

Received: January 2024 Accepted: February 2024

DOI: <https://doi.org/10.53555/ks.v12i2.2875>

Digital Application for Adult Stutters– Al-Lisan

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Abstract

The objective of the study was to develop “Al-Lisan”, a digital application for the assessment and management of adult stutters in Urdu and English Language. The current study developed a digital application following development of a manual utilizing 12 experts including 6 Speech Language Pathologists (SLP) and 6 Psychologists. The assessment and management approaches were finalized through expert opinion and thorough review of literature. The manual was analyzed by both Urdu and English language experts for the content analyses. The Content Validity Index (CVI) was calculated. On the basis of the manual, the digital application was developed with the assistance of software engineer and face validity of the application was calculated. “AL-Lisan”, was developed in Urdu and English languages. It comprises of three informal assessment options including self-rating of stuttering, self-evaluation of fluency and the stutter rater. While Self-management techniques inculcated in the application are Easy onset and Flexible rate of speech along with breathing exercises. Setting option has all the record keeping options for both assessment and management along with the option of language switching and security lock of the application as well. It has a face validity of 0.9 for SLPs and 0.78 for PWS. Al-Lisan, with excellent face validity, provides the opportunity to stutters for self-assessment and self-management. It also provides PWS options of scoring and recording for all the assessments and speech exercises. It facilitate the users as a digital technology mediated support for therapeutic purposes with the consultancy of the SLP.

Key Words: *Adult, Digital Applications, Management, Stuttering, Soft-wares, Technological Rehabilitation.*

Introduction

Stuttering is an idiopathic and common fluency disorder with a prevalence of 5 %. It is characterized by prolongation, block, and repetition of sound or words ¹. These primary features may be accompanied by secondary characteristics like tremors, rapid eye blinking, fist clenching and head nodding ², as well as a variety of psychosocial complications which are related to experiences that a stutterer faces in his life including being mocked or teased by others. This can result in poor self-esteem, low confidence, anxiety of social situations leading ultimately to isolation and avoidance, thus affecting social life, relationships and

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employment ³.

Speech-language pathologists (SLPs) usually manage the condition by therapies involving restructuring of the speech and management strategies ² encompassing a holistic approach ³. Though a number of interventions including methodologies, therapies and techniques are in practice which reduce the severity of stuttering however, none guarantees a permanent solution for the problem ⁴. Among certain techniques that are effective for comparatively longer period are slow rate for speaking with prolongation and pauses in it. Stutters who struggle with blocks and repetition usually have poor breathing patterns. SLPs help regain the control of breath by using diaphragmatic breathing technique for PWS. It acts as a relaxation technique if conducted at the beginning of the session, before initiating speech exercises ⁵. A fluency technique called Easy-onset helps in the production of vowels at the beginning of the words. Easy onset speech is acquired by the gradual onset of vocal fold vibration. Since at initiation of a word or phrase, stuttering can occur due to abrupt movement of the vocal folds and excessive tension in the area around the vocal folds, instead of attempting to do both of these things at once, SLPs make stutterers learn to first initiate an outbreath and then gradually turn the vocal folds on by using easy onsets to improve stuttering which is also possible by use of applications like Speak up ^{6, 7}. A therapeutic approach Lidcombe for children who stutter, utilizes parental involvement in the therapeutic process. The child is provided with an encouraging environment at home, in which he receives praise and positive reinforcement for fluent speech, hence building confidence in the child ⁸, as the main idea behind the Lidcombe program is to create a friendly and comfortable environment. Despite global advancements, the SLPs in Pakistan mainly rely on one-to-one sessions for management of adult stuttering either in clinic or in tele rehabilitation. There is barely any data available regarding the use and implementation of therapy via digital applications and literature about the usage of digital application or technological rehabilitation of adult stutters unlike the developed countries ⁹.

With research gap in the area and need of research into applications like StammerApp for use with PWS is need of the hour ¹⁰. Hence, the current study was conducted with the objective to develop Al-Lisan, a digital application for the assessment and management of adult stutters in Urdu and English Language keeping in view the idea of creating a user-friendly application for adult stutters to bridge the gap between the traditional therapeutic approaches and automated and digital solutions of stuttering. This is expected to also provide informal self-assessment opportunities for the stutterers under supervision of a SLP. The study is of significant importance since it will provide professionals and PWS an important application easily usable through their mobile phones, which will help in clinical assessment and management of PWS even in far flung areas of the country reducing financial constraints on the patient population. For adult stutters, who cannot take therapy because of any reasons, this Application Al-Lisan will assist them in assessing their speech informally and manage by following with speech exercises.

