COMPARING SPEECH PRODUCTION ERRORS OF 3 TO 5 YEAR OLD BENGALI CHILDREN WITH CLEFT LIP AND/ OR PALATE IN TWO CONTEXTS: WORD NAMING AND SENTENCE REPETITION

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Abstract

Research suggests various standardized assessment tools to collect and analyze the speech of the individual with cleft lip and/or palate (CLP). Despite the importance of developing an assessment framework for the growing CLP population, documentation on Bengali cleft speech is limited. This study aims to investigate the phonetic differences that happen in the speech sound production of 3 to 5-year-old Bengali-speaking CLP children in two different contexts: single word and sentence repetition. It also aims to evaluate the effects of these two speech assessment tools in those children's phonological evaluation to identify the proper evaluation for CLP individuals. In total, 12 Bengali-speaking CLP children from 3 to 5 years old participated in each test. Thus, data has been collected from a sample of 24 with 79-word stimuli. Two types of speech materials were used: single-word naming and sentence repetition tasks. The samples were analyzed using narrow phonetic transcription for targeted speech items. The percentage of consonants correct (PCC), percentage of correct places (PCP), percentage of correct manners (PCM), as well as phonological simplification processes (PSP) were assessed from the samples. Results showed a range of word structures and place-manner features produced by CLP children in both tasks. Also, the PCC, PCP, PCM, and PSP results were considerably less accurate in the sentence repetition task, suggesting that the task may provide a more accurate assessment of the CLP population.

Keywords: Cleft Lip and/or Palate, Word Naming, Sentence Repetition, Speech Production

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Introduction

CLP is one of the most frequently observed craniofacial anomalies present at birth, affecting the mouth and related anatomical structures and impeding normal speech development in children. It affects about 1 in 700 live births, with wide-ranging variability across geographical origin, cultural and racial groups, and environmental and socioeconomic conditions (Dixon, Marazita, & Beaty, 2011). There is a high prevalence of clefts in Asia: two to three per thousand live births (Paul, Spauwen, Spronk, & Niemeijer, 2007). Children with CLP are at high risk of phonetic problems (speech production difficulties) as they have structural deformities due to clefting (Bzoch, 1956; Kummer, 2011; Musgrave & McWilliams, 1977; Van Demark, Morris, & Vandehaar, 1979). Children with CLP might also be at risk for phonological difficulties as they may show delays in developing expressive language skills (Nation, 1970). Among the CLP population, phonetic errors are caused by inaccurate learning, anatomical deformities, and physiological or motor deficits (Chapman, 1993), and phonological errors occur due to developmental delay that hampers the child's speech sound organization and representation (Bernthal, Bankson, Flipsen, 2017).

Assessment of an individual's speech typically involves describing the speech production and comparing the outcome. Single word Naming (SWN) and Sentence Repetition Task (SRT) are the two most used tools for phonological assessment (Howard, Wells, & Local, 2008; Wolk & Meisler, 1998). One of the most reliable elicitation processes is the SWN test for the perceptual analysis of cleft speech, which provides a distinct unit of production that can be easily transcribed, especially in the case of highly unintelligible speech (Klinto, Salameh, Svensson, & Lohmander, 2015). In SWN task, one can easily include a variety of word structures and phonemes of the target language. Additionally, single-word transcription takes much less time than other speech analysis materials. However, compared with single-word production, SRT is considered more valid and reliable speech analysis material with good transcriber agreement (Klinto *et al.,* 2015) as it is close to conversational speech.

Children with CLP may show phonological problems, though a few studies have provided descriptions of the phonological disabilities of children with CLP (McWilliams, Morris, & Shelton, 1990). Studies suggest that children with CLP show articulation abilities below age expectations (Chapman & Hardin, 1992).

The study on cleft speech is very limited as it is understood that they show standard language skills after surgery. However, recent studies suggest that many children

with CLP have persistent speech issues (Sell *et al*., 2015). Furthermore, children with CLP make frequent errors on high-pressure sounds, predominantly affricates, and fricatives (Van Demark *et al.,* 1979; Philips & Harrison, 1969) which might be accurately found in SRT as a single word may generate an overgeneralized outcome.

Determining phonological information about CLP children is crucial to increase the effectiveness of assessment and intervention approaches (Chapman, 1993). Some published and unpublished studies have investigated the phonological processes of children with different speech and language disorders in Bangladesh within different linguistic contexts (Nisha, 2020). However, studies have yet to be documented about the CLP population's speech analysis materials as the study of communication disorders is a newly emerging field in Bangladesh (Nisha, 2020). Therefore, this study aims to identify the speech variations of 3 to 5-year-old Bengali children with CLP by comparing the two most popular speech assessment tools; Single Word Naming (SWN) and Sentence Repetition Task (SRT).

