

# Field-testing of Constant Therapy in Hindi and Kannada

*by* Goswami S.p.

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**ARF PROJECT PROPOSAL****Part -A**

- 1.0 Title of the Project** : Field-testing of Constant Therapy in Hindi and Kannada
- 1.1. Area of Research** : Speech, Language, Hearing
- 1.2 Principal Investigator** : Dr. S. P. Goswami, AIISH, Mysore, India,  
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- 1.3 Principal Co-Investigator(s):** NA  
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- 1.4 Collaborating Institution:** AIISH, Mysore and Department of Speech, Language,  
and Hearing Sciences Boston University Sargent  
College, USA
- 1.5 Total Grants Required** Rs. 5,61,000 (Five lakhs sixty one thousand)  
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**(in figures and in words)**
- 1.6 Duration of the Project:** 15 months

**2.0 Project Summary (Max. 300 words):**

In the Indian scenario, persons availing speech and language services face immense adversities due to the lack of manpower in the field of Speech-Language Pathology. With the undeniable and enduring issues of geographical barriers, high cost of available services and physical conditions of the PWA, gaining access to speech-language services is a difficult task. Literature quoted suggests that computer rehabilitation programs are effective in spite of lacking one-to-one interaction with the speech-language therapist. Moreover, providing rehabilitation services at home is found to be effective. Constant Therapy is one of the software programs available whose effectiveness is well established. Field testing of Constant Therapy in Hindi and Kannada languages can be useful in enabling tele-rehabilitation of persons with aphasia in remote places and facilitating access to continued services at home environments. Thus, with this

background in mind, need for conducting the current study with the aim of field-testing Constant Therapy in Hindi and Kannada language was felt essential.

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### 3.0 Introduction (under the following heads):

#### 3.1 Definition of the problem:

Overcoming the limitations of restricted diversity of available speech-language therapy tasks, Constant Therapy, an iPad (Apple Inc., Cupertino, CA) software platform was developed by Kiran, Des Roches, Balachandran & Ascenso (2014). It offers an impairment-based, individualized treatment plan for persons with aphasia, who have suffered a traumatic brain injury (TBI), stroke or dementia, or children with learning disabilities or other disorders by employing tele-treatment. To make the tele-treatment more systematic, individualized and personalized through Constant Therapy, a wide range of treatment tasks were designed based on extensive research, aiming to remediate linguistic and cognitive skills. Constant Therapy can be effectively used for tele-treatment since it enables manual delivery of tasks and also allows for the user to use dynamically upgraded tasks. It helps assess the participant's performance by measuring the accuracy and latency of the responses on each of the designed tasks. The software enables clinicians to monitor the participant's performance on each therapy task through distance mode effectively. The program also allows for analysis and graphical visualization of the accuracy and latency of scores for every session of usage. It is available for independent use or with multiple users, allows setting up homework and monitor PWA' progress to make better clinical decisions. Des Roches, Balachandran, Ascenso, Tripodis and Kiran (2014) studied the effectiveness of this tablet based software platform that delivers tailored therapy for PWA and found significant and positive changes in both domains of language and cognition. Thus, it is important to field test this program in different Indian languages to suit the ethno-cultural issues in Indian context.

3.2 Objectives: The aim of the present study is to Field Test Constant Therapy in Kannada and Hindi languages

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#### 3.3 Review of status of research and development in the subject:

Stroke Association of India (2013) estimates that 800,000 to 1,000,000 persons are affected by stroke annually. Aphasia, which is the impairment of language functions, is considered to be the second most disabling consequence of stroke (Agostini, Garzon, Benavides, De Pellegrin, Bencini, Rossi et al., 2014). Intensive and long term treatments are

