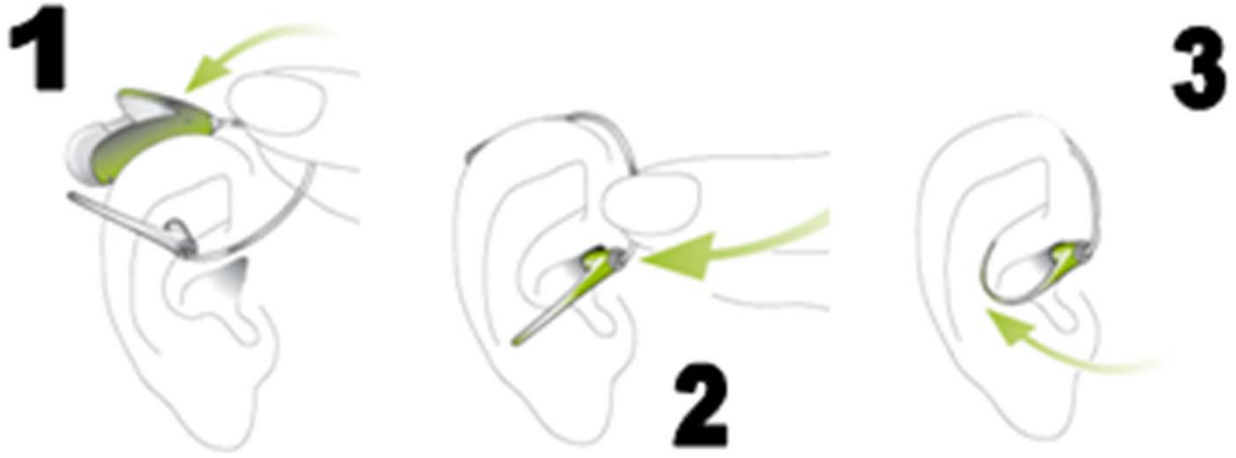
pted

out

ech

Wearing My FM System

Starting this semester, I am going to wear an FM system during Math. One part of the FM goes over my ear and the other part goes in my ear. If it does not feel right, I will ask my teacher for help. I will put it on before Math class and take it off after Math class.




Caitlin's FM System

Methods & Procedures

- **Week 1: *No FM System***
  - Observations: Observed by two independent observers during short reading period and math class
    - Recorded behaviors of children as on-task or off-task on recording form
    - Each child observed for approx. seven 30-second intervals per day
    - If off task, also recorded a code to define behavior

Off-Task Codes

- **1.** Does not follow teacher direction, but engages in distractible behaviors (e.g., does not take out or open book, doodles on paper, out of seat, blurts our answers without raising hand, or does not complete assigned work)
- **2.** Does not respond to the teacher's questions within 5 seconds or teacher had to talk directly to child to get child to respond to request
- **3.** Does not sit quietly when expected or asked, but instead, engages in other distractible behaviors (e.g., plays with anything in hands or with hands, shakes head back and forth, turns around in chair, shirt over head or face); talks to peer without permission
- **4.** Stares at children and teacher in other small group, does not follow along with activity (e.g., behind the rest of the group) and generally appears to be distracted

Off-Task Codes

- **5.** Stares off into space; appears to have zoned out; is repeatedly redirected by teacher to follow along with activity; has head down; slouches on chair or desk; fidgety and appears restless
- **6.** Inappropriate use of materials (e.g., plays with manipulatives, sticks it on face, stacks instead of using as instructed); plays with pens, pencils, paper, clothes, hair
- **7.** Talks with classmate when supposed to work on activity, looks at peer to see what to do on activity
- **8.** Displays other problem behavior (e.g., yells out, sings during instruction, curses or shouts, screams, throws objects on floor or at others, tantrums, or hits or hurts others)

Methods & Procedures

- **Weeks 2-3:** *Bilateral FM used*
  - FM system used 1 hour each day during reading time and math
  - Classroom observations: repeated each day using the Week 1 observation procedures
  - Speech recognition in noise:
    - Used BKB-SIN to assess speech-in-noise threshold at the 50% correct level

Methods & Procedures

- **Weeks 4-5:** *No FM System*
  - Classroom observations: repeated each day using the Week 1 observation procedures

Methods & Procedures

- **Weeks 6-8:** *Bilateral FM system used*
  - Again used for 1 hour during reading time and math
  - Classroom observations: repeated each day using the Week 1 observation procedures
  - Speech recognition in noise:
    - Used BKB-SIN to assess speech-in-noise threshold at the 50% correct level
    - Tested in no-FM and FM-system conditions
    - Typically-functioning peers tested in one no-FM condition in room with similar acoustics to the experimental group's room

Methods & Procedures

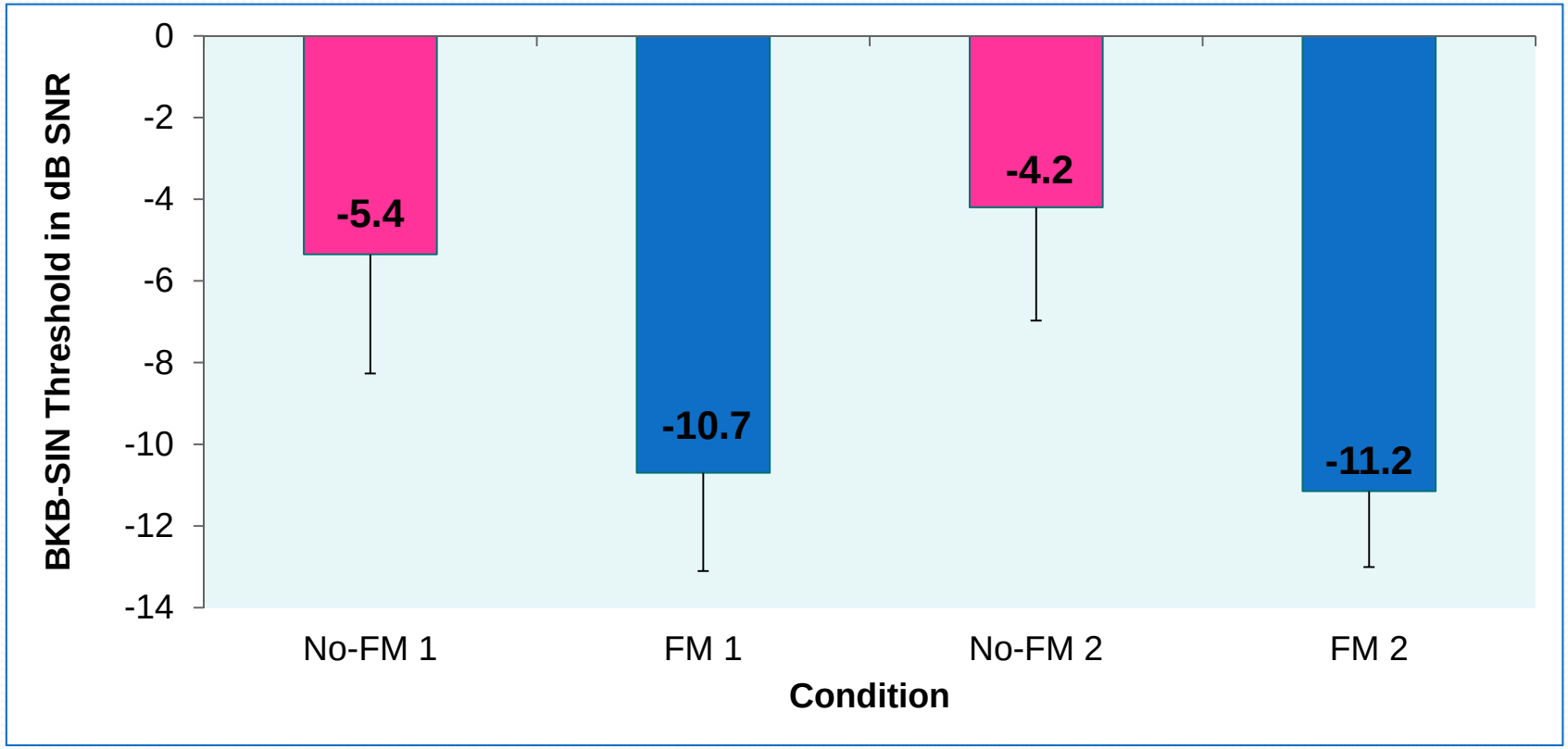
- **After study:** *Questionnaires*
  - Teacher Questionnaires:
    - S.I.F.T.E.R. and C.H.A.P.S. repeated, but teacher asked to rate typical behavior across the two FM-system trial periods
  - Validation Questionnaires:
    - Open-ended, subjective teacher questionnaire
    - Subjective child questionnaire

