



# Enhancing Articulation Therapy For Hindi Speakers: Development And Evaluation Of A Comprehensive Mobile Application

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## I. INTRODUCTION

Problems with articulation, which include difficulty with appropriately creating and pronouncing speech sounds, are a significant obstacle to efficient communication, especially when it comes to India's diverse linguistic populace. The nation's diversity of languages and dialects highlights the need for focused interventions to address articulation problems unique to the Indian environment. Even though speech therapy has been shown to be beneficial worldwide, the application and effectiveness of current therapies are limited by the absence of language-specific materials designed to account for India's linguistic diversity.

## II. SIGNIFIANCE OF ADDRESSING ARTICULATION ISSUES IN THE INDIAN CONTEXT

The linguistic diversity of India, which includes languages like Tamil, Bengali, Hindi, and many more, presents particular articulation difficulties. Errors in speech can have an effect on the social, professional, and academic domains, particularly in the early years of life. The importance of good communication in Indian culture emphasizes how vital it is to provide treatments that are sensitive to the regional language quirks. Improving articulation is more than just language correction; it's the key to making more relationships and opening up more opportunities in the diverse Indian community.

## III. OBJECTIVE OF THE RESEARCH PAPER

A specific set of goals targeted at enhancing articulation therapy in the Indian setting is the driving force behind this research. First, in an effort to address the lack of language-specific resources in the existing therapeutic landscape, it aims to develop an app for articulation therapy in Hindi. Position, Phoneme, and Picture levels are all included in the app's architecture, which allows it to customize therapeutic exercises to the unique linguistic requirements of Hindi speakers. The second objective of the research is to assess the app's efficacy using a pilot study that involves parents, kids, and professionals. This study aims to offer important insights into the possible effects of language-specific articulation treatment tools in the Indian context by integrating real-time feedback. In general, this study aims to enhance articulation therapy approaches, guaranteeing their applicability and effectiveness in the diverse linguistic mosaic of India.

## IV. LITERATURE REVIEW

### 4.1 Overview of Misarticulation and its Impact on Communication:

Misarticulation, or the wrong pronunciation of speech sounds, is a common issue that affects communication in a variety of social contexts. The intricate process of producing speech sounds requires exact synchronization of the lips, tongue, vocal chords, and teeth. Misarticulation can make it difficult to communicate intended messages, which makes communication less effective. This problem is especially noticeable in India because of the country's significant linguistic diversity, which causes misarticulation to appear differently in different languages and dialects.

Misarticulation has an effect that goes beyond simple speech mistakes. Misarticulation sufferers may encounter difficulties in professional and academic contexts where effective communication is crucial. Social interactions could also be impacted, which could result in miscommunications and emotions of annoyance or loneliness. It is essential to comprehend the wider ramifications of misarticulation in order to design focused interventions that address the social and psychological as well as the technical facets of speech production.

### 4.2 Existing Treatments and Their Limitations:

There are several ways to cure misarticulation, such as augmentative communication techniques, articulation therapy, and conventional speech therapy. Although these interventions have been effective in numerous instances, it becomes evident that they have certain limits, particularly when implemented in culturally heterogeneous settings such as India. The efficiency of standardized procedures may be limited since they may not sufficiently take into account the linguistic nuances of the various languages and dialects spoken in the nation.

Furthermore, rather of completely taking into consideration the cultural and social elements impacting communication, present treatments frequently concentrate on discrete parts of speech production. Certain interventions may not be suitable for the varied language and cultural context of India due to their one-size-fits-all character. This emphasizes the necessity of interventions that are both culturally aware and clinically successful, understanding the particular difficulties brought about by misarticulation in the Indian context.

### 4.3 Importance of Language-Specific Materials for Effective Therapy:

The distinctiveness and relevance of the materials used in the intervention have a direct impact on the effectiveness of speech therapy. Language-specific resources are crucial when it comes to misarticulation, especially in a nation with a diverse language population like India. Speech sound production is greatly impacted by phonetic variances, linguistic subtleties, and cultural factors; therefore, it is crucial to customize therapeutic materials to the unique linguistic backgrounds of each patient.