often recommended for persons with aphasia (PWA) owing to its chronic nature (Theodoros, Hill, Russell, Ward, & Wootton, 2008). But, a large proportion of PWA fail to gain access to and/or continue speech-language services because of a number of hindering factors such as geographical barriers, physical condition of the person himself/herself, lack of adequate number of service providers and high costs (Agostini et al., 2014). A great majority of healthcare professionals believe that reduced duration of hospital stay and providing various healthcare services at home improve the treatment outcomes (Reinkensmeyer, Pang, Nessler, & Painter, 2002). Advent of telecommunication technology propelled the process of tele-rehabilitation, thus aiding provision of services like assessment, intervention, consultation and education. This helps in providing these services through distance mode to persons with aphasia at their doorstep. To establish the efficacy of tele-rehabilitation services, researches have attempted to compare face-to-face treatment and tele-treatment. In persons with post-stroke anomia, Agostini et al. (2014) found significant improvements on treated items in both conditions. These findings suggested that factors like the absence of physical interaction between PWA and the therapist and technical intricacies did not impede the effectiveness of tele-treatment. The American Speech Language and Hearing Association posits tele-practice as an appropriate model of service delivery for the professions of Audiology and Speech-Language Pathology as it can be used to overcome barriers of access to services caused by distance, unavailability of specialists and/or sub-specialists, impaired mobility and thus, offer extended clinical services to remote, rural, and underserved populations (Speech-Language Pathologists Providing Clinical Services via Telepractice: Position Statement, 2005). This has encouraged dedicated research on computerized rehabilitation services to enhance tele-rehabilitation services (Brennan, Tindall, Theodoros, Brown, Campbell, Christiana et al., 2011). Tele-treatment has gained popularity in the Indian scenario in the recent past. A study by Goswami, Bhutada, and Jayachandran (2012) established efficacy of tele-treatment of 25 sessions for a person with Broca's Aphasia using a web camera based system via Skype. The study reported improved participation in the treatment program and improved language skills. Goswami and Renuka (2013) developed Computerized Version of Manual for Adult Aphasia Therapy – Kannada (CV-MAAT-K) to remediate Functional Communication, Repetition, Comprehension and Expression, Naming and Reading and Writing. Field testing of CV-MAAT- K has established it to be an effective tool in improving the communication skills of persons with aphasia. Software based tele-treatment is core to the process of tele-rehabilitation since it permits interaction between the therapist and PWA through long distance in an asynchronous manner. Software programs like CogMed, Lumosity, Sentence



Shaper, Lingraphica and Sentactics are commercially available and put to use very often. The effectiveness of CogMed (Pearson Company, Scandinavia, Sweden, 2011), a software program created for use with individuals with brain insult was tested on 18 persons with stroke for 5 weeks of treatment. Progress on untrained measures of working memory and attention and fewer cognitive problems were found with the tele-treatment (Westerberg, Jacobaeus, Hirvikoski et al., 2007) Finn and McDonald studied 16 participants with mild cognitive impairments using Lumosity (Lumos Lab, San Francisco, CA, 2007), an online-based tool available on the internet, targeting attention, speed of processing, visual memory over 30 sessions. Significant training effects on working memory and visual attention were found, establishing the efficacy of the software. Although effective, software based tele-rehabilitation options are limited in their functional applications and diversity of therapy tasks available. Overcoming the limitations of restricted diversity of available therapy tasks, Constant Therapy, an iPad (Apple Inc., Cupertino, CA) software platform was developed by Kiran, Des Roches, Balachandran & Ascenso (2014). It offers an impairment-based, individualized treatment plan for persons with aphasia, who have suffered a traumatic brain injury (TBI), stroke or dementia, or children with learning disabilities or other disorders through tele-treatment. To make the tele-treatment more systematic, individualized and personalized through Constant Therapy, a wide 4 range of treatment tasks were designed based on extensive research, aiming to remediate linguistic and cognitive skills. Constant Therapy can be effectively used for tele-treatment since it enables manual delivery of tasks and also allows for the user to use dynamically upgraded tasks. It helps assess the participant's performance by measuring the accuracy and latency of the responses on each of the designed tasks. The software enables clinicians to monitor the participant's performance on each therapy task through distance mode effectively. The program also allows for analysis and graphical visualization of the accuracy and latency of responses for every session of usage. It is available for use independently or with multiple users, allowing the therapist to set up homework and monitor PWA's progress, thus enabling speech-language pathologists, academicians and researchers to make better clinical decisions. Des Roches, Balachandran, Ascenso, Tripodis and Kiran (2014) studied the effectiveness of this tablet based software platform that delivers tailored therapy for PWA and found significant and positive changes in both the domains of language and cognition.