Overview of Study Measures

- Assessed in FM-on and FM-Off Conditions:
  - Speech recognition in noise performance (2 x)
  - Teacher questionnaires: attending behaviors and educational risk as compared to peers (pre-post)
  - Observed on- and off-task behaviors during class (2 no-FM trials and 2 FM trials over 32 days)
  - Subjective reports from teacher and child (after study)

Speech Recognition in Noise: ASD & ADHD

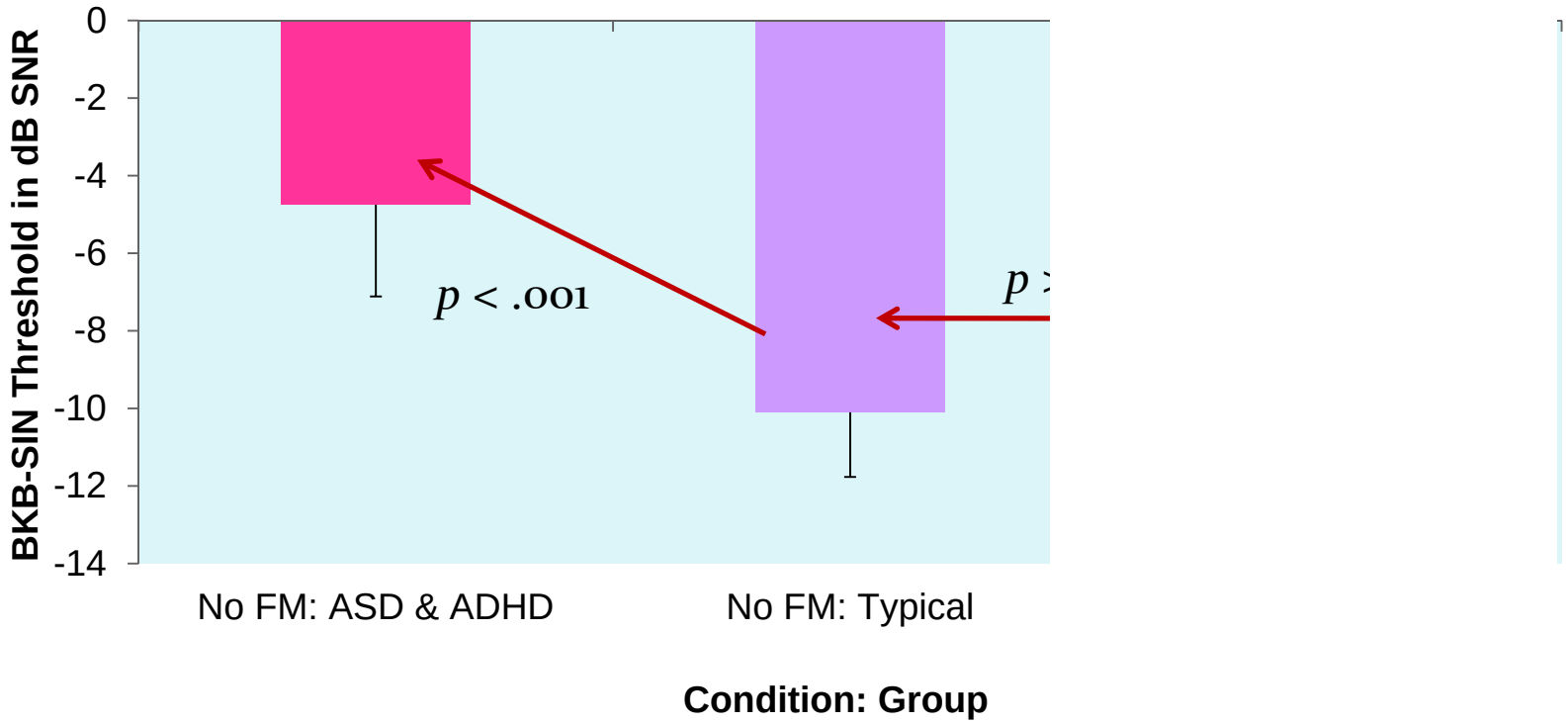
Lower scores are better!



- Significantly better performance in FM conditions
- Large effect sizes for no-FM vs. FM conditions for both sessions
- No effect of session

