

Development of Test of Auditory Comprehension in Kannada (TAC-K)

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Abstract

Auditory comprehension is an important listening skill to understand the spoken message and communicate effectively. An independent test to assess auditory comprehension in Kannada was not available and hence Test of Auditory comprehension in Kannada (TAC-K) was developed. TAC-K consisted of eight sub-tests namely (a) Yes-No questions, (b) Identification based on description – Closed set, (c) Identification based on description – Open set, (d) Following commands, (e) Comprehension of short paragraph, (f) Correcting the incorrect statements, (g) Identifying the category and (h) Problem solving. The test was administered on children in the age range of 4 to 9.11 years. The children were divided into six age groups with 30 children assessed in each age group. The age specific scores were obtained for all the sub-tests of TAC-K. There was no significant difference between the two lists for all the age groups suggesting that the two lists were equivalent. The reliability assessment results revealed reliability co-efficient of greater than 0.95 for all the sub-tests across all age groups which reflect very good test-retest reliability. The result of validity assessment also shows that the TAC-K test has good validity. Thus, TAC-K can be effectively used to determine the level of auditory comprehension of a child for a particular auditory comprehension skill.

Key words: Age specific scores, reliability, validity, comprehension sub-tests.

Auditory comprehension is the ability to understand the meaning of speech by answering questions, following an instruction, paraphrasing or participating in a conversation (Erber, 1982; Estabrooks, 2006). Auditory comprehension is a complex mechanism. Comprehension is thus very dependent on our mastery of the rules that govern our language system. In spoken language, these rules are coded both as words and as word clusters, i.e., auditory signals with acoustic and prosodic variations. There is a hierarchy in the development of auditory skills (Ling, 1976; Erber, 1982; Estabrooks, 2006).

The development of auditory perception always seems to follow a certain sequence (Erber, 1982; Ling, 1976). This includes (a) Detection, (b) Discrimination, (c) Identification, (d) Memory and Sequencing, and (e) Comprehension. Auditory comprehension is the highest level of auditory skill wherein the child learns to understand the spoken message, associate meaning, comprehending commands, and solving listening challenges (Estabrooks, 2006).

The measures of auditory comprehension require children to demonstrate understanding of spoken language at one or more levels, including single words, phrases, sentences and connected discourse. The tests to assess auditory comprehension abilities are important to know about the understanding abilities of the child. They help us

to understand the difficulties faced by the child in auditory comprehension tasks. These tests would also help a clinician to formulate the baseline and subsequently the intervention goals when addressing the auditory comprehension skills. The test also helps in monitoring the progress or studying the efficacy of the training technique.

Auditory comprehension is one of the important listening skills for all, including a child with hearing impairment. At present, several norm-referenced tests to assess listening comprehension are available as single skills tests or as sub-tests in speech-language (Woodcock & Mathew, 2004; Wechsler, 2001; Carrow, 1973; Trammell, 1976; Trammell & Owens, 1977).

It is ideal to have auditory comprehension tests in all languages as the individual perception of speech is influenced by their first language/mother tongue (Singh & Black, 1966). The auditory comprehension has been assessed as a few sub-tests of speech and language in Kannada (Basavaraj, 1981; Suchitra & Karanth, 1990; Regional Rehabilitation Training Centre (RRTC) & Ali Yavar Jung National Institute for the Hearing Handicapped (AYJNIHH), 1990). An independent test devoted to assess auditory comprehension in children who have Kannada as their mother tongue is not available.

The availability of age-specific scores enables clinicians to monitor a child's performance over time (Keith, 2000). The age specific scores would help to identify whether the auditory comprehension of the child is appropriate to the chronological age. It would also allow comparing children with normal hearing

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with that of those with disorders. Thus, developing age specific scores for the test is essential. It helps in monitoring progress of the child in rehabilitation, and for explaining auditory comprehension deficits to parents. Thus, in this study efforts were made to develop a test of auditory comprehension in Kannada (TAC-K).

