Treatment Approaches to Speech Sound Disorders: A Scoping Review

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Abstract

Objective: The objective was to highlight and review different therapeutic approaches to cater to speech sound disorders in Pakistan.

Methodology: To find the different therapeutic approaches, a literature search for related articles/ publications was conducted using the Keywords "speech sound disorders, phonological disorders, articulation disorder and a combination of words using search engines like Google & and databases like PubMed and other websites. Around 130 publications, reports, and articles were downloaded, of which 25 were used for literature review.

Results: There are many treatments used to cater for speech sound disorders including contextual utilisation, phonological contrast, complexity, core vocabulary, cycles phonological pattern, distinctive feature therapy, metaphor therapy, naturalist speech intelligibility, non-speech oral-motor therapy, speech sound perception training and bilingual or cross-lingual approach. However, novel trends like the use of hybrid treatment, speech motor learning- phonetic placement approach, blocked practice versus serial practice schedule & interventions using biofeedback need to be utilized.

Conclusion: Treatment approaches in use include contextual utilisation, phonological contrast, complexity, core vocabulary, cycles phonological pattern, distinctive feature therapy, metaphor therapy, naturalist speech intelligibility, non-speech oral-motor therapy, speech sound perception training and bilingual or cross-lingual approach, however, novel treatments need to be utilised.

Keywords: Articulation disorders, Phonological disorders, Phonological Representations

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1. Introduction

Speech is an essential requirement for communication and is composed of individual speech sounds that we articulate to use particular phonemes to make up words of speech. It is hypothesized that phonological representation (PR) or base in the mind saves the acoustic structure of sounds and coordinates with different levels of speech sound system to produce different sounds by interacting with articulators and vocal tract promptly through an interface module which mediates and maps sound's PR onto instructions for the articulators for sound production. Any error at the interface level will result in a lack of PR and will be represented as speech sound disorder (SSD),[1] thus limiting communication skills and ability to participate in social and academic environments effectively. Speech sounds and their numbers differ for different languages with English consisting of 44 sounds including 20 vowels and 24 consonants. On the other hand, the Urdu language does not consist of an independent system of sounds but is a combination of

Perso-Arabic and Indo-Aryan languages. As regards Urdu phonetic inventory, Farooq concluded that Urdu has 43 consonants and 13 vowels,[2] however, Urdu phoneticians do not agree upon several consonants and vowels.[3] These languages are not only different in speech sounds but the presence of certain additional pharyngeal and uvular sounds and aspirated speech sounds in Urdu that the English language doesn't have in its language arrangement render its implications. Speech sound disorders are characterized by difficulty in the production of speech sounds and are classified as phonetic or articulation disorders and phonemic or phonological disorders.[4] Phonetic disorders refer to an individual's incapacity to correctly produce phonemes, or speech sounds and a combination of these to produce words, phrases and sentences. It includes disorders of Addition, Omission, Distortion and Substitution. This inability is ordinarily due to incorrect placement, timing, direction, pressure, speed, or integration of articulatory structures.[5] Phonemic disorders are categorized into three subtypes depending on aetiology including structural anomalies in the areas essential for speech sound

production like tongue and alveolar ridge resulting in faulty or imperfect utterances; neurological abnormalities with restricted fine motor movements of oral musculature and unknown or developmental causes. Phonological processes are also considered in phonological disorders. These processes are patterns of sound errors that are usually adopted by developing children to make sounds easier as they learn to talk. These encompass essentially Backing, Fronting, Gliding, Final consonant deletion, Metathesis, Deaffrication, Velarization and Palatalization.[6]

Several tools are available for screening and assessment of Speech sound disorders in English including Quick Screener Stimulus Pictures, Vowel Screener, Speech Characteristics Rating Form, Stimulability Assessment and Diagnostic Evaluation of Articulation and Phonology[7] and in Urdu language including Urdu Articulation Screener and Test for Articulation and Phonological in Urdu (TAAPU).[8] While debating the treatment, several approaches are available however treatment opted for depends upon certain critical elements like the age of the child, severity and type of error and the pattern as well.[9] These include both articulation approaches which focus on speech sound acquisition and production and phonological approaches which focus on linguistic aspects of speech. Some lack evidence base but are still utilized while others need to be utilized in evidence-based practice along with novel treatment approaches.[10]

