Understanding the Phonological Strengths of Children with Tourette Syndrome

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Language acquisition is one of man’s developmental milestones; hence, scholars have always been intrigued to explain how the linguistic skill emerges at an early age (D’Souza & Filippi, 2017; Hoff, 2009). Furthermore, D’Souza and Filippi (2017) added that understanding language development has always been marked by nature-nurture controversy, thus, positing whether language is innately wired among individuals or is progressively acquired based on one’s growth and maturity.

However, it is relevant to note that language development is not always typical but may also be atypical. For example, Luinge (2016) reported that atypical language learning is considered one of the most common developmental issues marked in early childhood, with an overall frequency of 19%. Also, she
discussed that atypical language development might seem to have a relationship with problematic cognitive and memory skills. Therefore, an investigation among special populations is necessary to understand how their condition affects their linguistic development (Hoff, 2009). Lichtman (2013) described that limited literature offers extensive research about some types of atypical language learners. Ergo, particularities in their language development need further elucidation. One area in the spectrum that needs further investigation is the atypical language learners with Tourette Syndrome (TS).

**Gilles de la Tourette Syndrome**

TS or Gilles de la Tourette (GTS) is a condition that is characterized by motor and verbal tics and abnormalities in the frontal or basal-ganglia regions (Dye et al., 2016; Lavoie & O’ Connor, 2012). Furthermore, TS is a complicated neuropsychiatric disorder that is diagnosed during childhood or adolescence and is diagnosed with multiple motor and phonic tics (Conelea et al., 2014). Its important feature includes simple or complex tics (American Psychiatric Association, 2013). Even though the neurodevelopmental order of children with TS is affected by the tics, a few studies declared that this neurobiological lapse could be utilized to the advantage of the children with TS (Dye et al., 2016; Thibault et al., 2007).

**Speech Disfluencies or Issues of TS Patients**

Because TS is a neuropsychiatric condition marked by tics of either or both motor and vocal natures, these tics affect some areas of functioning (Van Borsel et al., 2004). As a result, various studies were conducted to understand how it affects the learners with TS, especially their oral communication. On the one hand, prior investigations on the speech disfluencies of individuals with TS disclosed cases of word repetitions, hesitations, interjections and prolongations, and stutter-like speech (Van Borsel et al., 2004). However, on the other hand, more recent studies suggest that the speech disfluencies of individuals suffering from TS, particularly stuttering, are not actual stuttering to an extent because it deviates from the classical patterns of stuttering (i.e., De Nil et al., 2005).

As for palilalia or repetition of words, it is reported that although some of the TS patients repeated some words or phrases at the end of clauses, they did not show that routine inclination to repeat words and phrases (Van Borsel et al., 2004). Hence, Van Borsel et al. (2004) posited that the speech disfluencies of the TS patients in their case study are reminiscent of stuttering, cluttering, and palilalia, though to some extent only. Simply put, the speech disfluencies of individuals with TS are unique due to their mixed patterns suggestive of stuttering, cluttering, and palilalia.

**Verbal and Vocal Strengths**

Despite seeing TS as an atypical language concern, the researchers asserted that TS patients also have advantages. Thibault et al. (2007) reported that GTS patients presented relatively “intact focal attention” with “overactive working memory updating processes” (p. 810) as reflected in their enhanced P300 oddball effect versus those who are pure OCD and GTS plus OCD conditions. Meanwhile, Strand et al. (2008) conducted a study exploring brain activations using fMRI over time as a phonological Working Memory (WM) task with auditory stimulus presentation. The study showed that the patients with TS still have activations in the posterior STS during the silent period, which the researchers suspected that the respondents were still thinking about the stimuli despite being “silent,” thus having those active brain regions. In terms of verbal strengths, the study of Dye et al. (2016, p. 61) aimed to investigate the speeded grammar in TS. Their study examined the children with TS to determine if they were faster at rule-governed grammatical combinations or morphemes and the phonemes or syllables. The findings of the study suggested that the frontal/basal ganglia may be the cause of the speeded rule-governed grammatical competence among individuals with TS.

