Violating the SSP in Child Language: A Contrastive Optimality Study

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Abstract:

This study is based on generative phonology, which is a rule-based theory that helps evaluate the restrictions of the Sonority Sequencing Principle (SSP) within the framework of Optimality Theory (OT) for native and native-like English-speaking children aged three to six years. It applies generative phonology and incorporates Hogg and McCully's model of sonority sequencing. The phonological processes to be analyzed in this study include insertion, deletion, stopping, glottalization, devoicing, voicing, palatalization, vocalization, and deaffrication, using OT as a constraint-based framework. The research aims to describe and explain different syllable-based processes observed in native and native-like English speakers, demonstrate how OT accounts for these processes, and, lastly, investigate violations of the SSP within OT for both groups.

Keywords : Cluster Simplification, Generative Phonology, Optimality Theory, Phonotactics, Sonority Sequencing Principle .

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مُخَالَفَة مبدأ تدرج الرنين الصوتي في لغة الطفل: دراسة تقابلية تفاضلية

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الملخص:-

تستند هذه الدراسة إلى علم الأصوات التوليدي، وهي نظرية قائمة على القواعد التي تساعد في تقييم القيود المفروضة من قبل مبدأ تدرج الرنين الصوتي (**Sonority Sequencing Principle**) الذي يعمل ضمن هيكلية النظرية التفاضلية (**Optimality Theory**) للمتحدثين (الأطفال) الأصليين وكذلك أشباه المتحدثين الأصليين (الأطفال) للغة الإنجليزية، الذين هم بين الاعمار من ثلاث الى ستة سنوات. كما ان الدراسة تطبق مبادئ علم اللغة التوليدي، وتوظف أنموذج **(Hogg and McCully)** لتدرج رنين الاصوات. وتشمل العمليات الصوتية التي تم تحليلها في هذه الدراسة: الإدخال والحذف والتوقف والهَمْز والجهْر وإزالة الجهْر والتغوير والنطق وإزالة الأصوات المركبة، والتي تم تحليلها باستخدام النظرية التفاضلية (OT) كإطار عمل قائم على القيود والقوانين. تهدف أسئلة البحث إلى وصف وشرح العمليات المختلفة والمستندة إلى مقطع لفظي التي تمت ملاحظتها بين للمتحدثين الأصليين وكذلك أشباه المتحدثين الأصليين للغة الإنجليزية وإظهار كيفية حساب النظرية التفاضلية (OT) للعمليات المستندة إلى مقطع لفظي"

كلمات مفتاحية: تبسيط المجاميع، علم الأصوات التوليدي، النظرية التفاضلية، قانون تتابع الأصوات مبدأ تدرج الرنين الصوتي.

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Introduction:-

Sonority, a nonbinary phonological feature, categorizes sounds using a relative scale based on loudness relative to similar sounds in terms of stress, pitch, and duration in a spoken language (Pouplier, 2011; Hamza et al., 2018). The sonority hierarchy, also referred to as the scale, classifies sounds in a language from lowest to highest, with vowels > glides > liquids > nasals > obstruents (Yavaş, 2020). Sounds closer to the peak of the hierarchy are considered more sonorous, leading to the prototypical pattern of onsets having an obstruent accompanied by an approximant (Easterday, 2019). The Sonority Sequencing Principle (SSP) is a phonotactic principle that outlines syllable structures based on sonority.

Phonotactics is a branch of phonology that deals with restrictions that allow phoneme combinations in a particular language. Phonotactics governs each language's rules and restrictions, allowing what types of sounds or phonemes will be next to each other (Halle and Clements, 1983). A phoneme is the smallest unit in a language that helps distinguish one word from another. To consider if a phoneme is right for a word in a language, it is concerned with sonority (Yavaş, 2003). The generative view of phonology has resulted in the issue of unconstrainedness, where the rules are too powerful and constrain language due to excessive illegal or unnatural derivations. In English, specific rules should be observed on the pronunciation of onset and coda clusters. The *Sound Pattern of English* includes ordered rules that are supposed to be observed but make it hard to learn some dialects, thus the need for flouting such rules (Dekkers et al., 2000). The phonological rules and phonotactic constraints restrict the consonant sequence on a syllable. The sonority peak is the nucleus of a syllable and is found within the internal structure of a syllable. The sonority value reduces with the distance from the nucleus and increases as it moves closer to the nucleus (Daana and Khrais, 2018).

1.2. Research Questions

The current study is an attempt to explore the following Research Questions:

1. **What are the phonological processes elicited in the performance of the** respective subjects?

2- Does OT adequately help account for syllable-based processes in native and

native-like English speakers?

3- How are violations of the SSP rule treated within the framework of OT?

1.3. Research Design

The research design is a mixed-method approach that includes both a quantitative experimental design and qualitative components. First, the researcher conducts a controlled experiment on a diverse sample of British children, including those of Iraqi origin who are native-like speakers of English and other native speakers of English from different demographic backgrounds. The experiment involves a dialogue or conversation with the children; comparing the findings of the recorded sessions with the SSP assists the researcher in determining the correlation between the children's phonological performance with the requirements of the SSP and concerning OT in the phonological development of language.

1.4. Instrument of Data Collection

This study focuses on collecting data on phonological awareness among English-speaking children. The researcher, located in Iraq, utilizes a team of profilers in England to conduct interviews and record responses. Recorded interviews are chosen to capture the most natural pronunciations and reactions of the children. High-quality recordings are ensured using reliable devices and specialized software for phonetic analysis. The researcher aims to observe the children's ease of pronunciation, phonemic segmentation, syllable splitting, and other phonological awareness skills. Non-verbal cues, such as facial expressions, are also considered during the interviews. The collected data consists of both video and audio recordings. The researcher uses pre-determined questions and scripts for consistency. Manual data processing is employed to analyze the collected data, considering both qualitative and real-time interpretation of the responses. Overall, the chosen data collection and processing methods facilitate the exploration of phonological awareness in young English-speaking children.

1.5. Research Sample

The research sample consists of twenty-five English-speaking children between the ages of three and six. These children are either native speakers or native-like speakers of English. The sample includes both boys and girls and is geographically located in England. The children's pronunciations and phonological awareness are assessed through recorded interviews

conducted by a team of profilers. The data collected from the sample is used to analyze and compare syllable-based processes and violations of the SSP within the framework of OT.

2. Theoretical Framework

The theoretical framework utilized in the current study is generative phonology. This framework provides a comprehensive and systematic approach to understanding phonological patterns and processes in language. The use of generative phonology as the theoretical framework allows for a structured examination of the underlying phonological representations and rules governing children's language production, providing valuable insights into the acquisition process and phonological constraints in child language.

2.2. Generative Phonology

Generative Phonology (GP) is a phonological theory comprising rules that generate grammatical sentences in any language. In generative grammar, the essential component is the phonological rules and structures, which portray the linguistic competence of a native speaker instead of performance. At the beginning of generative phonology, when it was first presented by Noam Chomsky and Morris Halle (1968), the aspect of the syllable was only included once Kahn saw the need for it in theory (Goldsmith, 2014). A syllable is a unit of higher level than a phoneme but not a word or morpheme and is a complex unit formed from nuclear and marginal elements (Rasool and Rashid, 2018). According to Kahn, the syllable is important in helping expound the idea of phonological rules in a simple way. Furthermore, it was later proposed that an organization of the individual phonemes would be possible since the syllable has an internal structure which consists of the onset and rhyme. Therefore, the prominence of the syllables in the GP has made it possible to account for the vowel epenthesis and consonantal deletions in accordance with the satisfaction of the sonority hierarchal structure. OT is a development of the GP theory, which enables it to retain the underlying surface representations (Bensoukas, 2004). OT asserts that linguistic generalizations are described using a set of constraints on surface representations which are given prominence in terms of their importance.