Cleft Lip and Palate (CLP)

Craniofacial conditions, including CLP are one of the most common congenital anomalies affecting the orofacial area. This condition happens from an interruption in embryologic growth between the 4th and 10th week of the developing embryo or fetus (Peterson-Falzone, Hardin-Jones, & Karnell, 2010). Cleft lip and cleft palates are the two frequent general types of CLP that happen due to abnormal space or split in the lip, alveolus, and palate (Chaurasia, 2010). The upper portion of the oral cavity is structured from the palate and flooring from the downside of mouth constructions, after that it bounds from the lower side of the eyes (cheeks). Cleft lips happen when the frontonasal and maxillary processes fail to fuse. Consequently, a varying degree of clefting occurs through the upper lip, alveolus, and the floor of the nose (Vyas *et al.,* 2020).

Cleft Lip: Clefting in the lip could occur alone or extend through lip to palate. If the cleft happens in one side of the upper lip, it is called unilateral cleft lip and if it happens in both sides of the upper lip, then it is called bilateral cleft lip (Vyas *et al.,* 2020). Another variation in cleft lip is complete and incomplete cleft lip. Complete clefting in lip extends through the nasal floor while in incomplete one, clefting does not prolong till the nasal floor (Semer, Sullivan, & Meara, 2010).

Cleft Palate: Palate is structured between the 6^{th} and the 9^{th} week of gestation. Clefting in palate (hard and/or soft palate) happens when the palatal shelves of the

maxillary processes fail to fuse during pregnancy (Semer *et al.,* 2010). Depending on the restricted fusion clefting could be categorized as front (anterior) and back (posterior). In terms of posterior cleft palate both soft and hard palate could be included, or only soft palate could be affected (also called bifid uvula) (Leslie & Marazita, 2013). If both anterior and posterior parts of the palate are involved in clefting, it is called complete cleft palate (Kosowski, Weathers, Wolfswinkel, & Ridgway, 2012).

CLP can happen together (both lip and palate are affected) or isolated (only lip or palate is affected) in a range of combinations with or without other congenital abnormalities (Gaurishankar, 2011; Kummer, 2011; Kummer, 2008). The reason of CLP is still not clear; however, it is believed that environmental (such as, drug abuse, maternal illness, and malnutrition) and genetic factors are potential causes of CLP (Lathrop-Marshall, 2022). With the development of medical technology, CLP is now usually identified before the child is born by ultrasonographic technique (Gaurishankar, 2011). Early detection helps to prepare for the precautions that are important for the child after birth, such as proper feeding, surgical procedure, and speech correction (Kummer, 2011; Kummer, 2001).

Velopharyngeal Mechanism

The velopharyngeal mechanism includes a muscular valve that encompasses the top of the mouth (hard palate), soft palate (velum), and various sides of the pharyngeal wall (Perry, 2011). This mechanism creates a strong seal and separates oral and nasal cavities during speech production swallowing, whistling, etc. For example, when we produce oral sounds (most of the consonants), air from the lung is required to be directed into the oral cavity and sealed from inflowing that air into the nasal cavity however, for nasal sounds /n/, /ng/ and /m/ no seal is happened (Kummer, 2001). This happens due to the closure of the VP valve (Perry, 2011).

Speech Errors of CLP

Typical VP mechanism is crucial to diagnose speech error for the CLP children as it is related to efficient speech production (Atkinson & Howard, 2011). As the children with CLP may show speech production errors because of the structural or functional deformities of the velopharyngeal mechanism (Chapman, 1992; Kummer, 2001). Moreover, they can also show phonological disorders due to the overall expressive language delay due to the clefting in addition to the structural deviations (Nation & Wetherbee, 1985; Van Demark *et al.,* 1979; Nation, 1970). It is important to mention that though speech errors are initially associated with

velopharyngeal insufficiency, over time they become phonological rule-based errors such as backing, fronting, substitutions, and assimilations (Perry, 2011). Speech error in association with velopharyngeal insufficiency (VPI) persists after surgery too and atypical velopharyngeal function may continue till adulthood (Mani *et al*., 2010; Moon, Kuehn, Chan, & Zhao, 2007).

A range of speech errors are associated with CLP that may affect the resonance and airflow (Warren, Dalston, & Mayo, 1993). Hypernasality or excessive nasality is considered one of the prominent speech features of cleft speech (Kuehn & Moller, 2000). Peterson-Falzone *et al.* (2003) mentioned that struggles reaching velopharyngeal closure could also disturb phonation and articulation. Other speech errors may include errors in producing high-pressured sounds, predominantly affricates and fricative consonants (Chapman & Hardin, 1992; Van Demark *et al.,* 1979). Also, delays in overall articulation skills have been found in various research (McWilliams *et al.,* 1990). While considering the speech and language pathologists' role in the therapy of cleft speech errors, they are only responsible for correcting compensatory misarticulations which happen due to the placement alterations due to the abnormal structure (Gooch, Hardin-Jones, Chapman, & Sussman, 2001)

Task Comparison between SWN and SRT:

Single Word Naming (SWN)