In summation, various studies that focused on TS demonstrated that tics affect the capacity of the population in terms of clarity in speaking (Van Borsel et al., 2004; De Nil et al., 2005). However, the condition facilitates activation of the Phonological Working Memory, resulting in speeded grammar or fast processing of the linguistic inputs (Strand et al., 2008; Dye et al., 2016). Based on the limited surviving literature on the oral capacity of the individuals with TS, it is evident that the field seems to be needed further investigation to prove the claims of the past
researchers in line with the phonological capacity of the said population. Thus, this paper attempts to explore the phonological capacities of individuals with TS. In addition, this study holds significance to the TS community in the Philippines, which needs further studies that allow them to understand their condition and seek opportunities to strengthen their capabilities. Also, the current study is essential as it contributes to the limited studies on the linguistic capabilities of individuals with TS. Thus, the subsequent part of this paper presents the study, its methods, and its findings.

The Current Study

Based on the literature gap, this current study aims to understand the phonological strengths of children with TS. Thus, this study attempts to answer the following questions:

1. Are children with TS capable of producing nonwords?
   a. Which phonemes are produced with accuracy?
   b. Which phonemes are not produced with accuracy?
2. How do children with TS respond to the given nonwords?

Innateness Theory and Natural Phonology Theory

This study is anchored on the innateness theory and natural phonology theory or biological determinism theory. Both theories assert that a child is naturally programmed to learn a language. The innateness theory, which Noam Chomsky introduced, supports the notion that it is a universal phenomenon for a child to possess an innate inclination toward language and learning it (Brown, 2000). Furthermore, a child is wired to focus on the utterances of adults, especially their caregivers. This phenomenon stems from the primordial goal of every child, which is to communicate with those who give them affection (Hoff, 2009). Also, the process allows the child to observe how vocal production happens so that the child can imitate. This bootstrapping technique is considered by Hoff (2009) as a natural phenomenon among children. It is also observed in other linguistic areas such as syntax, semantics, morphology, and phonology. Likewise, the said phenomenon allows the genetically transmitted set of procedures to be activated. Thus, it yields to production and understanding of their target language (Hoff, 2009). It results in children achieving accurate linguistic utterances; therefore, it enriches their linguistic experience.

Although a child is wired to acquire a language, Hoff (2009) explained that a genetically determined point controls what can be acquired. In phonology, this involves the physiological development and maturation of the speech organs that dictate the phonemes or human sounds (Hoff, 2009). Therefore, certain phonological utterances cannot be accurately executed by a child if his or her speech organ is not yet developed to produce the sound (Scovel, 2000). It also implies that even though they are biologically wired to speak, children with special conditions (CSN) have a higher probability of not uttering those words accurately if their speech organs are affected by their condition; therefore, physiological limitations affect the accuracy of the utterance. Thus, it can be inferred that the physiological make-up of the learners interferes actively with the innate ability of the learner to utter the language, which is evidence of acquisition.

Natural phonology also claims that the phonological processes of acquiring the language are natural or innate among learners; however, not in the way that Chomskian’s assertion that learners that wired to acquire the language. Instead, the phonological processes in acquiring a language reflect a universal articulatory process among human beings (Nathan, 1982). It also asserts the idea that a universal process occurs because the human speaking and perceptual apparatus are common among everyone regardless of the phonological features of the language; thus, allowing the young learners to be able to produce the phonemes despite these not being included in their L1 (Nathan, 1982). Being natural also implies that this process of learning the phonological features is not learned or consciously absorbed. Instead, they are “automatic responses to the nature of our vocal apparatus…” (p. 121). Given this nature, young L2 learners will no longer have difficulty in their phonological utterances as a result (Nathan, 1982). Hence, they can produce complex sounds. Mowrer (1980) explained that heredity plays an integral part in this phenomenon. He emphasized that speech-sound
development originates from a genetic component. He also meant that each child undergoes a sequence of distinct maturation stages of the vocal apparatus. About this, consonant and vowel sounds are produced in various stages (Mowrer, 1980). Based on this, it can be claimed that sound happens regardless of the phonological characteristics of a language.