2.3. Sonority Sequencing Principle

Sonority Sequencing Principle (SSP) is a phonotactic principle that outlines the syllable structures in terms of sonority. According to the SSP, the syllable nucleus (the syllable centre),

which is mostly a vowel, is responsible for the sonority peak. It is followed and/or preceded by segments of consonants that progressively decrease the sonority value. In simpler terms, sonority falls towards both ends of the syllable.

2.4. Sonority Hierarchy

Sonority hierarchy, also known as the sonority scale, is the classification of language sounds/phones in a pattern from the lowest to the highest. Sonority can be well-defined as the intensity of relative vibrations compared to other sounds with similar length, pitch, and stress (Parker, 2002). Sonority hierarchy plays a critical role in syllable structure analysis and understanding the segment's rules as they appear in onsets and codas such as in the SSP (Henke et al., 2012). Sonority hierarchy is determined by the grouping of the sounds. Therefore, the sonority ranking of speech is essential in creating phonological patterns in language.

2.5. Optimality Theory

Optimality Theory (OT) is a linguistic framework which posits that the recognized language forms are derived from optimal satisfaction of the contradictory constraints. OT provides generative linguistics with a larger framework, which supports the study of hypothesized internal grammatical structure and the modifications that have occurred over time. Alan Prince and Paul Smolensky were the first to talk about OT in 1991, which supported its development in 1993. OT has three basic components (Boersma and Levelt, 2003). The first component is the Generator (GEN) which grasps an input and produces a list of promising outputs. The input and the generator make the candidate set. OT assumes that any language-specific constraints do not face the input.

The second concept is Constraint Component (Con), which gives the criteria exhibited in strictly rated and violable constraints used to differentiate the candidates. The constraint set is made up of the CON. OT considers every constraint as universal. Therefore, the constraints are similar in every language. The constraints occur in two basic styles. The first one of the faithfulness constraints, which oblige the output/observed surface form, is similar to the input/lexical or underlying form in the same approach. The constraint requires that the input and output forms have some identity (Alahmari, 2018). The second type is markedness constraints which enforce the structural requirements on the output's well-formedness. The two types of constraints are

vital in OT since the markedness inspires change from the input while the faithfulness constraint inhibits the inputs from realization as unmarked form.

According to McCarthy and Prince (1995), the faithfulness constraints have three basic families. The first family is MAX (maximal) which prohibits deletion. Deletion/elimination deals with the omission of one of the sounds in a word or sentence to enable the acquisition of the word in a simpler manner. The second family is DEP (dependent) which prevents epenthesis. Epenthesis in phonology is the addition of a sound to a term, which mostly happens at the beginning of the word (prothesis) or at the end of the word (paragoge). The third family is IDENT (F) (identical) which inhibits the modification of the (F) value feature.

The third element is the Evaluator (EVAL), which selects the optimal output depending on the constraints, and the chosen candidates become the output (Baertsch, 2002). OT operates under the assumption that the components are universal. Therefore, the variations in grammar indicate rankings of the varied global constraint set. Sound acquisition can be represented as the process of modifying constraint rankings. The major focus of OT is linguistic typology, universal principles, and language acquisition.

2.6. Previous Studies Related to Sonority

Several previous studies have contributed valuable insights into the concept of sonority. Bokhari (2020) conducted a case study on coda clusters in Hijazi Arabic, a dialect spoken in Saudi Arabia, highlighting the critical role of sonority in the formation of these clusters. The study utilized the Saliency model to differentiate between fricative pharyngeal sounds based on their sonority levels, using phonological, articulatory, and acoustic-phonetic features. As-Sammer (2016) focused on the perceptibility of English sonority profiling among Iraqi university learners. The study examined the learners' ability to perceive and interpret sonority based on factors such as pitch, stress, and duration. The findings revealed that inadequate knowledge of sonority profiling hindered their ability to differentiate sounds based on loudness and pitch.

Zárate-Sández (2015) explored the acquisition and use of intonation patterns among bilingual speakers proficient in English and Spanish. The study investigated how language proficiency influenced the perception and production of intonation patterns at different levels of

proficiency. Through perceptual tests and production tasks, the research shed light on the interplay between language proficiency and accurate perception and production of rising, falling, and level pitch patterns.

Mok (2011) conducted a study on speech rhythm acquisition in Cantonese-English bilingual children and monolingual children. The research used acoustic and rhythmic metrics to analyze consonantal, vocalic, and syllabic intervals in the speech of these children. The study aimed to establish variations in recurrent metrics and their impact on speech rhythm. The findings revealed distinct patterns in the acquisition of rhythmic sounds by monolingual children, with higher rhythmic values observed. The study highlighted the influence of different languages on sound acquisition and contributed to our understanding of the phonological differences between monolingual and bilingual children.

In another study, Sherwin (1999) conducted a contrastive analysis on the application of the SSP in interlanguage phonology. The research focused on non-native speakers of English from various language backgrounds, examining their production of consonant clusters and the extent to which they adhered to the SSP. By identifying language-specific variations and challenges, the study provided insights into interlanguage phonology and the influence of native language on phonological constraints in second language learning.

3. Methodology

The study employs a contrastive optimality methodology to investigate the violation of the SSP in child language. The phonological patterns observed in children's language production are compared and contrasted with the expected patterns dictated by the SSP. The dataset of child language samples is analyzed to examine the frequency and nature of these violations. Various factors, including phonotactic constraints and language-specific influences, are considered in relation to their potential contribution to the observed violations. By employing a contrastive optimality approach, insights into the underlying mechanisms and constraints that shape phonological development in children can be gained, shedding light on the interaction between the SSP and other linguistic factors in child language acquisition.

3.1. Criteria for the Selection of the Data Collection

The criteria for selecting children for this study are based on their age, and language background. The number of children in this study is 25, selected from different demographics within the children population. Age is an essential factor in the selection of children. Four of the respondents are three- to four-year-old children, who are at nursery age, while two are from the reception age (ranging between 4-5 years old). The rest of the respondents are children who are 5-6 years old. The selection of children with different language backgrounds is a critical factor in this study because it allows for a comparison of the pronunciation abilities between two different groups of children. Eighteen of the selected participants are British children of Iraqi origin, suggesting that they have a bilingual language background encompassing both Arabic and English.

Because English has a larger variety of consonant clusters than Arabic does, and because Arabic consonant clusters are often less complex (Alshalaan, 2020). English is chosen by the researcher as the study language rather than Arabic. Due to the relatively limited presence of words with initial and ending consonant clusters in Arabic, conducting a comprehensive investigation of these patterns within the Arabic language may present certain challenges.

3.2. Data Collection and Recording Techniques: Recorded Interviews

Interviewing the children and recording their responses is a reliable data collection method because it allows one-on-one interaction between profiler and respondents. The profiler's materials are simply scripts to read the dialogue from. The questions to ask the responding children are pre-determined to facilitate their uniformity and effectiveness in research (Lobe et al., 2020). The profiler is also required to have a mobile phone to record videos of the children for analysis later during the research. The research data collection procedure involves the researcher isolating one child at a time after engaging them in a dialogue or conversation to pick out the elements of the phonological awareness they need.

However, it is understandable that working with younger children can present attention span and patience challenges and may require shorter interview times to accommodate their needs. This could have limited the number of words the researcher could include in the sample dialogue, particularly if the children needed help with certain sounds or pronunciations. As a

result, the sample dialogue may have included fewer words with initial and final consonant clusters than the researcher would have liked. It is important to note that even a smaller sample can still provide useful insights into the patterns and tendencies of pronunciation in the language being studied.

