Positional Effects in Phonological Development: A Case Study

by

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A thesis submitted to the

School of Graduate Studies

in partial fulfillment of the

requirements for the degree of

Master of Arts

Department of Linguistics

Memorial University of Newfoundland

June 2006

St. John's Newfoundland

Abstract

This thesis investigates positional effects in the acquisition of English, based on a longitudinal case study. Analyses of the acquisition of voicing contrasts and cluster development in onsets are conducted. In addition, an acoustic analysis of Voice Onset Time (VOT) is performed on obstruent stops in singleton onsets in order to test the reliability of the multiple-blind transcriptions used in the corpus.

While the results were inconclusive with regards to positional effects, significant observations were made. First, the acoustic investigation reveals that manually transcribed data are a reliable means of analysis, especially when following a multiple-blind protocol. Second, the analysis of the acquisition of voicing in onsets reveals that voicing contrasts were acquired extremely early. This finding is further supported by a recent study by Kager et al.'s (in press). Finally, the investigation of the acquisition of onset clusters reveals that branching onsets and s+C clusters are acquired following independent paths.

Acknowledgements

First and foremost, I must thank Yvan Rose for taking a chance and believing in me and my abilities. Without his patience, words of encouragement, support and enthusiasm, as well as his knowledge and expertise, this thesis certainly would not be possible. I am indebted to Megan Maloney for sitting with me for weeks on end, hour after hour, in transcribing and validating the speech data. I express my gratitude to Marguerite MacKenzie for her support financially, in allowing me to work for her over the past two years. I am thankful for the teaching mentorship of Becky Childs. Her guidance, advice, and teaching example have been exceptional. I wish to thank my father, Cyril Parsons, for his incredible support and endless motivation, for believing in me, continuously pushing me to go further, and cheering me on along the way. Finally, I must thank four of the greatest girls, Lindsay Babcock, Christine Champdoizeau, Kimberley Churchill and Carla Dunphy, for making this ride more enjoyable with their humor, creating unforgettable memories, and building lasting friendships.

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Chapter 1 - Introduction

Several studies to date have found positional effects in adult phonological systems across languages (e.g. Lombardi 1999, de Lacey 1998, Zoll 1998, Beckman 1997). These effects refer to the observation that certain prosodic positions such as stressed versus unstressed syllables enhance or hinder the realization of segments and segmental sequences. For example, in adult English, vocalic contrasts are neutralized in non-prominent positions (e.g. unstressed syllables). Thus, the first vowels in the related words "Plato" and "platonic" have different realizations; the vowel is fully realized as [eɪ] in the stressed syllable of *Plato* ['pleɪɾo], while that same vowel is reduced to a schwa [ə] in the unstressed syllable of *platonic* [plə'tʰɑnɪk]. The implication from these studies is that we should expect positional effects to also manifest themselves in the development of child language. There has been some research providing evidence of such effects (e.g. Kehoe and Hilaire-Debove 2004, Inkelas and Rose 2003, Rose 2000). These studies raise the question as to whether these positional effects are generalized across children and target languages, or limited to specific children.

To address this question, I investigate the acquisition of voicing contrasts and the acquisition of onset clusters based on a longitudinal case study of the acquisition of English as a first language. The results of this investigation have implications from methodological, empirical and theoretical perspectives. First, the results of this investigation do not yield any clear indication that positional effects manifest themselves

across developing phonologies. Indeed, no such effects could be found in my case study.

Despite the lack of conclusive results with regard to positional effects, this thesis does produce a number of important results. The first of these relates to methods of investigation of child language phonology. More specifically, in chapter 4, I propose a discussion in which impressionistic versus acoustic methods of investigation are confronted. I first address the issue of 'covert contrasts', which some researchers argue discredits child language acquisition studies that are based on impressionistic transcription. Researchers such as Scobbie (1998) claim that a truly accurate account of child language development must include acoustic measurements to possibly account for the occurrence of covert contrasts. I demonstrate that despite the commonly held assumption that acoustic investigations are inherently more sound methodologically, these methods also present challenges, particularly in terms of data interpretation. In order to test this, I first carry out an investigation of the accuracy of transcribed data following a triple-blind protocol. This study provides supporting evidence that impressionistic transcriptions offer valid data, at least when they are conducted in an appropriate way such as the one discussed in this thesis. Second, an acoustic analysis of Voice Onset Time (VOT) is conducted. As we will see, while the measurements themselves provide firm data, their interpretation, which requires a certain degree of arbitrariness in categorizing the results, pose a significant methodological challenge. This situation directly affects the results, because it can lead to inconclusive or potentially unreliable interpretations of the data. Finally, a comparison of the relationship between inter-transcriber reliability and VOT is conducted.