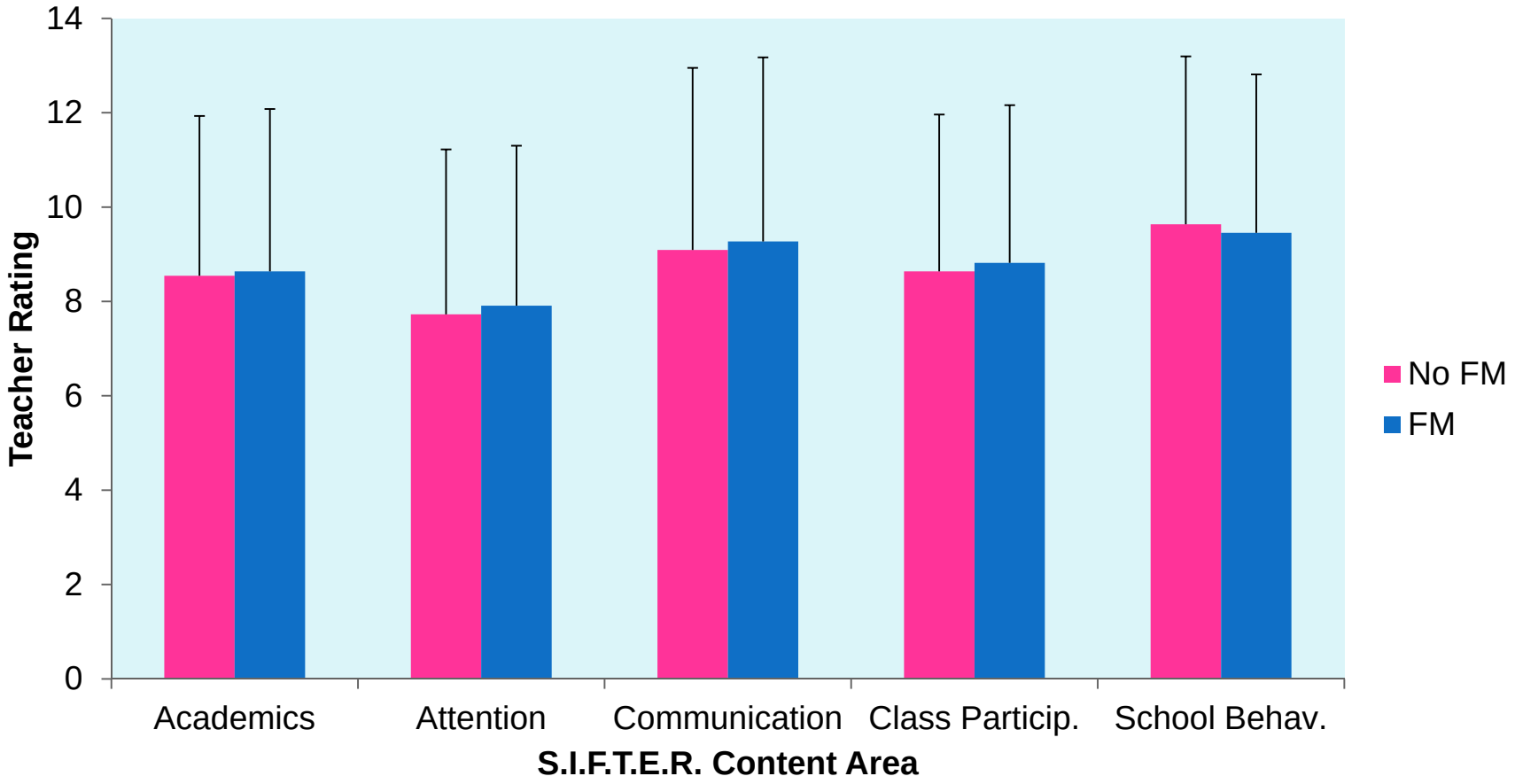
Speech Recognition in Noise: ASD/ADHD vs. Typical

Lower scores are better!



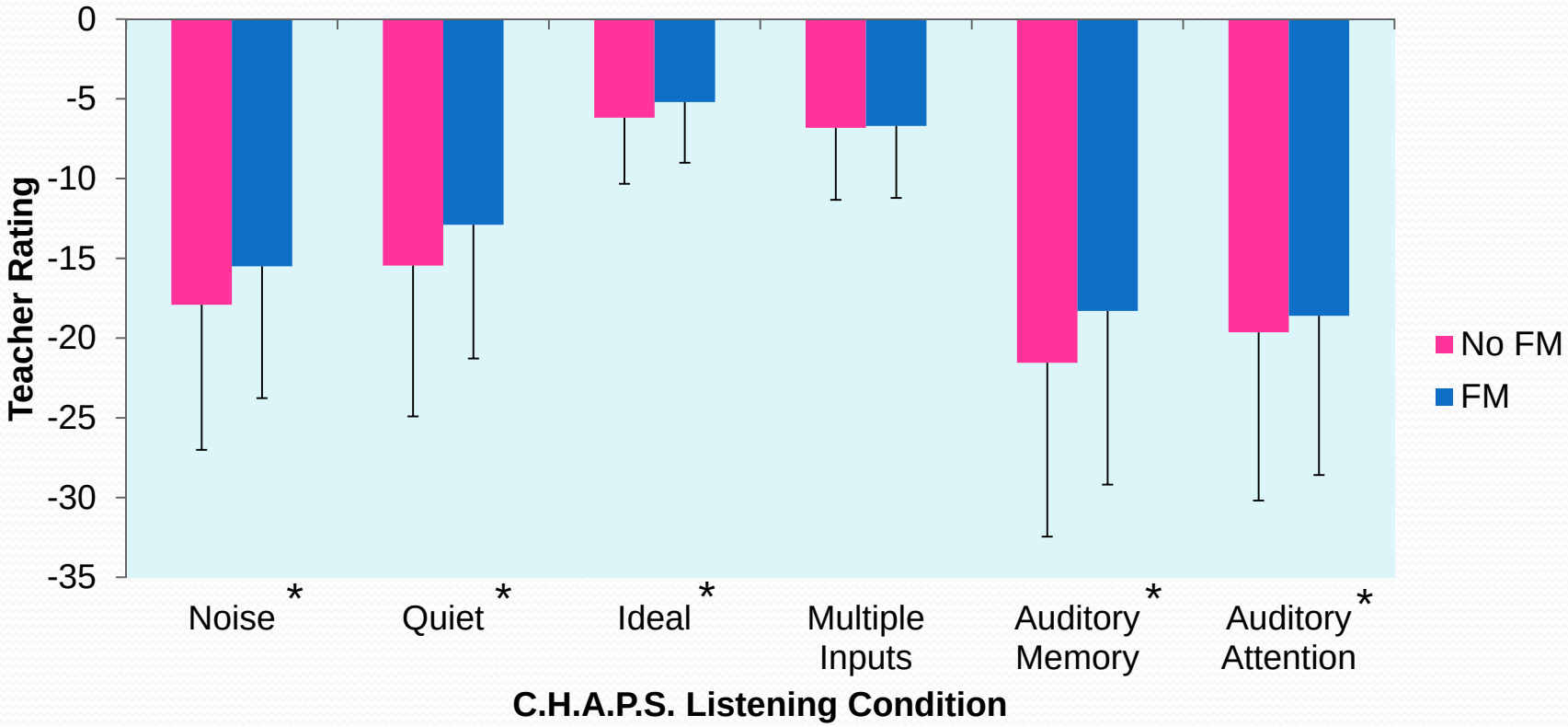
- Significantly poorer than typical peers
- Same as peers when using FM