4. Analyses, Models and Discussion of Results

The analyses, models, and discussion of results involve the use of OT tableaux, grids (histograms) of sonority levels, prosodic trees, and Hogg and McCully's (1987) model of sonority hierarchy. These tools facilitate a systematic examination of phonological patterns, deviations, and the organization of sonority within child language. The focus lies on consonant clusters in the onset or coda positions, with various simplification strategies being observed. The study utilizes prosodic trees to analyze the contextual factors influencing each process at the word level. Furthermore, it investigates whether children violate the SSP rule by overusing specific phonemes and whether they encounter difficulties in evaluating phonological correctness (Papakyritsis et al., 2019).

4.1. Hogg and McCully's (1987) Model of Sonority Hierarchy

The Sonority Hierarchy is a hierarchical sonority model proposed by Hogg and McCully (1987). It is a simple model that breaks down language sounds into levels. Hogg and McCully's model states that children start with simple categories, such as vowels and consonants, then move on to more complex patterns, such as syllable/foot/word (Anderson, 2018). In the table below, different sounds are ranked in terms of their sonority values

Sonority Values

Sounds	Sonority values
Low Vowels	10
Mid Vowels	9
High Vowels	8
Flaps	7
Laterals	6
Nasals	5
Voiced Fricative	4
Voiceless Fricatives	3
Voiced Stops	2
Voiceless Stops	1

4.2. Phonological Analysis within the Framework of Optimality Theory

OT provides a foundation for understanding how children, at a younger age, violate or flout the constraints of the sonority hierarchy as suggested by the SSP. The theory is chosen for phonological analysis due to its constraint-oriented framework. This framework seeks to manage the grammar of different languages worldwide, thus enabling the layman to better understand disorders present in speech. Exploring the theory of optimal tuning, this study looks at whether these constraints on speech development are violated in children's speech. It is later discussed if children's language learning (pronunciation) is affected by how fluent they are in English rather than the limitations of their native language.

4.3. Prosodic Morphology

Prosodic morphology is a subset of OT, which specializes in the analysis of words with respect to morphological templates (Dalrymple and Mycock, 2019). Every word is analyzed using a general template that consists of a prosodic word (PrWd), foot (ft), and the word's syllable (σ), which must contain at least one mora (μ). An illustration of the formed hierarchy is shown on the next page:

4.4. Types of the Simplification Strategies of Consonant Clusters

The types that are covered in this analysis are deletion, insertion, epenthesis, substitution (stopping), devoicing, palatalization, vocalization and glottalization.

Deletion is a type of elimination where the sound of one syllable is omitted, allowing smoother pronunciation (Moulidhanty and Wulandari, 2021). Often, the emitted sound is the unstressed syllable, resulting in a shorter version of the optimal word. Insertion is adding vowels and glides into the beginning or middle of words by moving the first constituent from its position to fill a gap created by another component. Insertion under the sonority principle is a term used to describe an instance in which the final consonant of a syllable is an obstruent or a sonorant.

Epenthesis involves the addition of one or more sounds in a constituent word. It occurs when an affricate consonant is substituted for an adjacent stop consonant in a language. The addition of a sound can involve vocal fold contact or oral cavity motion to produce speech sounds (Rahilly and Lowry, 2021). Stopping is the substitution of fricatives, stops and affricates with stops. For a stop sound to be articulated, there must be an abrupt release of air after completely stopping it (Ritchtsmeier, 2010). Another phonological process is glottalization, in which the glottal stop /ʔ/ gets substituted for the word-final consonant /t/ when they occur in the word-final position. It most commonly concerns the alveolar plosive (Czyżak et al., 2014).

Devoicing as a simplification strategy, voiced consonants get replaced with their voiceless counterparts. According to Dvořák (2010), devoicing can occur word-initially referred to as initial devoicing or word finally hence final devoicing. Palatalization is a phonological process violating the SSP rule whereby a sound is produced as a palatal rather than a non-palatal sound when there is a shift in the tongue's position (Hodson, 1980). Lastly, Vocalization is a process whereby a vowel replaces a liquid or nasal. Vocalization is an observed pattern of errors that developing children use to make a more straightforward speech as they cannot coordinate their auditory organs such as the jaws, tongue and lips (Horvath, 2008).

4.5. Analysis of the Performance of the Native Children

The analysis of native children's performance reveals a mixed adherence to and violation of the SSP. The findings indicate that while children generally follow the principle, they also employ simplification strategies when dealing with complex consonant clusters. This highlights the dynamic nature of phonological development in child language.

4.5.1. Deletion as a Violation of the SSP

Manure / mənjʊə/

The word "manure /mənjʊə/" has two syllables. The grid below represents the sonority hierarchy, with the two nuclei of the syllables being more sonorous than the other positions of the segments. There is a rise in sonority moving from the onset to the nucleus and a fall towards the coda of the syllable.

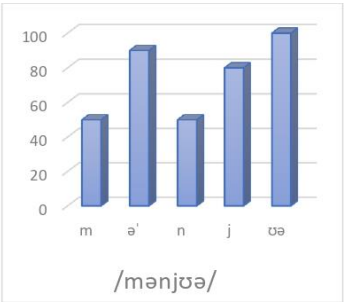


Figure 1: /mənjʊə/ grid.

Tableau 1: Consonant Cluster Simplification via the Omission of the Voiced Palatal Glide /j/.

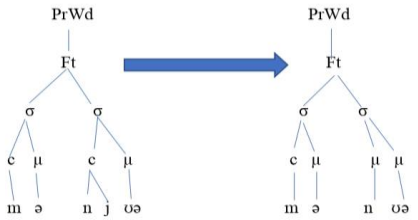
/mənjʊə/	Palatal	No palatal	MAX
a) mənjʊə	*!		
☞ b) mənʊə		*	*

Palatal>>No Palatal>>MAX

The tableau shows a violation of the SSP rule by the female subject No. (17) who omits the voiced palatal glide /j/ in her articulation of the word "manure". Candidate (a) is disregarded from the competition as it violates the highest-ranked constraint of Palatal. Candidate (b) is the winning candidate as it violates the lowest-ranked constraints of No palatal and MAX.

The tree to the left illustrates a well-formed output of the word "manure". The tree to the right is produced by the female subject No. (17).

manure /mənjʊə/



4.5.2. Insertion as a Violation of the SSP

1. Twelfth /twelfθ/

The word "twelfth /twelfθ/" presents very tense, energetic, and sharp sounds (Lopatina et al., 2021). The word has only one syllable. The grid below is a representation of sonority levels of

the monosyllabic word, whereby a rise in sonority is recorded towards the nucleus position of the word and a fall in sonority levels towards the coda position.

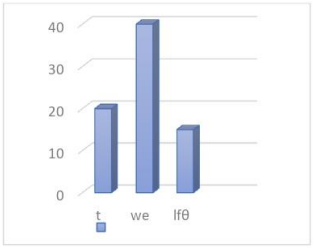


Figure 2: /twelfθ/ grid

Tableau 2: Consonant Cluster Simplification via the Insertion of the Short Vowel Sound /e/ in the Final Position.

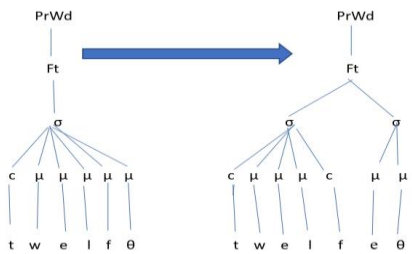
/twelfθ/	No Voiced	Voiced	DEP (v)	No Coda
a) twelfθ	*!			*
☞ b) twelfeθ		*	*	
c) twefθ	*!			*

NoVoiced>>Voiced>>DEP (v)>>No Coda

The word "twelfth" is monosyllabic. Violation of the SSP rule is produced by the male subject No. (20), aged six years, who inserts the short vowel /e/ between the voiceless labio-dental fricative /f/ and the voiceless dental fricative /θ/. Therefore, candidate (b) is the winning candidate since it violates the lowest-ranked constraints of Voiced and DEP (v). On the other hand, candidates (a) and (c) strongly violate the No Voiced and No Coda constraints, hence being eliminated from the competition.

