Product Development of Useful Products of Research carried out at AIISH

Project funded by the All India Institute of Speech and Hearing Research Fund (ARF)
(2017-2018)

Principal Investigators

Dr.Prashanth Prabhu P.
Assistant Professor in Audiology

Dr. Priya M. B.
Lecturer in Speech-Language Sciences

Co-investigator

Dr.Shijith Kumar C
Library and Information Officer

Project Staff

Ms. Merin Susan Mathew
Research Officer

Ms. Rekha D
Research Officer

All India Institute of Speech and Hearing
Manasagangothri, Mysore-570006

Acknowledgments

      The investigators would like to thank the Director, All India Institute of Speech and Hearing, Mysore, for funding the project and providing the infrastructure to carry out the project work. The investigators deeply acknowledge the support provided by the faculty to use the clinical materials carried out under their guidance.

Dr.Prashanth Prabhu P / Dr. Priya M.B.   Dr.Shijith Kumar C
Principal Investigators   Co-Investigator

TABLE OF CONTENTS

Chapter	Title	Page No.

LIST OF TABLES

CHAPTER 1

INTRODUCTION

The All India Institute of Speech and Hearing (AIISH) is a premier institute in the country imparting training in the field of Speech, Language, and Hearing. AIISH was established on 9th August, 1965 as an autonomous organization functioning under the aegis of the Union Ministry of Health and Family Welfare. It caters to manpower generation in the field, promoting research and providing clinical services in the area of Speech, Language, Hearing, and their disorders.

AIISH has always been a forerunner incarrying out research in the various areas of Speech, Language, and Hearing and their disorders. In addition to availing grants from external agencies for research purposes, AIISH is also home to intramural funds by the name, AIISH Research Fund (ARF). This was one of the important initiatives by AIISH for dedicated research funds in the fieldof Speech, Language, and Hearing. These research grants have led to the development of indigenous evidence-based clinical protocols, assessment and intervention tools. These tools are being prepared keeping in mind the ethnocultural diversity of India, thus catering to the Indian population with diverse language backgrounds.

In addition to the research outcomes from projects granted by extramural and intramural funds, a large body of clinical research is also taken up by students pursuing postgraduate, doctoral and postdoctoral programs at AIISH. As a result, several assessment tools and intervention manuals have been developed in various Indian languages. These materials have immediate clinical and research implications in the Indian context if put to use. Unfortunately, these have not been accessed by the professionals due to unavailability

in a published format, although there is a great need for the same. It is, however imperative that such resources be made available to professionals in different clinical setups. This will promote the use of indigenous resources for effective assessment and management of persons with communication disorders.

Further, with an increase in the number of training programs in the field of Speech, Language, and Hearing across the country, it is essential that every student and practicing professionalsbe aware of these indigenous clinical tools and their clinical utility for the Indian population. It is the need of the hour to make the clinicians understand the limitations of direct usage of Western assessment tools and intervention programs in the Indian context.

Though several clinical tools have been developed at AIISH, they have not been put to clinical use at the national/regional level. Despite considerable demand from the professionals to avail these materials for clinical applicability, they have not yet been used due to lack of accessibility of these materials in a published format. Availability of these materials will also reflect the growth of the profession and the contribution of the professionals at large.

There were attempts made in the past to make such materials available to the professionals across the country. As part of a project funded by ARF titled "Speech and Language Tests at AIISH (SaLT-AIISH)" (Prema, Savithri,& Jayaram, 2004), several tests were compiled for immediate clinical use. The tests were compiled in the area of articulation (nine), voice (nine), fluency (five), child language (ten), adult language (six),

reading (four), writing (three), and prosody (two) respectively. Further, 16 dissertations were reviewed and compiled as part of a project titled 'Screening and diagnostic test material and intervention manuals for speech and language disorders'' funded by ARF (Goswami, Priya, & Archana, 2012).

In continuation to the work by Goswami et al. (2012), the present project was taken up with the following objectives:

- Reviewing and compilation of the clinical tools developed at AIISH for assessment and management of Speech, Language and Hearing disorders from 2008-2017.

- Preparing a manual of each of the test/tool to serve as a ready-to-use material in various clinical setups.

CHAPTER 2

REVIEW OF LITERATURE

Communication is the act of sending and receiving information between two or more individuals. This information exchange can occur broadly in two modes: verbal (Speech, writing) and non-verbal (gestures, body language). Successful communication is important for an individual's positive integration into society and overall emotional wellbeing. Any disruption in an individual's ability to detect, comprehend, or apply language and speech to effectively engage in discourse can be termed as a communication disorder. American Speech-Language and Hearing Association stated that communication disorder is "an impairment in the ability to receive, send, process and comprehend concepts or verbal, non-verbal and graphic symbol system". Epidemiological data related to speech, language, and hearing issues are essential to understand the holistic status of communication disorders.

Prevalence of communication disorders

Epidemiology provides information regarding the incidence, prevalence, and distribution of diseases and other factors relating to health. Prevalence is a measurement of all the individuals of a given population with specific characteristics at a particular point of time. Availability of such data can aid health care professionals in planning service delivery, checking the efficacy of existing rehabilitation programs, and making comparisons between typical and atypical development. It can also influence the policy makers into framing policies that help integrate persons with communication disorders into society, promote their independence, and enable them to live a full and dignified life.

The prevalence of disability percentages across populations in selected countries around the world has been published in the World Report on Disability - 2011. Literature has revealed that hearing impairment is the most common cause of communication disability around the world. India is the second most populous and geographically, the seventh largest country in the world. It is a developing country, and is shown to have a higher prevalence of communication disorders than other developed countries. According to the National Sample Survey Organization (2011), the population of disabled persons with hearing impairment was reported to be 19%, 7% with speech handicap and 6% with intellectual disability.