Teacher Questionnaire: S.I.F.T.E.R. Results



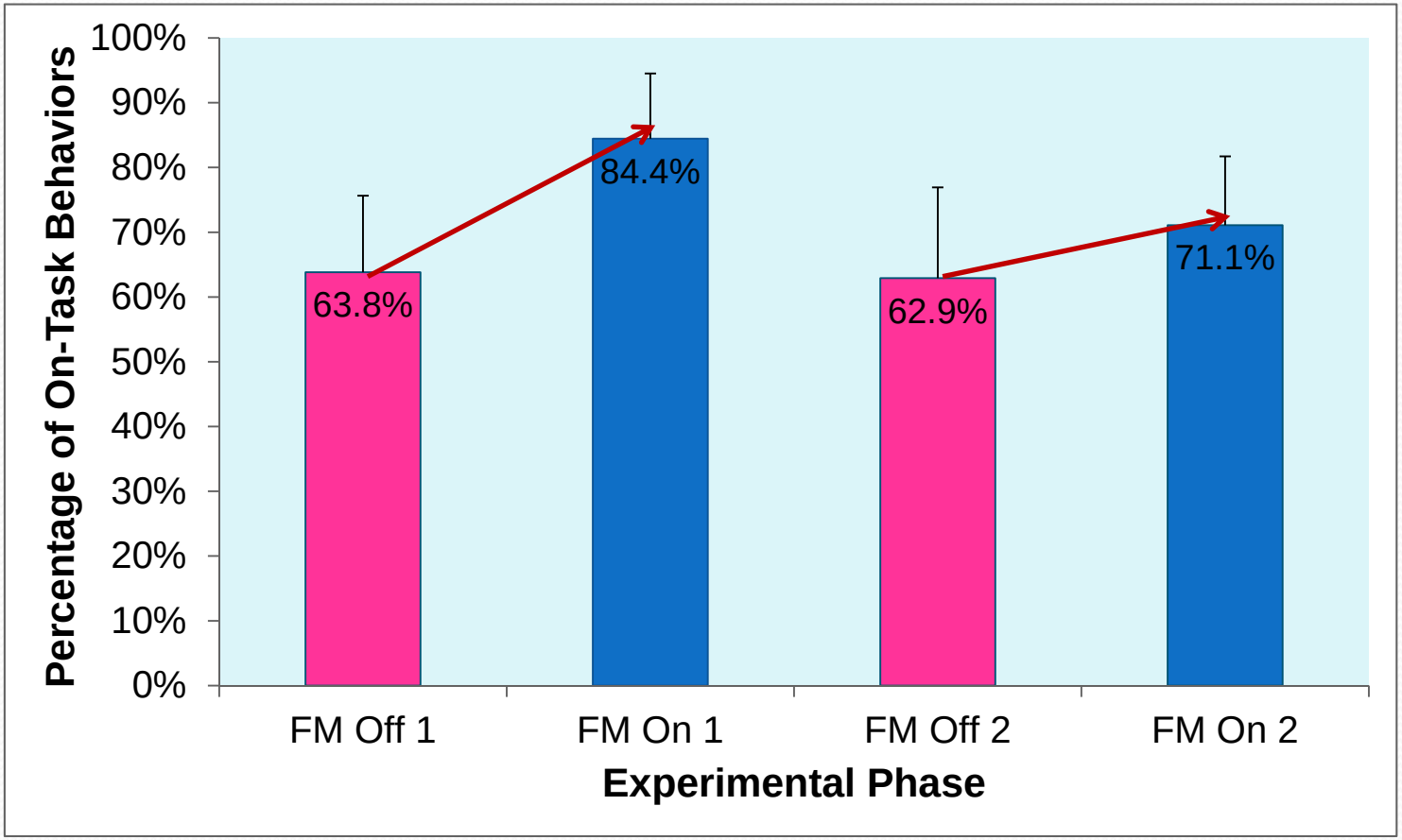
- No significant changes in educational risk across five areas

Teacher Questionnaire: C.H.A.P.S. Results



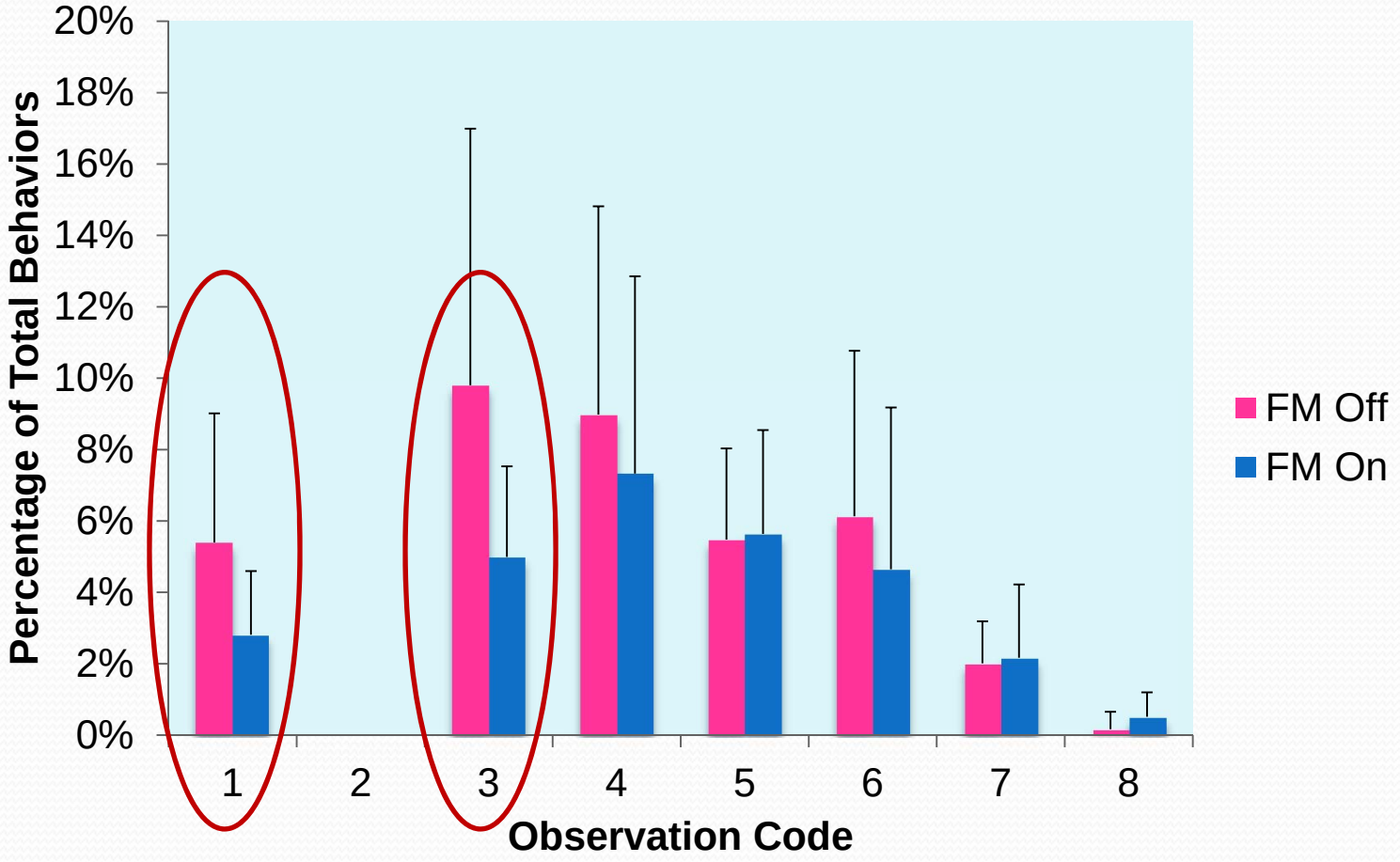
- Significant improvements in most areas*
- Medium effect sizes for all, except small effect size for auditory memory

On-Task Behaviors



- Significantly more on-task behaviors with FM during both trial periods
- Both FM conditions significantly better than both no-FM conditions
- Large effect sizes

Analysis of Codes



- Significant reduction in codes 1 and 3 with FM

Analysis of Codes

- **1.** Does not follow teacher direction, but engages in distractible behaviors (e.g., does not take out or open book, doodles on paper, out of seat, blurts our answers without raising hand, or does not complete assigned work)