The tree to the left illustrates a well-formed output of the correct pronunciation of the word "twelfth". The tree to the right is produced by the male subject No. (20).

twelfth /twelfθ/



4.5.3. Stopping (Substitution) as a Violation of the SSP

Three /θriː/

The word "three" is monosyllabic. The grid below shows the sonority in the word "three", whereby sonority rises from the dental fricative /θ/ to the alveolar approximant /r/ and keeps rising to the nucleus, which has the vowel hence the highest scale of sonority. The word "three" has no coda, so there is no fall of sonority.

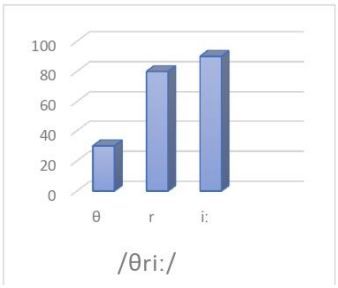


Figure 3: /θriː/ grid

Tableau 3: Consonant Cluster Simplification via the Substitution of the Voiceless Dental Fricative /θ/ with the Voiceless Alveolar Stop /t/.

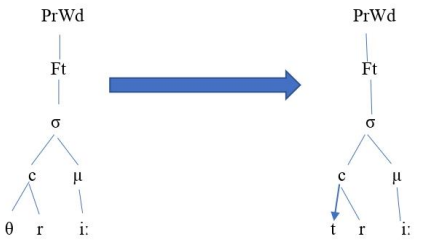
/θriː/	Alveolar	No Alveolar	IDENT (Place)
a) θriː	*!		
☞ b) triː		*	*

Alveolar>>No Alveolar>>IDENT (Place)

As observed by candidate (b), substitution occurs when the female subject No. (22) substitutes the dental fricative /θ/ with the alveolar stop /t/. Therefore, candidate (b) is the winning candidate since it violates the lowest-ranked constraints of No Alveolar and IDENT.

On the next page, the tree to the left illustrates a well-formed output of the correct pronunciation of the word "three". The tree to the right is produced by the female subject No. (22).

three /θriː/



4.5.4. Glottalization (Substitution) as a Violation of the SSP

At night /æt naIt/

The phrase "at night" has two syllables. The grid below illustrates the SSP rule that is moving towards the nucleus. The sonority level gradually rises and later falls from the nucleus to the coda position of the syllable.

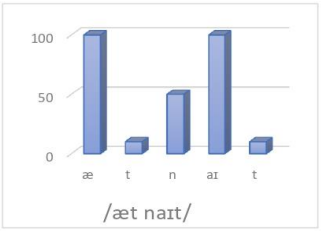


Figure 4: /æt naIt/ grid

Tableau 4: Consonant Cluster Simplification via the Substitution of the Voiceless Alveolar Plosive /t/ with the Glottal Stop /ʔ/

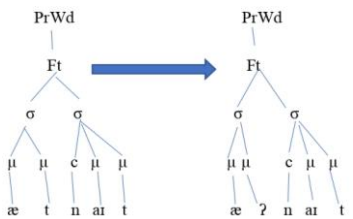
/æt naɪt/	Plosive	No Plosive	No Glottal	Glottal	IDENT (Manner)	IDENT (Place)
a) æt naɪt	*!		*			
☞ b) æʔ naɪt		*		*	*	*

Plosive>>No Plosive>>No Glottal>>Glottal>>IDENT (Manner)>>IDENT (Place)

Violation of the SSP rule is observed in the female subject No. (24) via substitution of the voiceless alveolar plosive /t/, at the coda position of the first syllable, with the glottal stop /ʔ/. In the tableau, candidate (a) is eliminated from the competition as it violates the highest constraint of Plosive. Candidate (b) is the winning candidate renders optimal as it violates the lowest-ranked constraints, No Plosive, Glottal IDENT (Manner) and IDENT (Place).

The tree to the left illustrates a well-formed output of the correct pronunciation of the phrase "at night". On the other hand, the tree to the right represents the deviated output produced by the female subject No. (24).

at night /æt naIt/



4.5.5. Palatalization as a Violation of the SSP

Would you /wʊd jʊ/

The phrase "would you" has two syllables. The grid, on the next page, represents the sonority hierarchy in the phrase "would you", whereby there is an increase in sonority towards the nuclei and a fall of sonority levels away from the nuclei towards the coda's position of the syllables.

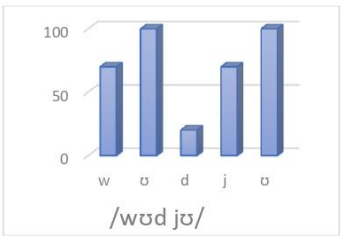


Figure 5: /wʊd jʊ/ grid.

Tableau 5: Consonant Cluster Reduction via the Assimilation of the Voiced Alveolar Plosive /d/ and the Voiced Palatal Approximant /j/ to the Voiced Postalveolar Affricate /dʒ/.

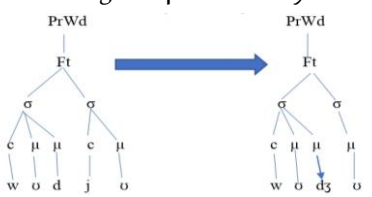
/wʊd jʊ/	Alveolar	No Alveolar	Palatal	No Palatal	Affricate	IDENT (Manner)	IDENT (Place)
a) wʊd jʊ	*!		*				
☞ b) wʊdʒʊ		*		*	*	*	*

Alveolar>>No Alveolar>>Palatal>>No Palatal>>Affricate>>IDENT(Manner)>>IDENT (Place)

The tableau above represents a violation of the SSP rule produced by the female subject no. (17). She assimilates the consonant cluster /d/ in the coda of the first syllable and the sound /j/ in the onset of the second syllable in the phrase "would you" to create the sound /dʒ/. Therefore, candidate (a) is eliminated from the competition due to violating the highest-ranked constraint of the Alveolar. Candidate (b) is marked optimal hence the winning candidate, as it violates the lowest-ranked constraints of No alveolar, No Palatal, Affricate, IDENT (manner), and IDENT (Place).

The tree to the left represents a well-formed output of the correct pronunciation of the bisyllabic phrase "would you", The tree to the right is produced by the female subject No. (17).

would you /wʊd jʊ/



4.5.6. Deaffrication as a Violation of the SSP

Matched /mætʃt /

The word "matched" has one syllable. The grid below clearly illustrates the sonorant hierarchy from the onset to the nucleus, which carries the vowel sound as is the most sonorant, and lastly, the coda, whereby their sonorant sequence falls with pronunciation.

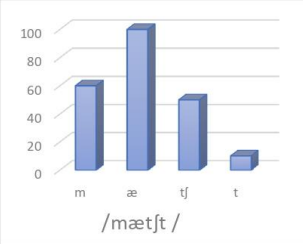


Figure 6: /mætʃt / grid Tableau 6: Consonant Cluster Simplification by Substituting of the Voiceless Postalveolar Affricate /tʃ/ with the Voiceless Postalveolar Fricative /ʃ/.

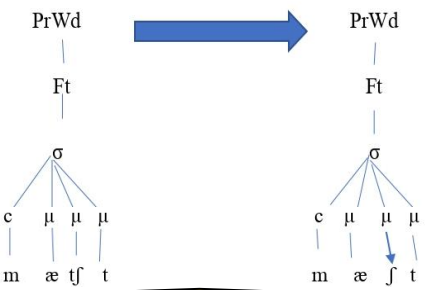
/mætʃt/	No Fricative	Fricative	IDENT (Manner)
a) mætʃt	*!		
☞ b) mæʃt		*	*
c) mætʃ	*!		

