A Secondary Data Analysis Describing the Syllable Structure Exhibited by Four-Year-Old Filipino-Dominant Speaking Children

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Abstract. The objective of the study is to describe the syllable structures exhibited by Filipino-dominant speaking four-year-old children. A total of nineteen audio-recorded connected speech samples were transcribed, segmented, and analyzed to describe the syllable structures through identifying the parts of a syllable, the number of syllables in a word, and the combination of the different syllable structures exhibited by the participants. Descriptive and cross-sectional secondary data analysis was used to describe the different syllable structures. The most frequently occurring syllable structure is CV followed by CVC. Consonants /n/ and /ŋ/ are the most frequently occurring onset and coda, and vowel /a/ for the nucleus. Furthermore, the most frequently occurring number of syllables are one-syllable and two-syllable words with syllable structure combinations CVC, CV.CV, CV.CVC, and CV. As for diphthongs and clusters, the occurrence was less frequent (less than 5% of the total sample) as Filipino words primarily do not contain these. The increase in number of syllables resulted from the reduplication of the verbs and affixes. Overall, the results of the current study may serve as basis for word structure, monitoring, and regulating the expected skills and development of Filipino children.

1. Introduction
Speech-language pathologists (SLPs) play a central role in the screening, assessment, diagnosis, and treatment of persons with speech sound disorders [1]. During the process of assessment, speech and language pathologists obtain and analyze speech samples from their clients to find out what speech sounds they can say and what syllable structures they can produce [2].

(SLPs) are effectively associated with the improvement of proficiency aptitudes and in the remediation of education issues [3]. Specifically, SLPs have a vital job in the evaluation of phonological mindfulness due to their knowledge of phonetics and phonological issue [4]. Phonological mindfulness has been appeared to be an essential factor basic early perusing accomplishment [5]. Furthermore, shortages in phonological mindfulness have been connected to perusing handicaps.

The appraisal of phonological mindfulness amid preschool and kindergarten gives basic knowledge into the aptitudes that youngsters use to figure out how to peruse [6]. Puranik [7] showed that phonological mindfulness, when contrasted with numerous different indicators, was the most steady and strong pointer of later perusing in a gathering of kids who were pursued from late preschool into
kindergarten and first grade. In another informational index, Catts et al. [8] found that a kindergarten proportion of phonological mindfulness was one of five factors that anticipated the nearness of a perusing handicap in second grade.

In the Philippines, The glottal stop is a notable feature of Filipino phonology. According to Malabonga [9], glottal stop is part of the Tagalog consonant inventory. Tagalog phonemic inventory includes sixteen consonants namely /b, k, d, g, h, l, m, n, l, p, r, s, t, w, j, / and five vowels namely /a, e, i, o, u./. The symbol /?/ represents the glottal stop. These consonants and vowels are combined to make syllables. A syllable is composed of at least a vowel (V) with or without consonant/s (C) combined to it. The vowel is called a nucleus and it may stand alone in a syllable. As early as three to six months of age, children start to babble and combine syllable structures into CV.CV format (i.e. mama). By the ninth to twelfth months, babbling and production of first words are more common. From one to three years old, syllable structure CVC begin to appear; however, omission of initial and final consonants, reduction of clusters and substitution of one consonant to another are still common.

In a study by Jacks [10], the relative frequency of one-syllable words, two-syllable words, and three-syllable words that appeared in English-speaking children aged two to three were analyzed. Two-syllable words were well-represented from among the participants but almost none occurred for three-syllable words. According to Kehoe and Stoel-Gammon [11] before children are able to combine different syllables, children develop CV (core syllable) first, followed by cvcv structure (e.g. nana) then CVC. Naidoo et al. [12] conducted a study regarding the syllable structure development of eighteen Zulu-speaking children ages 3-6. As a result, the most frequent combination of syllable structures produced across the age groups are VCVCV ,VCVCVCV, CVCV and CVCVCV. Agustin and Soriano [13] conducted a study on the syllable structures produced by two-year old Filipino children. They were able to report that the 24-to-35-month old children exhibited fifty-two syllable structure combination; however, only ten were considered mastered based on Templin's criteria, these are: CVCV, CV, VC, CVCVC, CVC, CVVC, CVCCV, CVCCVC, VC, and VCVCVC.