Aside from these methodological considerations, I also conduct a study on the acquisition of voicing contrasts in singleton onset plosives. As we will see, such contrasts appear to be acquired very early in English. Indeed, the voicing errors found in the corpus are seldom. These errors primarily come from inaccurate voicing of a target voiceless consonant, and not vice versa. These results are compared with those of a recent study by Kager, van der Feest, Fikkert, Kerkhoff and Zamuner (in press) who report that the contrast is acquired early in English and German, but later in Dutch.

In addition, this thesis offers some significant findings in the area of prosodic development, specifically concerning the development of onset clusters. The results here indicate that the relative sonority of the segments involved in a cluster play a role in the development of s+C clusters (e.g. spear vs. sweat; skip vs. slip), but not in the development of branching onsets. In sum, the results of this investigation show that while branching onsets are all acquired at the same time, the level of sonority distance between the [s] and following consonant of the s+C cluster determines the order of acquisition. This suggests first that the two cluster types (s+C versus branching onset) must be analyzed independently, and, second, that the development of these clusters may be affected differently by constraints such as those regulating the sonority profile of the consonants forming the cluster.

Finally, it must be noted that despite common beliefs, this thesis offers one of the rare *longitudinal* studies on the development of phonology in English (cf. Smith 1973, Pater 1996). While some of the patterns documented in the next chapter have already been documented in other studies, I provide a quantitative and qualitative look at the

developmental facts from a longitudinal perspective. This method enables interpretation of the patterns in light of overall phonological development. This thesis thus adds a significant contribution to the existing body of evidence available in the scientific literature on phonological development.

The thesis is organized as follows. In chapter 2, I provide a review of the current literature on positional effects. Chapter 3 outlines the methodology adopted in the study. In chapter 4, I investigate the production of voicing contrasts based on both manually transcribed and acoustically measured data. In chapter 5, I examine the acquisition of branching onsets and s+C onsets. Finally, in chapter 6, I provide a summary of the main findings unveiled by this study, and offer concluding remarks as well as suggestions for further research in the area of phonological development.

Chapter 2 - Background Literature

2.1 Relevant Findings in Current Literature

As mentioned in the introduction, the primary goal of the current investigation is to document positional effects in child language. There are several sources in the current literature that discuss positional effects. While the majority of studies available focus on positional effects in adult languages, there are a number of works available that discuss the phenomena in child language. In section 2.2, I outline some of the main findings that relate to positional effects in the current literature on adult languages. In section 2.3, I review the findings from the literature on child language. In section 2.4, I provide a summary in which I compare the findings from adult and child languages.

2.2 Positional Effects in Adult Languages

2.2.1 Positional Faithfulness

The central generalization about positional effects in adult languages, is that phonological contrasts tend to be maintained more accurately in prosodically strong positions such as word-initial or stressed positions, while they tend to be partially or completely neutralized in prosodically weaker positions. This observation is describe din the literature on theoretical phonology as a positional faithfulness effect (e.g. Beckman 1997). As Beckman (1997) points out, marked contrasts are confined to positions in which they can be more easily discerned, such as in word-initial position, stressed syllables, long vowels, syllable onsets and syllable nuclei.

Providing additional evidence , Lombardi (1999) discusses positional faithfulness effects as the force behind such phenomena as laryngeal neutralization and voicing assimilation in obstruent clusters. For example, in German, devoicing of obstruents occurs in syllable-final position, while voicing contrasts among obstruents are fully maintained in onset position. This correlates with the fact that, across languages, onsets are typically better licensors of contrasts than other consonantal positions within the syllable (e.g. Itô 1986, cf. Steriade 2001).

