Webber® HearBuilder® Following Directions Efficacy Study:
Improved Abilities for At-Risk Students to Follow Directions That Target Basic Concept Vocabulary

Amber B. Hodgson
N. Elizabeth Holland
Super Duper® Publications, Greenville, SC

Purpose: This study examined the effects of *Webber® HearBuilder® Following Directions*, an interactive computer program that uses a systematic approach to auditory training, on students' abilities to follow various types of directions that target basic concepts.

Method: This study was conducted in Las Vegas, Nevada, in 10 Clark County School District elementary schools; 54 total students participated. The students used *Webber® HearBuilder® Following Directions* for at least 8 weeks at 2 times per week for 30-minute sessions or 3 times per week for 20-minute sessions. They were pretested and posttested using *Webber® HearBuilder® Following Directions Inventory (FDI)* to assess the students' abilities to follow directions involving basic concept vocabulary.

Results: There was a statistically significant improvement in scores for the whole group of students in the study from pretest to posttest.

Conclusion: The results of this research study show that *Webber® HearBuilder® Following Directions* is an effective instructional component for improving specific auditory processing skills of students in general and special education programs when used in a variety of settings.

Introduction

Following verbal directions requires the ability to process and retain auditory information and a strong knowledge of basic concepts. Understanding these concepts is fundamental for students to perform everyday tasks such as listening, speaking, reading, writing, and arithmetic (Wiig, 2004). See Appendix A for examples of the different types of directions and specific basic concepts targeted in *Webber® HearBuilder® Following Directions*.

Merzenich et al.'s (1999) neurophysical and perceptual training studies showed that humans are subject to powerful positive brain/plasticity learning effects throughout life and that critical and basic listening skills can be improved at any age through intensive training. Further, Merzenich and Jenkins (1995) reason that intensive training which increases processing requirements gradually, results in maximal reorganization of the neural mechanism. As well, direct, theory-based auditory training may influence the organization of the auditory centers of the brain, increasing its function (Flexer, 1999).

Webber® HearBuilder® Following Directions is an interactive, theory-based approach to auditory training. It is a therapy tool that purportedly helps students improve auditory attention, auditory memory, basic concept knowledge, and auditory processing of verbal directions. *Webber® HearBuilder® Following Directions* uses a systematic

approach to auditory training that offers minimal increases in difficulty across the multiple levels in each activity. Students are required to be actively engaged when listening and following directions which allows for the enhancement of auditory processing skills. As well, the basic concept words that are targeted in *Webber® HearBuilder® Following Directions*, such as colors, numbers, location words, and descriptive words, are part of the language of instruction and communication in early education settings, and a good knowledge of these concepts is directly related to academic achievement (Wiig, 2004).

The following study was conducted to assess the effectiveness of *Webber® HearBuilder® Following Directions* for improving specific auditory processing skills in children with and without diagnosed language and/or learning disabilities.

Method

Participants

The *Webber® HearBuilder® Following Directions* study was conducted in Las Vegas, Nevada, from January to May of 2010 in 10 Clark County School District elementary schools with one speech-language pathologist per school to administer pre and posttesting and oversee the implementation of *Webber® HearBuilder® Following Directions*. Fifty-four (54) total students participated in this study. Seventy percent (70%) of the students were male and 30% were female. There were 19 students in preschool, 11 in kindergarten, 9 in first grade, 9 in second grade, 2 in third grade, 2 in fourth grade, and 2 in fifth grade. Forty-eight percent (48%) of the students were described as having Autism Spectrum Disorder, 19% were described as having a Learning Disability and/or a Language Impairment, and 17% were described as having a Developmental Delay. Two of the students did not have special education Individualized Education Plans (IEPs) and had previously been or were currently included in a Response to Intervention (RtI) program. Other diagnoses reported included Mental Retardation, Fetal Drug Affect, XXYY Syndrome, DeGeorge Syndrome, Attention Deficit Hyperactivity Disorder, and a Hearing Impairment.

Parents of the participants were asked to indicate students' race/ethnicity with the following results reported: 39% White, 33% Hispanic, 17% Black, and 11% "other." Reportedly, 81.5% of the students lived in homes where English was the primary language, and 18.5% of the students lived in homes where Spanish was spoken. Nineteen percent (19%) of the sample reportedly received Title I support and 6% of the sample were reported to qualify for free or reduced-priced meals. See Appendix B for specific participant information.