In Metro Manila, a recent study by Jacinto et al. [14] examined the consonant inventory and error patterns exhibited by 100 typically developing four-year old children; however, the study did not account for syllable structure and vowels exhibited by these children. Agustin and Soriano [13] examined the syllable structure of 20 two-year-old Filipino children. The study was able to determine different syllable structures and canonical forms, however, the researchers did not take into consideration the presence of glottal stop.

Due to this, Filipino SLPs resort to subjective clinical decisions or compare their assessment results to Westernized norms. However, Chen, Bernhardt, and Sternberger [15] stated that the normative data of one language cannot be applied to another since languages differ in terms of content and size of speech sound inventory, phonotactic constraints, syllable structure of words, and the phonetic complexity of sounds.

Due to the limited number of researches and literature, documentation of phonological acquisition development is crucial for a deeper understanding of the phonological development of children in Metro Manila. Thus, the general goal of the present study is to describe the syllable structures exhibited by typically developing, Filipino-language dominant four-year-old children in Metro Manila based on the secondary data obtained from the study of Jacinto et al. [14].

2. Methodology

2.1. Study Design

A descriptive and cross-sectional secondary data analysis from the phonological development study by Jacinto et al. [14] was used. This allowed the current researchers to gather and analyze qualitative and quantitative data regarding the syllable structures exhibited by the participants.
2.2. Use of Secondary Data
The participants of the study were ensured to be typically developing through ECCD file review, oral peripheral mechanism (OPM) testing, and formal audiological assessment. Also, Language Dominance Questionnaire was given to determine that the participants are Filipino language-dominant speakers. Furthermore, the connected speech samples were elicited through the use of story prompts patterned from McCabe's Conversation Map, wherein story prompts embedded in a conversation were used to elicit a personal narrative from a child.

2.3. Data Gathering Procedure
For this work, only 19 participants from the previous study agreed and signed a formal consent. The audio-recorded connected speech samples of the 19 participants were obtained through a hard drive given by the previous researchers during a formal meeting. All 19 audio-recorded samples obtained were transcribed and analyzed.

2.4. Ethical Consideration
This study complied with the principles of the Declaration of Helsinki and Good Clinical Practice Guidelines of the Philippine Health Research Ethics Board (PHREB). Prior to conducting this study, the researchers obtained approval from the University of Santo Tomas - College of Rehabilitation Sciences Ethics Review Committee (UST-CRS-ERC) with the protocol SI-2017-18. Furthermore, to protect the rights of the participants, the study abided with the Data Privacy Act of 2012.

3. Result and Discussion
The speech corpus gathered from the 19 participants contain varying length and number of words. The average length of the speech samples were approximately 13 minutes with a minimum duration of 3 minutes and 58 seconds, and a maximum of 19 minutes and 2 seconds. Approximately 7,100 words or 12,800 syllables were transcribed and analyzed. The number of words per participant were at least 90 words and at most 603 words with an average of 370 words per participant. Apart from unintelligible utterances, the researchers included all child utterances in the sample including child imitation of other speakers, exclamations, and responsive utterances. All words were transcribed to ensure all syllable structures during the whole elicitation procedure was accounted for.

3.1. Syllable Structure
The participants were able to produce twelve different syllable structures. Figure 1 shows the percentage of occurrence of the syllable structures exhibited. Results revealed that CV and CVC were the most frequently occurring syllable structures. Moreover, there is only a small percentage of other ten syllable structures which contains clusters and diphthongs. The participants were able to produce five syllable structures containing diphthongs which comprise only 2.82% of the total sample. These are CW, CWC, CCWC, CCW and CWCC. On the other hand, they were able to produce eight syllable structures containing clusters which has a total of only 3.60%. These are CCV, CVCC, CCVC, CCWC, CCVCC, CCW, CWCC and CVCCC. Overall, all were able to produce both diphthongs and clusters.
3.2. Onset
The participants were able to produce 40 different onsets, twenty-three of which are consonants while seventeen are consonants clusters. Figure 2 shows the percentage of occurrence of the onsets exhibited by the participants and the ten most frequently occurring consonant onsets. Clusters produced by the participants were /tr/, /kl/, /br/, /pr/, /dr/, /gr/, /dr/, /kw/, /bl/, /pl/, /tl/, /sw/, /kr/, /pw/, /sp/, /kj/ and /pj/. Comparing native and loan words, 74% of the clusters are found in loan words while 26% are in native words.