Furthermore, infants are claimed to have these specialized “receptor fields” or “feature detectors” (Mowrer, 1980). These detectors are treated as the cause why infants possess the innate capacity to have certain phonological biases and respond to the various features of the sound around their environment (Mowrer, 1980). Despite having a different take on the innate capacity of the young learners to acquire the language, this strengthens the argument that there is a mechanism within the children that causes them to produce various phonological utterances which may not necessarily be found in their L1.

However, this knowledge or capacity to produce similar phonemes may be affected by the adult speakers’ linguistic repertoire and the community’s sound system. As a result, young learners will eventually abandon some of these phonological inputs as they desire to communicate with adults (Mowrer, 1980).

For this study, both theories lay the foundation of the current study in investigating which theories claims are observed in adolescents, regardless of their existing condition, especially the assertion that all children are wired to learn a language. Furthermore, the methodology adopted was grounded on these theories as well.

**Methods**

**Research Design**

The current study utilized the experimental research design because it administered a nonword test instrument to determine the phonological capacity of individuals with TS. Christensen et al. (2014) described that this research design endeavors to conduct an objective observation that may occur in a controlled situation (p. 52). Thus, this investigation employs the test that controls the research participants’ phonetic utterances, revealing their phonological strengths and weaknesses.

**Research Participants**

Through the endorsement from the Philippine Tourette Syndrome Association, we invited four respondents. The target age was initially 8-10, but it became 13 years old due to the lack of children with TS in the given age bracket in Manila. Thus, three male respondents were the participants in this study. They were diagnosed with TS by either a neurologist or a developmental pediatrician. Below are the profiles of the participants who were given fictitious names to hide their real identities:

1. **Brian**

Brian’s first language is English, even though everyone in the family speaks Filipino. He eventually learned Filipino when he was in the third grade. Currently, he uses code-mixing of Filipino and English in talking to his caregivers, his parents. The manifestations of TS started to show when he was three years old when he suddenly twitched just once. The signs of TS appeared when he was six years old through constant blinking of the eyes. He was referred to a neurologist who confirmed that he has TS. According to the caregiver, he has been taking medications for five years to manage the symptoms. His tics involve the sudden movement of his oral cavity and eyes. However, his stronger tics made him bite the inner part of his cheeks, giving him tremendous pain. According to the caregiver, Brian does not have any known comorbidity. He had been active in school until he reached grade six, where he would have more tics. It made Brian suffer from anxiety in response to his desire to stop or manage his tics. This condition affects his self-esteem and confidence, which led him not to skip attending classes. When there are uncontrollable tics, he sometimes suffers from depression and sleeplessness. Because of this, he has taken Aripiprazole (to treat mood disorders because of tics), Clonazepam (to control the tics), and Jovia (to address anxiety issues). When Brian has good days, he performs well in school. He displays interest in spelling and Mathematics. It was observed that when he is calm, no tics or other TS manifestations are observed, and he can function well.

2. **Timothy**

Timothy speaks both Filipino and English at home. His family speaks Filipino at home, and he speaks English in school as this is their medium of
instruction. His caregiver reported that there were no early observable signs of TS when he was a child. However, when he had a seizure-like attack when he was 12 years old, his neurologist diagnosed TS. He also has ADHD, which is his comorbidity.

His tics include palilalia, spitting, biting off his fingers and the sides of his mouth. He also reported that he has sudden feelings of unexplained agitations, which he can also manage and control at some point. His medication includes Risperidone which helps him feel calm and sleep well. To channel his hyperactive tendencies, he joins in various church-related activities by playing musical instruments. He is also active in sports and is an achiever in school. Currently, he is studying at a state-run basic education institution.