The objectives of the study were to (1) to develop a Test of Auditory Comprehension in Kannada (TAC-K) and (2) to assess the sub-skills of auditory comprehension using eight sub-tests among children in the age from 4 to 9.11 years. The sub-skills included are: a) Yes/No questions b) Identification based on description - Closed set c) Identification based on description - Open set d) Following commands e) Comprehension of short paragraph f) Correcting the incorrect statements g) Identifying the category h) Problem solving. The third objective was to establish age specific scores for its sub-tests in children with normal hearing in the age from 4 to 9.11 years.

Method

Participants: The age range of the participants was between 4 to 9.11 years. The participants were assigned to one of the six age groups. They are: (1) 4 to 4.11 years (2) 5 to 5.11 years (3) 6 to 6.11 years (4) 7 to 7.11 years (5) 8 to 8.11 years (6) 9 to 9.11 years.

A total of 180 participants, with 30 participants (15 males and 15 females) in each group were included in the study. The hearing thresholds were below 20 dB HL at octave frequencies from 250 Hz to 8 kHz in both the ears. They had no complaint of any otologic/neurological problem. All participants had Kannada as their mother tongue. There was no complaint of hearing, speech and language problem in them. All of them were attending primary or kindergarten school.

Instrumentation: A calibrated diagnostic audiometer was used to perform the pure tone audiometry and the auditory comprehension test was administered through sound field of the audiometer.

Procedure: The test consisted of eight sub-tests which assessed the different aspects of auditory comprehension in children. The tasks were selected based on the comprehension skills of children in the age range of 4 to 9.11 years using the information reported in the literature. The sub-tests in Test of Auditory comprehension in Kannada (TAC-K) are: (1) Yes/No questions (2) Identification based on description - Closed set (3) Identification based on description - Open set (4) Following commands (5) Comprehension of short paragraph (6) Correcting the

incorrect statements (7) Identification of the category (8) Problem solving.

The test material was constructed based on a pilot study to assess familiarity. Two methods were used to check the test material for familiarity and appropriateness. In the first method, the test material was presented to ten children, five boys, and five girls, in the age of eight to ten years. The test items which were answered correctly by children were considered as familiar and the incorrect ones as unfamiliar. The test items which were answered correctly by more than 80% of the children were selected for the construction of final test material.

In the second method, an expert opinion regarding the stimulus familiarity and appropriateness was also taken from two teachers who taught at primary school level. The teachers were asked to assess familiarity considering the abilities of a child who was eight to ten year old. The entire material was given to the teachers and they were instructed to mark each item as familiar or unfamiliar. The items rated by 80 % of teachers as familiar to children in the age range of eight to ten years were considered. The test items which were rated as more than 80 % familiar by teachers and the children in the first method of pilot study were considered for construction of the final test material.

The eight sub-tests of TAC-K test are described below in terms of its construction, administration and scoring.

Yes/No questions

Construction of the test material: The child would be asked a question and he/she would be expected to answer by saying 'Yes' or 'No'. Initially, 40 questions which could be answered in the form of 'Yes' or 'No' were prepared. Among those, the most familiar 24 questions were selected for the actual test based on a pilot study on familiarity. Two lists were prepared with ten test questions and two practice items each. For e.g. *ninage ba:la ideya?* or *hasu sa:ku pra:Nina?*

Administration: The child is instructed to give appropriate answers by saying 'Yes' or 'No'.

Scoring: Each correct answer is scored as one and incorrect answer is scored as zero. Maximum score of 10 for each list and the total score is 20, as each list consisted of 10 questions.