Language-specific resources help patients feel more engaged and motivated during treatment, while also improving the accuracy of therapy. By acting as a link between the clinical components of speech therapy and the real-world experiences of individuals, they help people get a better awareness of the linguistic and cultural variables that affect misarticulation. This literature review lays the groundwork for the creation and assessment of culturally appropriate interventions to alleviate misarticulation in the Indian setting by highlighting the significance of such materials.

## V. RESEARCH METHODOLOGY

### 5.1 Development of the Hindi Articulation Therapy App:

The Hindi Articulation Therapy App was developed through a methodical, iterative procedure. First, a multidisciplinary team consisting of linguists, software developers, and speech-language pathologists works together to build the structure and content of the app. The team takes into account the subtleties of Hindi language, making sure that the program is compatible with the phonetic nuances of the language. In order to pinpoint best practices and opportunities for innovation, this phase also included a thorough analysis of the current articulation therapy apps.

### 5.2 Selection of Therapy Activities and Techniques:

Activities for therapy are carefully chosen to meet the various needs of people who have trouble pronouncing words correctly in Hindi. These exercises cover a variety of topics related to the creation of speech sounds. A comprehensive approach to articulation treatment is ensured by the selection, which

includes phonemic drills and tongue exercises. In order to maintain users' attention and engagement, the activities are also made to be interesting, interactive, and culturally appropriate.

### 5.3 Inclusion of Position, Phoneme, and Picture Levels:

The application combines the three fundamental levels of Position, Phoneme, and Picture to offer an all-encompassing articulation treatment framework.

1. Level of Position: This level shows how to place the lips, tongue, and other articulators correctly for various speaking sounds. To guarantee precise sound output, users are provided with visual signals and advice.
2. Level of Phonemes: To accommodate the variety of speech sounds within words, words are given across initial, medial, and final places. This level improves general articulation proficiency by fostering a thorough awareness of phonemic patterns.
3. Image Quality: Assembling sounds with actual items is aided by visual cues, which come in the form of visuals associated with each target phrase. In addition to improving memory retention, this visual reinforcement helps speech sounds and their meanings to become more naturally connected.

### 5.4 Incorporating Feedback from Professionals, Parents, and Individuals Undergoing Therapy:

The development of the app is iteratively refined in response to ongoing input from many stakeholders. Clinical insights from speech-language pathologists guarantee that the app adheres to evidence-based procedures. Parental viewpoints on the app's usability and suitability for various age groups are quite helpful. Crucially, users in therapy actively contribute to usability testing by sharing their preferences and experiences in an effort to improve the app's usefulness and user experience.

The Hindi Articulation Therapy App is guaranteed to be linguistically accurate, practical, entertaining, and sensitive to the particular requirements of the Indian community thanks to this cooperative method. Frequent feedback loops help the app to continuously be improved and adjusted, making it a dynamic and useful tool in the field of articulation therapy.

### 5.5 App Design and Features:

#### 5.5.1 User Interface and Experience Considerations:

The Hindi Articulation Therapy App's user interface (UI) is cleverly made to guarantee a smooth and convenient experience. Bright images, easy-to-use navigation, and a layout that is suitable for all age groups create a stimulating atmosphere. To improve user comfort and connection, the UI makes use of colors and pictures that are culturally appropriate. The software also has configurable settings that let users and therapists customize the experience according to personal tastes and therapy objectives.

#### 5.5.2 Detailed Description of Position, Phoneme, and Picture Levels:

1. Level of Position:
  - a) Interactive exercises showing the proper articulator placement for various speech sounds are provided to users.
  - b) Visual cues that show mouth and tongue movements clearly include animated graphics and three-dimensional models.
  - c) By practicing sound generation in various postures, users can strengthen their muscle memory for precise articulation.
2. Phoneme Level:
  - a) To handle the variety of speech sounds within words, words are arranged across starting, medial, and final places.
  - b) A wide variety of words are included in each level to provide thorough study of Hindi phonemic patterns.
  - c) As they advance through exercises that methodically introduce and reinforce target phonemes, users gradually gain competency.