Implementation

Students used *Webber® HearBuilder® Following Directions* for at least 8 weeks at 2 times per week for 30-minute sessions or 3 times per week for 20-minute sessions. The software was used in a variety of settings that included classrooms, therapy rooms, and computer labs. Students performed the software tasks independently, and the speech-language pathologists were instructed to give minimal assistance. *Webber® HearBuilder® Following Directions* provided students individualized practice of five different types of directions (basic, sequential, quantitative & spatial, temporal, and conditional) that targeted 40 essential basic concepts. The students were instructed to complete at least one level of 10 trials for each type of direction during each session.

Assessment

Students were pretested and posttested using *Webber® HearBuilder® Following Directions Inventory (FDI)*. Super Duper® Publications created this assessment because no standardized tests currently exist that are sensitive enough to assess the specific auditory processing skills involving basic concepts targeted in *Webber® HearBuilder® Following Directions*. The *FDI* consisted of 63 questions that focused on following basic, sequential, quantitative & spatial, temporal, and conditional directions involving basic concept vocabulary (See Appendix C for a list of test questions). It was completed in one session, administered online, and results were submitted electronically. Students qualified to participate in the study if a score of 75% or less was obtained on this assessment.

Analysis

This study employed a differential research, one-group pretest-posttest design. Data was analyzed using paired-sample t-tests in order to compare the pretest and posttest raw score totals obtained from the *FDI*. All analyses used a *p*-value of 0.05 as the criterion for identifying statistical significance.

Results

There was a statistically significant improvement in scores for the whole group of students (*N*=54) who participated in the study from pretest (*M*=24.74, *SD*=8.88) to posttest (*M*=34.54, *SD*=10.63); t(53)= -8.66, *p*<.001. These results suggest that the use of *Webber® HearBuilder® Following Directions* had an overall significant effect on the students' abilities to

follow directions as shown by pretest and posttest scores obtained from the *FDI* (see Figure 1). In addition to statistically significant results when data for all students was analyzed, when means for pretest and posttest raw score totals were compared for specific groups it generated statistically significant *p*-values as well. The groups that were analyzed included students with a Learning Disability and/or Language Impaired diagnosis, a Developmental Delay diagnosis, or an Autism Spectrum Disorder diagnosis; in grades preK through second; and considered to be White, Hispanic, Black, or "other." Figures 2 through 4 depict the pretest and posttest data derived from *FDI* raw score averages for all of the groups listed previously as well as the significant *p*-values and the number of students in each grouping.
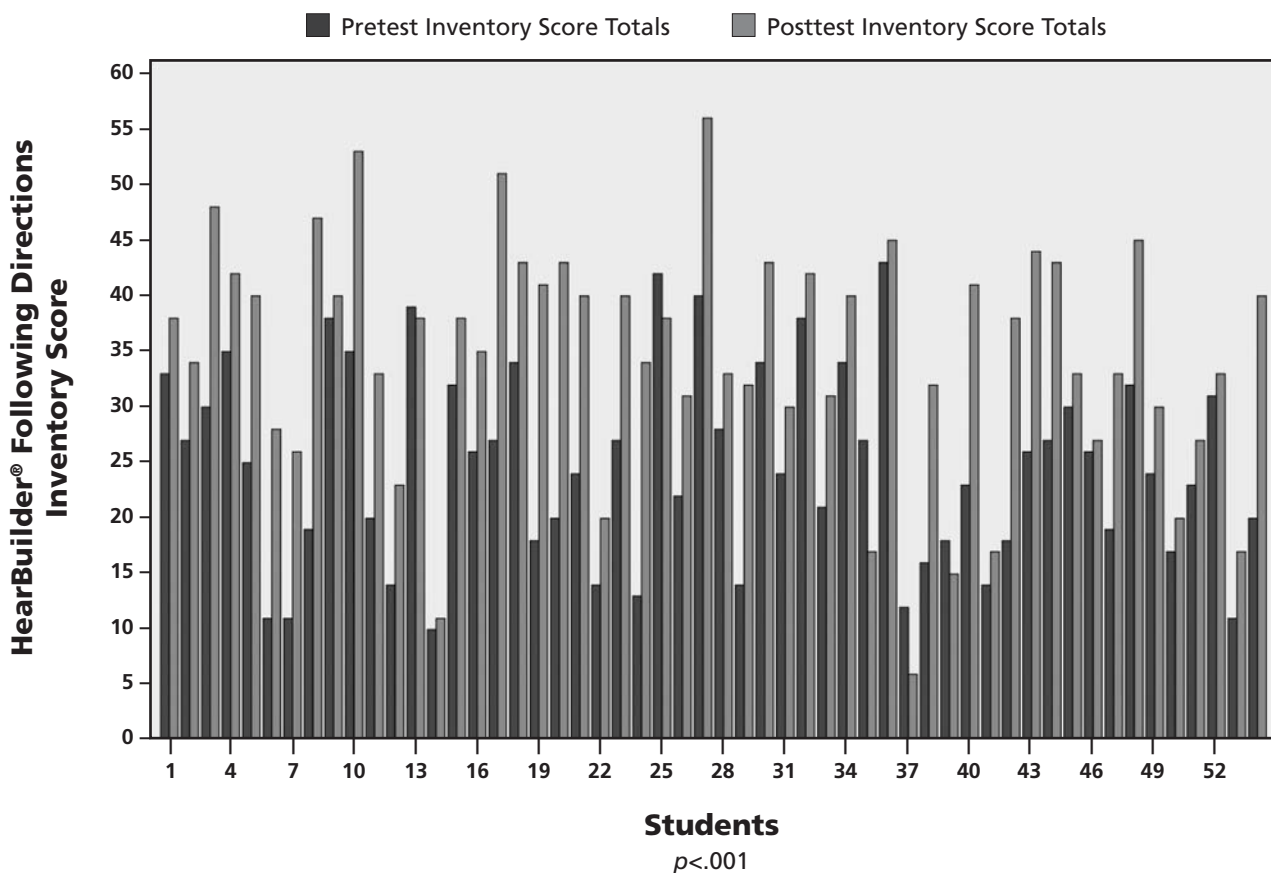