Within Optimality Theory (OT; Prince and Smolensky 1993), Universal Grammar (UG) has provided each specific grammar with a set of constraints. Differences across languages are accounted for by the different ranking of these constraints according to each particular grammar. In the literature on OT, tableaux are used to determine which output form is acceptable according to the particular rankings of that language. Within the tableaux, the candidate productions that violate the constraints are marked by an asterisk (*), while those violations that eliminate the possible production from surface realization are marked with an exclamation (!). The constraint ranking which allows for the coda-onset asymmetry in German is illustrated in tableau (2.1) below. As we can see, the onset consonant must obey the highly-ranked faithfulness constraint IDOns, which states that onsets must be faithful to underlying voicing, even at the cost of violating the lower-ranked markedness constraint *Lar, which militates against the preservation of voicing contrasts. In contrast, the coda consonant in (2.1a), which falls outside of the scope of the IDOns constraint, undergoes the markedness effects of *Lar, this constraint

being itself ranked over the faithfulness constraint IDLar, which states that segments must be faithful to input voicing.

(2.1) Syllable Final Neutralization Ranking (German; Lombardi 1999)

	IDOns	*Lar	IDLar
a. /rad/			
[rad]		*!	
☞ [rat]			*
b. /gut/			
☞ [gut]		*	
[kut]	*!		*

Another positional effect can be found in assimilatory processes. Voicing assimilation occurs in languages such as Yiddish, as a result of the high ranking of the constraint AGREE, which states that obstruent clusters must agree in voicing, ranked over the constraints IDOns and IDLar. The tableau in (2.2) below demonstrates how this ranking can affect output forms.

(2.2) Direction of Voicing Assimilation (Yiddish; Lombardi 1999)

	Agree	IDOns	IDLar
/bakbeyn/			
a. [bak.beyn]	*!		
☞ b. [bag.beyn]			*
c. [bak.peyn]		*!	*

As we can see, obstruent clusters must obey the highly-ranked constraint AGREE, which states that obstruents in a cluster must agree in voicing. The cost of ranking the constraints in this order is that (2.2b) remains as the output form, as choices (2.2a) and

(2.2c) violate higher ranked constraints. Lombardi (1999) argues that these effects are present in several adult languages such as Polish, Dutch, Catalan, and Sanskrit.

2.2.2 Positional Markedness

Another positional effect attested in adult languages relates to the observation that complex segments and segmental sequences tend to occur more freely in prosodically strong positions than in weak positions. This tendency is referred to in the literature on theoretical phonology as positional markedness (e.g. de Lacy 1998, Zoll 1998). Theories of positional markedness predict that marked (i.e. complex or rarely-occurring) segments and segmental sequences must preferentially appear in prosodically strong positions. De Lacy (1998), for example, argues for the necessity of markedness constraints to regulate relative segmental sonority in prominent positions. De Lacy gives the example of sonority constraints on onsets in Campidanian Sardinian (CS). In this language, rhotics and glides are not allowed to occur word-initially, but may occur elsewhere. De Lacy provides the word for "rose", which originates from the Latin form "rosa", as "aroza" in CS. He claims that the markedness constraint *σ_1/MAR/rhotic, which states that rhotics cannot occur word-initially, is ranked above some relative faithfulness constraint.

Adopting a similar approach, Zoll (1998) argues, based on evidence from Hamer, a language in which metathesis and assimilation processes cannot be accounted for solely with positional faithfulness constraints, that positional markedness constraints are indispensable and a necessary component of grammar. In the same vein Smith (2000) proposes that augmentation effects, (i.e. processes whereby prominent positions are

enhanced by attracting prosodic complexity), are driven by markedness constraints making reference to prosodically strong positions. Similarly, Alber (2001) argues for positional constraints that favor the realization of output segments in word initial syllables. Finally, Recasens (2004) discusses the effect of syllable position on consonant cluster reduction in Catalan. He finds that cluster reduction occurs word-finally, while strengthening occurs word-initially.

2.2.3 Summary

From this brief survey, we can see that positional effects are pervasive in adult languages, in which they can take many different forms. In the next section, I introduce similar evidence, from the perspective of child language.