A SWN task is one of the most widely used techniques for assessing cleft speech to evaluate specific speech characteristics (Klinto *et al.,* 2015). It is a popular method for investigating both lexical accuracy and articulatory accuracy. For example, picture naming has been used to analyze expressive vocabulary, to examine word-finding difficulties, and for other assessments focused on investigating speech production skills (Stackhouse, Vance, Pascoe, & Wells, 2007). Also, the significance of this task is it can include various phonemic features of a specific language. Moreover, it is easier to perform by considering the potential restrictions of CLP children (Masterson, Bernhardt, & Hofheinz, 2005). The present study is similar to identifying speech production skills of children with CLP. Few standardized assessment tests for this type of study are available in English. For researchers and clinicians, single-word tasks are easy to deal with. Wolk and Meisler (1998) have suggested that the significant benefits of using single-word naming tasks are the availability of predetermined word lists and the limited number of confounding factors they introduce from the phonetic environment.

Klinto *et al.* (2015) suggested a higher speech accuracy percentage of CLP children in SWN in terms of PCC, CSC (cleft speech characteristics) than other tasks such as SRT or narrative speech analysis. However, in the latter tasks, PCP was significantly higher. Furthermore, in SWN, task target stimuli can easily be identified and transcribed, particularly in case of more unintelligible speech. However, single-word tasks cannot capture the range of articulatory challenges faced in real-life communication of CLP population (Bernthal, Bankson, & Flipsen, 2017; Klein & Liu-Shea, 2009; Wolk & Meisler, 1998).

Sentence repetition Tasks (SRTs)

SRT is one of the most frequently used language assessment tools to evaluate and compare atypical language skills (Slobin & Welsh, 1973; Lee, 1971). Sentence repetition is not just a memorization task, it assists in understanding the participants' sentence analyzing skills by identifying thematic relations of the elements of a sentence (such as events order), interpreting the underlying representation of the syntactic structure, and elaborating articulation plan and execution by articulators (Levelt, 2001). Furthermore, it is argued that SRT is the closest to spontaneous speech production and is widely used to analyze speech characteristics when continuous speech analysis is difficult to perform (Devescovi & Caselli, 2007). Thus, to identify and prevent atypical speech characteristics SRT can be a reliable speech analysis tool (Klinto *et al.,* 2015; Bishop, 2006)

In CLP-related studies, both SWN and SRT are widely used though the results show great variations. Morrison and Shriberg (1992) found that SWN was more accurately associated with frequent error detection, however, while detecting complex PCC, SRT and narrative analysis of speech were more accurate in their study. Likewise, Masterson *et al.* (2005) suggested that SRT shows more complex variations than SWN in cleft speech analysis. In many studies, the difference between SRT and SWN is non-significant. This may have happened due to the diverse assessments and methodologies adopted in these studies (Masterson *et al.,* 2005; Wolk & Meisler, 1998) in addition to the variation of linguistic and cultural contexts (Klinto *et al.,* 2015).

It is important to mention that SRT is sometimes difficult to perform due to the complicated cleft features, and in that case, SWN can be the only way to analyze the cleft speech. Therefore, the individual characteristics of a Cleft child should be considered while determining the assessment tool (Klinto *et al.,* 2015).

The present study:

This present study analyzed the nature of the speech production of Bengali children with cleft lip and palate by narrow transcription of SWN and SRT. It emphasized the impaired articulatory area of those children during the production of words and sentences in everyday life. Thus, this study aimed to identify the speech production nature of Bengali children with CLP and make a document for them with the impaired place and manner of articulation by addressing the following questions:

- What speech characteristics are associated with children with CLP?
- Which places and manners of articulation of those speech characteristics are generally missing in this group of children with CLP?
- Which speech material is comparatively reliable for evaluating the speech characteristics of CLP children?

Methodology

Participants

This present study investigates the nature of speech production of Bengali children with cleft lip and palate. Seven female and five male children; altogether, twelve children with cleft lip and palate participated in the current study. All of them were from different areas of Bangladesh, ranging from 3 to 5 years old preschoolers (mean age of 4.1 and SD:0.63). Demographic information about the participants' ages is summarized in Table 1. Participants were either receiving phonological intervention at Sheikh Hasina Burn and Plastic Surgery Institute (SHNIBPS) and going to special schools or being seen for an initial evaluation, ultimately leading to a recommendation for speech therapy.

Table 1: Age and gender of the participants

Participants	Gender	Age
P1	M	3.5
P2	F	3.5
P3	M	4
P4	M	3.7
P5	M	4
P6	F	5
P7	F	5

P8	M	5
P9	F	3.5
P10	F	4
P11	F	4
P12	F	4.5

The following inclusion criteria were considered for participants: Children with the craniofacial anomaly defined as unilateral or bilateral cleft lip and palate, age was between 3.0 to 5.0 years old, had normal hearing limits as evidenced by the hearing screening conducted by the clinical setting of the institute, were native Bengali speakers (as they lived in the different area of the country, most of them used dialect), every participant had their surgical operation during the age of 4 months to 10 months.