Identification based on description - Closed Set

Construction of the test material: An object, person or animal would be described by providing one or two clues. The child had to identify the correct answer and point to the correct picture among the four alternatives that were provided in the form of

closed-set pictures. A list of 40 descriptions of 40 items was prepared and 24 most familiar items were selected based on a pilot study on familiarity. Two lists were prepared with ten test items and two practice items in each list. In each list, two clues were given for the first five items, and only one clue for the remaining five items. For e.g. Two clue item: /ha:lu koDuttade/ and /amba: ennutade/. The child would be expected to point to the picture of 'hasu'. One clue item: /ya:va pra:ni ka:Dina ra:ja/ and the child has to point to 'simha'.

Administration: The child is instructed to point to the appropriate picture among the four alternatives.

Scoring: Each correct answer is scored as one and incorrect answer is scored as zero. Maximum score of 10 for each list and the total score is 20, as each list consisted of 10 questions.

Identification based on description – Open Set

Construction of the test material: An object, person or animal would be described by providing one or two clues. The child has to identify the correct answer and provide the answer verbally. A list of 40 descriptions for 40 items was prepared and 24 most familiar items were selected based on a pilot study on familiarity. Two lists were prepared with ten test items and two practice items in each list. In each list, two clues were given for the first five items, and only one clue for the remaining five items.

Administration: The child is instructed to provide correct answer verbally based on the clues.

Scoring: Each correct answer is scored as one and incorrect answer is scored as zero. Maximum score is 10 for each list and the total score is 20, as each list consisted of 10 questions.

Following commands/directions

Construction of the test material: The child would be asked to perform certain motor activities after listening to one step, two step and three step commands. A list of 40 commands was initially formed and 24 familiar commands were selected based on the pilot study on familiarity. Two lists were prepared with ten commands in each list. There were two practice items in each list. Four one-step commands, four two-step commands and two three-step commands were used in each list. e.g.:

- One-step command was /chappa:Le taTTu/, /kaNNu muchu/
- Two-step: /tale alla:Disi, kaNNu muchu/
- Three-step: /kaNNu muchi, kai etti, chappa:Le taTTu/.

Administration: The child is instructed to perform the motor activity after listening to the commands.

Scoring: Each correct response is scored as one and incorrect answer is scored as zero. If incorrect, the command is not repeated. Maximum score of 10 for each list and the total score is 20, as each list consisted of 10 questions.

Comprehension of short paragraphs

Construction of the test material: A short paragraph would be read out to the child and five questions regarding the paragraph would be asked to the child. Initially, ten paragraphs were prepared and then five most familiar were selected for the test material based on the pilot study on familiarity study. The passages were selected from the Kannada text books of class one to five and kindergarten teaching material. For the test, one practice paragraph and four test paragraphs were used as the test material.

Administration: The child is instructed to answer questions regarding the paragraph.

Scoring: Each correct answer is scored as one and incorrect answer is scored as zero. Each paragraph had five questions and the maximum score was five for each passage. Total score for the test is 20 as there are 4 paragraphs.

Correcting the incorrect statements

Construction of the test material: A statement would be read out to the child and he/she has to say whether the statement was correct or incorrect. If incorrect, the child had to correct the statement. A list of 40 statements was initially formed and 24 familiar statements were selected based on the pilot study on familiarity. Two lists with ten test statement with two practice items in each list were used. e.g. /ha:lina baNNa kappu/. The child has to say incorrect and say /illa ha:lina baNNa biLi/

Administration: The child was instructed to say whether the statement was 'correct' or 'incorrect', if incorrect the child had to correct the statement.

Scoring: Each correct answer is scored as one and incorrect answer is scored as zero. Maximum score of 10 for each list and the total score is 20, as each list consisted of 10 questions.

Identification of the category

Construction of the test material: Four items like rose, lotus, jasmine and sunflower would be told to the child and the child had to identify the category and answer saying that 'all these are flowers.' Similarly, different categories like animals, birds, and insects would be included in the test. A list of 20 categories was prepared initially and 12 categories were selected based on the pilot study on familiarity. Two lists with five test categories and one practice item in each list were prepared. e.g. /se:bu/, /ma:vina haNNu/, /ba:Le haNNu/, /halasina haNNu/ would be

presented. The child was expected to answer as /haNNuLa/

Administration: The child is instructed to identify the category listening to the four items.