3. **Chuck**

Chuck speaks English, which he considers his first language, and Filipino, which he learned in school. He was diagnosed with autism before being diagnosed with TS. His caregiver, his mother, reported that he had delayed speech which led him to undergo a series of speech therapy to speak. He had studied at a Special Education school until he was eight years old and was transferred to a mainstream class. However, when he turned 12, he encountered a seizure-like attack similar to what Timothy experienced. Then, the signs of TS became more prominent. Several tests and consultations were made with a neurologist until a developmental pediatrician diagnosed Chuck with TS. He has tics, but they are mild and manageable. Usually, tics appear dormant unless he becomes anxious because of certain situations. He resumes his studies in a special education institution and enjoys varied school and physical activities.

**Instruments**

The current study used the nonword stimuli instrument in the investigation of Dye et al. (2016) from Gathercole et al. (1994). The nonword stimuli in the (children’s nonword repetition) CNRep comprises two, three, four, and five-syllable nonwords used in the present study. The said instrument utilized the phonological rules in the English language. Also, this test aims to identify the familiarity of the respondents concerning the phonemes. It was recorded by a female volunteer, similar to the study of Gathercole et al. (1994) and Dye et al. (2016). She recorded the CNRep with a 10-second interval compared to the five-second interval in the instrument of Gathercole et al. (1994). The recording began with the statement, “The funny nonwords.” Then, for each set or number of syllables, the part is introduced by the number of syllables the set has—for example, “four syllables” and then a 10-second interval.

**Procedure**

We submitted the research ethics documents as the study involved human participants with special needs. Simultaneously, we coordinated with the Philippine Tourette Syndrome Association to seek their help with contacting them. Caregivers who agreed to participate in the study were given an informed consent form to confirm their involvement in the research.

The caregivers decided where to meet for the data gathering. The parents of the two participants decided to meet at their own house, whereas one opted to meet at a coffee shop in a mall where the child-informant frequently visits. We explained the nature of the data gathering and the objective of the study. In order to establish trust on the part of the participant, we engage them in a conversation to make them more relaxed before they proceed to the actual tests. The sessions were audio-recorded, and the appearance of tics and other TS behaviors were noted.

For the coding of the data collected, the procedures below were adapted from the study of Dye et al. (2016). In order to analyze the first research question, which aimed at identifying the accuracy of the utterances of children with TS, three raters were invited. The three interraters are graduate students who know about the IPA symbols and the actual phonemic sound of the symbols. They listened to the recording, provided the corresponding IPA symbol of the utterances, and compared their symbols to the CNRep IPA symbols of the nonwords.

To answer the first Research Question, “Are children with Tourette Syndrome capable of pronouncing nonwords?” quantitative and qualitative analyses were used. For the quantitative part, the mean of the accurately pronounced was identified. Likewise, the phonemes represented by the IPA symbols from the recorded responses of the respondents were identified and validated by the invited interraters. Furthermore, our observations during the task serve as the qualitative basis for the analysis. This is aside from interraters’ explanation of the decision in the accuracy of the utterance.
To further analyze the phonological strengths, we discussed where the tics were present during the recording of the utterances. It helped in the analysis of the other data. Also, the participants' and caregivers' input were used in the crystallization of our observations. These helped in the qualitative analysis of the study.

Ethical Considerations

In compliance with the Data Privacy Act (2012) and anti-child abuse law (Republic Act 7610, 1992), no video recording was taken. Also, we decided not to videotape the data gathering procedure as the respondents’ nature is to feel uncomfortable with their condition. Likewise, doing so might affect the utterances of the respondents.

Limitations of the Study

We acknowledge that the following are considered as the limitations of the study:

First, there are only three child-respondents in the current study because of the location of most children with TS. Majority of the children are in Davao and Cebu.

Second, because there are only three child-respondents in the study, the quantitative part of this paper is recognized to be limited in terms of its statistical power. Hence, the qualitative input was also included. The previous parts explained the source of this.

Third, despite the original target age group as 8-12 years old, the current study used respondents as 12 ¼ to 13 as age because these children are the only ones available and are geographically close to us.

Most qualitative inputs were based on the children and their caregivers’ testimony. However, because there were no existing instruments that gauge actual aptitude, competence, and performance of the learners, we relied on descriptions and narratives of the respondents and their caregivers as well.