India is also a country with a highly diverse population. Socio-economic, cultural, and geographical factors influence the prevalence of communication disorders across various parts of the country. A small number of area-specific prevalence studies were previously conducted within India. These indicate a difference in the proportion of the population affected per area. A survey conducted by Sinha et al. (2016) in the rural population of Gujarat reported an overall 4.09% prevalence of communication disorders with a higher prevalence of ear-related than speech and language related communication disorders. Mishra, Verma, Shukla, Verma and Dwivedi (2017) on the other hand, reported a much higher prevalence (15.14%) of communication disorders in the rural areas of Lucknow district. A study conducted by Das et al. (2017) in the rural areas of Kolkata district, reported a high prevalence of stroke leading to communication impairments.

Ganesh, Das and Shashi (2016) and Bhagya and Ramakrishna (2017)carried out survey studies that indicated a high prevalence of mental disability in different communities of Karnataka. Konadath et al. (2013) reported that among the 15,441 individuals surveyed

in a rural district of Karnataka, the prevalence of communication disorders was found to be around 6.07%. Similarly, Konadath, Chatni, Lakshmi and Saini (2017) reported a prevalence of communication disorders to be 3.63% in the Lakshadweep group of islands.Another survey of communication disorders in Andaman and Nicobar Islands by Prabhu et al. (2020) reported that 3.38% of the surveyed population was referred for the camp. Hearing impairment was found to be more prevalent than language and speech disorders. It was also found that delayed birth cry, low-birth weight and pre-mature delivery were the major risk factors of communication disorders in the region. Amongst the referred individuals who attended the camp, 46.8% of ear-related issues and 53.2% of speech and language disorders was estimated. It was also observed that males were more affected by communication disorders than females. Cosnidering the high percentage of prevalence of communication disorders, it is important to have indigenous test/therapy materials which can help in assessment and management of individuals with communication disorders.

In the present project, it was attempted to compile tests and therapy materials developed as a part of Master's dissertation at AIISH between 2008 and 2017. During the period, materials developed in Audiology were related to the areas of central auditory processing disorders, dichotic listening tests, development of high frequency word lists and lexical neighborhood test. Similarly, aphasia, apraxia, autism and other language disorders were the focused areas in the domain of Speech Language Pathology. The following sections provide a brief review on the aforementioned focus areas.

Central Auditory Processing Disorders

Central Auditory Processing Disorder [CAPD] refers to difficulties in the processing of auditory information in the central nervous system, as demonstrated by poor

performance in one or more of the following skills: sound localization and lateralization; auditory discrimination; auditory pattern recognition; temporal aspects of audition, including temporal integration, temporal discrimination (e.g., temporal gap detection), temporal ordering, and temporal masking; auditory performance in competing acoustic signals (including dichotic listening); and auditory performance with degraded acoustic signals.

Conclusive diagnosis of CAPD cannot be made until specialized auditory testing is completed and other etiologies have been ruled out. Tests used for assessing central auditory functions fall under two major categories: behavioral tests and electrophysiological tests. The behavioral tests include monaural low-redundancy speech tests, dichotic speech tests, temporal patterning tests, and binaural interaction tests. Dichotic listening tasks utilizing sentences, words, digits and syllables have been useful in predicting cerebral dominance for speech.

Dichotic Listening

Dichotic listening tests are among the most powerful of the behavioral auditory processing test battery for the assessment of hemispheric function, interhemispheric transfer of information, development and maturation of the auditory nervous system, and the identification of lesion of the central auditory nervous system. In this, the two ears are stimulated simultaneously with different speech sounds and the subject is asked to report what is being heard, either in both ears (free recall) or in one of the ears, either left or right (directed attention). Commonly used speech stimuli for dichotic testing are consonant-vowel (CV) nonsense syllables, digits, words, spondees, and sentences. Among these, sentences have many contextual cues which will be useful for the

participant in dichotic listening tasks, compared to consonant-vowel stimuli. The dichotic CV's are considered to be more difficult than sentences. However, for monosyllabic words syntactical cues are limited, standardized words lists are easily available and frequently used, and an open-set stimulus makes them neither too easy nor too difficult which results in recognition performance in the middle of the difficulty continuum. It is ideal to have speech tests in all languages as the individual perception of speech is influenced by his/her first language or mother tongue.

Dichotic Rhyme test

This test can be used as an assessment tool for Central Auditory Processing Disorders.Dichotic rhyme test is used to assess the binaural integration abilities. The test consists of   pairs of commonly spoken, rhyming, bi-syllabic words. These pairs can be dichotically presented to the subjects at 60 dB HL intensity level. These words start with six plosives (/p/, /t/, /k/, /b/, /d/ and /g/) andthe two words in pair differed only in the initial consonant. The task given will be to write down the words heard after each presentation in an answer sheet. The responses will be scored in terms of single correct scores, double correct scores and ear correct scores.

Dichotic Word test

Dichotic word (CVC) test consists of monosyllabic words which are presented dichotically to assess binaural integration abilities. These monosyllabic words are paired in such a way that they differed in initial syllable and two words in a pair never had the same starting phoneme and same vowel. The participant will be asked to write the words heard after each presentation in an answer sheet. The responses will be scored in terms of single correct scores, double correct scores and ear correct scores.