### 3.4 International and national status:

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Des Roches et al., (2014) studied the effectiveness of the iPad- based therapy platform (Constant Therapy), in a group of 51 PWA with stroke and traumatic brain injury who had aphasia for duration of one month to about 359 months. The control group used Constant Therapy for one hour per week within clinic along with the clinician. The experimental groups used Constant Therapy for the same one hour at the clinic but were also advised for practice at home. The outcomes of their project were discussed in terms of four PWAs with varying cognitive-linguistic profiles. A detailed cognitive-linguistic profile of the PWAs was obtained before and after treatment using Revised-Western Aphasia Battery (WAB-R), Cognitive Linguistic Quick Test (CLQT), Boston Naming Test (BNT) and Pyramids and Palm Trees Test (PPTT). The choice of therapy tasks to be assigned came from a set of 30+ therapy tasks broadly divided in linguistic and cognitive therapy. Language therapy tasks were divided into (1) naming therapy (2) reading therapy (3) writing therapy (4) sentence planning. The cognitive therapy tasks were divided into (1) visuospatial processing (2) memory (3) attention (4) problem solving (5) executive function. After selecting potential tasks and administration, they were assigned as baseline. A task was taken up for therapy only if, the score on the task was below 80%. If the scores were higher than 80%, the next level of difficulty in a particular task was assigned for treatment. For the therapy schedule every week, five to six tasks with up to 10 items in each task were assigned to every PWA. A 10-week treatment program was employed during the study. The tasks for every PWA were modified based on the changing cognitive linguistic profile through the course of therapy. The control group was asked to practice therapy by logging into the Constant Therapy app using usernames and passwords for about six days a week for one hour every day. They were also recommended for weekly visits in the clinic to monitor the progress. Results were recorded by the software which included the scores on various tasks and therapy practice time. Four PWAs with Low Language Profile–Low Cognitive Profile, High Language Profile-Low Cognitive Profile, Low Language Profile- High Cognitive Profile and High Language Profile- High Cognitive Profile were analysed for outcomes on WAB-R, CLQT and PPTT as post therapy measures. Their results revealed that all four PWA improved on their iPad-based therapy tasks in terms of accuracy and latency. PWAs motivation levels were noted to be higher when assigned with the software based therapy practice for home which was inferred through the number of log in sessions per week for each PWA. Positive outcomes of treatment were also seen as improved scores on standardized test materials like WAB-R, CLQT and PPTT irrespective of the duration from which the person had aphasia or the cognitive-linguistic deficit. It was concluded from the study that smart-tablet and/or

internet based applications for therapy for PWA helps the individual continue therapy outside clinical settings and aids the conventional therapy procedures. Though such procedure cannot replace the traditional paper-pencil based therapies, easy access to PWA data, remote analysis of the outcomes on therapeutic tasks, multitude of tasks available for therapy in software and easy monitoring of home training put technology based interventions in the forefront which could be adapted by clinicians across the globe easily for better services to PWA.

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### 3.5 Importance of the proposed project in the context of current status

- The outcomes of therapy using Constant Therapy may guide tele-rehabilitation services for PWAs in the Indian context.
- By enabling service delivery through distance mode this software based tele-treatment program will assist Speech Language Pathologists to overcome problems of lack of man power and unavailability of adequate services for persons with aphasia.
- Effective documentation of treatment outcomes and monitoring the person's progress through an effective individualized treatment program are made easy through use of such technological tools.
- A tele-treatment program which can be easily accessed by the PWA might lead to better outcomes since it ensures improved home training.
- Interactive tele-treatment systems which provide instantaneous feedback may improve participation in the treatment program and reduce the attrition rates.