No Fricative>>Fricative>>IDENT(Manner)

Substitution occurs in the tableau when replacing the voiceless postalveolar affricate /tʃ/ with the voiceless postalveolar fricative /ʃ/ by the female subject No. (2). Candidates (a) and (c) are disregarded since they violate the highest-ranked constraint, No fricative. Candidate (b) is the winning Candidate since it violates the lowest-ranked constraints, Fricative and IDENT(Manner).

On the next page, the tree to the left illustrates a well-formed output of the correct pronunciation of the word "matched". The tree to the right is produced by the female subject No. (2). The arrow in the tree on the right shows the substituted sound.

matched /mætʃt/



4.5.7. Violation of the SSP via Multi-Process

Wanted /wɑntɪd/

The word "wanted" has two syllables. The violation of the SSP rule in this word occurs via deletion and substitution. The grid below represents sonority levels in the word "wanted". Two points mark the highest sonority levels, which is the nucleus of each syllable. There is an increase in sonority levels from the onset position of a syllable towards the nucleus. Also, there is a fall in sonority levels moving away from the nucleus towards the coda position of each syllable.

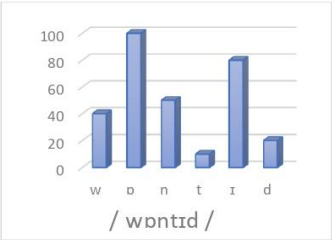


Figure 7: /wɑntɪd/ grid.

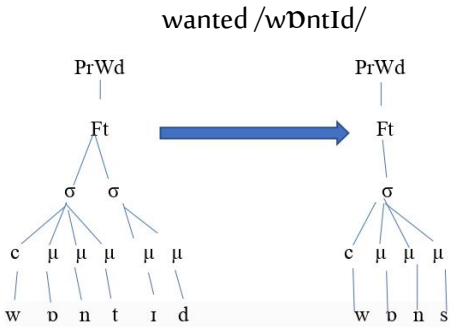
Tableau 7: Consonant Cluster Simplification Via the Omission of the Voiceless Alveolar Plosive /t/ in the Initial Consonant Position (Onset) of the Second Syllable and the Omission of the Whole Segment (Nucleus and Coda) in the Second Syllable and Substituting the Three Phonetic Structure CVC, with the Voiceless Alveolar Fricative /s/.

/wɒntɪd/	Plosive	Fricative	MAX	IDENT(Manner)	FtBIN
a) wɒntɪd	*!				
☞ b) wɒns		*	*	*	*

Plosive>>Fricative >>MAX>>IDENT (Manner)>>FtBIN

In the tableau, on the previous page, the voiceless alveolar plosive /t/ in the onset position of the second syllable and the whole segment (nucleus and coda) of the second syllable are omitted, which then are substituted by the voiceless alveolar fricative /s/ by the female subject No. (13). Candidate (a) gets eliminated from the competition as it violates the highest-ranked constraint of Plosive. Candidate (b) is the winning candidate as it violates most constraints but the lowest-ranked constraints of Fricative, MAX, IDENT(Manner), and FtBIN.

The tree to the left illustrates a well-formed output of the correct pronunciation of the word "wanted". The tree to the right demonstrates the violation as illustrated by the female subject No. (13).



4.6. Analysis of the Performance of the Native-Like Children

Native-like children exhibit a higher violation rate of the SSP compared to native children, suggesting potential difficulties in adhering to sonority sequencing patterns.

4.6.1. Deletion as a Violation of the SSP

Parents /peərənts/

The word "parents" has two syllables. The grid, on the next page, shows a presentation of the word "parents" with two instances where the sonority value rises in scale because of the rise in the first syllable at the nuclei position and the second syllable too.

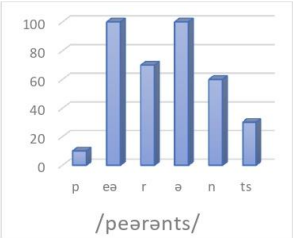


Figure 8: /peərənts/ grid

Tableau 8: Consonant Cluster Classification via the Omission of the Voiceless Alveolar Plosive /t/.

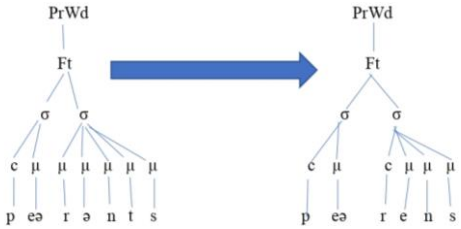
/peərənts/	Alveolar	No Alveolar	Max(c)
a) peərənts	*!		
☞ b) peərəns		*	*

Alveolar>> No Alveolar >>MAX(c)

The SSP rule is violated via the omission of the voiceless alveolar plosive /t/ as produced by the male subject No. (6). Candidate (a) is the disregarded since it violates the highest-ranked constraint, No alveolar. Candidate (b) is the winning candidate since it violates the lowest-

ranked constraints, the Alveolar and Max(c). The tree to the left illustrates the correct pronunciation of the word "parents". The tree to the right is produced by the male subject No. (6).

parents /peərənts/



4.6.2. Insertion as a Violation of the SSP

Scrunch /skrʌntʃ/

"Scrunch" is made up of only one syllable. Therefore, violation of the SSP rule via the insertion of different sounds in the word "scrunch" is recorded two times by other subjects. The grid below shows sonority levels in the word "scrunch" /skrʌntʃ/, whereby the most sonorous segment is at the vowel sound /ʌ/.

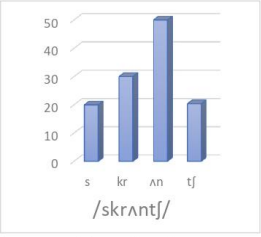


Figure 9: /skrʌntʃ/ grid

Tableau 9: Consonant Cluster Simplification by Inserting the Voiceless Glottal /h/

/skrʌntʃ/	No Glottal	Glottal	DEP (C)
a) skrʌntʃ	*!		
☞ b) skrʌhntʃ		*	*

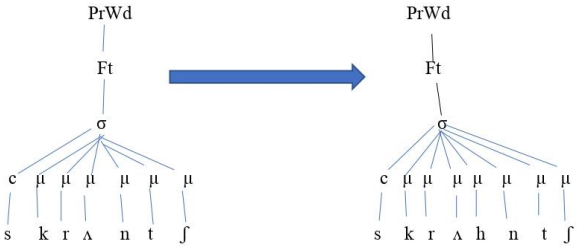
No glottal >> Glottal >>DEP (C)

Insertion occurs in this tableau with the addition of the voiceless glottal fricative /h/ by the male subject No. (4). Candidate (b) is clearly the winning candidate since it violates the lowest-ranked

constraints, DEP (C) and glottal. Conversely, candidate (a) is disregarded since it represents the well-formed output.

On the next page, the tree to the left illustrates a well-formed output of the correct pronunciation of the word "scrunch". The tree to the right is produced by the male subject No. (4).

scrunch /skrʌnt∫/



4.6.3. Stopping as a Violation of the SSP

On the /ɒn ðə/

The phrase "on the" is made up of two syllables. The female subject, No. (1) violates the SSP rule in this phrase whereby the voiced dental fricative /ð/ in "on the" /ɒn ðə/ is substituted with the voiced alveolar plosive /d/ to be / ɒn də /. This process is called stopping, which is a phonological process in which a fricative or an affricate sound is replaced by a stop sound (Vollmer, 2020). The grid below presents the sonority levels of the bisyllabic phrase "on the", whereby the first sonority is experienced at the first syllable, which lacks onset; hence the highest point of sonority is observed in the initial position of the phrase as it is represented by the short vowel /ɒ/ in the nucleus position; and, also, there is a high level of sonority at the nucleus position of the schwa sound /ə/ in the second syllable.