Instrumentation and Recording

Two different speech elicitation tasks were used: the first was a picture naming task for a single word, and the second was a sentence repetition task. For the single-word task, the words were chosen based on the expected vocabulary level of Bengali-speaking 3 to 5-year-old children. To ensure reliability, associated target words containing the specific phonemes were used to elicit sentence repetition samples. All samples were elicited from the participants with their parents in a quiet room. On behalf of the children, their parents gave written consent for their participation in the study. All twelve participants' speech production was recorded using a "Sony UX570" digital voice recorder and a 'Boya BY-M1' omnidirectional microphone.

Procedure

For single-word elicitation, 27 words were selected with some specific sounds placed at the word's initial, medial, and final positions. These sounds represented the place of articulation: bilabial, alveolar, velar, palatal, and glottal, and the manner of articulations were stop, fricative and nasal. At this age, children can produce phonemes like /p/, /b/, /k/, /m/, /n/, /g/, and /c/. The words contained one to three syllables and no consonant cluster word. A picture of the targeted sound positioned first of the word was presented, and the participant was asked to name it. Responses were recorded on an audio recorder and transcribed in a phonetic script.

The sentence repetition task was elicited by showing the participant one or two picture cues related to the sentence, and at the same time, the sentence was uttered by the data collector or the parents. The participants' parents participated in the sentence repetition task as the participants were not responding correctly. The sentence repetition task included 50 words in 10 complete simple sentences. Narrow transcription of the collected samples was done using the International Phonetic Alphabet (International Phonetics Association [IPA], 1999).

Data Transcription

The data from both tasks were analyzed using phonetic transcription. Vowel and consonant production were observed; however, this study focused on analyzing different ways of consonant production. Before narrow transcription, the data collectors also transcribed the data using broad transcription and wrote some background notes. This type of background information can help accurately use the transcription (Ladefoged, 2003).

Data Analysis

A cross-sectional study design was adopted to analyze the data. Percentage correct consonants (PCC), percentage correct places (PCP), percentage correct manners (PCM), percentage active cleft speech characteristics (CSC), and phonological simplification processes (PSP) were assessed by using comparison testing (t-test). The significance level was $p < 0.05$. Also, descriptive statistical measures were used to analyze demographic information.

Reliability test

An interjudge reliability task was performed to check the uniformity of the narrow phonetic transcription. To ensure interjudge reliability, the first & third author transcribed the responses separately. The agreement between the two transcriptions was 92% which is significant as the average agreement of the interjudge reliability test of phonetic transcription is 75% (Shriberg & Lof, 1991).

Results

A total of 27 single words were produced by the picture naming task, and during sentence repetition, 42 utterances were produced; among those, only targeted sounds were analyzed. The differences between the mean and standard deviation in the speech materials and different measures are presented in Table 2.

Table 2: Descriptive characteristics obtained by participants

	Mean Value		Standard deviation	
	SWN	SRT	SWN	SRT
PCC	60.24	42.26	13.39	13.35
PCP	46.78	34.53	10.49	13.76
PCM	53.97	37.41	10.83	13
PSP	39.30	16.32	6.97	5.72

Notes: *PCC= PCC= percentage of consonants correct, PCP= percentage of correct places, PCM= percentage of correct manner, PSP= percentage of phonological simplification process, SWN= Single Word Naming, SRT= Sentence Repetition Task*

From Table 2, differences were found regarding PCC, PCP, PCM, and PSP in both tasks. In all cases, SWN produces more scores which means that they show fewer phonological processes on SWN than SRT.

Table 3: Comparison of PCC, PCP, PCM, and PSP between SWN and SRT

	Paired Differences: SWN – SRT			95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
PCC	17.98	5.96	1.72	14.19	21.77	10.45	11	.000*
PCP	12.25	10.89	3.14	5.34	19.18	3.89	11	.002*
PCM	16.56	8.08	2.33	11.42	21.69	7.10	11	.000*
PSP	22.99	4.63	1.34	20.04	25.93	17.19	11	.000*

*. The mean difference is significant at the 0.05 level – Paired Sample T-test

From Table 3, a significant difference ($p < 0.005$) regarding PCC, PCP, PCM, and PSP has been found between SWN and SRT. That means PCC, PCP, PCM, and PSP in word naming tasks were significantly higher than the sentence repetition task.

Table 4: Place features of the specific consonants in single-word naming and sentence repetition task

Place features of single consonant target	SWN	SRT
Bilabial initial	38.89%	
Bilabial medial	52.78%	44.44%
Bilabial final	58.33%	
Alveolar initial	16.67%	
Alveolar medial	33.33%	8.33%
Alveolar final	45.83%	
Velar initial	62.55%	
Velar medial	50%	33.33%
Velar final	58.33%	
Palatal initial	41.67%	
Palatal medial	16.67%	41.67%
Palatal final	33.33%	
Glottal initial	58.33%	
Glottal medial	58.33%	25%
Glottal final	41.67%	

In SRT overall sound production was observed instead of initial, medial, and final position.