Fourth, the disfluencies that the study has are the motor or vocal tics, the clicking or barking sounds, uncontrollable sounds produced by the air passage or throat, the uncontrollable opening of the mouth, salivation or spitting, or palilalia (the repetitive utterance of any expressions such as expletives).

Results and Discussion

This section presents the findings of the study. It begins with the discussion on the phonological capacity of the research participants to the description of the responses to the nonwords. Children with Tourette Syndrome’s Production of Nonwords

Table 1

Mean of Correctly Pronounced Nonwords

<table>
<thead>
<tr>
<th>Recording</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-syllables</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>1.73</td>
</tr>
<tr>
<td>Three-syllables</td>
<td>5</td>
<td>3</td>
<td>6</td>
<td>4.6</td>
<td>1.53</td>
</tr>
<tr>
<td>Four-syllables</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2.3</td>
<td>1.39</td>
</tr>
</tbody>
</table>

Table 1 shows the number of correct utterances made by the participants with TS involving nonwords. As highlighted in Table 1, children with TS seem to have a higher success rate in producing words with a lower number of syllables, with two syllables (M=4; SD=1.73) and three syllables (M=4.6; SD = 1.53). In a similar vein, the saliency of errors in the production of the nonwords tends to increase as the number of syllables in words also increases, for example, four syllables (M=2.3; SD=1.39) and five syllables (M=2.6; SD=.58). Therefore, it can be deduced that these children with TS can produce nonwords as used in the study. All the respondents were able to utter the nonwords after listening to the voice recording, although these participants could not accurately produce the nonwords. One salient reason is the tics that suddenly occurred at the onset of the four-syllable nonwords onwards. It is also observed that during the four-syllable phase, the participants seemed to be more likely to produce their tics, particularly the motor tics before and after the actual utterance of the nonwords. The observations are similar to the study of Van Borsel et al. (2004), involving stuttering, which may be considered a form of tic. In their study, participants with TS tend to appear in the longer words rather than in the shorter ones. Moreover, it was also reported in the same study that the stutters seemed to be more preponderant on lexical words rather than the functional ones, which the present study may not determine due to its usage of nonwords.

According to the interraters, these children with TS seem to have difficulty enunciating the final syllables or phonemes for most nonwords and some phonemes found at the initial placement. We agree with the interraters that these children with TS appear
to exert their effort in producing the nonwords to the best of their phonological strengths and awareness, yet it seemed that their tics were impeding them from doing so. It must be noted, as previously stipulated, that the participants seemed to have issues with specific phonemes or syllables when placed in the final and initial positions of a nonword but most often in the final placement. It can be inferred that children with TS in the study tend to have difficulty properly producing the phonemes because of the uncontrolled signals from their brains that their tics would soon happen again, thus explaining the problematic production in most positions, particularly at the final placement. It seems that these children with TS are conditioning themselves to utter the prompted nonwords, but the uncontrollable signals to demonstrate their tics get in the way. Such a finding is akin to what Wilcox et al. (2011) tried to explain regarding children with speech impairments. They noted that these children tend to have difficulty producing final phonemes or may generally manifest a phonological pattern of errors like omitting the final consonant.

In the study by Van Borsel et al. (2014), they observed that the locus of the stutters exhibited by the individuals with TS is at the initial part of the sentences instead. Nevertheless, as for palilalia, which is also considered a form of tic, although the children with TS did not show that routine tendency to repeat words and phrases, some of them repeated some words or phrases at the end of clauses.

Van Borsel et al. (2014) posited that the speech disfluencies of the individuals with TS are unique per individual due to its mixed patterns suggestive of stuttering, palilalia, and other uncontrollable mannerisms. However, some patterns of problematic areas in phonological production may be noticeable due to their preponderance in studies.

**Phonemes Produced with Accuracy**

Table 2 shows the accurately articulated phonemes of the participants with TS. As shown in Table 2, there are several phonemes that they can produce with much accuracy, regardless of the number of syllables, even though their tics became more apparent during the four- and five-syllable phases and were not apparent in the two- and three-syllable categories. In line with this, the two theories (i.e., innateness theory and natural phonology or biological determinism theory) can be espoused, for based on the findings, despite the condition of the participants, they still managed to make accurate utterances of specific phonemes and when these phonemes are placed in particular loci in a word, thus aiding them in the utterance.