High frequency word lists

An individual with a hearing loss may have difficulty in the perception of speech depending on the degree and type of hearing loss and the configuration of the audiogram pattern. Depending on the pattern of audiogram, the speech perception ability of an individual varies. Individuals with sloping high frequency hearing loss would have difficulty mainly in hearing speech sounds having energy concentration in the high frequency region. A test which is not specifically designed for them would not be sensitive to identify their perceptual problem. In this way, the high frequency speech identification test will meet the needs of the individuals with a sloping high frequency hearing loss in both diagnosis and selection of hearing aids. It is highly possible that a person with a sloping high frequency hearing loss may get maximum scores if a regular speech identification test is used thereby resulting in overestimation of speech perception abilities in such individuals. Hence, speech identification scores obtained for high frequency word list is a better estimate for such individuals.

Lexical Neighborhood test

Speech stimuli aids in detecting perceptual difficulties that may go undetected if only pure-tones were used. Pathologies in the retro-cochlear region and higher auditory pathways have been reported to not manifest themselves if evaluated only using pure-tones. Several word identification tests are available to determine the auditory perceptual difficulties of children with hearing impairment. At one extreme are simple tests such as the pattern perception test. On the other extreme are phonemically-balanced open-set word tests that can be made more difficult by adding distortion such as noise. For children who are in the process of developing speech and language, there is a need for a speech identification test that is neither too easy nor too difficult. The Lexical Neighborhood Test (LNT),

developed by Kirk, Pisoni, and Osberger (1995) has been found to serve as one such test. This test permits the evaluation of the auditory perceptual difficulty of children with hearing impairment before they get to the stage where they can be evaluated with PB words. It assesses spoken word recognition in order to reveal the perceptual processes employed by children, especially among those using cochlear implants. The LNT test items were formed based on the frequency of occurrence of words in the language (word frequency) and the number of phonetically similar words surrounding the word (lexical density). In view of the need for language specific tests, the LNT has been developed in different languages such as Mandarin, Cantonese) and Chinese.

Aphasia

Of the various views on aphasia, it has also been described as a 'disorder of comprehension' with an inability to understand linguistic utterances that cannot be attributed to deficient sensory input or generalized cognitive deficits (Rosenbek, La Pointe,& Wertz, 1989). Basso and Cubelli (1999) define aphasia as "the loss or deterioration of verbal communication due to an acquired lesion of the nervous system involving one or more aspects of the processes of comprehending and producing verbal messages". However, the comprehension deficits in aphasia have been studied lesser than the expressive deficits. It can be possibly due to the fact that the analysis of comprehension needs to be based on observations of overt responses, which is usually confounded by the observed output deficits. Despite the vast ethno-cultural variations in India, there have been very few attempts at studying and developing language tests to assess individuals with brain damage in the Indian context. Aphasia tests developed in Indian languages are intended mostly at testing the expressive abilities of a person with aphasia in comparison to the comprehension

14

abilities.Of the various assessment tools, Revised Token Test assesses the receptive abilities of persons with aphasia in the respective languages.

Revised Token Test

The Revised Token Test (RTT), a clinical and research tool which is used in the assessment of individuals with Aphasia. RTT is a sensitive quantitative and descriptive test battery for auditory processing inefficiencies and disorders associated with brain damage, aphasia, and certain language and learning disabilities. In the test, the person is instructed to point out to the appropriate items, when named by the examiner. Prior to the actual test, pre-test instruction is given to the person. This is done to ensure that they are familiarised with the items, colours and sizes. If any part of the test trial is not performed correctly, the instructions can be repeated. The prosodic features ofspeech such as rate, fluency, stress, intonation and juncture should be maintained constant both between and within commands. It has ten sub-tests which are administered by the clinician. A 15-point multidimensional scoring system is used to describe performance, and quantify deficits and differences among normal and pathological groups.

Bedside Screening

Cerebral disorders rank high in causing structural variations in the central nervous system, which in turn results in aphasia. Among this, stroke (vascular diseases) is the common cause leading to aphasia, especially when stroke is in the region of language zone i.e. in the left hemisphere. Generally, aphasia is defined as a disorder of language where linguistic processing and linguistic knowledge are affected.There are many tools available for assessing the linguistic deficits in aphasia, both for detailed assessment and screening. Detailed examination is possible only when the person is physically stable and can attend to

the examination for a long time. During the initial post-acute stages of recovery, bedside screening tools play a very important role in predicting whether the person is deviating from normalcy. The screening tool is usually administered on adults from 18 years and above. The bedside screening testincludes six domains with its subsections. It is instructed to the patient that he/she will need to point to picture cards or objects and perform actions with objects placed on the table according to examiner's instructions.Based on the response of the patient, it is scored on a three point rating scale. The interpretation isbased on the comparison of the scores with the normative data.

Autism

Autism Spectrum Disorders (ASD) include a number of conditions which range in severity from mild to severe. All disorders that fall under the spectrum, however, share similar deficits which include profound deficits in communication, poor social skills and a restricted range of activities and interests. As a result of these deficits, individuals with ASD face marked difficulties in language comprehension, expression and use.A large number of treatment methods have emerged over the years and studies have focused on proving the efficacy of these techniques. However, the treatment of children with ASD poses a challenge to Speech-Language Pathologists due to the variety of communicative deficits they exhibit.

A treatment manual for children with Autism Spectrum disorders

A Treatment Manual for Children with Autism Spectrum Disorder helps to ensure uniformity in the selection of treatment goals and to enable the documentation of gains over the course of treatment.Five domains were selected for treatment keeping in mind the core deficit areas ofchildren with ASD. The manual contains a progression of items from simple to complex under the domains of Pre-Linguistic Skills, Receptive Language Skills,

Expressive Language Skills, Pragmatic Language Skills and Play Skills. Items in each level can be given a score of 0, 0.5 or 1. 0 is given when the child is unable to perform the skill, 0.5 is given child is able to perform the skill but inconsistently and 1 is given when the child is able to perform the skill consistently.The manual provides domain score and a total score.