2.3 Positional Effects in Child Language

2.3.1 Positional Faithfulness

Effects similar to those observed in adult languages are attested in child language. A number of studies document positionally-determined effects in child phonologies, both within the word and within the syllable. For example, Rose (2000) provides evidence for positional effects in the productions of Québec French-learning children. He notes that at the stage when branching onsets first emerge, they are realized only in stressed syllables while being reduced to singleton onsets in unstressed positions. This asymmetry is exemplified in (2.3).

(2.3) Examples of Branching Onset Production in Stressed vs. Unstressed Positions

Stressed Position	(a) *glisse* '(s/he) slides' /**gl**ɪs/ → [**kl**ɪs]
	(b) *citrouille* 'pumpkin' /si**tχ**ʊj/ → [θəˈ**tχ**uːj]
Unstressed Position	(c) *glissade* '(a) slide' /**gl**isad/ → [**k**aˈsæd]
	(d) *trouvé* 'found' /**tχ**uve/ → [**t**ʊˈve]

As we can see in the examples above, the [gl] cluster is maintained in the stressed position in example (2.3a) of *glisse* '(s/he) slides', but reduced to [k] in example (2.3c) of *glissade* '(a) slide'. The same is true of the [tχ] cluster. In the stressed position, the cluster is fully realized in example (2.3b), *citrouille* 'pumpkin', but it is reduced to [t] in example (2.3d), *trouvé* 'found'.

Building on the Rose (2000) study, Kehoe and Hilaire-Debove (2004) attempt to determine whether consonant-glide-vowel (CGV) sequences are acquired differently than consonant-liquid-vowel (CLV) sequences by French learners. They address the question of how these two types of sequences are acquired from different perspectives, including that of positional faithfulness effects. They find that the French-learning children were more accurate in their productions of CGV sequences in stressed syllables than in unstressed syllables. In contrast, they did not find the same effect in the production of CLV sequences, failing to support Rose's (2000) initial findings. However, Kehoe and Hilaire-Debove's study is based on cross-sectional data, in contrast to Rose's longitudinal approach, a situation which may have led to discrepancies in the results, thereby explaining the differences between the two studies.

2.3.2 Truncation

Another manifestation of positional effects in child language comes from patterns of syllable truncation. Truncation is a common process in early word production whereby children reduce the size of multi-syllabic words down to a smaller number of syllables. For example, many children go through a stage during which they produce 'banana' as [ˈnæna]. In this example, the three-syllable word has been truncated to a two-syllable word. Children who display syllable truncation typically maintain prominent syllables such as the stressed and word-final syllables, while deleting syllables located in other, less prominent positions within the word (Pater 1997). For example, the word 'hippopotamus' [hɪpəˈpɑɾəmʊs] is often pronounced as [ˈpɑmʊs] by English-learning children. Truncation occurs in adult language as well. As we observe in English, unstressed (prosodically weak) syllables containing [ə] are often omitted from speech, for example in the word *about* [əˈbaʊt], which is often realized as [ˈbaʊt].

2.3.3 Positional Neutralization

In addition to preservation or deletion effects, positional effects can also manifest themselves in some of the emerging processes observed in child language. One clear example of this comes from Inkelas and Rose (2003) who discuss velar fronting (VF) as an effect of positional neutralization. This study is based on a diary corpus of a single English-learning child which reveals that at the stage when VF occurred, it was attested only in prosodically strong positions, such as word-initial onsets, and onsets of primary

and secondary stressed syllables. The table in (2.4a) provides examples of the VF process by position, while table (2.4b) provides examples of velar production in prosodically weak positions.