Figure 1. Statistically significant pretest and posttest data based on Webber® HearBuilder® Following Directions Inventory *scores representing an improved ability to follow directions for majority of students in study.*
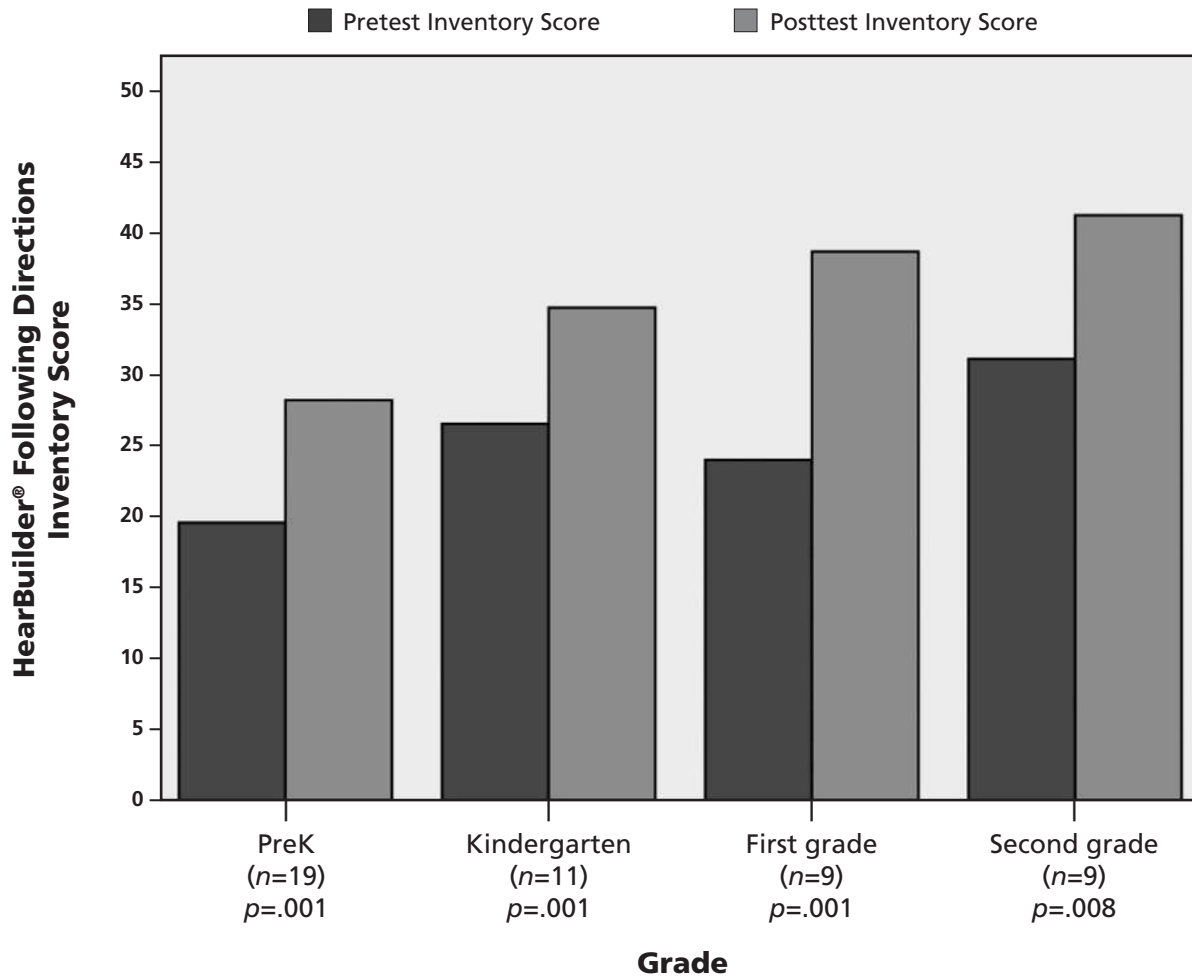
Pretest Inventory Score   Posttest Inventory Score