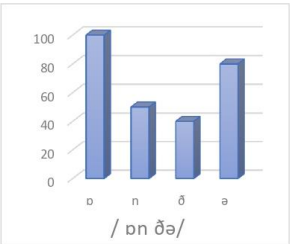


Figure 10: /ɒn ðə/ grid

Tableau 10: Consonant Cluster Simplification via the Substitution of the Voiced Dental Fricative /ð / with the Voiced Alveolar Plosive /d/.

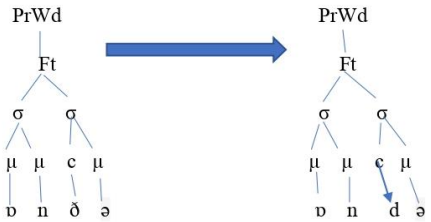
/ ɒn ðə/	Fricative	Plosive	IDENT (Manner)
a) ɒn ðə	*!		
☞ b) ɒn də		*	*

Fricative>>Plosive >>IDENT (Manner)

The female subject, No. (1), aged four years, violates the SSP rule by substituting the voiced dental fricative /ð/ with the voiced alveolar plosive /d/. Therefore, candidate (a) is eliminated from the competition as it violates the highest-ranked constraint, Fricative. Candidate (b) surfaces as the winning candidate since it violates the lowest-ranked constraints of Plosive and IDENT (Manner).

The tree to the left illustrates a well-formed output of the correct pronunciation of the phrase "on the." The tree to the right is produced by the female subject No. (1). The arrow on the right shows the substituted segment.

on the / ɒn ðə/



4.2.4. Glottalization as a Violation of the SSP

Without making /wIðaʊt meIkIŋ/

The phrase "without making" /wIðaʊt meIkIŋ/ has four syllables. The grid, in the next page, represents the sonority levels of the phrase "without making". In all four syllables, the sonority rises gradually from the onset to the nucleus and later drops down as it moves away from the nucleus. In the phrase, the vowel sounds /I/, /aʊ/, /eI/, and /I/ indicate the most sonorous levels in the phrase because they pose the nuclei of the four syllables.

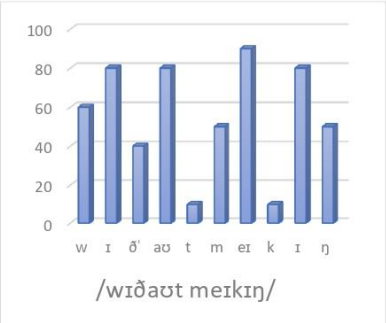


Figure 11: /wIðaʊt meIkIŋ/ grid

Tableau 11: Consonant Cluster Simplification Via the Substitution of the Voiceless Alveolar Plosive /t/ with the Glottal Stop /ʔ/.

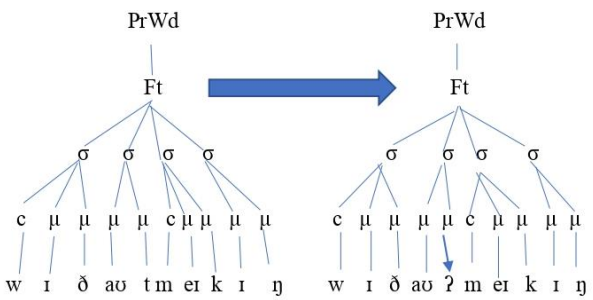
/wɪðaʊt meɪkɪŋ/	Plosive	No Plosive	No Glottal	Glottal	IDENT (Manner)	IDENT (Place)
a) wɪðaʊt meɪkɪŋ	*!		*			
☞b) wɪðaʊʔ meɪkɪŋ		*		*	*	*

Plosive>>No Plosive>>No Glottal>>Glottal>>IDENT (Manner)>>IDENT (Place)

In the tableau above, violation of the SSP rule is elicited in the substitution of the voiceless alveolar plosive /t/ with the glottal stop /ʔ/ evident by the male subject No. (9). Candidate (a) is eliminated from the competition as it violates the highest-ranked constraint of Plosive. Candidate (b) is the optimal candidate as it violates the four lowest ranked constraints of No plosive, Glottal, IDENT (Manner), and IDENT (Place).

On the next page, the tree to the left illustrates a well-formed output of the correct pronunciation of the phrase "without making." While the tree to the right is produced by the male subject No. (9).

without making /wIðaʊt meIkIŋ/



4.6.5. Devoicing as Violation of the SSP

Mind /maɪnd/

The word "mind" is monosyllabic. The grid below represents sonority levels in the word "mind", which records high levels of sonority in the nucleus position and a fall in sonority levels away from the nucleus towards the coda position.

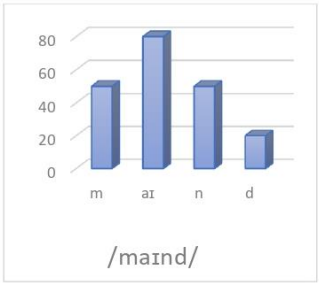


Figure 12: / maɪnd/grid

Tableau 12: Consonant Cluster Simplification via the Substitution of the Voiced Alveolar Plosive /d/ with the Voiceless Alveolar Plosive /t/.

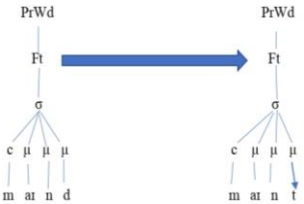
/maɪnd/	Voiced	No Voiced	IDENT (Voicing)
a) maɪnd	*!		
☞b) maɪnt		*	*

Voiced>>No Voiced>>IDENT (Voicing)

The tableau, on the previous page, represents the violation of the SSP rule as produced in the female subject No (14), who substitutes the voiced plosive /d/ with its voiceless plosive counterpart /t/, articulating the word "mind" /maɪnd/ as /maɪnt/. Given a target output of "mind", candidate (a) is eliminated from the competition by its fatal violation of the highly ranked constraint of Voiced. Candidate (b) is selected as the optimal even though it violates the two lowest- ranked constraints of No Voiced and IDENT (Voicing).

The tree to the left illustrates a well-formed output of the correct pronunciation of the word "mind". The tree to the right is produced by the female subject No. (14).

mind /maɪnd/



4.6.6. Palatalization as a Violation of the SSP

Did you /dɪd jʊ/

The phrase "did you" consists of two syllables. On the following page, the grid illustrates the levels of sonority in the sounds of the phrase "did you" /dɪd jʊ/. There is a rise in sonority levels from the onset position to the nucleus position, and a fall is also noted in the first syllable. In the second syllable, the same is noted; however, there is a fall in sonority levels as the second syllable lacks a coda segment.

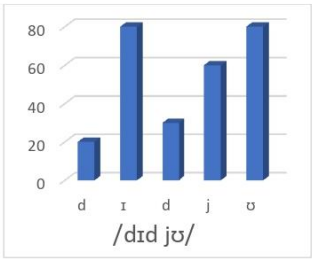


Figure 13: / dɪd jʊ/ grid

Tableau 13: Consonant Cluster Simplification via the Assimilation of the Voiced Alveolar Plosive /d/ and the Voiced Palatal Approximant /j/ to form the Voiced Postalveolar Affricate /dʒ/.