- **3.** Does not sit quietly when expected or asked, but instead, engages in other distractible behaviors (e.g., plays with anything in hands or with hands, shakes head back and forth, turns around in chair, shirt over head or face); talks to peer without permission

Subjective Teacher Questionnaire

- Transmitter:
  - Thought transmitter was easy to use
  - Would like to be able to dial into individual students
- Receivers:
  - Students were able to insert with practice
- Overall Benefit?
  - Noticed better attention when in room with more noise or activity
  - Easier to get children's attention
  - Children with more sensory issues had a more difficult time
  - Would work better in mainstreamed classroom where all children on same academic levels

Subjective Child Questionnaire

- Receiver:
  - 8/10 agreed it was easier to put on after practice
  - 3/10 had retention issues
  - 9/10 thought default volume comfortable
    - If had choice of volume, 2 would do softer & 4 louder than default
  - 8/10 thought it was comfortable
  - All liked using the FM and thought it helped them listen better in class
  - 9/10 would like to continue using it

Subjective Child Questionnaire

What did you like best?

- “Makes me feel like a spy”
- “Fun, it’s cool”
- “Easy to communicate with teacher”
- “Helps you remember what the teacher says”
- “Helped kids learn”
- “Hear better”

What did you like least?

- “Nothing” from 6/10
- “Wanted volume control”
- “Fell out” from 2/10
- “Hear other people also”
- “Itching and distracting”

Clinical Implications

- Use of an FM system in children with ASD & ADHD has the potential to:
  - Improve speech recognition in noise
  - Enhance positive auditory and listening behaviors in class
  - Increase on-task behavior during class
    - Follow directions instead of engaging in distractible behaviors
    - Sits quietly when expected
  - Teachers report ease of use and benefit to children
  - Most children like to use FM system

Questions?

Clinical Recommendations

- How should you determine if a child with ASD or ADHD will benefit from a FM system at school??
- According to IDEA 2004, under assistive technology:
  - “The evaluation of the needs of a child with a disability, including a functional evaluation of the child in the child’s customary environment”
  - What is a “functional evaluation”??

Clinical Recommendations

- How we define “functional evaluation”:
  - 1. Formal evaluation: audiological, speech recognition in noise
  - 2. Informal evaluation:
    - 1. Teacher/Parent Questionnaires: C.H.A.P.S.
    - 2. Classroom Observation: on-task vs. off-task behaviors
    - 3. Interview Parent & Student: listening difficulties?
    - 4. Review of Sp. Ed. File: Other assessments show problems? Could FM support a current IEP goal?
    - 5. Academic Standing: Academic need  educational need
    - 6. During FM trial: repeat C.H.A.P.S., observation, & interviews

Formal Evaluation

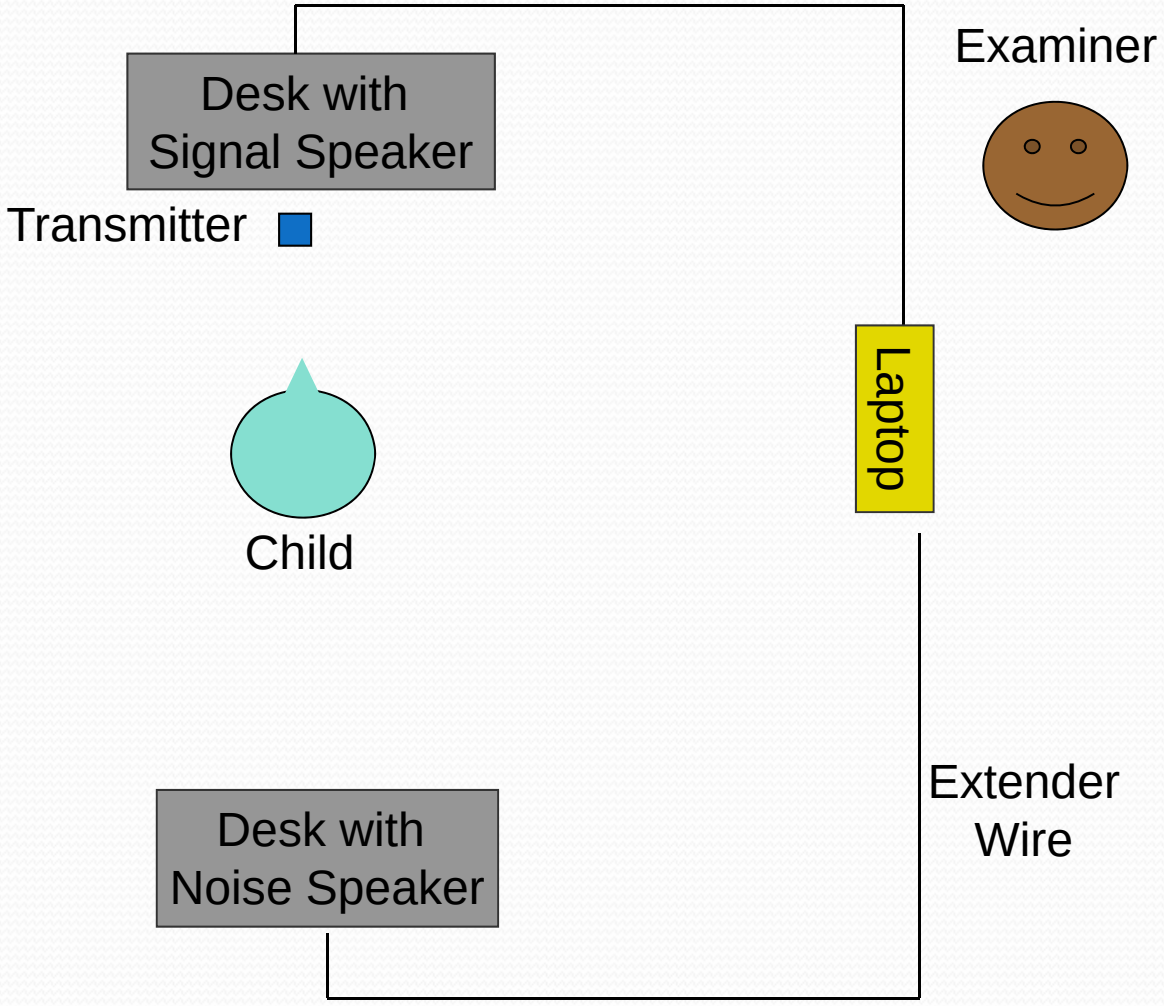
- Stimuli:
  - BKB-SIN: children 6 years+ and adults – present at 60 dBA
  - Phrases in Noise Test (PINT): children 3+
- Conditions:
  - No FM
  - FM 1
  - FM 2 (if applicable)
- Test Environment:
  - Soundbooth: speakers at 0 and 180° azimuth, transmitter suspended 3 to 6” from signal speaker
  - Classroom --- it’s portable!!