Figure 2. Statistically significant pretest and posttest data displaying Webber® HearBuilder® Following Directions Inventory *score averages based on grade.*
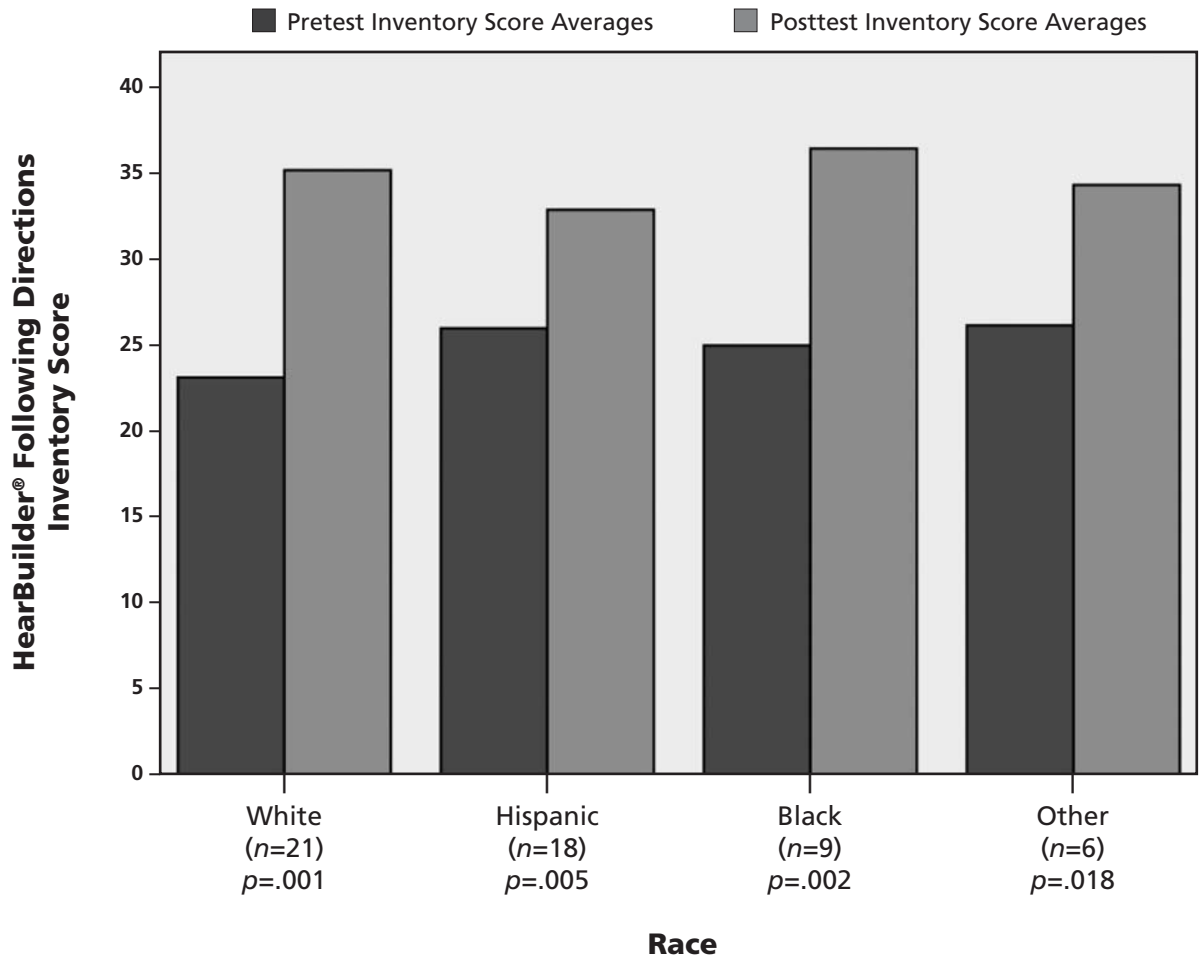
Figure 3. Statistically significant pretest and posttest data displaying