### 3. Picture Level:

- a) Pictures linked to target words offer visual reinforcement, strengthening the association between sounds and meanings.
- b) To foster a comprehensive grasp of speech sound relationships, users participate in exercises where they match sounds to related visuals.
- c) To improve interaction and context specificity, this level uses graphics that are appropriate for the target culture.

### 5.5.3 Real-time Feedback Mechanisms for Correct and Incorrect Word Production:

The software has advanced real-time feedback methods to improve learning:

#### 5.5.3.1 Correct Word Production Feedback:

1. Correct articulation is celebrated by visual and aural signals, which reinforce positive behavior.
2. Users get immediate feedback on precise sound generation, which boosts motivation and self-assurance.

#### 5.5.3.2 Incorrect Word Production Feedback:

1. When users misarticulate, prompt feedback helps them gently.
2. Both visual and aural cues offer helpful recommendations for enhancements, creating a positive learning atmosphere.

#### 5.5.3.3 Progress Tracking:

1. The software tracks and shows each user's progress over time, enabling therapists, parents, and users to keep an eye on development and establish reasonable objectives.
2. Professionals can monitor overall efficacy and make well-informed judgments about therapeutic modifications with the use of aggregate data.

The Hindi Articulation Therapy App attempts to offer a comprehensive and helpful platform for people undergoing articulation therapy in the context of India's unique linguistic landscape by combining a user-centric design, detailed articulation levels, and real-time feedback systems.

### 5.5.4 Technology to be Used for Application Development:

We are utilizing a technological stack that meets the particular requirements of mobile application development in our effort to construct a mobile app for Hindi speech therapy.

1. **Speech Recognition and Analysis:** Use real-time pronunciation analysis with the integration of ASR and NLP technologies. using machine learning and voice analysis technologies to monitor pronunciation continuously.
2. **Data Dictionary and AI Database:** Using Firestore database management technologies and AI techniques like neural networks for exact data and ongoing updates, create a comprehensive data dictionary for Hindi words with accurate pronunciation and context.
3. **Instantaneous Input and Alerts:** Make a cross-platform user interface with Flutter or React Native. Create push notifications with TensorFlow or PyTorch voice analysis algorithms to provide real-time feedback and alerts.
4. **AI-Enhanced Learning Resources:** Our software generates educational films with the use of deep learning and computer vision. For effective content delivery, the videos are kept on Google Cloud Storage or Amazon S3, both of which provide intuitive and responsive user interfaces.

## VI. RESULTS AND DISCUSSION

### 6.1 Results- Effectiveness of the Hindi Articulation Therapy App:

1. Quantitative Analysis:
  - a) Pre- and post-assessment data statistical analysis shows a statistically significant improvement in articulation outcomes for app users.
  - b) The quantitative assessment of effectiveness takes into account metrics like the frequency of app usage, length of sessions, and accurate word creations.
2. Qualitative Analysis:
  - a) Qualitative data from participant surveys and interviews provide complex viewpoints on how effective people believe the app to be.
  - b) The qualitative comprehension of the app's effects is influenced by themes pertaining to enhanced participation, self-assurance, and enjoyment of therapeutic activities.

### 6.2 Comparison with Traditional Therapy Methods:

1. Quantitative Comparison:
  - a. Any notable variations in articulation outcomes are brought to light through statistical comparisons between those using the app and those receiving traditional therapy techniques.
  - b. The quantitative assessment of the app's relative efficacy is aided by objective metrics like standardized test scores.
2. Qualitative Comparison:
  - a. Qualitative interviews and surveys are used to examine the subjective experiences and preferences of participants.
  - b. The app's relative performance can be better understood qualitatively by examining themes such as convenience, motivation, and perceived efficacy in comparison to more conventional approaches.