From Table 4, bilabial medial and bilabial final were more frequent than bilabial initial in the SWN task. In this task, glottal sound production seems easier than Alveolar, especially alveolar initial. Also, palatal sound production seems less frequent in SWN. In the second task, due to the intelligibility of production, it took much work to check the sound production in different positions; therefore, the overall place of articulation was observed, and found the worst performance in the production of alveolar sounds followed by velar.

Table 5: Manner features of the specific consonants in single word naming and sentence repetition task.

Manner features of single consonant targets	SWN	SRT
Stop initial	18.06%	
Stop medial	27.78%	38.33%
Stop final	25%	
Fricative initial	58.33%	
Fricative medial	58.33%	25%
Fricative final	41.67%	
Nasal initial	41.67%	
Nasal medial	66.67%	33.33%
Nasal final	83.33%	

In SRT overall sound production was observed instead of initial, medial, and final position.

In terms of the manner of articulation, Bangla speech is classified as plosive (stop), nasal, fricative, trill, approximate, affricate, or lateral approximate (Ali, 2001). From Table 5, only stop, fricative, and nasal sounds were found. In SWN, more fricative and nasal sounds were produced regardless of the position. Stop sound seems challenging to produce in SWN but better in SRT. However, fricatives and nasals were quite difficult to produce in SRT.

Discussion

Speech characteristics associated with children with CLP

The rate of speech accuracy of the children with CLP was substantially higher for picture naming. This outcome was similar to a few other studies too. In a study, Wolk and Meisler (1998) found a greater percentage of consonant correction in children with phonological disorders in sentence repetition compared to single-word naming. A lower percentage of consonant correction (PCC) in word naming was also reported by Masterson *et al.* (2005). In this study, all the speech features, such as percentage correct consonants (PCC), percentage correct manner (PCM), and percentage of phonological simplification process (PSP), showed higher speech

production in word naming tasks than sentence repetition. A comparison between group means also indicated that the average PCC, PCM, PCP, and PSP associated with the picture naming task was significantly higher than the average from the sentence repetition task. This means children with CLP show more accuracy when they produce a sound in a single word condition but if the linguistic complexity increases, they perform lower. This established that SRT might provide more accurate data from participants with CLP. Thus, SRT can be used to investigate a child's performance with more accuracy (Klinto *et al.,* 2015). Also, it should be noted that the phonological system is presented narrowly in the single-word task.

Places and manners of articulation of children with cleft lip and palate

Word Features (place of articulation)

In this study, CLP participants frequently produced bilabial final sounds. Also, bilabial medial and bilabial initial were produced for instances, /kap/, /dab/ and /apla/ (instead of /ʃapla/), /binal/ (instead of /biral/) etc. These sounds were produced more frequently in the SWN rather than the SRT. Word-initial and word-final velars and word-final bilabial are also found significantly in the SWN task in a study by Masterson (2005). On the other hand, palatal medial, alveolar initial, palatal initial, and glottal final words were the most difficult for the participants with CLP; both in word naming and sentence repetition task. For example, most participants uttered /fut̪ka/ instead of /fucka/; here, the palatal medial sound became dental medial. Again, the word containing the alveolar initial sound / nouka/ was uttered as /ua/, /nua/, /ɔua/ etc. Here we found the deletion feature of consonants. For the palatal initial example, /cabi/ was produced as /kabi/, / habi/, /cai/ etc. Here assimilation process was found. In another place, the glottal final word /guha/ was mainly produced as /gua/, /guia/, /ua/ etc. Glottal sounds are difficult for them to utter as these sounds are focused on the extreme sound pressure of the vocal tract and they cannot utter alveolars properly (Chapman, 1991). Scherer, Oravkinova, & McBee, (2013) also found that children with CLP have compensatory production for high-pressure consonants, palatal, and alveolar sounds but after proper intervention, these compensatory productions gradually get exchanged with appropriate articulation over time. The timing of surgery or intervention is crucial as the VP closure contributes to better articulation (Larsson, Maniscalco, Mark, Jönsson & Persson, 2022). However, all these features were performed significantly better in word naming tasks and poorer in repetition tasks which again refers that sentence repetition may lead to more accurate features of cleft speech (Klinto *et al*., 2015).