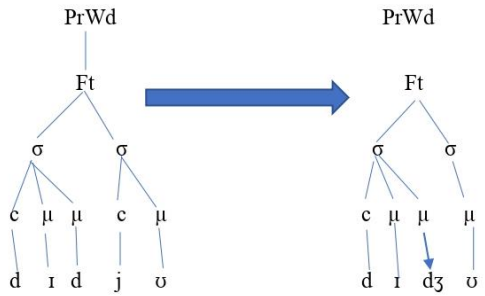
/dɪd jʊ/	Plosive	No Plosive	Glide	No Glide	IDENT (Place)	IDENT (Manner)
a) dɪd jʊ	*!		*			
☞ b) dɪdʒʊ		*		*	*	*

Plosive>>No Plosive>>Glide>>No Glide>>IDENT (Place)>>IDENT (Manner)

The tableau above represents the violation of the SSP rule in the male subject No. (19) who assimilates the voiced alveolar plosive /d/ with the voiced palatal glide (approximant) /j/ to form the voiced postalveolar affricate /dʒ/. The well-formed output (a) is pushed out of the competition due to a substantial violation of the highest constraint. Candidate (b) is elected as the winning candidate due to violating the lowest-ranked constraint of No Plosive, No Glide, IDENT (Place) and IDENT (Manner).

The tree to the left represents a well-formed output of the correct pronunciation of the bisyllabic phrase "did you". The tree to the right is produced by the male subject No. (19).

did you /dɪd jʊ/



4.6.7. Voicing as a Violation of the SSP

Practised /præktɪst/

The word "practised" has two syllables. The first syllable shows sonority in the short vowel /æ/, while both the onset and coda of the first syllable show a fall in sonority. In the second syllable, sonority is higher in the nucleus, /ɪ/, compared to its surroundings, which is the same syllable's onset and coda. This illustration is presented in the grid below. It is worth noting that the word "practised" was meant to be articulated by the profiler. Nevertheless, subject No. (11) articulates the word since he was repeating sentences the profiler would read.

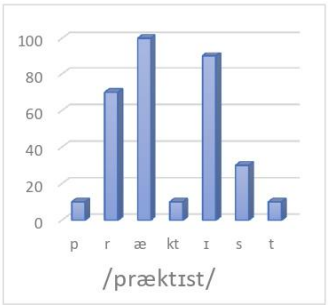


Figure 14: /præktɪst/ grid

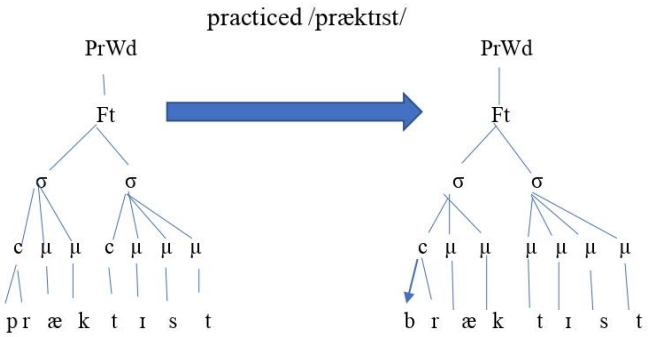
Tableau 14: Consonant Simplification via Substituting the Voiceless Bilabial Plosive /p/ with the Voiced Bilabial Plosive /b/.

/præktɪst/	Voiced	No Voiced	IDENT (Voicing)
a) præktɪst	*!		
☞ b) brækɪst		*	*

Voiced>>No Voiced>>IDENT (Voicing)

The voiced bilabial plosive /b/ is employed in the tableau in place of the voiceless bilabial plosive /p/ as an example of substitution. The violation of the SSP rule is observed in the male subject No. (11). Candidate (a) is disregarded since the output contains the highest-ranked constraint. Candidate (b) is the winning candidate since it violates the lowest-ranked constraints, the No Voiced and IDENT (Voicing).

The tree to the left illustrates a well-formed output of the correct pronunciation of the word "practised". The tree to the right is produced by the male subject No. (11).



4.6.8. Vocalization as a Violation of the SSP

Apple /æpl/

The word "apple" has two syllables. It is important to note that this word is not written in the sample dialogue with children; however, the male subject No. (21), aged six years, has articulated this word when he was asked, "What do you think leaves do when they fall from the tree?" and he responded by uttering *appo*, which meant the word "apple". The male subject No. (21) replied with the word "apple" /æpl/ due to the fact that he did not receive the expected answer to the question as per the dialogue with the profiler.

The grid, on the next page, represents sonority levels in the word "apple"/æpl/, whereby the word is marked with high levels of sonority as the word lacks an onset segment in the first syllable and the second syllable despite lacking a vowel sound, with the presence of the syllabic /l/ which carries the +voiced feature hence being sonorous and recording highest levels of sonority in the second syllable.

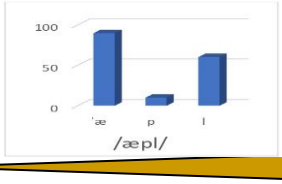


Figure 11: /æpl/ grid

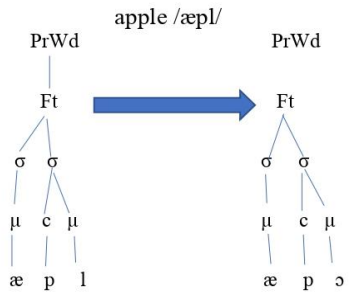
Tableau 15: Consonant Cluster Simplification via the Vocalization of the Voiced Alveolar Lateral-approximant /l/ with the Rounded Short Vowel /ɔ/

/æpl/	Lateral	No Lateral	Back	Central	Rounded	IDENT (Voicing)
a) æpl	*!					
☞ b) æpɔ		*	*	*	*	*

Lateral>>No Lateral>>Back>>Central>>Rounded>>IDENT (Voicing)

Violation of the SSP rule is observed in the male subject No. (21) who substitutes the vocalic sound /l/ in the coda position with a rounded vowel sound /ɔ/ hence articulating the word "apple" /æpl/ as "appo" / æpɔ /, a phonological process known as *vocalization* (Turton, 2017). Candidate (a), which is a well-formed output, is not part of the competition as it includes the highest violated constraint of Lateral. On the other hand, candidate (b) is the optimal output due to violating the lowest-ranked constraints of No Lateral, Back, Central, Rounded, and IDENT (Voicing).

The tree to the left illustrates a well-formed output of the correct pronunciation of the word "apple". The tree to the right is produced by the male subject No. (21). The arrow in the tree on the right shows the inserted vowel.



4.6.9. Violation of the SSP through Multi-Process

Interesting /IntrəstIŋ/

It is worth noting that the word "interesting" was meant to be articulated by the profiler. Nevertheless, subject No. (11) has articulated the word since he was repeating sentences the profiler would read. The word "interesting" is a tri-syllabic word. However, the word "interesting" can still have four syllables, but it has undergone a process of losing a syllable

which is referred to as *syncope* when one of the segments in a syllable is unstressed, whereby a schwa is deleted between a stressed and unstressed vowel, for example in words such as, "gen(e)ral" (Polgárdi, 2014).

The grid below represents the sonority hierarchy of the segments of the syllables in the word "interesting" /ɪntrəstɪŋ/. Sonority levels are observed to increase towards the nucleus position of the syllable from the onset of the syllable and decrease towards the coda position from the nucleus.

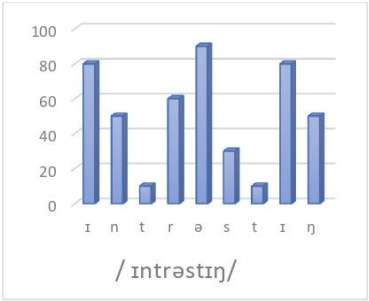


Figure 12: /ɪntrəstɪŋ/ grid.