Material & Methods

Ethical Approval

The study was carried out after obtaining ethical approval of research from Research Ethics Committee of Riphah College of Rehab & Allied Health Sciences, Riphah International University vide registration No REC/RCR & AHS/21/1111 and informed consent of

participants.

Development of the Manual for the Application

Before developing the application, a manual was built with the assistance of 12 experts. “Manual Development Panel” including six SLPs and six Psychologists with working experience of more than five years with PWS, since literature reveals that both SLPs and psychologists work with PWS all over the world ¹¹. Qualification wise this expert sample five PhDs, three PhD Scholar and four experts with Masters qualification with experience ranging from 6 to 20 years.

Table 1: Demographic Characteristics of Manual Development Panel (N=12).

S. No	Profession	Years of Experience	Qualification
1	Speech Language Pathologists	9	Ph.D
2		25	Ph D (Scholar)
3		16	Ph.D (Scholar)
4 & 5		10	MS
6		6	MS
7	Psychologists	20	Ph.D (Scholar)
8 & 9		16	MS.
10 & 11		15	MS.
12		10	Ph.D (Scholar)

According to the American Psychological Association (APA), a manual is a document with step-by step instructions to carry out a specific task or do something. It is often referred to as a user handbook or an instruction manual. It provides in depth details about operations, standards and guidelines and features. It is essential to have a guide at the beginning of the manual. It can be present in both soft and hard form, or in both, according to the need of the user ¹².

A Manual was developed in both Urdu and English languages. The Urdu content was first evaluated by an Urdu language expert and the English content was reviewed by an English language expert. The assessment methods and management approaches, which are part of the application, were suggested and reviewed by a relevant “Clinical Review Panel” which comprised of five expert SLPs among which four were PhD scholars with broad experience.

Table 2: Demographic Characteristics of Clinical Review Panel (N=05).

Sr. no	Years of Experience	Qualification
1	12	MS
2	16	Ph.D*
3	20	Ph.D*
4	7	Ph.D*
5	10	Ph.D*

A manual is considered as a guidebook for an application provided to a user to aid in the effortless use of the product, or service, hence, it provides a guideline to the software engineer who will assist in the development of the digital Application. It was ensured that the manual was a detailed document that included preface, instructions, assessment and management techniques to be added in the digital Application along with speech practice words, phrases,

sentences and paragraphs.

Hence, the manual contained a detailed description of how the application will be built. The current manual begins with the overview of Application and then the description of the main page is given with its features. The settings description includes language switching option, password setting and the history setting of all the previous assessment and speech practice exercises. It also comprises the description of all three assessment techniques which are; Self Rating of Stuttering, Self-Evaluation of Fluency and Stutter Rater. The Self-Management description includes Breathing exercises, Flexible rate of speech and Easy onset. The manual encompasses all the lists of speech exercises of words, phrases, sentences and paragraphs of both speech techniques.

Opinions of the expert SLPs were also utilized for determination of content validity of the manual and content validity index was calculated at 0.82.

Development of AL-Lisan

After development of the manual, it was converted into the digital Application AL-Lisan with the assistance of a software engineer as per guidelines provided in the manual.

Engagement with PWS and SLPs working with PWS

After the development of the Application, face validity of the Application was measured by engaging both SLPs working with PWS and stutters themselves as being primary stakeholders “Application Assessment Panel”. The purpose was to find the extent to which this Application measures what it claims to measure. The Application was given to 5 PWS and 5 SLPs with a questionnaire to rate it.

Table 3: Demographic Characteristics of Stutters (N=05) & Speech Language Pathologists (N=05).

	Sr. no	Age	Gender	Qualification
Demographic Characteristics of Stutters	1	20 years	M	BS (hons)
	2	28 years	M	MS
	3	23 years	M	Bs (hons)
	4	20 years	F	Matric
	5	25 years	F	Masters
	Sr. no	Years of Experience	Qualification	
Demographic Characteristics of Speech Language Pathologists	1	12	MS	
	2	16	Ph.D*	
	3	20	Ph.D*	
	4	7	Ph.D*	
	5	10	Ph.D*	

They were asked to mark either sufficient or insufficient, for each of the item, according to their perception. The questions covered all the content; Main page, Settings (Password, History, Language), Stuttering Overview, Self-assessment (Self Rating of Stuttering, Self-Evaluation of Fluency, Stutter Rater) and Self-Management (Breathing Exercises, Flexible rate of speech, Easy Onset). The Face validity score was calculated separately for both PWS and SLPs.