Apraxia

'Praxis' is a Greek word, which is used to describe the learned ability to plan, and carryout sequences of coordinated movements in order to achieve an objective, which could be a speech or a non-speech act. Praxis control is very important for speech production in terms of generation of articulatory postures and seriation of speech gestures. In children with childhood apraxia of speech (CAS), the deficits in verbal praxis are primarily due to the inability to sequence or seriate muscle contractions, thereby leading to inaccurate control of skilled speech action sequences. Because of these deficits/ disruptions, children with developmental apraxia of speech exhibit various speech sound errors like metathetic, perseverative and anticipatory errors that may be related to the sequencing of sound elements and to reductions in the complexity of word shapes. A particular difficulty in the sequencing of phoneme elements is also present. There is a need to have an assessment Protocol for Oral Motor, Oral Praxis, and Verbal Praxis Skills in Children with Childhood Apraxia of Speech and Suspected Apraxia of Speech. The protocol has several sub domains for Verbal Praxis assessment. The domains include isolated verbal movements, sequential verbal movements, diadochokinetic (DDK) tasks, word level praxis assessment, sentence level praxis assessment and analysis of spontaneous speech. The praxis errors are determined in all these domains and appropriate diagnosis is formulated.

CHAPTER 3

METHOD

The method followed in the project to review and compile the materials was similar to that of Goswami et al (2012). Suitable modifications were incorporated whereever necessary. The dissertations carried out at AIISH during a ten year span from 2008 to 2017 were reviewed. Based on the review for each material, a compiled short version of the material was prepared. During the review and preparation of the material, it was found that some of the materials were lacking in certain clinical usage aspects. Hence, the materials were compiled and formatted for publication so as to provide a professional appearance to the tool/s. However, no modifications concerning the overall contents of the original test material were made. All the test materials considered under the project are provided with an ISBN.

The method for the project was broadly divided into the following phases:

Phase – 1: Reviewing the dissertations related to Speech-Language Pathology and Audiology

After reviewing, the tests which were developed from the year 2008 to 2017 as part of Master's dissertation were considered for this project. A total of 112 dissertations were listed in the first phase of the study. Considering the demand from the professionals and the clinical utility, 71 and 42 dissertations pertaining to audiology, and speech-language pathology respectively were further shortlisted. Amongst these, 20 dissertations were finalized considering the time frame and clinical utility with minimum modifications required. The details of the speech and language, and audiology test materials considered in the project are given in Tables 3.1 and 3.2 respectively.

Table 3.1

Details of the speech-language pathology test materials considered in the project

Sl. No	Authors (Year)	Test/ Tool
1.	Lincy Mary Varghese & S. P. Goswami (2010)	Revised token test in Malayalam
2.	Aditi Rao & K. C. Shyamala (2015)	Development and validation of "A treatment manual for children with autism spectrum disorders"
3.	Santosh, D & S. P. Goswami (2013)	Beside screening evaluation-Telugu
4.	Korah, R.M. & R. Manjula (2012)	Assessment Protocol for Oral Motor, Oral Praxis, and Verbal Praxis Skills in Malayalam Speaking Children with Childhood Apraxia of Speech and Suspected Apraxia of Speech (APOOV-M)

Table 3.2

Details of the audiology test materials considered in the project

Sl. No.	Authors (Year)	Test/ Tool
1.	Prashanth Prabhu P. & Manjula P. (2010)	Test of Auditory Comprehension in Kannada
2.	Bharathidasan S. & Rajalakshmi K. R. (2013)	Dichotic Rhyme test –Tamil
3.	Sangamesh C. & Rajalakshmi K. R. (2008)	Dichotic Rhyme test – Kannada
4.	Kishore T. & Rajalakshmi K. R. (2008)	Dichotic Rhyme test – Telugu
5.	Giridhar G. K. & Rajalakshmi K. R. (2010)	Dichotic Rhyme test – Malayalam
6.	Arunraj K. & Devi N.(2009)	Dichotic Word Test - Indian English
7.	Gurdeep Singh Chhabra & Devi N. (2009)	Dichotic Word Test – Kannada
8.	Mukesh Kumar & Chandni Jain (2011)	Dichotic Word Test – Hindi
9.	Nakhawa Sonal Chintamani & Asha Yathiraj (2017)	High Frequency Speech Identification Test - Indian English

10.	Sinthiya K. & Sandeep M. (2009)	High Frequency Speech Identification Test – Tamil
11.	Margaret Hmangte & Geetha C. (2012)	High Frequency Speech Identification Test- Manipuri
12.	Ratnakar Y.V. & N. M. Mamatha (2012)	High Frequency Speech Identification Test- Telugu
13.	Prerna Alok Chandekar & Asha Yathiraj (2013)	Lexical Neighbourhood Test- Telugu
14.	Apoorva H. M. & Asha Yathiraj (2012)	Lexical Neighbourhood Test- Kannada
15.	Chhayakanta P. & Asha Yathiraj (2010)	Lexical Neighbourhood Test- Indian English
16.	Tamanna Khurana & Vijayalakshmi Basavaraj (2009)	Binaural Fusion Test

Phase-2:

During compilation, the following issues were observed:

- Lack of uniformity across tests/tools

- Unavailability of IPA version of test stimuli

- Incompatibility of the soft copies of the stimuli of most tests for appropriate formatting and hence, the same had to be retyped in the present format.

- Inability to effectively use the available soft copies of these materials as the details of the software used to type the test stimuli in the corresponding Indian script were not provided

- Lack of appropriate instructions in several subtests

- Poor quality of picture stimuli in some of the tests, necessitating the need to replace the same with suitable pictures.