Scoring: Each correct answer is scored as one and incorrect answer is scored as zero. Maximum score is five for each list and the total score was 10, as each list consisted of five test items each.

Problem Solving

Construction of the test material: A situation that needs a solution would be read to the child and child would be expected to provide a suitable solution. A list of 20 situations/problems was prepared initially and 12 problems based on the familiarity assessment were selected for the actual test. Two lists with five test situations and one practice item for each list were prepared e.g. /maLe barta ide. ni:nu neniba:radu andare e:nu upayogistIya/. The child was expected to answer by saying /chatri/ or /rain coat/.

Administration: The child is instructed to provide suitable solution to the situation.

Scoring: Each correct answer is scored as one and incorrect answer is scored as zero. Maximum score was five for each list and the total score was 10, as each list consisted of five test items in each of the two lists.

Test Administration: For each participant, all the test items of each sub-test were presented through a calibrated sound field diagnostic audiometer. Monitored live voice was used for the test administration. The intensity dial was set to a most comfortable level (40 dB HL). The practice items were used to familiarize the child to carry out the task. The child was instructed to perform the task heard through sound field. For the closed set tasks, a picture book was placed in front of the child and the response would be elicited by picture pointing.

Total Score: The individual scores of all the sub-tests were added to get the total score. The maximum score possible on this test is 140. The total score was converted to percentage correct score.

Reliability assessment: Test-retest reliability was assessed. 18 participants, three from each group (10%) were randomly selected from the group. These participants were tested again, within 15 days, using the test battery. This was done to assess the reliability of the test.

Validity assessment: To assess the validity of the test, the test was administered on another group of participants who were not included in the study to obtain age specific scores for TAC-K. 18

participants, three from each age group (10%) were selected and the test was administered. The results were analyzed to determine whether the scores obtained in these participants were similar to the age specific scores obtained for the test.

Results and Discussion

Mean, standard deviation (SD) and 95th percentile obtained for the sub-tests in children of different age groups

Mean, SD and 95th percentile for sub-tests in children of 4 - 4.11 years: The mean, standard deviation (SD) and 95th percentile of the scores obtained for different sub-tests are depicted in Table 1. The mean score for TAC-K obtained by children (N=30) in the age range of 4 - 4.11 years is 41.07 (29.44 %). The children in the age range of 4 - 4.11 years obtained the minimum scores among all the age groups. Owens (1999) reported that 4-5 year old children answer simple questions on stories, follow one to two step simple commands. Hence, the children in the age range of 4-4.11 years have obtained minimum scores.

Mean, SD and 95th percentile for sub-tests in children of 5 - 5.11 years: The mean, standard deviation (SD) and 95th percentile of the scores obtained for different sub-tests are depicted in Table 2. The mean score for TAC-K obtained by children (N=30) in the age range of 5 - 5.11 years is 60.03 (42.63 %). Owens (1999) reported that 5-6 year old children love stories, understands pronouns, remembers five items in a story, starts to understand complex sentences. Thus, there is a gradual increase in scores obtained by children in the age range of 5 - 5.11 years compared to children aged 4 - 4.11 years.

Mean, SD and 95th percentile for sub-tests in children of 6 - 6.11 years: The mean, standard deviation (SD) and 95th percentile of the scores obtained for different sub-tests are depicted in Table 3. The mean score for TAC-K obtained by children (N=30) in the age range of 6 - 6.11 years is 71.33 (50.93 %). Owens (1999) reported that 6-7 year old children understand six-items in a story, understands comparatives and there is an improvement in their short-term memory. Hence, there is a gradual increase in scores obtained by children in the age range of 6 - 6.11 years compared to children aged 5 - 5.11 years.