Results

Al-Lisan, a Digital application for self- assessment and management was developed for adult stutters in Urdu and English Language. The initial Preview of the Application is as follows

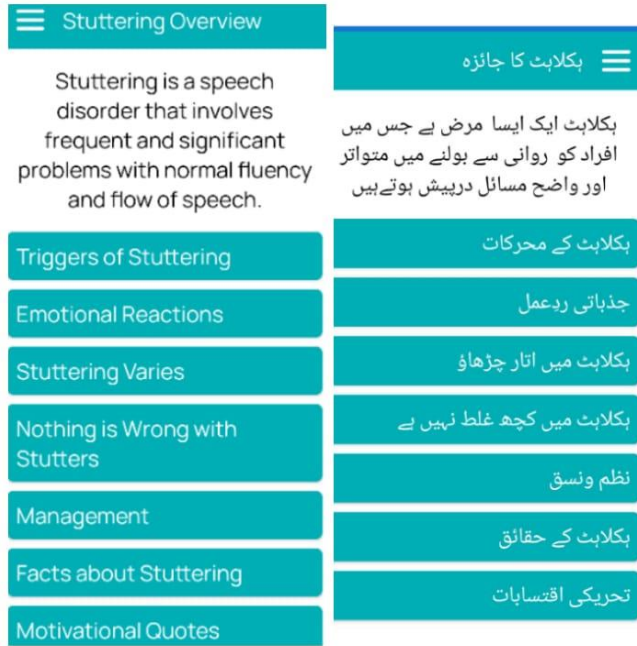


Figure 1: Initial Preview of the Application.

A brief introduction of stuttering is presented at the front page to educate the stutters about stuttering, what triggers stuttering's, facts about prognosis of stuttering and its management. A list of content included the self-assessment, management, settings and exit.

Stuttering Overview	بکلاہٹ کا جائزہ
Self Management -	سیلف مینجمنٹ -
> Breathing Exercises	< سانس لینے کی مشقیں
> Flexible rate of speech	< روانی سے بولنے کی شرح
> Easy Onset	< آسان بات چیت کا آغاز
Self Assessment -	خود تشخیص -
> Self Rating of Stuttering	< بکلانے کی خود درجہ بندی
> Self Evaluation of Fluency	< بولنے میں روانی کا جائزہ
> Stutter Rater	< بکلانے کی فیصد میں درجہ بندی
Settings	ترتیبات

Figure 2: List of Content Included the Self-Assessment, Management Settings and Exit.

The Self-assessment has three sub sections. The first is self-rating of stuttering, which provides the insight about the level of stuttering to the stutter. The second informal assessment is a Questionnaire, self-evaluation of fluency, which stutters has to rate according to the severity of level by scoring from 1 to 4. It consists of questions about their experience of fluency, primary and secondary symptoms, use of therapeutic technique and its efficacy. The third assessment method is Stutter Rater. It is an informal stuttering calculator which the stutter employs by themselves. The touch/tap method is employed by the stutter after each word and upon stuttering too. At the end, stuttering per minute and stuttering per word will be automatically calculated.

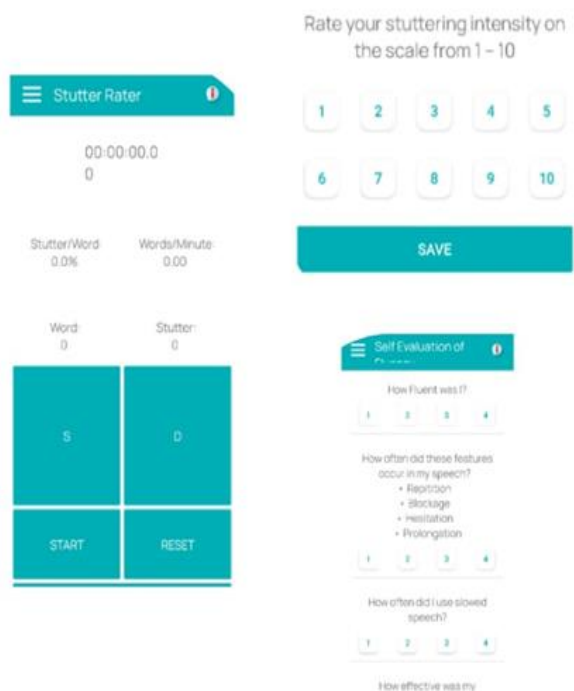


Figure 3: Stutter Rater Preview.

After development of the application, the face validity of the application was calculated which revealed excellent face validity of 0.9 for SLPs and 0.78 for the PWS.