- Lack of uniformity in the pictures as some were in black and white format, while others were in color format.

- Lack of comprehensive score sheets and normative tables

Considering the above issues, the following aspects were included in the final versions of the tests/tools included in the project:

- Brief description of the test/tool and its purpose

- Test construction and design

- Language of the tool that was developed

- The target population on which the tool can be used

- Administration of the test including the instructions

- Test stimuli, Scoring procedure

- Normative data/Study scores (wherever applicable)

Phase 3:

The test materials were formatted into a manual to give a professional look by a graphic designer. This included:

- Ensuring uniformity in the size of the manual (Crown paper size)

- Ensuring uniform font type (Times New Roman) and size (12)

- Providing picture stimuli (wherever applicable) separately or at the end of the manual for ease of administration

- Providing audio material where applicable

- Designing cover page for each material

- Incorporating the details of the author(s) on the cover page. Due credit to the faculty under whose guidance these tests were developed was ensured by considering them as one of the authors.

- Inclusion of the year of publication, cost, and details of copyright in each manual

- Inclusion of ISBN for each manual.

The materials thus compiled shall be useful inthe assessment of various speech, language and hearing related conditions as well as intervention. They will also serve as good resource materials to the professionals in the area of Speech and Hearing across the country. These manuals do reflect the contribution of AIISH in providing indigenous materials for the professionals and also broadens the publication scope of AIISH, Mysore.

CHAPTER 4

BRIEF DESCRIPTION OF THE TESTS/TOOLS

A brief description of each of the 20 tests/tools included under the project has been given below:

Dissertations related to Speech-Language Pathology

1. Assessment protocol for oral motor, oral praxis, and verbal praxis skills in Malayalam speaking children with childhood apraxia of speech and suspected apraxia of speech (APOOV-M) (Korah, R.M.& R. Manjula, 2012)

APOOV-M was compiled and developed to assess and profile young Malayalam speaking children of $\geq$2.6 to $\leq$4.6 years of age diagnosed with Childhood Apraxia of Speech (CAS) and Suspected Apraxia of Speech (sAOS). It consists of three main domains namely, oral motor, oral praxis, and verbal praxis, with sub-domains under each. The first two domains were adopted from Banumathy (2008), and the last domain was compiled and developed by the authors based on the linguistic structure of Malayalam language. The material development was followed by item validity and familiarity check. The reliability and the sensitivity testing proved the protocol to be sensitive enough in documenting the level of breakdown in children with CAS and sAOS. The entire protocol was then administered on two clinical groups: Clinical group I (CAS) and Clinical group II (sAOS including children with Expressive Language Disorder, Autism & Developmental Coordination Disorder). The findings indicated deficits related to praxis failure in both groups of participants in all three domains of the tool. Even though each participant exhibited a unique profile, all of them exhibited deficits in all domains and sub-domains of the protocol proving the usefulness and sensitivity of the protocol in identifying the praxis breakdown at different levels in different domains.

2. **Development of Revised Token Test – Malayalam (RTT-M) (Lincy Mary Varghese & Goswami S. P., 2010)**

The need to assess comprehension abilities in persons with aphasia in the respective language is widely acknowledged. Revised Token Test is the most common test used to assess comprehension abilities in persons with aphasia via the auditory modality. On similar lines, Revised Token Test was developed in Malayalam language to assess receptive abilities of persons with aphasia who are native speakers of Malayalam. The test developed was administered on neurotypical adult participants who are native speakers of Malayalam and hence, provides a basis for comparison between the comprehension abilities of neurotypical persons and persons with aphasia. The RTT consists of 10 subtests involving the 20 test stimuli which assess comprehension of commands of increasing length and complexity, and different sentence types. A comprehensive layout for placing the tokens, separate scoring sheet and statistical data for comparison is provided in the manual.

3. **ATreatment Manual for Children with Autism Spectrum Disorders (TMCASD) (Aditi Rao & Shyamala K.C., 2015)**

Autism Spectrum Disorders (ASD) comprise a number of conditions which range in severity from mild to severe. All disorders that fall under the spectrum, however, share similar deficits which include profound deficits in communication, poor social skills and a restricted range of activities and interests. As a result of these deficits, individuals with ASD face marked difficulties in language comprehension, expression and use. A large number of treatment methods have emerged over the years and studies have focused on proving the efficacy of these techniques. However, the treatment of children with ASD poses a challenge to Speech-Language Pathologists due to the variety of communicative deficits they exhibit.

TMCASD was developed to ensure uniformity in the selection of treatment goals and to enable the documentation of gains throughout treatment. Various sources of information regarding language development, assessment protocols and treatment programs for children with ASD were reviewed from books, journals, standardized treatment manuals, and various internet sources. The diverse information obtained from these sources was condensed and adapted for this manual. The domains of Pre-linguistic skills, Receptive language skills, Expressive language skills, Pragmatic language skills and Play skills were selected keeping in mind the core deficit areas of children with ASD. With the exception of prelinguistic skills, the other domains consisted of beginner, intermediate and advanced levels. The manual, therefore, can be used with children with ASD who have just been enrolled in an intervention program as well as highly verbal children with ASD who may have deficits in pragmatics.The manual provides a domain score and a total score and hence, helps quantify the progress seen across the different domains and thereby, overall language skills.