Webber® HearBuilder® Following Directions Inventory *score averages based on race.*
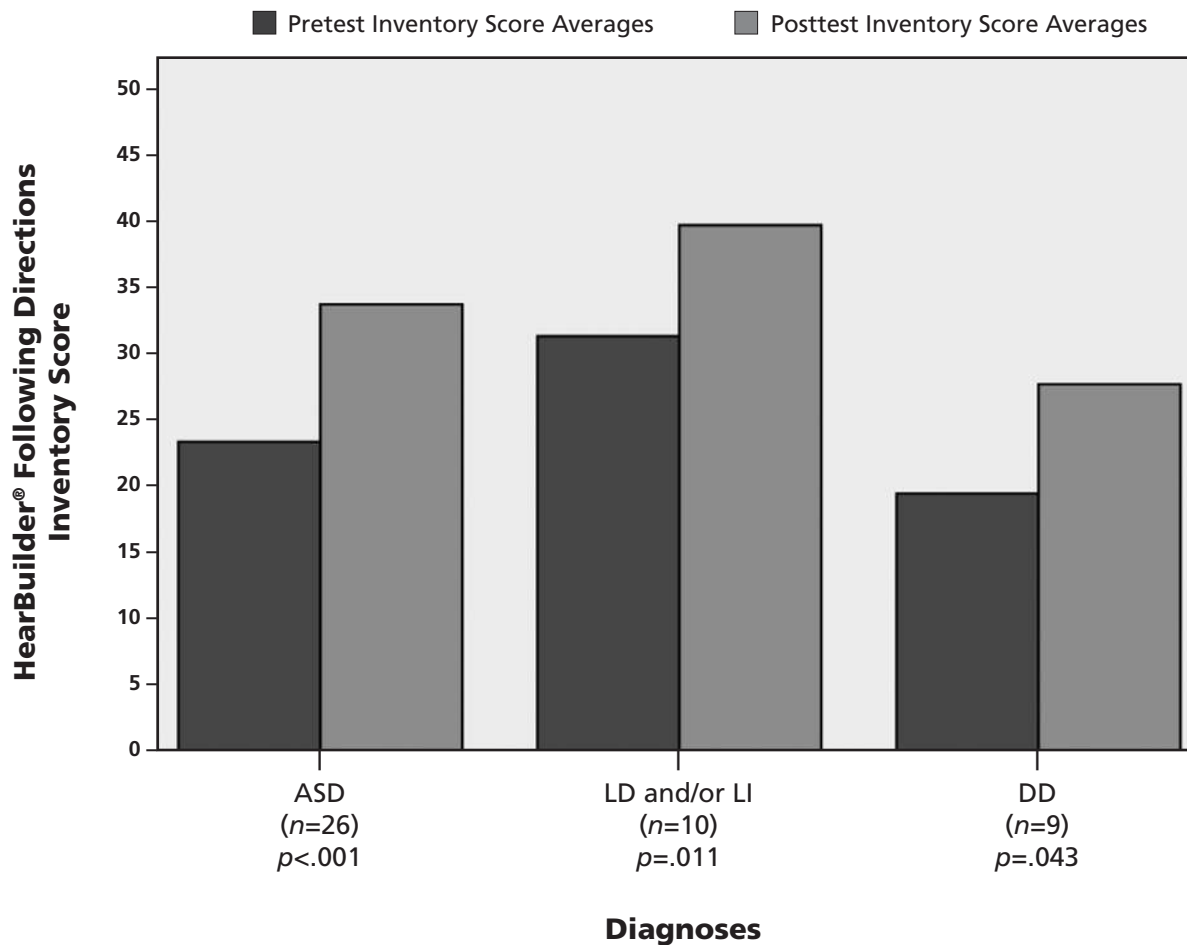
Figure 4. Statistically significant pretest and posttest data displaying Webber® HearBuilder® Following Directions Inventory *score averages based on diagnosis.*