As discussed earlier, there are many approaches for therapeutic interventions but most widely used by Speech Language Pathologists are Flexible rate of speech and Easy onset. As a management approach, both are inculcated in the application. According to the level of severity, it has been further divided into word, phrases, sentences and stories. 100 words, 100 phrases, 50 sentences and 10 stories have been incorporated in the Application along with Audio option both in Urdu and English language. Each level will be locked until the stutter complete previous speech exercises tasks. Therapy is effective only when speech practice is done when a stutter feels relaxed. That is why, it is necessary to do deep breathing exercise before initiating the speech exercise. Breathing exercise module is also present in this application. User can set the minutes and do the breathing exercises.

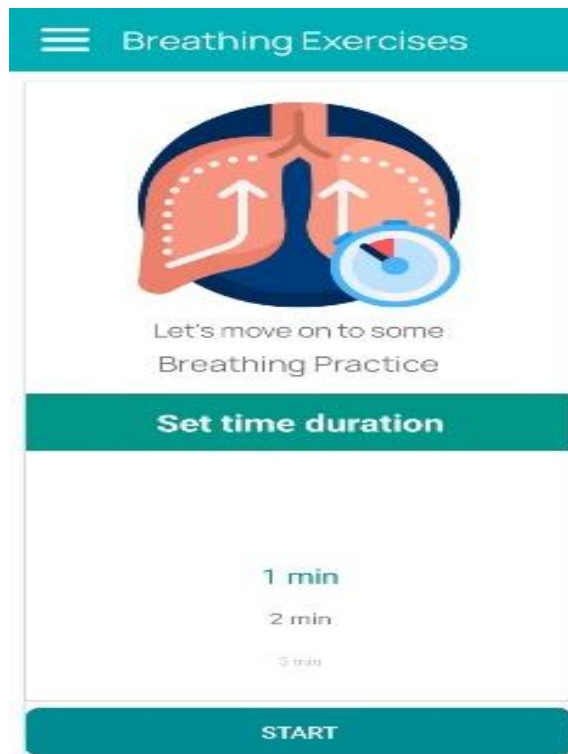


Figure 4: Preface for Breathing Exercises.

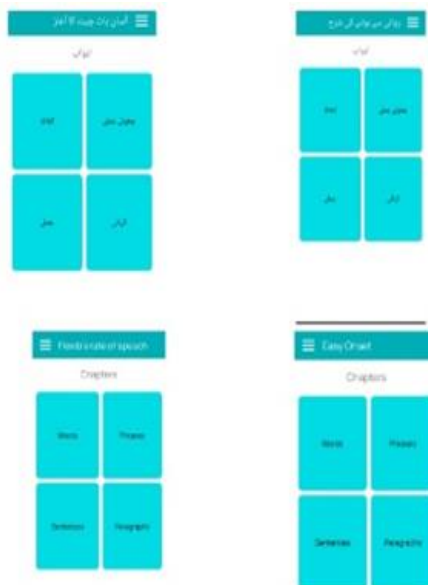


Figure 5: Preface for Speech Exercises.

In the settings, all logs of self-management and self-assessment will be recorded. Option of language switching will be available and option of Application lock is also present.

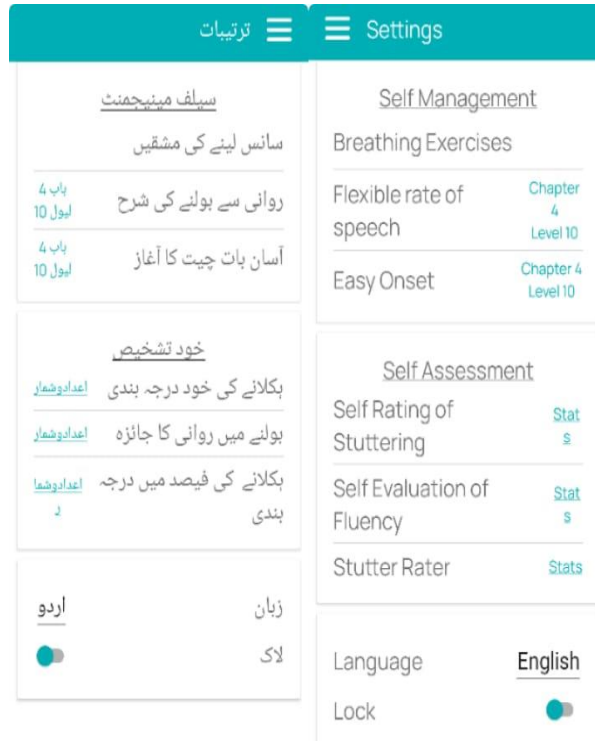


Figure 6: Preface of Settings.