Mean, SD and 95th percentile for sub-tests in children of 7 - 7.11 years: The mean, standard deviation (SD) and 95th percentile of the scores obtained for different sub-tests are depicted in Table 4. The mean score for TAC-K obtained by children (N=30) in the age range of 7 - 7.11 years is 94.23 (67.28 %). Owens (1999) reported that 7-8 year old children understand opposites, comprehends complex

sentences and there is an improvement in reasoning skills. The sub-skills of auditory comprehension like paraphrasing, following multi-step commands, answering questions about a story are developed by the age of 8 years (Estabrooks, 2006). The improvement in comprehension skills leads to gradual increase in scores obtained by children in the age range of 7 – 7.11 years compared to children aged 6 – 6.11 years.

Mean, SD and 95th percentile for sub-tests in children of 7 – 7.11 years: The mean, standard deviation (SD) and 95th percentile of the scores obtained for different sub-tests are depicted in Table

4. The mean score for TAC-K obtained by children (N=30) in the age range of 7 – 7.11 years is 94.23 (67.28 %). Owens (1999) reported that 7-8 year old children understand opposites, comprehends complex sentences and there is an improvement in reasoning skills. The sub-skills of auditory comprehension like paraphrasing, following multi-step commands, answering questions about a story are developed by the age of 8 years (Estabrooks, 2006). The improvement in comprehension skills leads to gradual increase in scores obtained by children in the age range of 7 – 7.11 years compared to children aged 6 – 6.11 years.

Table 1. Mean, SD and 95th percentile for sub-tests in children of 4 – 4.11 years

Sub-Tests	Lists	Mean (Max Score)	SD	95 th Percentile
1. Yes/No Questions	List 1	3.30 (10)	0.47	4
	List 2	3.57 (10)	0.5	4
2. Identification based on description- Closed set	List 1	4.40 (10)	0.5	5
	List 2	4.23 (10)	0.5	3
3. Identification based on description - Open set	List 1	2.10 (10)	0.31	3
	List 2	2.00 (10)	0.00	2
4. Following commands	List 1	3.80 (10)	0.41	4
	List 2	3.72 (10)	0.45	4
5. Comprehension of short paragraph		2.70 (20)	0.47	3
6. Correcting the incorrect	List 1	2.77 (10)	0.63	4
	List 2	3.00 (10)	0.69	4
7. Identification of category	List 1	1.50 (5)	0.51	2
	List 2	1.57 (5)	0.50	2
8. Problem Solving	List 1	1.80 (5)	0.41	3
	List 2	1.63 (5)	0.49	2
Total Score/ Max Score		41.07 (140)	4.02	49

Table 2. Mean, SD and 95th percentile for sub-tests in children of 5 – 5.11 years

Sub-Tests	Lists	Mean (Max Score)	SD	95 th Percentile
1. Yes/No Questions	List 1	5.07 (10)	0.25	6
	List 2	4.83 (10)	0.70	6
2. Identification based on description- Closed set	List 1	6.40 (10)	0.50	7
	List 2	6.11 (10)	0.61	6
3. Identification based on description - Open set	List 1	3.17 (10)	0.38	4
	List 2	3.20 (10)	0.41	4
4. Following commands	List 1	5.00 (10)	0.00	5
	List 2	4.33 (10)	0.48	5
5. Comprehension of short paragraph		4.03 (20)	0.72	5
6. Correcting the incorrect	List 1	4.70 (10)	0.47	5
	List 2	3.83 (10)	0.46	5
7. Identification of category	List 1	2.80 (5)	0.41	3
	List 2	2.70 (5)	0.49	3
8. Problem Solving	List 1	2.40 (5)	0.50	4
	List 2	2.20 (5)	0.41	3
Total Score/ Max Score		60.03 (140)	3.54	67