Word Features (manner of articulation)

In this study, participants with CLP maintained some of the correct manners, and most of the time, they articulated in the wrong manner for the specific sound. Regarding manner features, participants with CLP performed better in stop-medial, stop-final, and nasal-final positions in the word naming task. On the other hand, the participants were mostly weak in producing fricative sounds. These results regarding higher accuracy in word naming are consistent with Masterson *et al*. (2005), where the researchers found that affricates in both word-initial and final and nasals in word-final position are more frequently occurring in the single-word task. As accounted for words with stop final, as/ such as/ am/, /dab/, /kap/ etc., words were produced most significantly in the word naming task. Children with CLP mostly use nasal sounds. They also made other sounds nasal for example hypernasality in vowels and nasalized consonant production are very common in the speech of children with CLP (Maier *et al*., 2009). As per the data transcribed from the sample, it was found that words containing nasal-final sounds produced most significantly in the word naming task. For example, /d^{h}an/and/am/ are the words. Here, participants faced difficulty producing words with fricative sounds in any place, such as/pahar/, /guha/, horin/. Instead of this utterance they produced sounds like, /paa/, /aar/, /gua/, /ua/, guia/, /oin/, /orin/ etc. Therefore, children with CLP faced difficulty articulating fricative sounds at any word position.

In terms of manners of articulation, SWN, and SRT provide different results too. In some cases, stop or plosive production was performed well in SRT though nasal, and fricatives were difficult to produce in SRT but better in SWN. It might happen because of the children's unique speech production skills, though more studies with larger samples should be conducted to prove this outcome.

Reliable Speech Material for Evaluating Cleft Speech

Both SWN and SRT tasks vary in terms of speech characteristics and place and manners of articulation. Regarding PCC, PCP, PCM, and PSP, significant differences have been found, which means that if a clinician only uses word naming task, he/she will get unique characteristics such as the percentage of consonants, correct place, correct manners, and simplification process are less prominent in this task. On the other hand, sentence repetition may provide more insight into all the mentioned measurements of speech. Considering this, the SRT could be more reliable than SWN. However, there are some situations when SRT is difficult to conduct, especially if the child has poor speech quality. Thus, we cannot disregard the importance of SWN testing. As SWN is comparatively easier to transcribe

and SRT could be difficult due to the unintelligible nature of cleft speech, thus the outcome of SWN is positively influenced (Shriberg & Lof, 1991). So, choosing a specific standard tool in cleft speech is challenging (Gooch *et al.,* 2001). Therefore, many studies recommended both single word naming and sentence repetition tasks depending on cleft speech quality and environment (Klinto *et al.,* 2015; Peterson Ellis, Hupp, Tucker, 2003).

Strengths and Limitations

This study highlights the cleft speech characteristics of Bengali-speaking children with cleft lip and/or plate that can provide an evidence base for evaluating and treating cleft speech in the Bangladeshi context. By analyzing the Bengali language, this study provides brief information about the speech patterns of children with CLP in two individual contexts- SWN and SRT. Another strength of this study is the narrow transcription analysis which provides a detailed phonetic explanation of the utterance of CLP children and their strengths and limitations in sound production.

However, some limitations may have influenced the results. Due to the small sample size, the results, especially the word naming task, might need to be more generalized. Also, there is no picture naming test in Bangla, so the words were selected randomly according to the age range of the typically developing Bengali-speaking children, which an image could easily present. Finally, a few socioeconomic factors are present that may have influenced the speech production of the participants of this research. Numerous social factors, including gender, sibling status, socioeconomic positions, parenting behavior, and perception towards any impairment of difficulty, can shape children's speech production (Dodd, Holm, Hua, & Crosbie, 2003). The possible influence of those factors on the speech production of the participants in this study must be considered.

Clinical Implications

This present study investigated the core area of the speech pattern of children with CLP between single words and sentence repetition tasks among Bengali-speaking children. As sentence repetition speech material is very near to the representation of natural speech patterns, this study has the potential to support the evaluation, assessment, and treatment of children with CLP. Single-word tests can be useful for assessing the target consonants produced by children with CLP (Klein & Moses, 1999). It is essential to mention that almost all the processes found in single-word production are continued in the sentence repetition segment. This research

evidence can guide pathologists in formulating assessment and intervention plans for stabilizing the speech of children with speech difficulties. Moreover, it was evident that many unique variations were found in the SRT that did not occur in SWN. These findings emphasize that sentence repetition could accurately assess Cleft speech. This finding may help the pathologists to choose the correct method for assessing cleft speech depending on the child's speech features.

Conclusion

This study investigated the speech production errors of Bengali-speaking CLP children. The result shows a range of places and manners features of cleft speech. The present study also reveals that though SWN provides some unique variations, SRT provides more atypical speech characteristics. This study also indicates that word naming is easier to administrate, however, SWN seems more reliable for evaluating the accurate performance of cleft speech. Therefore, picture naming tasks and sentence repetition could be recommended depending on the environment, child's condition, and other physical requirements.

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References

Ali, Z. I. (2001). ধ্বনিবিজ্ঞানের ভূমিকা *(Introduction to phonetics).* Dhaka: Mowla Brothers.

Atkinson, M., & Howard, S. (2011). Physical structure and function and speech production associated with cleft palate. *Cleft palate speech: Assessment and intervention*, 5-22.