Conclusion

The results of this research study show that *Webber® HearBuilder® Following Directions* is an effective instructional component in improving students' abilities to follow directions that target basic concepts, in special education programs, when used in therapy, classroom, or computer lab settings. In addition, all of the students in this study were considered to be "at-risk" based on having a diagnosed disability; enrollment in Title I/free and reduced meals program; limited English proficiency; and/or low assessment scores, and in 8 weeks, as indicated by pretest/posttest scores, there was an overall significant improvement in the students' abilities to follow various types of directions involving basic concept vocabulary.

Future research regarding *Webber® HearBuilder® Following Directions* should include alternate pretest and posttest assessments, control groups, greater sample sizes, and varied demographics from across the country in order to increase validity of all results obtained.

References

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APPENDIX A

The Five Different Types of Directions Targeted in *Webber® HearBuilder® Following Directions*

Basic Directions

This activity starts with a simple, one-step direction using one element *(Click on the monkey)*. As the activity progresses, the difficulty increases and adds more elements to the verbal directions, such as color *(Click on the red monkey)*, size *(Click on the large monkey)*, action *(Click on the spinning monkey)*, and location *(Click on the monkey that is below the car)*. Then, the higher levels combine these elements *(Click on the small red monkey that is spinning below the car)*.

Sequential Directions

This activity targets the ability to follow multistep and sequential directions *(First set the temperature to cold, next set the shape to square, and then press* "Start"*)*. Students have to set the position of one to four switches. Some levels allow students to set the switches in any order, and others require the student to set the switches in a specific order.

Quantitative and Spatial Directions

This activity provides verbal directions that involve quantitative concepts *(Choose one ball)* and spatial relations *(Choose the first doll)*. Higher levels of this activity combine quantitative and spatial relations with descriptive elements such as size and color *(Choose the toy that is between the small green rocket and the big yellow train)*.

Temporal Directions

This activity has students follow directions containing the words "before" and "after" in a variety of positions within the utterance. For example, in some levels, the term "before" is located in the middle of the utterance *(Put the truck in the box before you put the robot in the box)*. The following level positions the term "before" at the beginning of the utterance *(Before you put the doll in the box, put the rocket in the box)*. Higher levels of this activity increase auditory memory and processing demands by adding color attributes *(After you put the green doll in the box, put the red plane in the box)*.

Conditional Directions

This activity has students decide if a certain task should be performed based on the condition in a direction *(If a doll is in the box, put the box on the truck)*. Some directions in this activity also involve negation *(If a rocket is not in the box, put the box on the truck)*. Higher levels add elements such as color, quantity, and size to increase the auditory memory and processing demands *(If a green doll and a blue train are in the box, put the box on the large truck. If not, put the box on the small truck)*.

The Forty Essential Basic Concepts Targeted in *Webber® HearBuilder® Following Directions*

Basic colors – red, blue, green, yellow

Quantities – one, two, all, both, either, except, nor, or, and, don't, not

Sequences – first, second, third, then, next, last

Shapes – circle, square, triangle, star
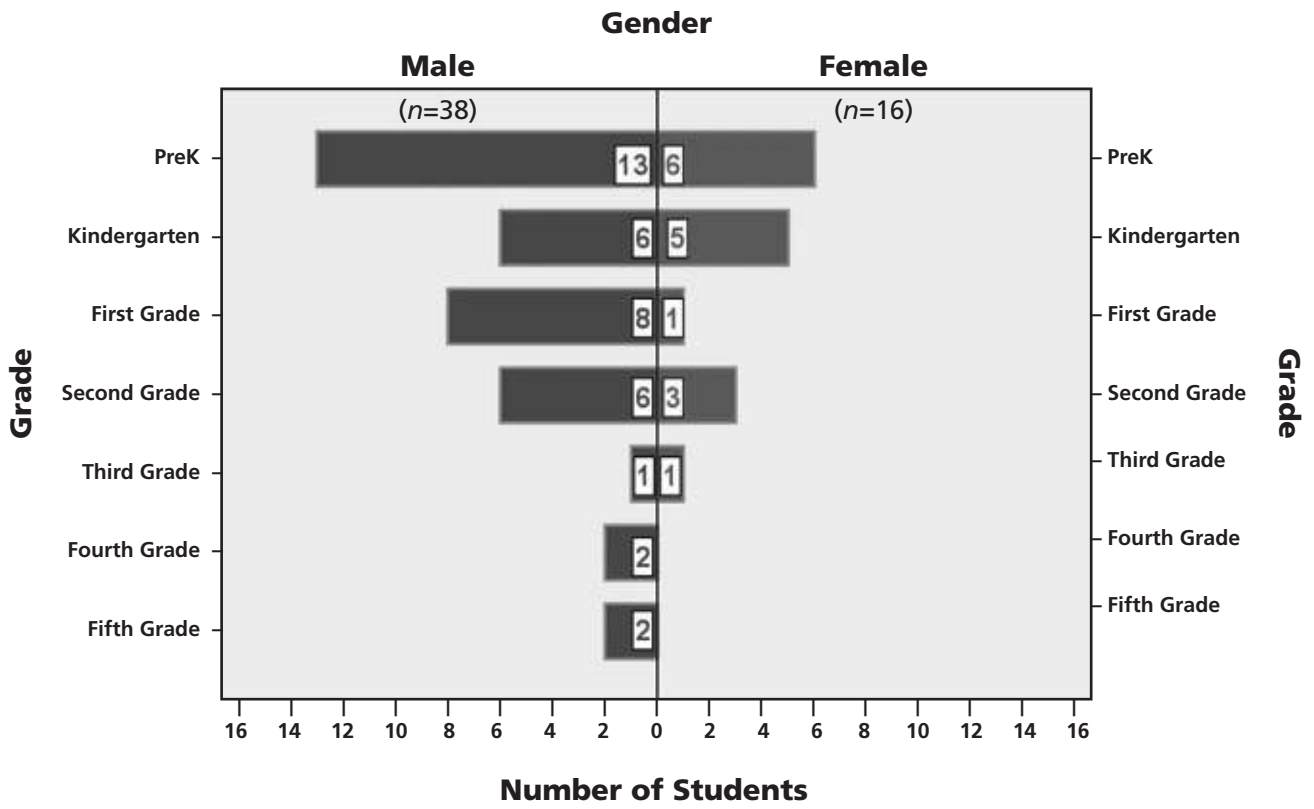
Size – large, small