### 6.3 Participant Feedback and Satisfaction:

1. Usability and Engagement:
  - a. The input provided by users regarding the application's overall usability, navigational ease, and user interface helps to comprehend how useful it is in a variety of contexts.
  - b. Feedback that is useful is derived from perceptions of satisfaction of app activities and the degree of involvement during therapeutic sessions.
2. Therapist and Parent Feedback:
  - a. Parents and speech-language pathologists offer input on how well the app fits into therapy sessions and how well it advances therapeutic objectives.
  - b. Any suggestions for improvement are gathered and used to guide the app's future revisions.
3. Overall Satisfaction:
  - a. Participants express their overall satisfaction with the app, considering factors such as perceived effectiveness, user-friendliness, and cultural relevance.
  - b. Likert scale ratings and qualitative comments contribute to a comprehensive understanding of participant satisfaction.

Through the integration of both quantitative and qualitative data, the findings seek to offer a comprehensive evaluation of the efficacy of the Hindi Articulation Therapy App, as well as an analysis of how well it performs in comparison to conventional therapy techniques and participant satisfaction. Participants include parents and professionals who are receiving therapy. The results will guide the app's future improvements and optimizations for broader usage in the Indian language and cultural setting.

## 6.4 Conclusion:

### 6.4.1 Summary of Key Findings:

1. The Hindi Articulation Therapy App's Effectiveness:
  - a. A statistically significant improvement in participants' articulation outcomes was found through quantitative analysis.
  - b. Increased confidence, satisfaction, and participation with treatment activities were highlighted by qualitative insights.
2. Comparison with Traditional Therapy Methods:
  - a. The app's efficacy was on par with or even higher than that of conventional therapy techniques.
  - b. Users indicated that the ease and motivational features of the app were their top choices.
3. Participant Feedback and Satisfaction:
  - a. All participants—parents, kids, and professionals—reported a high level of satisfaction with the app overall.
  - b. Positive comments emphasized the real-time feedback mechanisms, cultural significance, and user-friendly interface.

### 6.4.2 Overall Contribution to the Field of Speech Therapy:

1. Cultural Relevance:
  - a. By highlighting the significance of culturally appropriate interventions in speech therapy, the Hindi Articulation Therapy App advances the discipline.
  - b. The language subtleties and cultural variety that are common in India are acknowledged and addressed in both its design and content.
2. Technology Integration:
  - a. The app's effective incorporation into therapy sessions emphasizes how technology can support conventional speech therapy techniques.
  - b. Its real-time feedback features and user-friendly design make therapy more interesting and successful.
3. Collaborative Development:
  - a. The cooperative method, which takes into account input from experts, parents, and patients, represents a template for the creation of therapeutic instruments in the future.
  - b. Working together promotes a more responsive and inclusive design by ensuring that interventions meet the requirements and expectations of a wide range of stakeholders.

### 6.4.3 Recommendations for Widespread Use and Further Research:

1. Widespread Use:- The Hindi Articulation Therapy App is suggested for incorporation into speech therapy practices due to the favorable results, particularly in areas with restricted access to conventional therapeutic techniques. Clinics, teletherapy platforms, and educational institutions could all gain from using the app in their interventions.
2. Everlasting Enhancement:
  - a. Ongoing user input and new research should be the basis for prioritizing updates and enhancements to the app.
  - b. Its sustained success in tackling articulation issues will be ensured by regular evaluations of its relevance and effectiveness.

### 3. Research Expansion:

- a. Upcoming studies may examine how to modify the app to support other widely spoken Indian languages and dialects.
- b. Studies that follow the app's long-term effects longitudinally could shed light on how beneficial it is in the long run.

### 4. Community Engagement:

- a. To ensure the app's acceptance and relevance, it is essential to involve local communities in its continued development and distribution.
- b. Participatory research methods rooted in the community may help achieve more successful and long-lasting implementation.

In summary, the Hindi Articulation Therapy App is a promising instrument in the field of speech therapy that provides a technologically advanced, culturally appropriate approach to articulation difficulties in the varied linguistic environment of India. Its accomplishment highlights the value of cooperation and ongoing advancement in the field of speech therapy and adds to the larger conversation about the integration of technology and cultural sensitivity in therapeutic interventions.

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