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## 4.0 Work Plan

### 4.1 Method: Subjects / Participants

#### Participants

The present study aims at field testing of Constant Therapy in Hindi and Kannada on persons with aphasia (PWA). A formal permission from the authors and creators of Constant Therapy will be taken for field-testing Constant Therapy in Hindi and Kannada. The authors of Constant Therapy will be duly acknowledged in the current study. This will be single subject design study. A total of 20 PWAs (10 each in Hindi and Kannada) will be recruited for the study. All the relevant information related to PWA will be documented such as the details of stroke, medical, therapy, personal details and any other information reported or documented



by PWA or their family members. The factors such as type of aphasia, site of lesion, type of treatment (physical, occupational, speech-language, psychotherapy and any other treatment) educations, geographical distribution socioeconomic status, languages known, handedness, vocation, family status and any other information will be documented. These will be considered while analyzing the data

### Inclusionary criteria

1. Native /fluent speakers of Kannada and Hindi will be enrolled for field testing.
2. Participants with an affirmed diagnosis of aphasia on administration of Western Aphasia Battery in Hindi/ Kannada (WAB-H/K) will be recruited for the study
3. Participants with pre-morbid neurological illness, psychiatric disorders and/or cognitive decline and significant sensory and/or cognitive deficits will not be enrolled for the field testing.

**Material:** iPad (Apple Inc., Cupertino, CA) software platform

### Phase- I: Stimulus development

Reviewing of the developed Kannada and Hindi material for Constant Therapy, which has been prepared as a part of Masters level dissertation.

**Table 1 Stimulus Summary of Constant Therapy Kannada**

Sl. No.	Therapy Task	No. of Stimulus Items Prepared				Picture Stimuli
		Questions/ Word Pairs	Words/ Answers	Distractors		
1.	Auditory Command Task	4 General questions for 4 levels prepared*	-	-	635	
2.	Calendar Task	100	100	200	12	
3.	Categories	635	-	-	635	
4.	Currency Task	196	-	-	196	
5.	Feature Task	101	1022	61278	*	
6.	Letter to Phoneme Task	44	44	44	-	
7.	Map Task	50	50	100	5	
8.	Math Task	114	-	-	-	
9.	Phoneme to Letter Task	44	44	44	-	



10.	Phoneme to Word Task	635	-	-	-
11.	Reading Task**				-
12.	Rhyming Task	282	282	100	-
13.	Semantic Minimal Pair Task	138	138	138	-
14.	Semantic Odd One Out Task	100	100	400	-
15.	Sentence Completion Task**				-
16.	Syllable Task	635	635	-	-

**Table 2 Stimulus Summary of Constant Therapy Hindi**

Sl. No.	Therapy Task	No. of Stimulus Items Prepared			Picture Stimuli
		Questions/ Words/ Word Pairs	Answers	Distractors	
1.	Auditory Command Task	4	-	-	*
2.	Calendar Task	180	180	360	12
3.	Categories	638	-	-	638
4.	Currency Task	196	-	-	196
5.	Feature Task	101	1022	61278	*
6.	Letter to Phoneme Task	46	46	46	-
7.	Map Task	50	50	100	05
8.	Math Task	118	-	-	-
9.	Phoneme to Letter Task	46	46	46	-
10.	Phoneme to Word Task	638	-	-	-
11.	Reading Task**	30	30	60	-
12.	Rhyming Task	212	212	100	-
13.	Semantic Minimal Pair Task	140	140	140	-
14.	Semantic Odd One Out Task	100	500	200	-

	Sentence				
15.	Completion Task**	50	50	300	-
16.	Syllable Task	638	-	-	638

### **Audio recording of the developed stimulus material**

Appropriateness of translations, modifications and adaptations of stimuli under 15 therapy tasks and core vocabulary under 29 lexical categories already developed consisting of questions, statements, words along with answers and distractors will be reviewed and any changes required will be made before finalizing the materials. These finalized stimuli will be audio recorded using appropriate instrumentation by a native Kannada and Hindi speaker.

### **Obtaining a feedback rating of the audio-recorded stimulus**

The audio recorded stimulus will be provided to 3 judges for perceptual evaluation using an appropriate rating scale.