Formal Evaluation

- Classroom testing necessities:
  - 1. CD of stimuli, must have speech and noise on different channels
  - 2. Sound Level Meter – great apps out now
  - 4. Tape measure
    - 3-6 feet from either loudspeaker
  - 5. Laptop with high-quality loudspeakers
    - Bose Companion II Series II

Classroom Testing

1. Attach extender wire to loudspeakers & then to laptop
2. Place speakers on desks equidistant to child's seat (3 feet)
3. If doing FM testing, place transmitter mic 3 to 6" from speaker
4. Verify output of each speaker using calibration track on CD and SLM app



Questions or Comments??

- Thank you for attending this talk!
- Please e-mail us if you have more questions:
  - Erin.Schafer@unt.edu
  - Lauren.Mathews@unt.edu

S.I.F.T.E.R.

SCREENING INSTRUMENT FOR TARGETING EDUCATIONAL RISK

by Karen L. Anderson, Ed.S., CCC-A

STUDENT _____ TEACHER _____ GRADE _____

DATE COMPLETED _____ SCHOOL _____ DISTRICT _____

The above child is suspect for hearing problems which may or may not be affecting his/her school performance. This rating scale has been designed to sift out students who are educationally at risk possibly as a result of hearing problems.

Based on your knowledge from observations of this student, circle the number best representing his/her behavior. After answering the questions, please record any comments about the student in the space provided on the reverse side.

1. What is your estimate of the student's class standing in comparison of that of his/her classmates?	UPPER	5	4	MIDDLE	3	2	LOWER	1	ACADEMICS
2. How does the student's achievement compare to your estimation of her/her potential?	EQUAL	5	4	LOWER	3	2	MUCH LOWER	1	
3. What is the student's reading level, reading ability group or reading readiness group in the classroom (e.g., a student with average reading ability performs in the middle group)?	UPPER	5	4	MIDDLE	3	2	LOWER	1	
4. How distractible is the student in comparison to his/her classmates?	NOT VERY	5	4	AVERAGE	3	2	VERY	1	ATTENTION
5. What is the student's attention span in comparison to that of his/her classmates?	LONGER	5	4	AVERAGE	3	2	SHORTER	1	
6. How often does the student hesitate or become confused when responding to oral directions (e.g., "Turn to page . . ")?	NEVER	5	4	OCCASIONALLY	3	2	FREQUENTLY	1	
7. How does the student's comprehension compare to the average understanding ability of her/her classmates?	ABOVE	5	4	AVERAGE	3	2	BELOW	1	COMMUNICATION
8. How does the student's vocabulary and word usage skills compare with those of other students in his/her age group?	ABOVE	5	4	AVERAGE	3	2	BELOW	1	
9. How proficient is the student at telling a story or relating happenings from home when compared to classmates?	ABOVE	5	4	AVERAGE	3	2	BELOW	1	

CLASS PARTICIPATION

10. How often does the student volunteer information to class discussions or in answer to teacher questions?	FREQUENTLY	5	4	OCCASIONALLY	3	2	NEVER	1	
11. With what frequency does the student complete his/her class and homework assignments within the time allocated?	ALWAYS	5	4	USUALLY	3	2	SELDOM	1	
12. After instruction, does the student have difficulty starting to work (looks at other students working or asks for help)?	NEVER	5	4	OCCASIONALLY	3	2	FREQUENTLY	1	

SCORING

Sum the responses to the three questions in each content area and record in the appropriate box on the reverse side and under Total Score below. Place an **X** on the number that corresponds most closely with the content area score (e.g., if a teacher circled 3, 4 and 2 for the questions in the Academics area, an **X** would be placed on the number 9 across from the Academics content area). Connect the **X**'s to make a profile.

CONTENT AREA	TOTAL SCORE	PASS						MARGINAL		FAIL				
ACADEMICS		15	14	13	12	11	10	9	8	7	6	5	4	3
ATTENTION		15	14	13	12	11	10	9	8	7	6	5	4	3
COMMUNICATION		15	14	13	12	11		10	9	8	7	6	5	4	3
CLASS PARTICIPATION		15	14	13	12	11	10	9	8	7	6	5	4	3
SOCIAL BEHAVIOR		15	14	13	12	11	10	9	8	7	6	5	4	3

C. H. A. P. S.

Children's Auditory Performance Scale

by Walter J. Smoski, Ph.D., Michael A. Brunt, Ph.D., J. Curtis Tannahill, Ph.D.

Child's Name_____ Age (years____ months____) Date Completed_____

Name of Person Completing CHAPS_____ Relationship to Child _____

PLEASE READ INSTRUCTIONS CAREFULLY

Answer all questions by comparing this child to other children of similar age and background. Do not answer the questions based only on the difficulty of the listening condition. For example, all 8-year-old children, to a certain extent, may not hear and understand when listening in a noisy room; this would be a difficult listening condition for all children. However, some children may have more difficulty in this listening condition than others. You must judge whether or not THIS child has MORE difficulty than other children in each listening condition cited. Please make your judgment using the following response choices.CIRCLE a number for each item. For ages 7 and above.

LISTENING CONDITION	LESS DIFFICULTY	SAME AMOUNT OF DIFFICULTY	SLIGHTLY MORE DIFFICULTY	MORE DIFFICULTY	CONSIDERABLY MORE DIFFICULTY	SIGNIFICANTLY MORE DIFFICULTY	CANNOT FUNCTION AT ALL
NOISE							
TOTAL CONDITION SCORE ☐							
If listening in a room where there is background noise such as TV, music, others talking, children playing, etc., this child has difficulty hearing and understanding compared to other children of similar age and background							
1. When paying attention	+1	0	-1	-2	-3	-4	-5
2. When being asked a question	+1	0	-1	-2	-3	-4	-5
3. When being given simple instructions	+1	0	-1	-2	-3	-4	-5
4. When being given complicated, multiple instructions	+1	0	-1	-2	-3	-4	-5
5. When not paying attention	+1	0	-1	-2	-3	-4	-5
6. When involved with other activities, i.e., coloring, reading, etc	+1	0	-1	-2	-3	-4	-5.
7. When listening with a group of children	+1	0	-1	-2	-3	-4	-5

COMMENTS:

LISTENING CONDITION

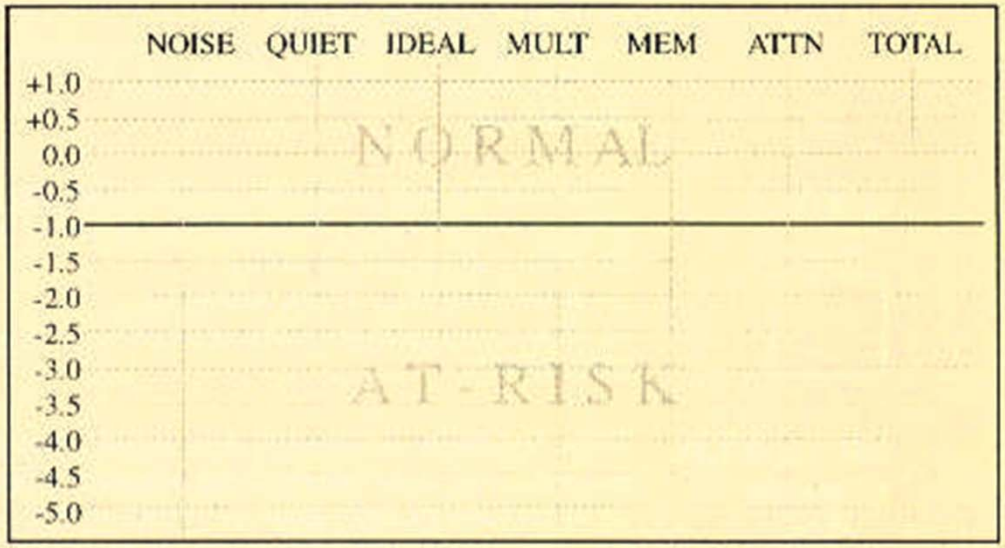
	LESS DIFFICULT	SAME AMOUNT	SLIGHTLY MOR	MORE DIFFICU	CONSID. MORE	SIGNIFIC. MOR	CAN'T FUNCTIO
AUDITORY MEMORY SEQUENCING							
TOTAL CONDITION SCORE							
If required to recall spoken information, this child has difficulty hearing and understanding compared to other children of similar age and background							
21. Immediately recalling information such as a word, word spelling, numbers	+1	0	-1	-2	-3	-4	-5
22. Immediately recalling simple instructions	+1	0	-1	-2	-3	-4	-5
23. Immediately recalling multiple instructions	+1	0	-1	-2	-3	-4	-5
24. Not only recalling information, but also the order and sequence of the information	+1	0	-1	-2	-3	-4	-5
25. When delayed recollection (1 hour or more) of words, word spelling, numbers, etc. is required	+1	0	-1	-2	-3	-4	-5
26. When delayed recollection (1 hour or more) of simple instructions is required	+1	0	-1	-2	-3	-4	-5.
27. When delayed recollection (1 hour or more) of multiple instructions is required	+1	0	-1	-2	-3	-4	-5
28. When delayed recollection (24 hours or more) is required	+1	0	-1	-2	-3	-4	-5
COMMENTS:							
INPUTS							
TOTAL CONDITION							
difficulty hearing and understanding compared to other children of similar age and background.							
18. When listening and watching the speaker's face	+1	0	-1	-2	-3	-4	-5
AUDITORY ATTENTION SPAN							
TOTAL CONDITION SCORE							
If extended periods of listening are required, this child has difficulty paying attention, that is, being attentive to what is being said compared to other children of similar age and background.							
29. When the listening time is less than 5 minutes	+1	0	-1	-2	-3	-4	-5
30. When the listening time is 5-10 minutes	+1	0	-1	-2	-3	-4	-5
31 When the listening time is over 10 minutes	+1	0	-1	-2	-3	-4	-5
32. When listening in a quiet room	+1	0	-1	-2	-3	-4	-5
33 When listening in a noisy room	+1	0	-1	-2	-3	-4	-5
34. When listening first thing in the morning	+1	0	-1	-2	-3	-4	-5
35. When listening near the end of the day, i.e., before supper time	+1	0	-1	-2	-3	-4	-5
36. When listening in a room where there are also visual distractions	+1	0	-1	-2	-3	-4	-5
COMMENTS:							

SCORING: The CHAPS can be scored two ways. Add the circled responses for each condition and place the sum in the Total Condition Score box in under each listed listening condition. Be careful to note "+" and "-" values when adding. Transcribe these sums as indicated below and determine the average score for each listening condition. The Total Condition Scores can be compared to the indicated PASS and FAIL ranges and the appropriate box checked. In addition, the average condition scores can be plotted on the graph to display performance as compared to the normal range. See the CHAPS manual for more complete validity and interpretation information.

LISTENING CONDITION	TOTAL CONDITION SCORE		AVERAGE CONDITION SCORE			
NOISE	_____	÷ 7 =	_____	Pass	Risk
QUIET	_____	÷ 7 =	_____	Pass	Risk
IDEAL	_____	÷ 3 =	_____	Pass	Risk
MULTIPLE	_____	÷ 3 =	_____	Pass	Risk
MEMORY	_____	÷ 8 =	_____	Pass	Risk
ATTENTION	_____	÷ 8 =	_____	Pass	Risk
TOTAL	_____	÷ 36 =	_____	Pass	Risk

TOTAL CONDITION SCORE:
PASS RANGE +36 to -11
AT-RISK RANGE -12 to -130

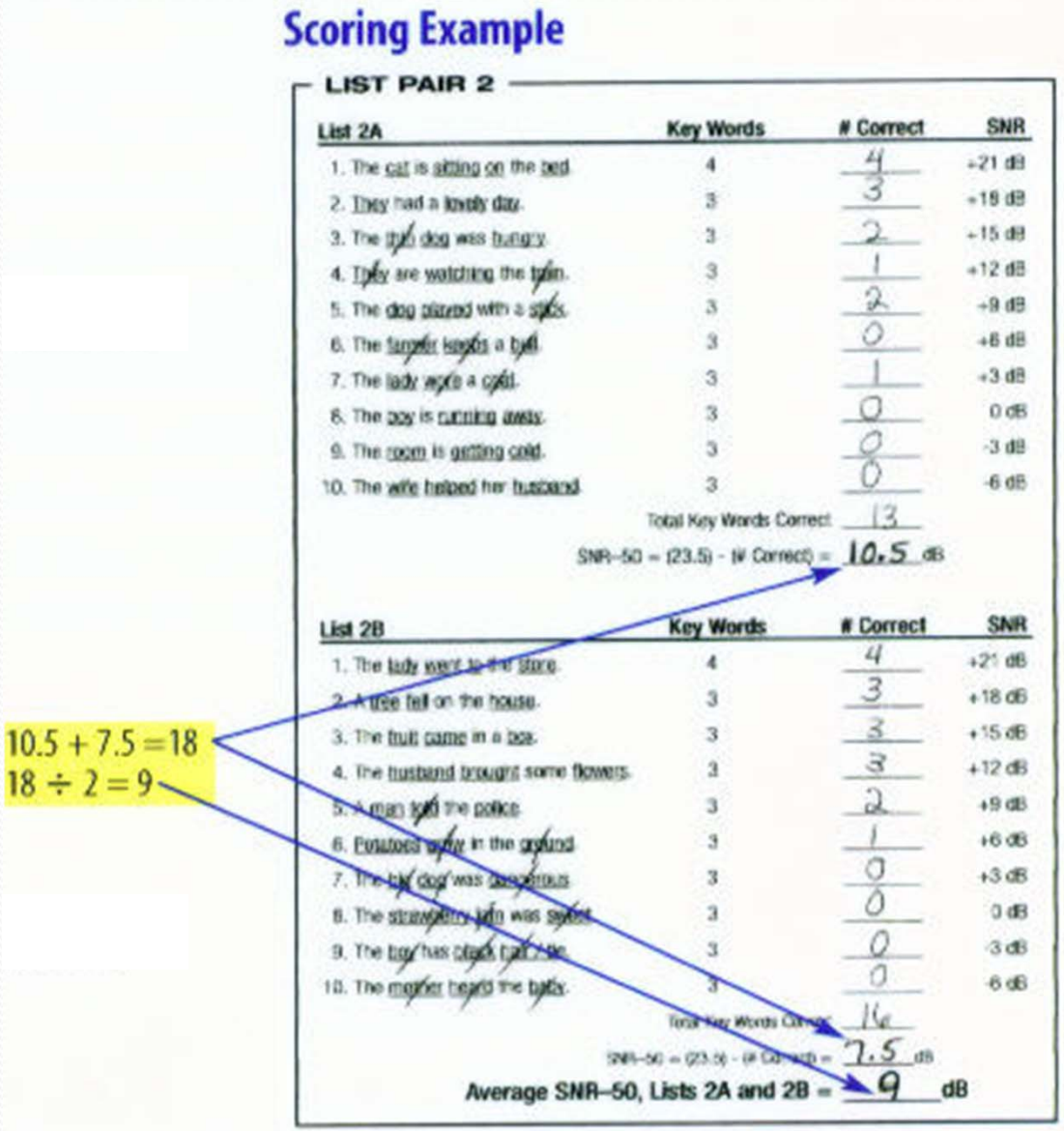
CHAPS Listening Condition Analysis: Transfer Average Condition Scores by entering "X" on graph (round 0.5 scores up to next decimal).