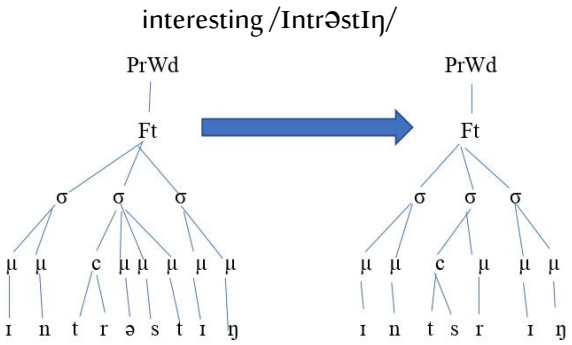
Tableau 16: Consonant Cluster Simplification via the Omission of the Voiced Alveolar Approximant (Rhotic) /r/ and the Substitution of the Voiceless Alveolar Plosive /t/ with the Voiced Alveolar Approximant (Rhotic) /r/.

/ mtrəstɪŋ/	Voiceless	No Voiceless	Rhotic R	MAX	NUC	IDENT (Voicing)	IDENT (Manner)
a) mtrəstɪŋ	*!		*				
☞b) mtsrɪŋ		*	*	*	*	*	*

Voiceless>>No Voiceless>>Rhotic R>>MAX>>NUC>>IDENT(Voicing)>>IDENT (Manner).

Violation of the SSP rule is observed in the performance of the male subject No. (11) who first omits the voiced alveolar approximant /r/ in the second syllable and the schwa vowel /ə/ in the second syllable. Lastly, he substitutes the voiceless alveolar plosive/t/ with the voiced alveolar approximant /r/. Candidate (a) is eliminated from the competition as it violates the highest-ranked constraint of the Voiceless. Candidate (b) is the winning candidate as it violates the lowest ranked constraints in the tableau.

The tree to the left illustrates a well-formed output of the correct pronunciation of the word "interesting". The tree to the right is produced by the male subject No. (11).



4.7. Discussion of Results

In the processes of deletion, glottalization, devoicing, palatalization and multi-processes, the female and male subjects recorded equal ratios, 50 % each. The male subjects occupy the most in the insertion simplification strategy process, occupying 87.5%, against the female subjects, who occupy the least of 12.5%, stopping being dominated by the female subjects occupying 66.7% and the male subjects occupying 33.3%. The male subjects occupy 100% of the total for vocalization and voicing, while the female subjects record 0%. Additionally, deaffrication is violated by one female subject occupying 100% and having no male subjects violating the simplification strategy.

The recorded mean is of 50 for each simplification strategy. The other calculation is concerned with the maximum and minimum values. the Max value and the Min value for the deletion, glottalization, devoicing, and palatalization are tied with 50 for each simplification strategy. This value is so because, in the mentioned simplification strategies above, 50 is the largest and also the smallest value. Stopping records a Max value of 67, while Min has a value of 33. Lastly, is insertion recording a Max of 88 and a Min of 12.

5. Conclusions

Based on the analysis of the data of the respective subjects via prosodic analysis and OT model, a number of findings emerged.

٥,١ . Optimality Findings

This study has shown the OT framework's adequacy in analysing the SSP in child language. This section on Optimality findings has answered one of the main objectives of the study in demonstrating how OT accounts for syllable-based processes.

a. Deletion in OT: In both native and native-like participants, the constraint responsible for deletion, MAX, plays a crucial role. In deletion, the positive form of the manner of articulation, place, and voice, for example, *Voiced*, is ranked the highest, followed by the negative form of the same form, *No Voiced*. In elision, the faithfulness constraint is ranked lowest to ensure that the output is not violated. Therefore, deletion is observed in the selected optimal candidate.

b. Epenthesis in OT: The violation of the SSP rules through epenthesis is governed by the DEP constraint, which is ranked higher in both native and native-like participants. The other constraint, *No Coda*, is ranked lowest. Most inserted segments are the vowels within consonant clusters to break the clusters. Children tend to avoid pronouncing consonant clusters to aid in the ease of articulation. OT explained this process through the requirement of the higher-ranked markedness constraints. The way the vowels have been inserted has also ensured a steady rise in sonority hierarchy within the syllable, preventing it from violating the SSP rule.

c. Stopping in OT: Stopping, observed in both native and native-like participants, involves the substitution of a stop sound with a fricative sound. This process is supported by the IDENT constraint, which ensures faithfulness to the input segment. The IDENT is a faithfulness constraint that prohibits alteration of the segment features in a syllable. In stopping, markedness constraints are ranked higher than the faithfulness constraint to allow the output that is the same as the input to be eliminated from the competition. The markedness constraint is the constraint of place or manner of articulation starting with "No", for example, *No Fricative*. The highest-ranked constraint has to be ranked the highest in the optimality tableau so that the output that falls under it would be fatally violated and leave space for the selected optimal candidate. The IDENT constraint is ranked lowest.

d. Glottalization in OT. Glottalization is an example of substitution supported by the IDENT constraint. Glottalization is observed only in native participants, specifically in the coda position of a syllable. Faithfulness constraints are ranked highest than the markedness constraint. The faithfulness constraint observed in glottalization is the constraint for place and manner of articulation. Unlike stopping, the *No Constraint* is the markedness constraint ranked second. For example, the alveolar constraint is ranked the highest, followed by *No Alveolar*. This determines

which generated subjects are dismissed from the competition; in glottalization, the IDENT constraint that takes control is the faithfulness constraint.

e. Devoicing in OT. Devoicing is a form of substitution process, and the constraint responsible is the IDENT. It is present in native-like participants only. In devoicing, the faithfulness constraint is ranked the highest, followed by the markedness constraint. Next, the voiced constraint is ranked highest, followed by the *No Voiced* constraint to eliminate the candidate whose output is the same as the input. This gives the violated word opportunity to be selected as the optimal candidate. Finally, the IDENT constraint is ranked lowest since it is a substitution.

f- Palatalization in OT. Palatalization falls under assimilation process, occurs in both native and native-like participants. The constraint responsible for assimilation is IDENT. The faithfulness constraint of manner or place of articulation is ranked highest than the markedness constraint. For example, the constraint *Alveolar* is ranked before the constraint *No Alveolar*. The constraint ranked the lowest responsible for the assimilation of the IDENT constraint.

g- Vocalization in OT. Vocalization is a substitution process, observed in the native-like participants only and the constraint responsible for vocalization is the IDENT constraint. The faithfulness constraint is ranked the highest compared with the markedness constraint. This ensures that the candidate with the same output as the input is eliminated from the competition. For example, the faithfulness constraint *Lateral* is ranked the highest, followed by the *No Lateral*, which is the markedness constraint. The faithfulness (constraint) ranked the lowest in the OT model is the IDENT constraint to ensure that the vocalized constraint is selected as optimal.

h- Voicing in OT. The faithfulness constraint Voiced is ranked the highest. meaning that any candidate that violates it is eliminated from the competition. Violation of the SSP in this process is only observed only in native-like participants. The markedness constraint of *No Voiced* is then ranked next. Finally, IDENT (Voicing) is ranked the lowest to ensure the output substituted from voiceless to voice as the marked optimal.

i- Deaffrication in OT. Deaffrication is a form of substitution falling within the IDENT constraint and is observed in native participants only. The markedness constraint is ranked the highest, while the faithfulness constraint is next. For example, the highest-ranked constraint is the *No Fricative*, and the *Fricative* constraint is ranked the next. Also, the IDENT constraint is

ranked lowest. This ensures that the well-formed output that is the same as the input is eliminated from the competition. The rankings also lead to the selection of the optimal candidate whose output was altered through the deaffrication process.

5.2. Prosodic Analysis Findings

The prosodic theory clearly operates within the framework of OT. The prosodic frame analyzes the selected words using two trees. The tree to the left illustrates a well-formed output of the correct pronunciation of the selected word, while the tree to the right represents the deviated output produced by the subject, which is marked optimal in the optimality tableau.

5.3. Recommendations

In view of the findings stated so far, the researcher recommends the following:

This study has captured a depth in the phonological processes that will pave the way for other studies and be accounted for within OT. Therefore, it can be used as a guide for studying the violations of the SSP under the framework of OT.

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