Time – before, after

Spatial Relationships and Positions – first, second, third, last, between, beside, next to, above, below

Condition – hot, cold

Demographics

Gender

Male   **Female**

(*n*=38)   (*n*=16)

Grade	Male	Female
PreK	13	6
Kindergarten	6	5
First Grade	8	1
Second Grade	6	3
Third Grade	1	1
Fourth Grade	2	
Fifth Grade	2	

16 14 12 10 8 6 4 2 0 2 4 6 8 10 12 14 16

Number of Students

Demographics

■ White	(n=21)
■ Hispanic	(n=18)
■ Black	(n=9)
■ Other	(n=6)
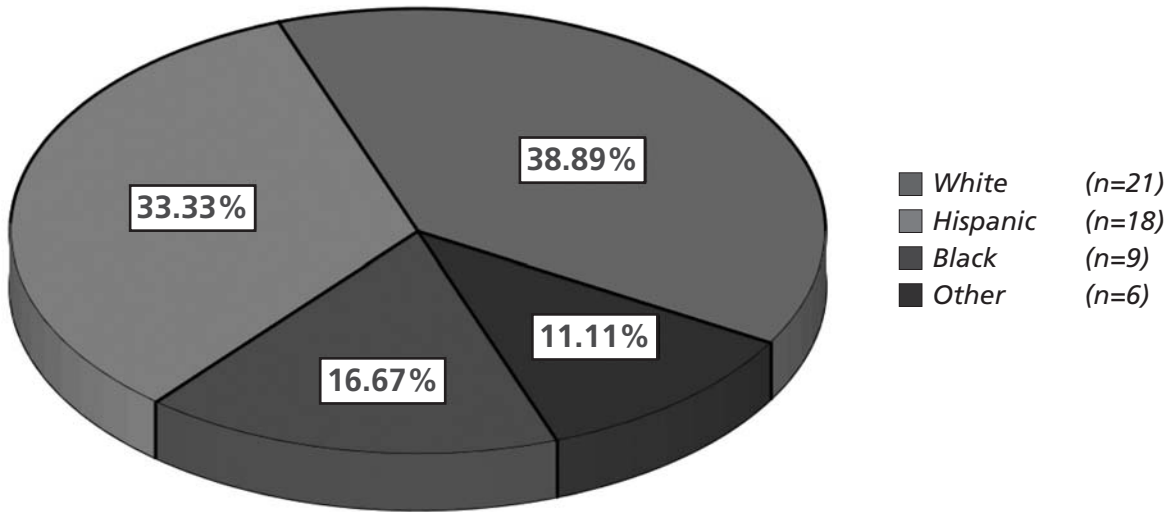
Total Number of Students = 54

Diagnoses
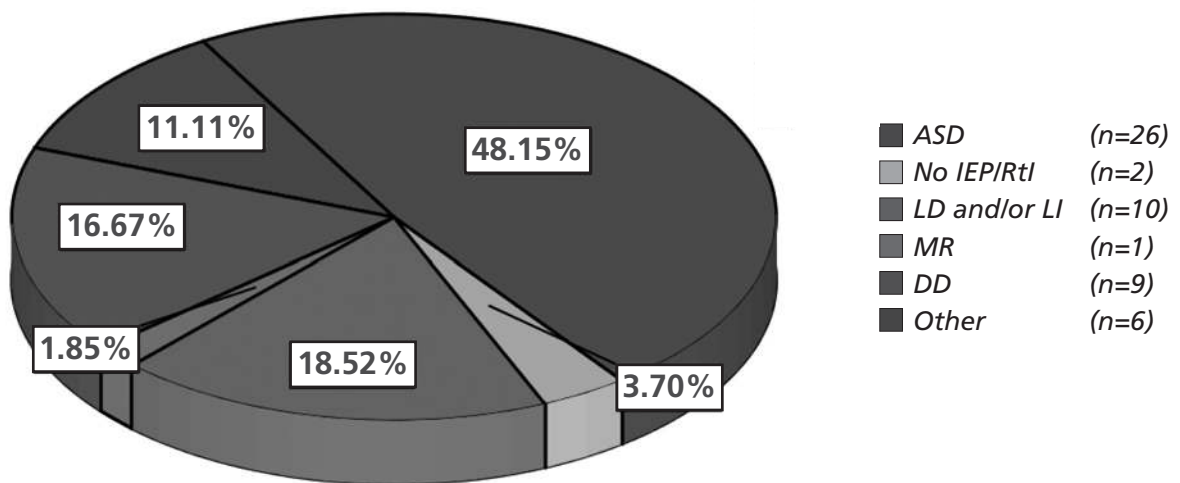
■ ASD	(n=26)
■ No IEP/RtI	(n=2)
■ LD and/or LI	(n=10)
■ MR	(n=1)
■ DD	(n=9)
■ Other	(n=6)