Hence this study was conducted to highlight and review different therapeutic approaches to cater to speech sound disorders. This study is of significant importance since it can help clinicians in making decisions for the possible use of therapeutic approaches in line with evidence-based practice and conduct research using old as well as novel therapeutic strategies for speech sound disorders which are commonly present in the Pakistani population due to a surge in particular of this age group.

2. Materials & Methods

To highlight and review different therapeutic approaches to cater to speech sound disorders, articles/publications related to the treatment of speech sound disorders were conducted by using the Keywords "speech sound disorders, phonological disorders, articulation disorder and combination of words using search engines like Google & and databases like Medline & PubMed and other websites. About 130 publications and articles were skimmed after downloading to identify 75 relevant ones, of which 25 were abstracted and used for the literature review including references 11 to 22 for the methodology section.

Inclusion Criteria: Publications & articles included in the study were English, full text, on the subject of the study and published in the last 5 years.

Exclusion Criteria: Non-English, repetitive and very old studies were excluded.

Being a scoping review, no statistical analysis was done.

3. Results

There are many general and specific treatment approaches (table 1) that are used by Speech Pathologists to treat children with SSD.[11] These include:

1. Contextual Utilization Approach: In the Contextual Utilization approach speech production occurs in some context and the form of connected speech so the Speech Pathologist provides a particular syllable context to the child, to facilitate the production. It is particularly helpful for children who have inconsistent speech production errors. Instruction for a specific sound is initiated in the syllable context where the sound can be produced correctly. The syllable is used as the building block for practice at more complex levels.[12]

2. Phonological Contrast Approaches: These are used for the Phonological error pattern by Speech Pathologists. Phonemic contrasting is done to make the child aware of the differences between different phonemes. Four major strategies of this approach include i) Minimal oppositions/ Minimal pairs which use a different pair of words that differ with one phoneme but change the meaning of the word e.g. Car vs Bar; ii) Maximal oppositions approach uses those contrastive words that are maximally distant and varies on the dimensions of voicing, placement and manner e.g. "Mouse" and "cat"; iii) Treatment of Empty set uses two pair of words with maximal opposition e.g. "say" vs " day"; and iv) Multiple Opposition uses a contrastive pair of the word that must contain a child's error sound and three to four contrastive words e.g. "bye", "shy", " hi", "Sky". [13]

3. Complexity Approach: In this approach, complex linguistic stimuli are used for the generalization of

the target speech sound using the maximal oppositional approach and this approach is according to the hierarchy of complexity and stimulability.[14]

4. Core Vocabulary Approach: The Core vocabulary approach uses whole word production as a therapeutic intervention for those children who have inconsistent speech errors. The selection of the words is done based on the child's functional communication needs. A list is generated accordingly and then words are been selected for weekly goals.[15]

5. Cycles Phonological Pattern Approach (CPPA): CCPA is a combination of traditional and linguistic approaches and is effective for those children who have highly unintelligible speech. Treatment consists of 5 to 16 weeks and is scheduled in cycles. In each cycle, phonological patterns are selected and after its completion, another cycle begins. These cycles continue until the child can use these targeted sounds in his reciprocal communication.[16]

6. Distinctive Feature Therapy: As the name suggests, this therapy focuses on the different features of phonemes that are not present in a child's speech or substituted with some other speech sound. A minimal pair strategy is used and Patterns of features can be identified and targeted; producing one target sound often generalizes to other sounds that share the target.[17]

7. Metaphon Therapy: Metaphon therapy is structured to provide meta-phonological awareness of a particular language, to the child. This therapy believes that it is important to teach the child about the phonological system of a language first then they will use its rules in their language accordingly.[18]