The stimulus thus finalized will be sent to the developers of Constant Therapy for implementation into the software platform for the purpose of field testing.

### **Phase-II: Field Testing of Constant Therapy in Kannada and Hindi**

The study will be carried out with a total of 20 participants (10 each in Hindi and Kannada PWAs). Each participant will be recommended to use 15 login sessions of the iPad version of Constant Therapy in Kannada and Hindi. Participant selection will be made following the ethical procedures as recommended by the ethical committee of AIISH, Mysore.

### **Procedure for data collection:**

- a) Prior written consent will be taken from the participant/caregiver for the participation in the study.
- b) All the participants will be tested in a quiet, noise free environment at home, school or clinical setting.
- c) The aim of the study, procedure, and duration of testing will be explained to the participant/caregiver.
- d) The stimuli will be presented through an i-Pad or a Smart Phone

- e) Separate scoring will be carried out for each task by the software program on the i-Pad or Smart Phone.
- f) Performances of each participant from baseline to midsession and in the last session will be compared across various log in tasks to assess their progress. This in turn will help in testing the level and appropriateness of various stimuli in the newly developed constant therapy program in Hindi and Kannada.

The field testing of Constant Therapy in Kannada and Hindi will be conducted in a clinical setting. A detailed cognitive-linguistic profile of the PWA will be obtained prior to commencement of the treatment program. For accessing the treatment through Constant Therapy in Hindi and Kannada, the PWA will be registered with the software platform, either with clinician's monitoring or for use by self at home environments. Prospective therapy tasks based on the cognitive-linguistic profile will be recommended for the PWA. Selection of prospective tasks would be made based on an 80% criterion for accuracy as stated in Constant Therapy. Tasks for therapy will be upgraded to the next level of difficulty, if the participant reaches the 80% accuracy criteria. A total of 15 login sessions of Constant Therapy each for Kannada and Hindi participants will be considered for field testing. Along with baseline measurements of scores prior to beginning the tele-treatment, progress will be assessed throughout the treatment process, to determine the degree of change across different sessions.

### **Scoring**

The software provides the feedback as "correct" or "incorrect response" and displays score on each task on every trials based on the number of items attempted.

### **Statistics**

Obtained scores will be tabulated and appropriate statistical analysis will be carried out.

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## **6.0 Implications of the results of the study (Illustrative)**

### **(a) Presentation of scientific papers in professional seminars / publication of articles**

#### **Approximate number of outputs from the present study:**

Research publications: 2

Scientific papers in professional seminars: 1

- (b) **Discussion with professionals:** It is an international collaborative initiative, which will help in strengthening the activities of AIISH at a global level.



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- (c) **To utilize the results in the development of remediation:** Field testing of constant therapy in Hindi and Kannada will help in improving the cognitive and communication skills of various PWA in various setting which in turn will improve the overall quality of life of persons with aphasia

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**7.0 Utilization of results of the study:**

- The outcomes of therapy using Constant Therapy may guide tele-rehabilitation services for PWAs in the Indian context.
- Developing a software tool for use with tele-rehabilitation services in the Indian context would facilitate improved service delivery in the field of Speech Language Pathology. Given that Hindi and Kannada are such prevalent languages in India, adaptation of Constant Therapy into the Hindi and Kannada will make it accessible to several patients across the country.
- Having a treatment program that can be accessed by the patient leads to improved home training and the immediate feedback provided by the software leads to better participation in the treatment program.

# Field-testing of Constant Therapy in Hindi and Kannada

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STUDENT PAPERS

## PRIMARY SOURCES

- 1** Kiran, Swathi, Carrie Roches, Isabel Balachandran, and Elsa Ascenso. "Development of an Impairment-Based Individualized Treatment Workflow Using an iPad-Based Software Platform", Seminars in Speech and Language, 2014.  
Publication 4%
- 2** Submitted to All India Institute of Speech & Hearing  
Student Paper 1%
- 3** [www.aiishmysore.in](http://www.aiishmysore.in)  
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