Total Number of Students = 54

Webber® HearBuilder® Following Directions Inventory

1. Click on the cat.

2. Click on the star.

3. Click on the green tree.

4. Click on the yellow shoe.

5. Click on the small fork.

6. Click on the large fish.

7. Click on the tree that is below the fork.

8. Click on the bed that is next to the fish.

9. Click on the cat that is beside the bird.

10. Click on the small bird that is above the cat.

11. Click on the small blue tree that is below the green fish.

12. Click on the large green fork that is beside the red tree.

13. Click on the shoe that is green.

14. Click on the bird that is small.

15. Click on the apple that is red, then click on the fork that is small.

16. First click on the fish that is green, then click on the bed that is large.

17. Click on the fork that is small, then click on the bed that is yellow, and finally click on the apple that is small.

18. First, click on the star that is green, next, click on the apple that is yellow, and finally, click on the cat that is small.

19. Click on the bed that is large, then the shoe that is large. Next, click on the star that is green, and then, the bird that is blue.

20. Click on the star that is red, then, click on the fish that is small, then, click on the tree that is green, and then, click on the apple that is large.

21. First, click on the apple that is green. Next, click on the shoe that is large, then, click on the star that is small, and finally, click on the fish that is blue.

22. First, click on the bed that is blue. Second, click on the cat that is large. Third, click on the star that is green, and finally, click on the apple that is small.

23. Click on the shoe that is small, then, click on the star that is green, then click, on the cat that is yellow, and then, click on the fish that is large.

24. First, click on the tree that is small. Next, click on the fork that is large, then, click on the apple that is large, and then, click on the fish that is yellow.

25. First, click on the cat that is large. Second, click on the star that is small. Third, click on the shoe that is green, and finally, click on the tree that is red.

26. Choose two apples.

27. Choose both of the beds.

28. Choose all of the trees.

29. Choose either an apple or a star.

30. Choose a fork and a tree.

31. Choose a shoe or a bed.

32. Choose all of the items except the fish.

33. Don't choose the cat; choose the tree.

34. Choose the star that is between the beds.

35. Choose the apple, but not the shoe.

36. Choose the first star.

37. Choose the third cat.

38. Choose both of the green trees.

39. Choose one red star.

40. Choose the last yellow fish.

41. Choose the fish that is between the green apples.

42. Don't choose a small blue cat; choose a small yellow fork.

43. Choose the second red fish.

44. Click on a star before you click on a fish.

45. Click on a cat after you click on an apple.

46. Before you click on a star, click on a fork.

47. After you click on a cat, click on a fish.

48. Before you click on a bird, click on a star.

49. Click on a tree before you click on a fork.

50. Click on the red apple before you click on the green fish.

51. Click on the yellow cat after you click on the red bird.

52. After you click on the blue fish, click on the green tree.

53. Before you click on the red fork, click on the yellow star.

54. If a fish is in the box choose the circle, if not, choose the square.

55. If a red bird is in the box choose the square, if not, choose the circle.

56. If a fork and a cat are in the box, choose the square, if not, choose the circle.

57. If a red cat and a blue apple are in the box, choose the circle, if not, choose the square.

58. If a green tree is not in the box, choose the circle.

59. If a green cat and a red tree are in the box, choose the square, if not, choose the circle.

60. If a red fork and a yellow apple are in the box, choose the small circle, if not, choose the large square.

61. If a green cat is in the box, choose the square. If a red tree is in the box, choose the circle.

62. If an apple is in the box, choose the large square, in not, choose the small circle.

63. If a yellow fork is in the box, choose the small circle, if not, choose the large circle.