**Table 2**

*Accurately Produced Phonemes*

<table>
<thead>
<tr>
<th>Phonemes</th>
<th>Diphthongs</th>
</tr>
</thead>
<tbody>
<tr>
<td>/b/, /a/, /l/, /І/, /g/, /s/, /n/, /d/, /u/, /f/</td>
<td>/el/, /al/</td>
</tr>
<tr>
<td>/z/, /m/, /l/, /k/, /θ/, /i/, /r/</td>
<td>*/t/ (when placed at the initial locus)</td>
</tr>
<tr>
<td>*/*p/ (only true for participants 1 and 3)</td>
<td></td>
</tr>
</tbody>
</table>

Simply put, they are wired to acquire language, and more specifically, they utter or produce sounds that they hear in their immediate surroundings (Hoff, 2009). Therefore, although accurately uttering all the nonwords in the instrument at hand was a failure for them, it is but natural because children with special conditions like them are reported to always have some speech disfluencies to an extent (Scovel, 2000), especially if it involves the physiological readiness toward the utterance. Arguably, the condition of TS is triggered by the brain, but it is physiologically manifested regardless of whether it is motor or vocal by nature, thus affecting their utterances.

Furthermore, these findings seem to support the tenet behind the biological determinism theory, explaining that children are wired to produce sounds outside of their mother tongue. Given that the nonwords used in the present study are using English sounds as phonologically standardized by the International Phonetic Alphabet, they could still produce the sounds of most phonemes.

Moreover, the linguistic model plays a crucial role concerning the phonological strengths and weaknesses of the participants, for it can be noted that only two out of the three participants with TS have no issues between the phonemes /p/ and /θ/. We relate such findings to the participants and their caregivers’ socio-economic status (SES) because several studies claim that SES is correlated to one’s language development, including phonological awareness and production (i.e., Pittman et al., 2020; Ambrose et al., 2012). Also, the environment, as reflected in the SES of the parents, may affect the linguistic input. Because the two participants belong to the upper-middle-class family, the linguistic repertoire is much more varied than the remaining participant.
who belongs to a lower SES sector, thus explaining the disfluency with /p/ and /f/, for instance. Also, in the nativist approach, the linguistic experience from the environment may contribute to the linguistic capabilities of learners (Hoff, 2009).

Less Accurate Phonemes

Table 3

<table>
<thead>
<tr>
<th>Phonemes</th>
<th>Diphthongs</th>
</tr>
</thead>
<tbody>
<tr>
<td>/p/ substituted when placed at the final locus</td>
<td>NA</td>
</tr>
<tr>
<td>/t/ missing when placed at the final locus</td>
<td></td>
</tr>
<tr>
<td>/ŋ/ substituted to /n/ when placed at the final locus</td>
<td></td>
</tr>
<tr>
<td>/d/ substituted to /n/ when placed at the final locus</td>
<td></td>
</tr>
<tr>
<td>/r/ missing when placed at the final locus</td>
<td></td>
</tr>
<tr>
<td>/k/ missing when placed at the final locus</td>
<td></td>
</tr>
<tr>
<td>/ə/ substituting schwa to other vowel sounds</td>
<td></td>
</tr>
</tbody>
</table>
*Some final syllables were either missing or not produced at all.  
*Some words were not uttered at all.

Table 3 presents the phonemes that the participants had some difficulties with in terms of production. As shown in Table 3, several phonemes may be problematic for them, especially when placed in particular loci in words. As stipulated in the earlier discussions, children with TS seemed to have difficulties with specific phonemes, particularly in the final locus (Wilcox et al., 2011) and in the initial locus (Van Borsel et al., 2004). Moreover, another salient speech disfluency noticeable among these participants is their phoneme substitution. Wilcox et al. (2011) posited that children with speech impairments, like children with TS, have difficulty with articulation, such as substituting one sound for another, as in “thay” instead of “say” (p. 278).