8. Naturalist Speech Intelligibility Intervention: This intervention recommends the use of target sounds in natural environment activities where a child might have more frequent opportunities for the sound to be used. This is effective for those children who can recast effectively as according to this therapy; errors are recast, not corrected by direct prompts.[19]

9. Non-Speech Oral–Motor Therapy: It uses oral motor training before it starts teaching the child how to produce a particular sound. This therapy belief is that if a child's oral motor control is not mature enough, it will cause poor articulation or miss some speech sounds. So, before teaching the sound, it is important to make sure that his oral motor skills are up to the mark to produce the particular sound. Then, teaching the sound will be more effective.[20]

10. Speech Sound Perception Training: This training helps give the child perception of the targeted phonemes and phones, the purpose is to make sure that the child is perceiving sufficient acoustic cues and listening to them correctly. It is done through auditory bombardment and the identification of correct speech sounds. Tasks usually progress from the child's judgment of speech sounds that are produced by someone else. Speech sound perception training is frequently used before speech production training.[21]

11. Bilingual Or Cross-Lingual Approach Of Treatment: Different strategies can be made for the treatment protocol of the child including making the choice to use a bilingual or cross-lingual approach of treatment according to the needs of child, choosing the right language in which therapy has to be provided, Strategies used when designing a treatment protocol include, identifying different ways of providing correct models for target phonemes that are exclusive to the child's language, when the Speech pathologist is unable to do so and noting if achievement generalizes across languages through the treatment procedure.[22]

Table 1: Treatment Approaches for Speech Sound Disorders

Approach	Target therapy
Contextual utilisation [12].	speech production occurs in some syllable context
Phonological contrast [13].	Phonemic contrasting is done to bring awareness of the differences between different phonemes
Complexity [14].	complex linguistic stimuli are used to generalise target speech sound
Core vocabulary [15].	Uses the whole-word production method
Cycles phonological Pattern [16].	Different phonological patterns are selected in each cycle
Distinctive feature therapy [17].	Focus on different features of phonemes
Metaphor therapy [18].	Provide meta-phonological awareness
Naturalist speech intelligibility intervention [19].	Presentation of target sound in natural environmental activity
Non-speech oral–motor therapy [20].	Oral motor training before teaching the production of a particular sound
Speech sound perception training [21].	Auditory bombardment for identification of correct speech sounds

Bilingual or cross-lingual approach [22].	Identifying different ways of providing correct models for target phonemes that are exclusive to the child's language

4. Discussion

Wren Y, et al. in their systematic review, classified treatment strategies for speech sound disorders (SSD) into Environmental, Auditory Perceptual, Cognitive linguistic, Production and Combined.[13] Many children come to Speech-Language Pathologists (SLPs) with presenting complaints of speech sound errors but are bilingual or multilingual. While treating such populations, an SLP works on two or more systems of language, hence making the therapy and intervention more complex. Certain speech sounds are common in all languages however numerous sounds are unique to a particular language and have different phonemic rules. One system of a language may affect the system of another language. It's the role of the SLP to find out whether these differences are speech sound disorders or communication disorders as a result of the overlapping of two languages.

Speech difficulties at times continue throughout the school years and into adulthood. These are called Persistent speech difficulties, the approaches to treatment and intervention will vary according to the individual's difficulty level and area of concern. For developing the intervention and treatment protocol, the SLP must take into consideration the teaching strategies and use of self-monitoring techniques to facilitate the consistent use of learned skills. Speech pathologists must also collaborate with teachers and other school personnel to prop up the child and to make the smooth progress of his way into the academic curriculum. Speech pathologists must also be managing psychosocial factors, including self-esteem issues and bullying etc to protect the child's self-esteem and level of motivation.

