

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

SCREENING IDENTIFICATION FOR TARGETING EDUCATIONAL RISK

**In Children with Identified Hearing Loss
Ages 3 through Kindergarten**

By

Karen L. Anderson, Ph.D.

Noel D. Matkin, Ph.D.

USER'S MANUAL

Available from
The Educational Audiology Association
(800) 460-7322
EAA@L-TGraye.com

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

SCREENING IDENTIFICATION FOR TARGETING EDUCATIONAL RISK In Preschool Children (age 3 through Kindergarten)

By Karen Anderson, Ph.D. & Noel Matkin, Ph.D.

USER'S MANUAL

BACKGROUND: Many children with congenital sensorineural hearing losses are identified each year through neonatal screening programs. However, it is estimated that 20 - 30% of children with educationally significant sensorineural hearing impairments acquire their impairment during the preschool years. Further there is a large number of otitis-prone youngsters who experience repeated ear infections and periods of conductive hearing loss during the early developmental years. Many of the hearing losses among young children are relatively mild and there is ongoing debate as to the adverse effects of fluctuating conductive hearing impairment upon cognitive, emotional, social and speech-language development. With the implementation of Public Law 99-457, increasing numbers of children are being evaluated through Child Find programs.

There has generally been positive feedback from clinicians and teachers who have used the original S.I.F.T.E.R. as a screening tool to identify elementary age students at risk for academic problems due to hearing loss. On the basis of such feedback a decision was made to modify the original instrument and develop a version for use with preschool and kindergarten age children. The format used in the initial instrument was incorporated into the Preschool S.I.F.T.E.R. to facilitate implementation, administration, and interpretation when the test is used by those familiar with the S.I.F.T.E.R. By combining the use of these two instruments, educational screening can be performed on children with permanent and fluctuating hearing impairment in a systematic manner for ages 3 through grade 6.

The purpose of the Preschool S.I.F.T.E.R. is to provide an instrument which can be used to screen children with hearing problems relative to the adequacy of those developmental skills believed to be important for success in the classroom. Those children who are identified as being at-risk for significant developmental/educational difficulties can then be referred for formal assessment and evaluation as directed by local school policy.

DEVELOPMENT: The Preschool S.I.F.T.E.R. originated from a 25 question format generated by the authors. In 1992-1993, this 25 question format was field tested. The data from 95 students allowed analysis of item effectiveness and content areas for the purpose of reducing the instrument into a shorter format. Subsequently, a 15 question version underwent national field testing during the 1993-1994 and the 1994-1995 school years.

CONTENT VALIDITY: In 1991, a 25 item questionnaire was developed. First, the questions from the original instrument were examined. When appropriate, the intent of the questions was modified to reflect either an earlier developmental level or classroom activities for younger children. Ultimately, 5 questions were adopted in each of the five general content areas: Preadacademics, Attention, Communication, Class Participation, and Social Behavior.

ITEM EFFECTIVENESS: The purpose of the 25 item questionnaire was to generate data with which to perform item analysis and content area reliability tests. During the 1993-95 school years teacher responses were collected for 78 age three through kindergarten students who were identified as having hearing problems and 17 normal hearing, negative ear problem history children serving as controls. Item analysis determined which of the 5 questions in each content area were most discriminating.

These item effectiveness methods were the same as used in the development of the original S.I.F.T.E.R. and precisely followed mathematical operations to determine item effectiveness. Item effectiveness allowed the valid selection of 3 questions each content area to occur (only the most discriminating questions were included). The wording of the three questions was further adjusted based on comments received from users following national field testing of the S.I.F.T.E.R. Index of Efficiency for the Preschool S.I.F.T.E.R. is below.

<u>PRE-ACADEMICS</u>	<u>ATTEN.</u>	<u>COMMUNICATION</u>	<u>CLASS PARTICIPATION</u>	<u>SOC. BEHAVIOR</u>
1. 50	4. .59	7. .57	10. .57	13. .48
2. 56	5. .50	8. .59	11. .61	14. .59
3. 45	6. .50	9. .60	12. .55	15. .49

FACTORS MEASURED BY PRESCHOOL S.I.F.T.E.R.: It was anticipated that the 15 items were measuring only one factor, but it was found that two factors actually were being measured. It was determined that 9 items were centered primarily on factor 1) Expressive Communication skills, and the remaining 5 items were centered around factor 2) Socially Appropriate Behavior. One item (#12) is incorporated into both factor one and factor two. Items that best describe factor 1 are 7, 8, 9, 10, 11, and 14. These Expressive Communication items have .80 correlations or greater. Factor 2 items are numbers 4, 5, 6, 13, and 15. These Socially Appropriate Behavior items all have correlations of at least .70. Cronbach Alpha analysis for Expressive Communication revealed a very high interitem correlation coefficient of .9477. Factor 1 mean performance for the normal hearing group was 19.13 whereas the sensorineural group mean was 13.09 and the mean for the conductive loss group was 15.21. Differences were significant in each case. When factor 2 was examined, the normal group mean was 12.84, sensorineural group mean was 11.20 and the conductive group mean was 11.22. Both hearing loss groups were significantly different from normal group performance but not significantly different from one another. Analysis of variance of factor 1 and factor 2 revealed high significance at the .00001 level for factor 1 and at the .0015 level of significance for factor 2.