Accurate articulation may be impeded by the motor tics, which usually affect the articulators, including the lips, tongue, teeth, and others; thus, enunciating seems challenging for these children with TS. It is also interesting to note the types of sounds based on the placement of articulators, which these participants seem to have difficulty. Following are the challenging sounds: alveolars (t, r, d); velars (k, ŋ); bilabial (p); labiodental (f). Also, the schwa sound seemed to be very problematic as well in terms of articulation. Other sounds were not just produced because the entire word was not uttered at all; most of these were under the four- and five-syllable categories.

Moreover, according to the raters, the medial locus of /l/ in the nonword, tafflest, became /p/, for the participants might connect the nonword to topless, which may be familiar to them in their linguistic repertoire. In sum, there seems to be an interplay of cognitive and non-cognitive factors affecting the phonological strengths and weaknesses of children with TS.

Response to Nonwords

Based on the computed per-second-mean interval of the respondents for the set of nonwords (CNReP), the overall mean response rate is 0.51 seconds. Thus, for Brian, his overall response rate is 0.76 seconds. Meanwhile, Timothy’s response rate is 0.40 seconds, whereas Chucks’ rate is 0.37.

According to the average response rate of Timothy, whose L1 is Filipino, the result seems to espouse the natural phonology theory, especially the claim that speaking and perceptual apparatus are ordinary among everyone regardless of the phonological features of the language, and this allows the young learners to produce the phonemes despite these not being included in their L1 (Nathan, 1982). However, it must be considered that his accuracy, as presented in the previous part of this section, is lower than the other two respondents. It can be attributed to the fact that his L1 is Filipino compared to the other two respondents. Hence, his oral cavity may not have been acquainted with the oral cavity movement if the language spoken is English.

This significant observation may confirm the premise of the innateness theory that the physiological make-up of the children may be most likely to interfere with the innate ability of the learner to utter the language. Aside from L1, the vocal tics may have also influenced the accuracy of the execution of the phonemes. Albeit the limitations brought about by Timothy’s oral cavity, it is undeniable that despite the inaccuracy, his response rate was fast, which may have
shown his lack of hesitation in uttering the phonemes. This supports the notion of the biological determinism that the process of learning the phonological features is not learned or consciously absorbed but are “automatic response” of the vocal apparatus (Nathan, 1982).

Aside from Brian having the lowest response rate, it was observed during the recording that the recurrence of his vocal tics became more frequent and stronger as the number of syllables increased. Likewise, some tics were heard in his audio recording, and these sounds of tics usually appeared in the first three words starting from the three-syllable words. Likewise, anxiety could be observed because he repeatedly asked whether the set of words was complex, which may indicate that he was beginning to find some words from the three-syllable words difficult.

This recurrence of vocal tics was also observed in Timothy, starting from the two-word syllables. Because his vocal tics were in the form of spitting, there was an observance of salivation and a deliberate attempt to prohibit himself from spitting. Hence, similar to what was happening to Brian. However, unlike Brian, Timothy appeared excited as the number of syllables increased. It was observed through his positive facial reaction. Albeit the response, it must be noted that the said respondent did not clearly utter some words.

Chuck, on the other hand, did not show any signs of anxiety or excitement. He continuously repeated the nonword inputs. Although based on the caregiver, Chuck does not show observable vocal or motor tics for an extended period already, and he would show physical reactions such as raising his shoulders or blinking more often when the syllables increased to three. However, physical observation cannot strongly support that he exhibited motor or vocal tics during the audio recording.

Despite the varying reactions of the participants, it must be noted that the three reacted to the given phonological input, and the reaction may stem from the familiarization with the phonemes; however, their unfamiliarity with the words they uttered may have triggered the vocal or motor tics. This phenomenon might have occurred because a critical component of phonological bootstrapping is the child’s observance of how the adults’ oral cavity moves during the utterance (Hoff, 2009). Unfortunately, this vital component of the bootstrapping technique has been absent in the study. Hence, forcing the participant to rely on the auditory input. As a result, the process of imitation a child usually has in learning a language is incomplete during the recording.