As a child with persistent speech difficulties may have communication, writing, reading and social communication difficulties, it is important to plan the transitions of life the SLP discussion with the child when he is in middle or high school and also recommends post-secondary education and vocational educational plan that he can get benefit from. The speech pathologist also provides him with information about the Disability Support Services which is an individualized support program for postsecondary students that includes extensive time for tests, accommodations for oral speaking assignments, the use of assistive technology to help him with reading and writing tasks and the use of methods and devices to augment oral communication, if necessary.[23] The Speech pathologist determines the type of treatment that is required and also considers the other service deliveries that are variable and may have an impact on treatment outcomes. It includes Dosage, which is the frequency, intensity, and duration of service, Format that whether a person is seen for treatment individually or in a group, Provider, the person administering the treatment, setting, the Location of treatment and Timing when intervention occurs relative to the diagnosis.

Technology can be integrated into the delivery of services for speech sound disorders, including the use of telepractice as a format for delivering face-to-face services distantly. Keeping in view the current pandemic of COVID-19, tele-practice has emerged as the need of the hour for clinical practices. The combination of service delivery factors is important to consider so that children receive the best possible intervention to ensure efficient and effective change.[24]

Novel & Current Trend

Geertsema and Roux have highlighted the promising role of a novel hybrid treatment strategy, Speech motor learning -phonetic placement approach (SML-PPA) platform) for motor-based articulation disorders utilizing specific MLP, blocked practice (BP) versus serial practice (SP) schedule.[24]

Interventions utilizing visual biofeedback can be more beneficial compared to traditional approaches, especially for children with residual speech errors, however large controlled trials which are randomized need to be conducted.[25]

Strengths and Limitations: Though multiple keywords were utilized to include all relevant studies since the study was limited to include studies published in the last five years, hence omissions of older studies and those published in languages other than English are possible.

5. Conclusion

Several treatment approaches are being used to cater to speech sound disorders including approaches like contextual utilisation, phonological contrast, complexity, core vocabulary, cycles phonological pattern, distinctive feature therapy, metaphor therapy,

naturalist speech intelligibility, non-speech oral-motor therapy, speech sound perception training and bilingual or cross-lingual approach. However tele-practice as an alternate delivery method compared to face-to-face is also gaining popularity, however, novel trends like the use of hybrid treatment, speech motor learning- phonetic placement approach, blocked practice versus serial practice schedule & interventions using biofeedback need to be utilized.

CONFLICTS OF INTEREST- None

Contributions:
H.N - Conception of study
N.M - Experimentation/Study Conduction
H.N - Analysis/Interpretation/Discussion
H.N, N.M - Manuscript Writing
G.S - Critical Review
G.S - Facilitation and Material analysis