Based on this interpretation of field test data, the Preschool S.I.F.T.E.R. explores two major questions:

- 1) Does the child have a major deficit relative to expressive language skills?
- 2) Does the child exhibit deficits relative to developmentally appropriate social skills?

Performance in relation to these two factors will be indicated in the following field test data subgroups as appropriate.

NATIONAL FIELD TEST POPULATION: It is important to realize the stratification of the field test population when considering which group of hearing impaired students the Preschool S.I.F.T.E.R. can be used with most reliably. Therefore, the following information about the 351 hearing impaired students and the 136 normal hearing students in the field test population has been included:

Gender: Males 53% Females 47%

The only gender difference noted on the Preschool S.I.F.T.E.R. was noted on factor 2. Data analysis supported the accepted observation that females display more socially acceptable behaviors and better communication skills than males. These results were significant at a P value of less than a .05 level.

	Males (N=184)	Females (N=164)
Expressive Communication	Mean 15.16 SD (6.43)	Mean 16.56 SD (6.92)
Socially Appropriate Behavior	Mean 11.03 SD (3.81)	Mean 12.59 SD (3.95)

Race: Caucasian 70% Black 7% Hispanic 23%

Asian, American Indian and Other subjects were in insufficient numbers to be included in this analysis as representative groups. Performance by ethnic groups on factors 1 and 2 revealed differences among means which were non-significant. Therefore, there was no evidence of cultural bias when examining these three groups.

Age: Age analysis did not reveal any consistent change, however, if the data were grouped into younger versus older students (3-4 vs. 5-6) the data for factor 1 suggested younger subjects performed more poorly than older subjects. A similar trend was observed for factor 2 but to a lesser degree. The Preschool S.I.F.T.E.R. differentiates between normal hearing and hearing loss groups at all age groups, however, differences were weakest for the children aged 3.0 - 3.6 years.

Additional Handicaps

All subjects that had additional handicaps indicated during field test data collections were removed from the analysis group entirely.

Hearing Loss Type:

Normals	30%
Conductive	36%
Sensorineural	34%

The Mixed hearing loss group was represented in field test data in numbers too low to consider it a separate group. Unilateral and High Frequency loss groups were also in insufficient numbers to analyze and will, therefore, not be considered as separate groups.

<u>Hearing Loss Degree</u>	<u>Combined Loss Categories</u>
Minimal (16-25 dB)	Normal
Mild (26-40 dB)	Limited
Moderate (41-55 dB)	(Minimal, Mild, Moderate)
Moderate-Severe (56-70 dB)	Hard of Hearing
Severe (71-90 dB)	(Moderate-Severe, Severe)
Profound (91 dB or more)	Deaf (Profound)

Analysis of hearing loss degree was performed for the 4 combined loss categories. These categories were established based on the similar performance of the included hearing loss group(s) for each category. The Preschool S.I.F.T.E.R. was found to differentiate among degrees of hearing loss for factor 1: Expressive Communication and factor 2: Socially Appropriate Behavior. Below are the mean scores for each of the hearing loss groups.

<u>Hearing Loss Groups</u>	<u>Expressive Communication</u>	<u>Socially Appropriate Behavior</u>
Normal	19.13	12.84
Limited	16.10	11.66
Hard of Hearing	14.94	11.38
Deaf	11.27	10.63

Normals were found to be significantly different from all three hearing loss groups. Limited hearing loss was found to be significantly different from the Deaf group; Deaf was found to be significantly different from the Hard of Hearing group; but Limited was not significantly different from the Hard of Hearing group. These results can be interpreted as the Preschool S.I.F.T.E.R. differentiating normal hearing children from all categories of hearing loss. The greater degree of hearing loss is reflected in lower performance on Expressive Communication items.

Based on the above information, the Preschool S.I.F.T.E.R. was felt to have the greatest validity when used with Caucasian students, age 3.0 through kindergarten (6.6), with known hearing loss of moderate to profound degree.

INTERNAL CONSISTENCY:

PRIMARY FACTORS AND SKILL AREAS	CRONBACH ALPHA
<u>Factors</u>	
Expressive Communication	.95
Socially Appropriate Behavior	.89
<u>Skill Areas</u>	
Preacademics	.87
Attention	.92
Communication	.93
Class Participation	.86
Social Behavior	.72

These alpha values indicate a high internal consistency with the exception of the social behavior area, which had very acceptable internal consistency for screening measure purposes.