3.3. Nucleus
The participants were able to produce a total of twelve different nuclei, five of which are vowels while seven are diphthongs. Figure 3 shows the percentage of occurrence of the nucleus exhibited by the participants. Comparing vowels and diphthongs in native and loan words, vowels are more common in native words while diphthongs are more common in loan words. In native words, 97.29% are vowels and 2.71% are diphthongs. In loan words, 86.97% are vowels and 13.03% are diphthongs. The most dominant vowel and diphthong for both native and loan words are /a/ and /ail/, respectively.
3.4. Coda

The participants were able to produce a total of thirty-four different codas, sixteen of which are consonants and eighteen are consonant clusters. Figure 4 shows the percentage of occurrence of the codas exhibited by the participants and the ten most frequently occurring consonant codas. Clusters produced by the participants were /ns/, /ks/, /nd3/, /ts/, /Ind/, /Irk/, /ris/, //rl/, /rsl/, /rst/, /ls/, /ls/, /lrtf/, and /lrs/.

3.5. Overall Discussion

From the current study, it was found that the most frequently occurring syllable structures were CV and CVC which were also mentioned by Malabonga [9] to be the most common syllable structures in the Filipino language. McFarland [16] found out that the most frequently occurring Filipino words from Filipino literary works are the following: na, sa, ko, mga, ang, ng, ay, at and hindi. These results can be correlated to the current study as these words only contain CV and eve syllable structures.

Agustin and Soriano [13] stated that Filipino children can produce two-element clusters at the age of two. In comparison, all participants of the current study aged four years old were also able to produce two-element clusters; however, three-element clusters (e.g., Charles /tfarls/) were only
produced by the participant of the current study and not by the participants of Agusti n and Soriano (2007). This may indicate that syllable structure increase in complexity as one ages.

Malabonga and Marinova-Todd [17] mentioned that clusters are absent in the Tagalog words and are mostly present in loanwords. However, the current study showed that the participants were able to produce clusters. This can be attributed to the occurrence of loanwords in the sample such as trabaho /trabaho/ and blue /blu/. Also, the current study found presence of clusters in the native words but these were mostly brought about by phonological changes; omission seen in the word bibli (the Tagalog word for will buy) which was produced as /b1b1I/ and addition as seen in the word lagnat (the Tagalog word for fever) which was produced as /klanat/.

Aside from clusters, diphthongs were also produced by the participants. Diphthongs constituted 13.03% of loanwords’ total number of nucleus and 2.71% of the native words. Although lesser than vowels, presence of diphthongs were still noted from the samples such as baboy /babo1/, lagay /laga1/, and gumagalaw /gumagalau/ which differs from the findings of Ramos [18] stating that diphthongs in the Filipino language only occurred in the loan words.

Consonants /n/, /?/, and /kl/ are the most frequently occurring onsets. This can be correlated with the list of most frequently occurring words in the Filipino language by McFarland [16] as most of these words start with /n/ such as ‘na’, /?/ such as ‘ako’, and /kl/ such as ‘ko’. The frequently occurring onsets can also be compared to the frequently occurring phonemes in the syllable initial position in the study of Jacinto et al. [14]. The results are similar except for the /?/ which is only present in the current study. Since Jacinto & Maximo et al [14] did not strictly transcribe and analyze the glottal stop in the syllable initial word initial position.

4. Conclusion
In looking at the connected speech samples of four-year-old Filipino children from Metro Manila, it was found out that the most frequently exhibited syllable structures are CV and CVC. However, they are also expected to produce clusters and diphthongs, but these are attributed to the presence of loanwords in the samples. The most frequently occurring onset, nucleus, and coda are /n/, /?/, and /kl; /al, /III, and /lo/; and /n/, /l/, and /?/, respectively. This information will guide SLPs on what consonants and vowels to expect during assessment and what to target first in a specific position during therapy. More syllable combinations can be expected from four-year-old children who have the ability to use affixes and reduplications to denote verb tenses. However, as more syllables are combined, children tend to use simpler syllable structures. These findings provide preliminary normative indications that can be useful for Filipino SLPs in terms of assessment and management of four-year-old Filipino-dominant speaking children in Metro Manila who may exhibit syllable structure deficits.

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