Bernthal, J. E., Bankson, N. W., & Flipsen, P. (2017). Articulation and phonological disorders: Speech sound disorders in children. *Boston, MA: Pearson*.

Bishop, D. V. (2006). What causes specific language impairment in children?. *Current directions in psychological science*, *15*(5), 217-221.

Bzoch, K. R. (1956). An investigation of the speech of preschool cleft palate children. *Doctoral thesis. Evanston, IL: Northwestern University.*

Chapman, K. L. (1993). Phonologic processes in children with cleft palate. *The Cleft palate-craniofacial journal*, *30*(1), 64-72.

Chapman, K. L., & Hardin, M. A. (1992). Phonetic and phonologic skills of two-year olds with cleft palate. *The Cleft palate-craniofacial journal*, *29*(5), 435-443.

Chapman, K. L. (1991). Vocalizations of toddlers with cleft lip and palate. Cleft Palate-Craniofacial Journal, 28, 172–178.

Chaurasia B. D., (2010) *Human Anatomy head and neck, brain* (5th ed.). CBS Publishers.

Devescovi, A., & Cristina Caselli, M. (2007). Sentence repetition as a measure of early grammatical development in Italian. *International Journal of Language & Communication Disorders*, *42*(2), 187-208.

Dixon, M. J., Marazita, M. L., Beaty, T. H., & Murray, J. C. (2011). Cleft lip and palate: understanding genetic and environmental influences. *Nature Reviews Genetics*, *12*(3), 167-178.

Dodd, B., Holm, A., Hua, Z., & Crosbie, S. (2003). Phonological development: A normative study of British English-speaking children. *Clinical Linguistics & Phonetics*, *17*(8), 617-643.

Gaurishankar, S. (2011). *Textbook of orthodontics (*1st ed.). Paras Medical Publication

Gooch, J. L., Hardin-Jones, M. A., Chapman, K. L., and Sussman, J., (2001), Reliability of listener transcriptions of compensatory articulations. *Cleft Palate-Craniofacial Journal*, 38, p- 59-67.

Howard, S., Wells, B., & Local, J. (2008). *Connected speech. The Handbook of Clinical Linguistics*, 583-602. Chichester: Wiley-Blackwell.

Klein, H. B., & Liu-Shea, M. (2009). Between-word simplification patterns in the continuous speech of children with speech sound disorders.

Klein, H., & Moses, N. (1999). Intervention planning for children with communication disorders: A guide for clinical practicum and professional practice.

Klinto, K., Salameh, E. K., Svensson, H., & Lohmander, A. (2015). The impact of speech material on speech judgment in children with and without cleft palate. *International Journal of Language & Communication Disorders*, 1-13.

Kosowski, T. R., Weathers, W. M., Wolfswinkel, E. M., & Ridgway, E. B. (2012, November). Cleft palate. In *Seminars in plastic surgery* (Vol. 26, No. 04, pp. 164-169). Thieme Medical Publishers.

Kuehn, D. P., & Moller, K. T. (2000). Speech and language issues in the cleft palate population: the state of the art. *The Cleft palate-craniofacial journal*, 37(4), 1-35.

Kummer, A. W. (2011, May). Speech therapy for errors secondary to cleft palate and velopharyngeal dysfunction. In *Seminars in speech and language* (Vol. 32, No. 02, pp. 191-198). © Thieme Medical Publishers.

Kummer, A. W. (2001). Cleft palate and craniofacial anomalies: the effects on speech and resonance. *Taylor & Francis US.*

Ladefoged, P. (2003, August). Phonetic fieldwork. In *Proc. 15th ICPhS* (pp. 203-206).

Larsson, A., Miniscalco, C., Mark, H., Jönsson, R., & Persson, C. (2022). Persisting speech difficulties at 7–8 years of age–a longitudinal study of speech production in internationally adopted children with cleft lip and palate. *Logopedics Phoniatrics Vocology*, 1-10.

Lathrop-Marshall, H., Keyser, M. M. B., Jhingree, S., Giduz, N., Bocklage, C., Couldwell, S., ... & Jacox, L. A. (2022). Orthognathic speech pathology: impacts of Class III malocclusion on speech. *European Journal of Orthodontics*, 44(3), 340-351.

Lee, L. (1971). *The Northwestern Syntax Screening Test*; Northwestern University Press: Evanston, IL, USA.

Leslie, E. J., & Marazita, M. L. (2013, November). Genetics of cleft lip and cleft palate. In *American Journal of Medical Genetics Part C: Seminars in Medical Genetics* (Vol. 163, No. 4, pp. 246-258).

Levelt, W.J.M. (2001). Spoken word production: A theory of lexical access. Proc. Natl. Acad. Sci. USA, 13464–13471.

Maier, A., Hönig, F., Bocklet, T., Nöth, E., Stelzle, F., Nkenke, E., & Schuster, M. (2009). Automatic detection of articulation disorders in children with cleft lip and palate. *The Journal of the Acoustical Society of America*, *126*(5), 2589-2602.