Mean, SD and 95th percentile for sub-tests in children of 7 – 7.11 years: The mean, standard deviation (SD) and 95th percentile of the scores obtained for different sub-tests are depicted in Table 4. The mean score for TAC-K obtained by children (N=30) in the age range of 7 – 7.11 years is 94.23 (67.28 %). Owens (1999) reported that 7-8 year old children understand opposites, comprehends complex sentences and there is an improvement in reasoning skills. The sub-skills of auditory comprehension like paraphrasing, following multi-step commands, answering questions about a story are developed by the age of 8 years (Estabrooks, 2006). The improvement in comprehension skills leads to gradual increase in scores obtained by children in the age range of 7 – 7.11 years compared to children aged 6 – 6.11 years.

Mean, SD and 95th percentile for sub-tests in children of 8 – 8.11 years: The mean, standard deviation (SD) and 95th percentile of the scores obtained for different sub-tests are depicted in Table 5. The mean score for TAC-K obtained by children (N=30) in the age range of 8 - 8.11 years is 116.47 (83.17 %). Owens (1999) reported that the reasoning abilities improve, develop more interest in scientific facts, understand implied meanings and comprehend complex multi-step commands/questions. Hence, there is a gradual increase in scores obtained by children in the age range of 8 – 8.11 years compared to children aged 7 – 7.11 years.

Mean, SD and 95th percentile for sub-tests in children of 9 – 9.11 years: The mean, standard deviation (SD) and 95th percentile of the scores obtained for different sub-tests are depicted in Table 6. The mean score for TAC-K obtained by children (N=30) in the age range of 9 - 9.11 years is 133.60 (95.42 %). Owens (1999) reported that 9-10 year old children have developed most of the auditory comprehension skills like understanding of complex directions without repetition, understanding implied meanings, comprehending and answering all questions of short stories. There is a gradual increase in scores obtained by children in the age range of 9 - 9.11 years compared to children aged 8 - 8.11 years. The result of mean, SD and range of scores across age group suggests that there is a gradual increase in scores with increase in age of the children. The children in the age range of 9-10 years obtained maximum scores whereas, children in the age range of 4-5 years obtained minimum scores.

These age specific scores for the sub-tests could serve as a reference to determine the auditory comprehension age of the child for a particular auditory comprehension skill. The test can be used to identify children with difficulty in auditory comprehension. The results can be used to plan goals for therapy to improve auditory comprehension. The test is helpful in grouping children for rehabilitation purposes.

Table 3. Mean, SD and 95th percentile for sub-tests in children of 6 – 6.11 years

Sub-Tests	Lists	Mean (Max Score)	SD	95 th Percentile
1. Yes/No Questions	List 1	5.73 (10)	0.45	6
	List 2	5.67 (10)	0.45	6
2. Identification based on description - Closed set	List 1	6.53 (10)	0.51	7
	List 2	6.40 (10)	0.50	6
3. Identification based on description - Open set	List 1	4.07 (10)	0.25	5
	List 2	4.17 (10)	0.38	5
4. Following commands	List 1	5.33 (10)	0.71	6
	List 2	4.93 (10)	0.45	5
5. Comprehension of short paragraph		6.70 (20)	1.09	8
6. Correcting the incorrect	List 1	5.40 (10)	0.67	6
	List 2	5.03 (10)	0.49	6
7. Identification of category	List 1	2.90 (5)	0.18	3
	List 2	2.80 (5)	0.38	3
8. Problem Solving	List 1	3.40 (5)	0.50	4
	List 2	3.20 (5)	0.00	3
Total Score/ Max Score		71.33 (140)	4.94	79

Table 4. Mean, SD and 95th percentile for sub-tests in children of 7 – 7.11 years