4. Bedside Screening Test In Telugu (BST – Te) (Santosh, D. & Goswami S. P., 2013)

Language disturbances in aphasia can be assessed either through a detailed assessment or screening. A person needs to be physically stable and attentive during a detailed assessment as it involves examination for a long time. During the initial post-acute stages of recovery, screening tools play a very important role to predict whether the person is deviating from the normalcy. A bedside screening test can be used for screening to assess speech and language skills in persons with stroke. It is less time consuming and can quickly give an idea about the presence or absence of aphasia, post-stroke. It helps in planning, an appropriate management program for persons with aphasia. Bedside Screening Test In Telugu (BST – Te) was developed on lines similar to that of Bedside Screening Tests in Kannada (Ramya & Goswami, 2012) and Malayalam (Kanthima & Goswami, 2012)

languages. BST – Te includes a total of six domains namely Spontaneous speech, Auditory verbal comprehension, Repetition, Naming, Reading and Writing. A three point rating scale is used to score the responses of persons with aphasia. Instructions, score sheet and normative scores for each domain are available in the manual.

Dissertations Related to Audiology

1. Test of Auditory Comprehension in Kannada (TAC-K) (Prashanth Prabhu & Manjula, P., 2010)

Test of Auditory comprehension in Kannada (TAC-K) will help us to identify whether the auditory comprehension of the child is appropriate to the chronological age. The test was administered on 180 children in the age range from 4 to 9.11 years, and age-specific scores were obtained for all the sub-tests of TAC-K. The score increases with an increase in the age of the children and the test have very good test-retest reliability. The two lists in the sub-tests are equivalent, and the test has good validity.

It includes the following subsections.

       1. Yes/no questions

       2. Identification based on a description-closed set

       3. Identification based on a description-open set

       4. Following commands

       5. Comprehension of a short paragraph

       6. Correcting the incorrect statements

       7. Identification of the category

       8. Problem-solving

This test can be used to identify auditory comprehension difficulties in Kannada speaking children. The results obtained from the test can be used to plan goals for therapy to

improve auditory comprehension. It also helps to monitor the progress of the child during rehabilitation. It can be used to counsel the parents/caregivers regarding the auditory comprehension difficulties of their children. The instructions to use and the normative are provided in the test manual.

2. **Dichotic Rhyme Test –Kannada (DRT-K) (Sangamesh, C. & Rajalakshmi, K., 2008)**

3. **Dichotic Rhyme Test –Telugu (DRT-Te) (Kishore, T. & Rajalakshmi, K., 2008)**

4. **Dichotic Rhyme Test –Malayalam (DRT-M) (Giridhar, K. & Rajalakshmi, K.,2010)**

5. **Dichotic Rhyme Test –Tamil(DRT-Ta) (Bharathidasan, S. & Rajalakshmi, K., 2013)**

Dichotic Rhyme Test can be used as an assessment tool for Central Auditory Processing Disorders, specifically to assess the binaural integration phenomenon.The test was developed in four languages – Kannada, Telugu, Malayalam and Tamil.The test consists of 18 pairs of commonly spoken, rhyming, bi-syllabic words in the respective language. These words start with plosives (/p/, /ṭ/, /k/, /b/, /ḍ/ and /g/), and the two words in a pair differed only in the initial consonant. The test was administered on 50 normalhearing adults (25 males and 25 females) between the age ranges of 18 – 30 years (17 – 25 years for DRT –Te) who are native speakers of the particular language.

These word pairs are dichotically presented to the subjects at an intensity level of 60 dB HL. The subject is instructed to write down the words heard in each ear after each presentation in a response sheet. The responses are scored as single correct scores, double correct scores, and ear correct scores. The manual includes test stimuli, instructions, scoring sheet and study scores for interpretation.

6. **Dichotic Word Test – Indian English (DWT-IE) (Arunraj, K.& Devi, N., 2009)**

7. **Dichotic Word Test – Kannada (DWT-K) (Gurdeep Singh & Devi, N., 2009)**

8. **Dichotic Word Test – Hindi(DWT-H) (Mukesh Kumar & Chandni Jain, 2011)**

Dichotic Word Testcan be used as an assessment tool for Central Auditory Processing Disorders to evaluate the phenomenon of binaural integration. The test was developed in Kannada, Hindi and Indian English. The test was administered on 100normalhearing children (50 boys and 50 girls) between the age ranges of 7 - 12 years in the particular language for Kannada and Indian English. Similarly, DWT-H was admistered on a total of 90 normalhearing children(45 boys and 45 girls) who were native speakers of Hindi. The test stimuli includes two lists of 20 pairs of words in the respective language that are dichotically presented to the subjects at their most comfortable level (40 dB SL ref SRT). The subject is instructed to repeat both the words heard. The responses are scored as Right ear score, Left ear score and double correct score. The manual includes test stimuli, instructions, scoring sheet and study scores for interpretation.

9. **High Frequency Speech Identification Test – Tamil(HFSIT-Ta) (Sinthiya, K.& Sandeep, M., 2009)**

10. **High Frequency Speech Identification Test – Telugu (HFSIT-Te) (Ratnakar, Y.V. & Mamatha, N.M., 2012)**

11. **High Frequency Speech Identification Test – Manipuri (HFSIT-Manipuri) (Margaret Hmangte & Geetha, C., 2012)**

An individual with a hearing loss is bound to have difficulty in the perception of speech depending on the degree & type of hearing loss, and the configuration of the audiogram. Individuals with sloping high frequency hearing loss would have difficulty mainly in hearing speech sounds having energy concentration in the high frequency region. The high frequency speech identification test will meet the needs of individuals with a sloping high frequency

hearing loss in both audiological diagnosis and selection of hearing aids. The test was developed in Tamil, Telugu and Manipuri languages. Word lists were prepared considering the high frequency vowels and consonants in the respective languages. 2 bsiyllabic aand 1 trisyllabic word lists were included in Tamil and Telugu whereas 2 monosyllabic word lists were included in Manipuri. HFSIT-Ta was standardized by administering it on 100 normal hearing Tamil speaking individuals in the age range of 19 – 25 years. HFSIT-Te was standardized by administering it on 100 normal hearing Telugu speaking individuals in the age range of 19 – 30 years. Similarly, HFSIT-Manipuri was standardized by administering it on 60 normal hearing individuals in the age range of 18 – 30 years who were native speakers of the language. The test manual includes test stimuli, instructions and response sheet for the respective languages.