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References

1. Pathi S, Mondal P. The mental representation of sounds in speech sound disorders. Humanit Soc Sci Commun. 2021;8(27). DOI.10.1057/s41599-021-00706-z
2. Bilal HA, Azher M, Ishfaq M, Mumtaz A. Acoustic Investigation of Back Vowels of Pakistani English. Review of Education, Administration & Law. 2021;4(1):37-52.
3. Rehman I. Urdu vowel system and perception of English vowels by Punjabi-Urdu speakers. University of Kent (United Kingdom); 2019.
4. Cabbage K, Farquharson K, DeVeney S. Speech Sound Disorder Treatment Approaches Used by School-Based Clinicians: An Application of the Experience Sampling Method. Lang Speech Hear Serv Sch. 2022 Jul 6;53(3):860-873. DOI: 10.1044/2022_LSHSS-21-00167.
5. Yavas M. Applied English Phonology. John Wiley & Sons; 2020 May 5.
6. Namasivayam AK, Coleman D, O'Dwyer A, van Lieshout P. Speech Sound Disorders in Children: An Articulatory Phonology Perspective. Front Psychol. 2020 Jan 28;10:2998. DOI: 10.3389/fpsyg.2019.029987.
7. Muzaffar H, Iftikhar N, Khan MSG, Malik SN. Development of articulation screening tool to assess the articulation errors in Urdu speaking school going children. UMT Education Review. 2019;2(1):23-37.
8. Khan MSG, Noreen H, Khan MA. Effectiveness of linguistic base approach and traditional articulation therapy to improve articulation among children (8-12 years) with mild to severe hearing loss. J Rehman Med Inst. 2021;7(1):08-12.
9. McAllister T, Preston JL, Hitchcock ER, Hill J. Protocol for correcting residual errors with spectral, ultrasound, traditional speech therapy randomized controlled trial (C-RESULTS RCT). BMC pediatrics. 2020;20:1-14. DOI.10.1186/s12887-020-1941-5
10. Sugden E, Lloyd S, Lam J, Cleland J. Systematic review of ultrasound visual biofeedback in intervention for speech sound disorders. Int J Lang Commun Disord. 2019;54(5):705-28. DOI: 10.1111/1460-6984.12478.
11. Bowen C. Children's speech sound disorders. John Wiley & Sons. 2023 Jul 24.
12. McCollum AG, Baković E, Mai A, Meinhardt E. Unbounded circumambient patterns in segmental phonology. Phonology. 2020;37(2):215-55. DOI.10.1017/S095267572000010X
13. Barnard PA. Multi-age organisation, complexity theory and secondary school reform. Int. J. Educ. Manag.2021;35(5):955-68. DOI. 10.1108/IJEM-06-2020-0303
14. Strand EA. Dynamic temporal and tactile cueing: A treatment strategy for childhood apraxia of speech. Am J Speech Lang Pathol . 2020;29(1):30-48. DOI. 10.1044/2019_AJSLP-19-0005
15. Laubscher E, Light J. Core vocabulary lists for young children and considerations for early language development: a narrative review. Augment Altern Commun. 2020 Mar;36(1):43-53. DOI: 10.1080/07434618.2020.1737964.
16. Packard EA. The Effect of the Cycles Phonological Remediation Approach: A Case Study.. 2021 Mar;56(2):271-282. DOI: 10.1111/1460-6984.12595.
17. Furlong LM, Morris ME, Serry TA, Erickson S. Treating Childhood Speech Sound Disorders: Current Approaches to Management by Australian Speech-Language Pathologists. Lang Speech Hear Serv Sch. 2021 Apr 20;52(2):581-596. DOI: 10.1044/2020_LSHSS-20-00092.
18. Scherer NJ, Kaiser AP, Frey JR, Lancaster HS, Lien K, Roberts MY. Effects of a naturalistic intervention on the speech outcomes of young children with cleft palate. Int J Speech Lang Pathol. 2020 Oct;22(5):549-558. DOI: 10.1080/17549507.2019.1702719
19. Alhaidary A. Treatment of speech sound disorders in children: Nonspeech oral exercises. Int J Pediatr Adolesc Med. 2021 Mar;8(1):1-4. DOI: 10.1016/j.ijpam.2019.07.008.
20. Hearnshaw S, Baker E, Munro N. Speech Perception Skills of Children With Speech Sound Disorders: A Systematic Review and Meta-Analysis. J Speech Lang Hear Res. 2019 Oct 25;62(10):3771-3789. DOI: 10.1044/2019_JSLHR-S-18-0519.
21. Kanclerz K, Miłkowski P, Kocoń J. Cross-lingual deep neural transfer learning in sentiment analysis. Procedia Computer Science. 2020;176:128-37.
22. Geertsema S, le Roux M. The effect of blocked versus serial practice in the treatment of developmental motor-based articulation disorder. Commun. Disord. Q. 2020;41(4):199-213. DOI.10.1177/15257401198369
23. Vaezipour A, Campbell J, Theodoros D, Russell T. Mobile apps for speech-language therapy in adults with communication disorders: review of content and quality. JMIR mHealth and uHealth. 2020;8(10):e18858.
24. Findley BR, Gasparyan D. Use of Speech-to-Text Biofeedback in Intervention for Children With Articulation Disorders. Perspectives of the ASHA Special Interest Groups. 2022;7(3):926-37.