Sub-Tests	Lists	Mean (Max Score)	SD	95 th Percentile
1. Yes/No Questions	List 1	7.77 (10)	0.57	9
	List 2	7.53 (10)	0.50	8
2. Identification based on description - Closed set	List 1	7.70 (10)	0.47	8
	List 2	7.20 (10)	0.41	8
3. Identification based on description - Open set	List 1	6.40 (10)	0.50	7
	List 2	6.07 (10)	0.83	6
4. Following commands	List 1	7.13 (10)	0.51	7
	List 2	6.70 (10)	0.53	7
5. Comprehension of short paragraph		9.23 (20)	0.68	11
6. Correcting the incorrect	List 1	7.00 (10)	0.00	7
	List 2	6.90 (10)	0.48	7
7. Identification of category	List 1	4.00 (5)	0.00	5
	List 2	3.47 (5)	0.51	4
8. Problem Solving	List 1	3.80 (5)	0.41	4
	List 2	3.90 (5)	0.50	4
Total Score/ Max Score		94.23 (140)	3.05	99

MANOVA (Multiple Analysis of Variance) was carried out to determine the significant difference in scores for the sub-tests across age groups. The result of MANOVA suggests that, there is a highly significant difference in scores for the sub-tests across age groups. Duncan's Post-hoc Analysis shows that the scores were significantly different across all the age groups for all the sub-tests at a 0.05 level of significance. There is a gradual increase in scores with the increasing age and the results show that there is no overlap in scores across age groups. Hence, the age specific scores obtained for all the

sub-tests can be used effectively to determine the comprehension age of the child.

Paired sample t-tests were carried out to determine significant difference between the two lists for different sub-tests. The statistics were carried out for all the age groups of the study. The results reveal that there is no significant difference in scores between the two lists of all the sub-tests. This finding was consistent across all the age groups. This suggests that the two lists are equivalent and yield similar results.

Table 5. Mean, SD and 95th percentile for sub-tests in children of 8 – 8.11 years

Sub-Tests	Lists	Mean (Max Score)	SD	95 th Percentile
1. Yes/No Questions	List 1	8.70 (10)	0.60	10
	List 2	8.50 (10)	0.62	10
2. Identification based on description - Closed set	List 1	9.27 (10)	0.45	10
	List 2	9.00 (10)	0.00	9
3. Identification based on description - Open set	List 1	7.80 (10)	0.66	9
	List 2	7.53 (10)	0.63	9
4. Following commands	List 1	8.80 (10)	0.41	9
	List 2	8.73 (10)	0.45	9
5. Comprehension of short paragraph		14.70 (20)	0.99	16
6. Correcting the incorrect	List 1	8.10 (10)	0.48	9
	List 2	7.93 (10)	0.52	9
7. Identification of category	List 1	4.53 (5)	0.51	5
	List 2	4.52 (5)	0.51	5
8. Problem Solving	List 1	5.00 (5)	0.00	5
	List 2	4.8 (5)	0.38	5
Total Score/ Max Score		116.47 (140)	2.86	123

Table 6. Mean, SD and 95th percentile for sub-tests in children of 9 - 9.11 years

Sub-Tests	Lists	Mean (Max Score)	SD	95 th Percentile
1. Yes/No Questions	List 1	10 (10)	0.00	10
	List 2	9.87 (10)	0.35	10
2. Identification based on description - Closed set	List 1	10 (10)	0.00	10
	List 2	9.77 (10)	0.50	10
3. Identification based on description - Open set	List 1	8.90 (10)	0.31	9
	List 2	8.57 (10)	0.50	9
4. Following commands	List 1	10 (10)	0.00	10
	List 2	9.97 (10)	0.18	10
5. Comprehension of short paragraph		17.93 (20)	0.74	19
6. Correcting the incorrect	List 1	9.53 (10)	0.51	10
	List 2	9.50 (10)	0.92	10
7. Identification of category	List 1	5 (5)	0.00	5
	List 2	5 (5)	0.00	5
8. Problem Solving	List 1	5 (5)	0.00	5
	List 2	5 (5)	0.00	5
Total Score/ Max Score		133.6 (140)	1.57	136

The correlation between the two lists was also considered to determine the equivalency of both the lists. Pearson's correlation co-efficient was used to determine the correlation. The result shows that the correlation co-efficient was greater than 0.85 ($p < 0.001$) for all the sub-tests. This result was consistent across all the age groups.