12. **High Frequency Word Identification Test for Children in Indian English (HFWITC-IE) (Nakhawa Sonal Chintamani & Asha Yathiraj, 2017)**

The speech perception ability of an individual varies depending on the pattern of the audiogram.Individuals with sloping high frequency hearing loss would have difficulty mainly in hearing speech sounds having energy concentration in the high frequency region. Use of a regular speech identification test will overestimate the speech perception abilities in persons with a sloping high frequency hearing loss. Hence, speech identification scores obtained for high frequency word listsare generally used to evaluate such individuals. High frequency word identification tests are available for adults but the same cannot be used for children with high frequency hearing loss due to differences in vocabulary. Thus, HFWITCIE was designed to assess the speech perception difficulties faced by children having high frequency hearing loss. The test was validated on 48 typically developing childrenin the age range of 6 - 9 years.The test stimuli includes four equivalent lists, each with 25 monosyllabic words majorly consisting

of high frequency phonemes in English. The test manual includes test stimuli, instructions, response sheet and study scores for interpretation.

13. **Lexical Neighbourhood Test – Indian English (LNT-IE) (Chhayakanta, P.& Asha Yathiraj, 2010)**

14. **Lexical Neighbourhood Test – Kannada (LNT-K) (Apoorva, H.M. & Asha Yathiraj, 2012)**

15. **Lexical Neighbourhood Test –Telugu (LNT-Te) (Prerna Alok Chandekar & Asha Yathiraj, 2013)**

Speech identification tests developed for children should neither be too easy nor too difficult as children are in the process of developing speech and language. Lexical Neighbourhood Test (LNT), developed by Kirk, Pisoni, and Osberger (1995) has been found to serve as one such test. This test permits the evaluation of the auditory perceptual difficulty of children with hearing impairment before they get to the stage where they can be evaluated with phonetically balanced words. To suit the Indian population, LNT was developed in Indian languages. The test was developed in Indian English, Kannada and Telugu. It was validated on 30 typically developing children in the age range of 6- 8 years in the respective languages. The test stimuli includes two word lists with 40 words each, constructed based on the frequency of occurrence and lexical density in the particular language. Each list has equal number of lexically easy and lexically hard words wich are randomized. The manual includes test stimuli, instructions, response sheet and study scores for interpretation.

16. **Binaural Fusion Test in Kannada for Children (BFT-K) (Tamanna Khurana & Vijayalakshmi Basavaraj, 2009)**

Binaural fusion test isa sensitive tool to identify binaural interaction deficits in children withauditory processing problems. The test is used in the APD test battery to assess the presence of brainstem dysfunction. The test involves presentation of high pass filtered speech to one ear and low pass filtered speech to other ear. The participant has to identify the whole word by combining the information heard in both the ears. BFT in Kannada was developed to assess binaural interaction abilities in Kannada speaking children.The test was standardized on 100 typically developing normal hearing children in the age range of 7-12 years who were native speakers of Kannada. The test has two phonetically balanced lists, containing 25 words each. List I was picturable and list II was non-picturable. The manual includes test stimuli, instructions, response sheet and study scores for interpretation.

The materials listed above are prepared in the format suitable for professional usage and will be accessible from AIISH. This is one of the attempts to disseminate the available clinical tests/tools developed as part of the Master's dissertation at AIISH.

CHAPTER 5

SUMMARY AND CONCLUSIONS

The present project attempted to review and compile various clinical tools developed at AIISH for assessment and management of Speech, Language and Hearing disorders from 2008-2017 as a part of student masters's dissertation. Intially, the dissertations carried out at AIISH during a ten year span from 2008 to 2017 were reviewed.

Based on the review, sixteen audiology based and four speech –language pathology based dissetations in which clinical tools are developed were selected for compilation. For each material, a compiled short version of the material was prepared. The material included a brief description of the test/tool and its purpose, test construction and design, language of the tool that was developed, the target population on which the tool can be used, administration of the test including the instructions, test stimuli, scoring procedure and normative data/study scores.

During the review and preparation of the material, it was found that some of the materials were lacking in certain aspects pertaining to immediate clinical usage. Hence, the materials were compiled and formatted for publication so as to provide a professional appearance to the tool/s. However, no modifications concerning the overall contents of the original test material were made. All the test materials considered under the project are provided with an ISBN.

References

Aditi, R. & Shyamala, K. C. (2015). Development and validation of "a treatment manual for children with autism spectrum disorders". *Student Research at AIISH, Mysore, 13*, 25-36.

Apoorva, H. M. & Yathiraj, A. (2012). Development of Lexical Neighbourhood Test-Kannada. *Student Research at AIISH, Mysore, 11*, 17-32.

Arunraj, K. & Devi, N. (2009). Development of Dichotic Word Test-Indian English. *Student Research at AIISH, Mysore, 7*, 1-17.

Basso, A. & Cubelli, R. (2020). Clinical aspects of aphasia. In *Handbook of clinical and experimental neuropsychology* (pp. 181-194). Psychology Press.

Bhagya, B. & Ramakrishna, A. (2013). Prevalence of mental retardation among children in Mangalore. *Journal of Health and Allied Sciences NU*, *3*(04), 063-066.

Bharathidasan, S. & Rajalakshmi, K. R. (2013). Development of dichotic rhyme test in Tamil.*Student Research at AIISH, Mysore, 12*, 48-57.