MEANS AND STANDARD DEVIATIONS:

PRIMARY FACTORS AND SKILL AREAS	NORMAL N=114	LIMITED N=59	HARD OF HEARING N=110	DEAF N=67
Expressive Communication SD	19.13 (6.00)	16.10 (6.24)	14.94 (6.30)	11.27 (5.86)
Socially Appropriate Behavior SD	12.84 (3.60)	11.66 (3.86)	11.38 (4.03)	10.63 (4.06)
Preacademics SD	9.89 (2.64)	8.73 (2.78)	8.41 (3.04)	7.36 (3.27)
Attention SD	9.43 (2.96)	8.46 (3.06)	8.06 (3.18)	7.40 (3.27)
Communication SD	9.52 (3.21)	7.54 (3.27)	6.90 (3.19)	5.07 (2.96)
Class Participation SD	9.85 (2.95)	9.10 (3.33)	8.63 (3.44)	7.51 (3.18)
Social Behavior SD	10.25 (2.57)	9.22 (2.77)	9.32 (3.06)	8.31 (2.95)

SCORING METHOD DEVELOPMENT:

Percentage of students across hearing loss groups correctly identified are below. Definitions have been included to assist in interpretation of cutoff score information.

% Correct - Normal	The percentage of normals who are correctly identified as not having hearing loss.
% Correct - Limited	The percentage of students with limited hearing loss who are correctly identified as having hearing loss.
% Correct - Moderate	The percentage of students with moderate hearing loss (hard of hearing) who are correctly identified as having hearing loss.
% Correct - Profound	The percentage of students with profound hearing loss who are correctly identified as having hearing loss.

SUM Each sum is the sum of the percentage of correctly identified normals and the percentage of correctly identified students with hearing loss for each hearing loss category for a specified score.

CUTOFF SCORE The cutoff score was selected to maximize the percentage correctly identified across all groups (total sum). If the total sums are very close (e.g., expressive communication) the highest total sum given that false negative decisions for the normals has limited risk for those students. **Cutoff scores should be viewed as guidelines as opposed to highly accurate decision points.** The recommended cutoff scores have been indicated below. These scores indicate the estimated percent that would be identified for each group.

TIED PERCENTAGES When tied percentages occurred the percentages were distributed equally across the score intervals in which the ties occurred (smoothing the curve).

The cutoff score for each primary factor and each of the 5 skill areas has been indicated below.

Score	% Correct Normal A	% Correct Limited B	Sum (A+B)	% Correct Moderate C	Sum (A+C)	% Correct Profound D	Sum (A+D)	Total Sum
	EXPRESSIVE COMMUNICATION (Items 7, 8, 9, 10, 11, 14)							
13	82.5	35.6	116.1	45.5	123.8	71.6	154.1	400.2
	APPROPRIATE BEHAVIOR (Items 4, 5, 6, 13)							
11	67.5	49.2	116.7	50.9	118.4	59.7	127.2	362.3
	PREACADEMICS							
6	92.1	22.0	114.1	27.3	119.4	40.3	132.4	385.9
	ATTENTION							
8	64.9	45.3	110.7	55.5	120.4	61.2	126.1	357.2
	COMMUNICATION							
8	69.3	57.6	126.9	65.4	135.7	88.1	157.4	420.0
	CLASS PARTICIPATION							
6	86.8	28.5	115.6	31.8	118.6	40.3	127.1	351.3
	SOCIAL BEHAVIOR							
8	77.2	47.5	124.7	40.9	113.1	52.2	129.4	372.2

HOW TO USE THE PRESCHOOL S.I.F.T.E.R.: It is suggested that school personnel utilize the Preschool S.I.F.T.E.R. for all identified children with hearing loss. The purpose is to ensure that the student's school performance is not eroding from the effects of the hearing loss. It is also suggested that the S.I.F.T.E.R. be used to screen students for expressive communication and socially appropriate behavior who are identified following complete hearing evaluation procedures to determine if any educational difficulties that could be due to hearing problems are occurring. Following teacher's completion of the Preschool S.I.F.T.E.R. the educational audiologist, principal, speech clinician or any other educational designee can score the Preschool S.I.F.T.E.R. If the child does not pass the Expressive Communication and/or Socially Appropriate Behavior areas, their scores can then be applied to the 5 skill areas. If they are found to score in the at-risk range in one or more skill areas, the school team may wish to consider the student's progress and perform assessments as appropriate to school district standard procedures.

It is hoped that this valid and useable screening tool will help identify children with educationally significant hearing loss of preschool and kindergarten age. Not all children who exhibit abnormal hearing have educationally significant hearing problems. Conversely, the severity of the hearing loss as defined by an audiogram is frequently not a valid predictor of learning difficulties. Only by determining educational significance as well as hearing sensitivity can we adequately follow-up the learner with a hearing impairment.

Questions and comments can be directed to the author by contacting the Educational Audiology Association in care of Karen L. Anderson, Ph.D., or via email messaging to: karenlanderson@earthlink.net.