This suggests high correlation between lists for all the sub-tests across all age groups. The result again substantiates that the lists are equivalent for all the sub-tests considered for the study.

Reliability assessment of the test: Three (10 %) out of 30 children in each group were randomly selected and they re-tested within 15 days to assess the reliability of the test. Cronbach's Alpha test was used to determine the reliability co-efficient for all the age groups using SPSS 10.0 software. The result showed that the reliability co-efficient are greater than 0.95 for all the age groups.

Nunnally and Bernstein (1994) provided guidance in the interpretation of the reliability coefficient by stating that a value of 0.70 is sufficient for early stages of research, but that basic research should require test scores to have a reliability coefficient of 0.80 or higher. When important decisions are to be made with test scores, a reliability coefficient of 0.90 is the minimum with 0.95 or higher a desirable standard. Since, the presently developed test i.e., TAC-K has reliability co-efficient of 0.95; it is highly reliable.

Hoverstien and Gloria (1997) conducted a reliability and validity assessment of Test of Auditory Comprehension (TAC). TAC reliability

was derived from the results of 82 participants with hearing impairment who were re-tested with the TAC within a two to three week period after initial testing; a reliability coefficient of 0.98 was obtained.

Anderson, Hess, and Richardson (1980) assessed the test-retest reliability of Test for Auditory Comprehension of Language (TACL) and reported reliability co-efficient of 0.91. The test items in the present study have reliability co-efficient of greater than 0.95, suggesting very good test test-retest reliability.

Validity of the test: The test was administered on another group of participants who were not included in the study to obtain age specific scores for the sub-tests. 18 participants, three from each group (10 %) were selected and the test was administered. The scores obtained for children in this group were compared with the mean values for that particular age group.

The result showed that the scores obtained by children considered for assessing validity are similar to the mean scores and are within ± 1 SD. This result shows that the TAC-K test has good validity. In the present study, only 3 children in each age group were studied. A detailed assessment of validity considering larger samples is essential.

Conclusions

The present study made an attempt to develop a test of auditory comprehension in Kannada. The test consisted of eight sub-tests assessing the different aspects of auditory comprehension. The test was administered on 180 children in the age range of 4 to

9.11 years who were divided into six age groups with 30 in each group. The age specific scores for all the sub-tests of TAC-K were obtained.

The results obtained were tabulated and analyzed using suitable statistical measures. The mean scores across age groups suggested that there is a gradual increase in scores for all the sub-tests with increase in age from four to ten years. The result of MANOVA suggested that there is a significant difference in scores across age groups for all the sub-tests. This suggests that the scores are unique to the age group and the scores do not overlap between the age groups. These age specific scores can be used to determine the level of auditory comprehension of the child.

The equivalency between the two lists for all the sub-tests was also determined. The result suggested that there is no significant difference between the two lists for all the age groups. There was a high correlation between the lists which suggests that the lists are equivalent. 18 participants, three from each group (10%) were randomly selected from the group. These participants were tested again, within 10 days, using the test battery. This was done to assess the test-retest reliability of the test. The reliability assessment results revealed reliability co-efficient of greater than 0.95 for all the sub-tests across all age groups which suggest very good test-retest reliability. The result of validity assessment also showed that the TAC-K test has good validity. A detailed assessment of validity considering a large sample is essential.

Applications of the study

The test can be used to identify auditory comprehension difficulties in Kannada among children. These age specific scores for the sub-tests could serve as a reference to determine the level of auditory comprehension of the child for a particular auditory comprehension skill. The results can be used to plan goals for therapy to improve auditory comprehension. It helps to monitor the progress of the child during rehabilitation and to explain the parents/caregivers regarding the auditory comprehension difficulties of their children.

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