Mani, M., Morén, S., Thorvardsson, O., Jakobsson, O., Skoog, V., & Holmström, M. (2010). Objective assessment of the nasal airway in unilateral cleft lip and palate—a long-term study. *The Cleft palate-craniofacial journal*, *47*(3), 217-224.

Masterson, J. J., Bernhardt, B. H., & Hofheinz, M. K. (2005). A comparison of single words and conversational speech in phonological evaluation. *American Journal of Speech-Language Pathology*, 14, 229–241.

McWilliams, B. J., Morris, H. L., & Shelton, R. L. (1990). Language disorders. *Cleft Palate Speech. Philadelphia, PA: BC Decker*, 236-246.

Moon, J. B., Kuehn, D. P., Chan, G., & Zhao, L. (2007). Induced velopharyngeal fatigue effects in speakers with repaired palatal clefts. *The Cleft palate-craniofacial journal*, *44*(3), 251-260.

Nation, J. E. (1970). Vocabulary comprehension and usage of preschool cleft palate and normal children. *The Cleft Palate Journal*, *7*, 639-644.

Nation, J. E., & Wetherbee, M. A. (1985). Cognitive-communicative development of identical triplets, one with unilateral cleft lip and palate. *The Cleft Palate Journal*, *22*(1), 38-50.

Nisha, S. I. (2020). Speech Variability of Typically Developing Bangla Speaking Children in Two Contexts-Single Word Naming and Connected Speech. *Social Science Review, The Dhaka University Studies*, Part D- 37(1), 177-196.

Paul, A. L., Spauwen, P. H. M., Spronk, C. A., Niemeijer, R. P. E., (2007) Cleft lip and palate treatment in Bangladesh. *European Journal of Plastic Surgery.* 29(6): 267-270.

Perry, J. L. (2011, May). Anatomy and physiology of the velopharyngeal mechanism. In *Seminars in speech and language* (Vol. 32, No. 02, pp. 083-092). © Thieme Medical Publishers.

Peterson L. J., Ellis E., Hupp R. J., Tucker M. R, (2003). *Contemporary oral and maxillofacial surgery* (4th ed). Elsevier Mosby.

Peterson-Falzone, S. J., Hardin-Jones, M. A., & Karnell, M. P. (2010). Cleft palate speech (4th. ed.). St Louis, MI: Mosby

Philips, B. J., & Harrison, R. J. (1969). Articulation patterns of preschool cleft palate children. *The Cleft Palate Journal*, *6*(3), 245-253.

Scherer, N. J., Oravkinova, Z., & McBee, M. T. (2013). Longitudinal comparison of early speech and language milestones in children with cleft palate: A comparison of US and Slovak children. *Clinical linguistics & phonetics*, *27*(6-7), 404-418.

Sell, D., Mildenhall, S., Albery, L., Wills, A. K., Sandy, J. R., & Ness, A. R. (2015). The Cleft Care UK study. Part 4: perceptual speech outcomes. *Orthodontics & craniofacial research*, *18*, 36-46.

Semer, N. B., Sullivan, S. R., & Meara, J. G. (2010). Plastic surgery and global health: how plastic surgery impacts the global burden of surgical disease. *Journal of plastic, reconstructive & aesthetic surgery*, *63*(8), 1244-1248.

Shriberg, L. D., & Lof, G. L. (1991). Reliability studies in broad and narrow phonetic transcription. *Clinical Linguistics & Phonetics*, *5*(3), 225-279.

Slobin, D.I., & Welsh, C.A. (1973). Elicited imitation as a research tool in developmental psycholinguistics. In C. Ferguson & D. Slobin (Eds.). *Studies of child language development* (pp. 485–497). New York: Holt, Rinehart & Winston.

Stackhouse, J., Vance, M., Pascoe, M., & Wells, B. (2007). *Compendium of auditory and speech tasks: children's speech and literacy difficulties 4 with CD-ROM*. West Sussex: John Wiley & Sons.

Van Demark, D. R. (1979). Predictability of velopharyngeal competency. *The Cleft Palate Journal*, *16*(4), 429-435.

Van Demark, D. R., Morris, H. L., & Vandehaar, C. (1979). Patterns of articulation abilities in speakers with cleft palate. *The Cleft Palate Journal*, *16*(3), 230-239.

Vyas, T., Gupta, P., Kumar, S., Gupta, R., Gupta, T., & Singh, H. P. (2020). Cleft of lip and palate: A review. *Journal of family medicine and primary care*, *9*(6), 2621.

Warren, D. W., Dalston, R. M., & Mayo, R. (1993). Hypernasality in the presence of "adequate" velopharyngeal closure. *The Cleft palate-craniofacial journal*, *30*(2), 150-154.

Wolk, L., & Meisler, A. W. (1998). Phonological assessment: A systematic comparison of conversation and picture naming. *Journal of communication disorders*, *31*(4), 291-313.