Discussion

One to one session, group therapy, tele practice and use of digital applications are the main choices of treatment in the modern world for the persons who stutter (PWS). As the world is evolving with technology, tele practice and digital applications are becoming the utmost choice of stutters, especially the adults¹³. In the modern world, a number of applications have been used by those stutters who are technology oriented. These programs of rehabilitation include video therapy, video group therapy, digital auditory feedback programs, soft wares used for virtual reality and applications for both users of Android and Apple¹⁴. With 68% of Pakistani smartphone users on android and 60% using more than once mobile¹⁵, using applications like Al Lisan is a feasible option. Research for development of applications for other speech problems including articulation issues in children has also been conducted in Pakistan¹⁶.

The application developed in current study “Al Lisan” for adult stutters is for self- training of PWS by following the techniques designed according to their severity level of stuttering. Two most commonly used therapeutic techniques by Speech Language Pathologists (SLPs) including Easy onset and Flexible rate of speech¹⁷, have been incorporated in current application.

A unique characteristic of this Application is that it is available for Urdu and English both language users. “Al-Lisan” is customized in a way that there are three ways for self-assessment along with two speech exercise techniques followed by scale for severity level of the stutters. As there are many causes of stuttering, hence many methodologies and strategies exist to treat it, but there are always some adult stutters who relapse, don't want to get therapeutic

interventions and find themselves unable to have professional help as well ¹⁸. This digital application will help such individuals and train them to speak fluently in English as well as Urdu language and make them better communicators. Since in bilinguals' pattern of stuttering, the stuttering pattern in two languages may be different ¹⁹, Al-Lisan can be used for managing both languages.

This is an android application which is more useful for Pakistani environment since research has shown that in Pakistan there are more android mobile users compared to iOS mobile users with only 6 % of population using iOS mobiles while 94 % with android phones ²⁰. Hence this application will help target a larger segment of population.

Stuttering, typically starts at an early age and in many cases may last for a life time. Relapses are evident from available literature ²¹. This application can be extremely beneficial for all such PWS by bringing positive changes if used on regular basis. Al-Lisan, the digital application will serve as a pocket guide for individuals who stutter and are looking for ways to improve speech fluency. This application will help adult stutters to read and identify the solution to overcome the stuttering in their mother language Urdu or in English, as they prefer. It will help stutters to train themselves by following various methodologies customized for their severity level and assist in becoming smooth conversationists. This Application is also powered to save the record of assessments as well as the speech practice to determine the rate of prognosis and progress in fluent communication. With some similarity, StammerApp, is a mobile Application through which adult stutter can get benefit in terms of group therapy along with individualized guidance program ¹⁰. while, PRAAT, another software, has been designed to tackle with the secondary symptoms, which are diagnosed through speech synthesis programs ²². Similarly, a number of Virtual reality environments (VREs) are available which enable the stutters to experience situations similar to those encountered in the real world. It helps them to overcome anxiety of social speaking faced in real life ²³. A Saudi study involving Tele practice (TP) application for assessment of stuttering revealed that it was a feasible method to address challenges and gives a high satisfaction to caregivers and PWS ²⁴. Similarly, a mobile software project I Aware my Stuttering, for stutters targets similar areas of assessment ²⁵. A Chinese study revealed that a tool CoPracTter, an online tool for supporting PWS targets scenarios for providing personal practice to PWS and also provides feedback considering as helpful, which is in line with current application ²⁶.

The current application "Al-Lisan" revealed an excellent face validity of 0.78 of PWS and 0.9 for SLPs. Similarly, a study revealed good reliability and validity for assessing overt stuttering through tele practice for 6 to 15 years population ²⁴.

Limitations & Recommendations

The reliability and validity of this application should be established through larger field trials of Al-Lisan with a wider sample of PWS. Use of informal attitudinal rating scales can be added in the Application in future along with more speech exercises and technique to enhance the functionality of the application for PWS and SLPs.

Conclusions

Al-Lisan is a digital application with excellent face validity, which provides the opportunity to stutters for self-assessment and self-management. It also provides PWS, the options of scoring

and recording all the assessments and speech exercises. This application is designed to allow users a technology mediated support for therapeutic purposes with the consultancy of the SLPs.

Acknowledgement: I am grateful to my Software Engineer Mr. Manzar Gulzar, who helped me and worked hard with me for this project.

Conflict of Interest: None.

Grant Support & Financial Disclosures: None.

Disclaimer: The article is a part of PhD research.

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