NOTE: Children who score in the at-risk range on the CHAPS will not necessarily require a special academic support program in school. Research found that 45% of students scoring in the at-risk range required no special support services. 50% of students scoring in the at-risk range had below grade level reading ability. 55% required some type of special support or accommodations to achieve success in school.

Formal Evaluation: BKB-SIN

- 18 list pairs equated for difficulty
  - Each pair has 8-10 sentences and takes approximately 3 minutes to administer and score
- Score based on number of key words repeated correctly, then use formula to calculate SNR loss
- Recorded Split track or Standard CD



2010 Version: Phrases in Noise Test (PINT)

- 2010 study designed to:
  - 1. Create a sensitive test in noise that is appropriate for preschool-aged children (ages 3-6)
  - 2. Design a test that is reliable and valid
  - 3. Design a test and equipment set-up that can be used in real classrooms or in a soundbooth
  - 4. Determine normative data on PINT and effects of age on 3-6 year-olds
  - 5. Assess effects of spatial separation of speech and noise sources (i.e., release from masking in young children)

Phrases in Noise Test (PINT): Stimuli

- PINT consists of 12 phrases
  - May be acted out with a doll and objects
  - Sample phrases:

Brush his teeth	Comb his hair	Pull his toes
Find his shoe	Blow his nose	Hide his face

- Phrases are of equal duration & equal intelligibility in the presence of four-classroom noise
  - Pilot data with 20 adults established that the phrases were equally-intelligible in noise

Phrases in Noise Test (PINT): Stimuli

- PINT uses a modified-adaptive paradigm to measure 50% correct speech-in-noise thresholds (e.g., BKB-SIN)
- Tested normal hearing children, ages 3-6, with:
  - 1. Speech and noise from same loudspeaker (So/No)
  - Speech and noise from separate loudspeakers (So/N180)

Phrases in Noise Test (PINT)
LIST ONE - SPEECH 0° / NOISE 0°

Condition:

Trial	SNR	Phrase	Response	Trial	SNR	Phrase	Response
1.	+15	Hold his hand	+	13.	-18	Move his arm	−
2.	+12	Brush his teeth	+	14.	-15	Comb his hair	−
3.	+9	Touch his tongue	+	15.	-12	Wipe his mouth	−
4.	+6	Wipe his mouth	+	16.	-9	Pull his toes	−
5.	+3	Blow his nose	+	17.	-6	Blow his nose	−
6.	0	Stomp his feet	+	18.	-3	Hide his face	−
7.	-3	Comb his hair	+	19.	0	Find his shoe	+
8.	-6	Hide his face	−	20.	+3	Brush his teeth	+
9.	-9	Find his shoe	−	21.	+6	Stomp his feet	+
10.	-12	Pat his leg	−	22.	+9	Touch his tongue	+
11.	-15	Move his arm	−	23.	+12	Hold his hand	+
12.	-18	Pull his toes	−	24.	+15	Pat his leg	+

HARDER

EASIER

THRESHOLD = -1.5 dB

Observation Recording Sheet

Interval	Response	Interval	Response	Interval	Response	Interval	Response	Interval	Response	Interval	Response
1. (30s)		13. (30s)		25. (30s)		37. (30s)		49. (30s)		61. (30s)	
2. (60s)		14. (60s)		26. (60s)		38. (60s)		50. (60s)		62. (60s)	
3. (30s)		15. (30s)		27. (30s)		39. (30s)		51. (30s)		63. (30s)	
4. (60s)		16. (60s)		28. (60s)		40. (60s)		52. (60s)		64. (60s)	
5. (30s)		17. (30s)		29. (30s)		41. (30s)		53. (30s)		65. (30s)	
6. (60s)		18. (60s)		30. (60s)		42. (60s)		54. (60s)		66. (60s)	
7. (30s)		19. (30s)		31. (30s)		43. (30s)		55. (30s)		67. (30s)	
8. (60s)		20. (60s)		32. (60s)		44. (60s)		56. (60s)		68. (60s)	
9. (30s)		21. (30s)		33. (30s)		45. (30s)		57. (30s)		69. (30s)	
10. (60s)		22. (60s)		34. (60s)		46. (60s)		58. (60s)		70. (60s)	
11. (30s)		23. (30s)		35. (30s)		47. (30s)		59. (30s)			
12. (60s)		24. (60s)		36. (60s)		48. (60s)		60. (60s)			
6 minutes over		**12 minutes over**		**18 minutes over**		**24 minutes over**		**30 minutes over**		**35 minutes over**	

Inter-observer Reliability Sheet

Interval	Agreement	Interval	Agreement	Interval	Agreement
1. (30s)	✓	25. (30s)	×	49. (30s)	×
2. (60s)	✓	26. (60s)	×	50. (60s)	×
3. (30s)	✓	27. (30s)	✓	51. (30s)	×
4. (60s)	✓	28. (60s)	✓	52. (60s)	✓
5. (30s)	×	29. (30s)	✓	53. (30s)	✓
6. (60s)	✓	30. (60s)	✓	54. (60s)	✓
7. (30s)	✓	31. (30s)	✓	55. (30s)	✓
8. (60s)	✓	32. (60s)	✓	56. (60s)	✓
9. (30s)	✓	33. (30s)	✓	57. (30s)	✓
10. (60s)	×	34. (60s)	✓	58. (60s)	✓
11. (30s)	✓	35. (30s)	✓	59. (30s)	✓
12. (60s)	✓	36. (60s)	✓	60. (60s)	×
13. (30s)	✓	37. (30s)	✓	61. (30s)	✓
14. (60s)	✓	38. (60s)	✓	62. (60s)	✓
15. (30s)	✓	39. (30s)	✓	63. (30s)	×
16. (60s)	✓	40. (60s)	✓	64. (60s)	×
17. (30s)	✓	41. (30s)	✓	65. (30s)	✓
18. (60s)	✓	42. (60s)	✓	66. (60s)	✓
19. (30s)	×	43. (30s)	✓	67. (30s)	✓
20. (60s)	×	44. (60s)	✓	68. (60s)	✓
21. (30s)	✓	45. (30s)	×	69. (30s)	✓
22. (60s)	✓	46. (60s)	×	70. (60s)	✓
23. (30s)	✓	47. (30s)	×		
24. (60s)	✓	48. (60s)	×		