(2.4) Positionally-Determined Velar Fronting (Inkelas and Rose 2003)

a) Velar Fronting in Prosodically Strong Position

Position	**Production**	**Target Form**
Word-initial primary-stressed syllable onset	[ˈ**t**^{h}ʌp]	'cup'
Word-initial unstressed syllable onset	[**d**ʊˈdʊ]	'Gügü'
Word-medial primary-stressed syllable onset	[əˈ**d**ɪn]	'again'
Word-medial secondary-stressed syllable onset	[ˈhɛw̩**t**ɔptɛə]	'helicopter'

b) Velar Production in Prosodically Weak Position

Position	**Production**	**Target Form**
Word-medial unstressed syllable onset	[ˈbʌ**k**ɨt]	'bucket'
Word-internal coda	[ˈæ**k**ʧwi]	'actually'
Word-final consonant	[ˈbɪ**g**]	'big'

Inkelas and Rose argue that physiological constraints imposed by the shape of the child's immature vocal tract must be considered to explain VF. This process is, in fact, problematic from a theoretical point of view for two reasons. First, there are no attestations of VF in adult languages, an observation that already puts the phenomenon at odds with the literature on theoretical phonology. In addition, based on the findings such as the ones listed above from the literature on positional faithfulness and positional markedness, one would expect velar neutralization to a coronal in weak positions, but not in prosodically strong positions. By referring to physiological constraints such as the

relative largeness of the child's tongue especially with regard to the proportionally short palate, Inkelas and Rose propose that VF in strong positions is a result of the articulatory enhancement of velars in strong onset positions, which yields extended contact of the tongue body on the anterior portion of the palate into the coronal region. This articulatory enhancement is also evident in adult language (Fougeron and Keating 1996). However, because of the mature shape of the adult vocal tract, it does not result in neutralization patterns such as those observed in (2.4).

2.4 Summary and Comparison

It thus appears, from the brief review of positional effects in child language provided above, that there exist similarities between developing (child) and end-state (adult) systems. Both adults' and children's grammars appear to be sensitive to prosodic factors relating to various positions within the syllable and the word, which directly affects their phonologies. However, as alluded to above, the evidence from child language is often limited to cross-sectional studies, which prevent a truly developmental look into the phenomena observed, and to a handful of longitudinal case studies, which provide only a subset of the longitudinal evidence required for a full understanding of the positionally determined phenomena. To better understand the interaction between prosodic factors and phonological development, additional longitudinal studies of the acquisition of segmental sequences and contrasts across different prosodic positions are required. This thesis offers one step in this direction.

Chapter 3 - Methodology

3.1 Introduction

This chapter introduces the methodology adopted in this research. In section 3.2, I first discuss the data recording and transcription. I then discuss, in section 3.3, the method adopted for performing acoustic measurements of VOT in singleton onsets. In section 3.4, I describe the procedure for extraction and compilation of the data on the acquisition of onset clusters, as well as the method of phonological analysis of branching onsets.

3.2 Data Recording

The data analyzed in this study come from a corpus gathered with a North American, English-learning child named Sonya. Recordings of the child were conducted approximately every second week, between the child's ages of 1;04.18 and 2;06.02. The recording sessions were conducted in the child's everyday environment to capture spontaneous speech in a naturalistic setting.[1] A total of 3866 speech samples, most of which contain several words, were recorded. Thus, this corpus provides a sound basis to capture the most central aspects of the child's developing phonological system throughout the period covered by the study.

Sonya was recorded on TDK SA90 tapes while playing with toys or looking at picture books, using an analogue recording machine Marantz PMD221 with a multidirectional tabletop microphone Sound Grabber P2M-12-SG. The microphone was

[1] The recording and segmentation of the data were funded under an FCAR grant to Heather Goad at McGill University.

placed between the interviewer and Sonya on a foam cushion on the floor to reduce interfering noise from toys and movement. The recording sessions generally lasted between 20 and 45 minutes, occasionally for longer periods of time, depending on Sonya's mood and attention span on that particular day. However, in the case of a shorter session, the next recording session was held within less than two weeks whenever possible, to insure that the corpus was maximally representative of each important step in the child's phonological development. During the recording sessions, the interviewer focused mainly on allowing the child to produce spontaneous speech. At times, the interviewer also repeated the child's attempted words in order to facilitate the later identification of the words for data extraction and transcription.

Once the recording sessions were complete, the tapes were digitized using SoundEdit 16v2 in 16-bit sample size at a sample rate of 22.05 kHz. The digitized tokens were then labeled and imported into the database program *ChildPhon* (Rose 2003), which enables transcription, coding, and compilation of the tokens.