In terms of nonwords, the four-syllable word, “altupatory,” had the fastest response rate. For Brian, it was 0.02 seconds; for Timothy, it was 0.03 seconds, and for Chuck, 0.27, and the mean rate is 0.11 seconds. The word contains an initial short vowel, which is common in both the Filipino and English languages. The word “comeeciate” is the second fastest response rate, which has a mean of 0.17 seconds, and the third is “contramponist” which has a mean of 0.22 seconds. It only shows that the speed of the response is not based on the number of syllables but on the combination of vowels and consonants.

For the word with the slowest response, it was the first word in the two-syllable set and the very first word in the entire CNRep: “ballop.” This nonword garnered a response rate mean of 0.92 seconds. Brian has the lowest response rate in this word, 1.34 seconds, while Timothy and Chuck have a roughly similar rate, which is 0.70 seconds.

Meanwhile, the word that has the second lowest response rate is “bannifer” which has a mean of 0.84 seconds. For Brian, he has 1.8 seconds as his duration. Timothy has 0.41 seconds, and Chuck has 0.30 seconds. Looking closely at the phonological structure of “bannifer” and “ballop” both of them are bilabial sounds. It is interesting to observe that Brian has a slower response rate on words with /b/ sound.

**Conclusion**

Children with TS are innately wired to acquire a language because they are genetically and biologically inclined to follow growth and maturity principles. However, phonologically, individuals with TS are faced with slight challenges in articulation given their neurological condition. Their brains send signals, making them demonstrate uncontrollable tics, which may either be motor or vocal in nature or a combination of both. Given such conditions, their tics impede them from doing so, resulting in phoneme substitution or non-articulation of the phonemes. Generally observed, patterns of articulation errors tend to appear more saliently at the final locus of the word, whereas some have patterns of articulation errors that tend to be observed as well at the initial locus of the word.
In addition, tics are observable when they engage themselves with longer words rather than short ones. Although some phonemes were explicitly identified as problematic and generally accurate, such problematic or accurate production may still be generally affected by the loci of these phonemes in words. Nonetheless, it may also be concluded that despite their TS, these participants develop their linguistic skills in a typical manner concerning rich linguistic experiences, including the impetus for a correct linguistic model, correct caregiver input, and conducive linguistic context or environment, which may have their relationships to socio-economic status. Moreover, the physiological readiness or maturity of the participants as dictated by their age also plays a vital role in the accurate production of words; however, due to tics that involve the articulators, individuals with TS seem to be constantly challenged in pronouncing, enunciating, and articulating each phoneme with accuracy.

Based on the significant findings in the study, it is an important area in language acquisition that underscores the fact that everyone, even those with the physiological condition, is wired to learn a language. Moreover, the study gives light to identifying phonological issues that language teachers or speech therapists may intervene to address the challenges.

Also, it informs especially the parents and the teachers about the capabilities of the individuals with TS. Hence, parents can provide opportunities for their children to improve their oral communication further to build confidence in speaking. Thus, exposing their children to learning materials and experiences may improve their linguistic and social capital. For teachers, especially language teachers, the data that this study provides may be used in searching for pedagogical strategies that can hone the oral communication skills of the learners. Also, they can be powerful instruments in removing negative stigma about the population.

Recommendations

Studies on this population are very much encouraged as it is evident that much needs to be explored. Also, an exploration that compares the typically-developing learners to the TD cohort may help establish normative data in the Philippine setting. In addition, it is recommended that the study is implemented on more samples.

Moreover, further studies including fMRI may help amplify the present study’s findings to delve deeper into the brain activity of individuals with TS whenever faced with such prompts like in the study of Strand et al. (2008), which explored the brain activations using fMRI over time as phonological working memory (WM) task, with auditory stimulus presentation, was being done.

Declaration of Possible Conflict of Interest

The researchers declare that there is no conflict of interest in line with this study.

References