Chhayakanta, P. & Yathiraj, A. (2010). *Development of Lexical Neighbourhood Test- Indian English. Student Research at AIISH, Mysore*, *8*, 44–54.

Das, S. K., Biswas, A., Roy, T., Banerjee, T. K., Mukherjee, C. S., Raut, D. K., & Chaudhuri, A. (2006). A random sample survey for prevalence of major neurological disorders in Kolkata. *Indian Journal of Medical Research*, *124*(2), 163.

Ganesh, K. S., Das, A., & Shashi, J. S. (2008). Epidemiology of disability in a rural community of Karnataka. *Indian J Public Health*, *52*(3), 125-129.

Giridhar, G.K. & Rajalakshmi, K. R. (2010). Development of dichotic rhyme test in Malayalam.*Student Research at AIISH, Mysore*, *8*, 87–95.

Goswami, S. P., Priya, M. B., & Archana, G. (2012). *Screening and diagnostic test materials and intervention manuals for speech and language disorders.*A project funded by AIISH Research Fund, AIISH, Mysore.

Gurdeep Singh C. & Devi, N. (2009). Development of Dichotic Word Test-Kannada.*Student Research at AIISH, Mysore, 7*, 35-53.

Kirk, K. I., Pisoni, D. B., & Osberger, M. J. (1995). Lexical effects on spoken word recognition by pediatric cochlear implant users. *Ear and hearing*, *16*(5), 470.

Kishore, T. & Rajalakshmi, K. R. (2008). Development of dichotic rhyme test in Telugu.*Student Research at AIISH, Mysore, 6*, 120-130.

Konadath, S., Suma, C., Jayaram, G., Sandeep, M., Mahima, G. & Shreyank, P. (2013). Prevalence of communication disorders in a rural population of India. *Journal of Hearing Science.3,*41–49.

Konadath, S., Chatni, S., Lakshmi, M. S., & Saini, J. K. (2017). Prevalence of communication disorders in a group of islands in India. *Clinical epidemiology and global health*, *5*(2), 79-86.

Korah, R. M. & Manjula, R. (2012). Assessment Protocol for Oral Motor, Oral Praxis, and Verbal Praxis Skills in Malayalam Speaking Children with Childhood Apraxia of Speech and Suspected Apraxia of Speech. *Student Research at AIISH, Mysore, 10*, 101-119.

Lincy, M. V. & Goswami, S. P. (2010). Development of Revised Token Test- Malayalam. *Student Research at AIISH, Mysore, 8*, 121-130.

Margaret Hmangte & Geetha, C. (2012). Development of High Frequency Speech Identification Test-Manipuri.*Student Research at AIISH, Mysore, 11*, 132-140.

Mishra, A., Verma, V., Shukla, G. K., Mishra, S. C., & Dwivedi, R. (2011). Prevalence of hearing impairment in the district of Lucknow, India. *Indian Journal of Public Health*, *55*(2), 132.

Mukesh Kumar & Jain, C. (2011). Development of Dichotic Word Test-Hindi. *Student Research at AIISH, Mysore, 10*, 122-130.

Nakhawa, S.C. & Yathiraj, A. (2017). Development of high frequency speech identification test in Indian English. *Student Research at AIISH, Mysore, 15*, 240-250.

National Sample Survey Organization (2011). Census2011.co.in. Literacy Rate of India-population Census. 2011; 2011 http://www.census2011.co.in/literacy.php.

Prabhu, P. P. & Manjula, P. (2010). Development of Test of Auditory Comprehension in Kannada (TAC-K). *Student Research at AIISH, Mysore*, *8*, 147–155.

Prabhu, P., Konadath, S., Kasturi, V. J., Arumugam, V., Srikar, M., Rahman, A., ... & Biji, A. P. (2020). Estimation of prevalence and screening of communication disorders in North and Middle Andaman and Nicobar Islands. *Clinical Epidemiology and Global Health*, *8*(2), 519-525.

Prema, K. S., Savithri, S. R., & Jayaram, M. (2004). *Speech and Language Tests at AIISH (SaLT-AIISH).* A project funded by AIISH Research Fund, AIISH, Mysore.

Prerna, A. C. & Yathiraj, A. (2013).Development of Lexical Neighbourhood Test- Telugu. *Student Research at AIISH, Mysore*, *12*, 157–165.

Ratnakar, Y.V. &Mamatha, N. M. (2010). Development of High-Frequency Speech Identification Test-Telugu.*Student Research at AIISH, Mysore*, *8*, 213-219.

Rosenbek, J. C., LaPointe, L. L., & Wertz, R. T. (1989). *Aphasia: A clinical approach*. Pro Ed.

Sangamesh, C. & Rajalakshmi, K. R. (2008). Development of dichotic rhyme test in Kannada. *Student Research at AIISH, Mysore*, *6*, 203-216

Santosh, D. & Goswami, S. P. (2013). Development and validation of Beside screening evaluation-Telugu. *Student Research at AIISH, Mysore*, *11,* 246-255.

Sinha, S. K., Shivaswamy, J., Barman, A., Seth, D., Seshadri, D., & Savithri, S. R. (2017). Prevalence of communication disorders in a rural population at taluq level of Gujarat, India. *Clinical epidemiology and global health*, *5*(2), 73-78.

Sinthiya, K. & Maruthy, S. (2009). Development of High-Frequency Speech Identification Test-Tamil.*Student Research at AIISH, Mysore*, *7*, 246-255.

Tamanna, K. & Basavaraj, V. (2009). Binaural fusion test in Kannada for children. *Student Research at AIISH, Mysore (Articles Based on dissertation done at AIISH), 7*, 270-281.