3.2.1 Transcription

As mentioned above, the corpus contains 3866 utterances, all of which have been transcribed as narrowly as possible using the standards of the International Phonetic Alphabet (IPA). The transcriptions were performed following a triple-blind protocol using Sony Dynamic Stereo headphones MDR-V600. Three native English transcribers performed full transcription on the corpus, without access to each other's transcriptions. This resulted in three sets of fully transcribed data. All transcriptions were then compared

and validated by two of the three transcribers, in order to attain the most accurate results possible. This validation process involved the two transcribers simultaneously listening to the utterances and reviewing all three corresponding phonetic transcriptions. Both transcribers had to agree upon one transcription for it to be validated. When the transcribers could not mutually agree on a suitable transcription, the transcription was modified until an agreement was reached.

3.3 Acoustic Analysis of Plosives in Singleton Onsets

An analysis of plosives in singleton onsets was carried out to capture the development of voicing contrasts in Sonya's speech. Consonant voicing was analyzed acoustically by measuring the VOT values of obstruent stops from spectrograms using *Praat* (http://www.fon.hum.uva.nl/praat/), a software program specialized for acoustic measurements of speech sounds. The acoustic analysis was performed manually on good quality speech samples from the first two-third portion of the corpus. Child speech is often difficult to analyze acoustically due to unusual phonetic properties such as formant structure, or to the high frequency pitch of child speech (Buder and Stoel-Gammon 1993). However, this problem was compensated for by acoustic measurement of a large amount of speech samples. In addition, the limitations inherent to child speech analysis mentioned above do not affect VOT measurement as much as they affect the measurement of vocalic properties such as vowel formant structure. Since VOT is the focus of the measurements performed in the current research, the technical difficulties

mentioned in Buder et al. (1996) do not significantly affect the results presented in chapter 4.

3.4 Data Compilation

Once the acoustic analyses were completed, the data were transferred to *Phon* (Rose, MacWhinney, Byrne, Hedlund, Maddocks, O'Brien and Wareham 2006) a new software program designed specifically for the study of child language. Using the query functions of *Phon*, production patterns of segment and segmental sequences were extracted according to each prosodic position that may be potentially relevant. Building on Inkelas and Rose (2003), I list, in (3.1), the six positions that were coded for. (Recall that the scope of my research does not include word-final consonants or consonant clusters.)

(3.1) Prosodic Positions that are Relevant for the Study of Positional Effects in Onsets

a. Word-initial primary-stressed syllable

b. Word-initial secondary-stressed syllable

c. Word-initial unstressed syllable

d. Word-medial primary-stressed syllable

e. Word-medial secondary-stressed syllable

f. Word-medial unstressed syllable

Note that there is no a priori reason to believe that all of these positions should necessarily influence the acquisition process. However, the exhaustive listing for onsets in (3.1) has the merit of enabling a systematic compilation of phonological behaviors of all relevant prosodic positions, several of which proved relevant in Inkelas and Rose's (2003) study of positional velar fronting (especially, the distinction between prosodically weak versus strong positions).

A systematic comparison of target utterances and actual renditions of these utterances allow for the accurate detection of the phonological processes found throughout the corpus. The consonantal sequences are analyzed based on the phonetic transcriptions. Consonant clusters are considered reduced when one or both of their consonants undergo deletion in the form produced by the child. When two consonants are produced, the classification is based on the phonetic make up of the consonants realized. For example, /tr/ → [t] is classified as 'second consonant deletion', /tr/ → [tw] is labeled as 'second consonant modification', where the target /r/ is substituted by [w], and /tr/ → [tr] is considered as 'target-like'. This aspect of my study is primarily concerned with the acquisition of prosodic constituents, irrespective of the actual phonetic make up of the consonants produced. However, this latter issue will be discussed whenever necessary.

The results are analyzed in light of the general hypothesis discussed in chapter 2, that prosodically strong positions are more likely to license, therefore to facilitate the acquisition of, segmental contrasts and segmental sequences. Conversely, prosodically weak positions are predicted to hinder the acquisition process.

In the next chapter, I demonstrate that despite general criticisms in the field of linguistics about the validity of the transcriptions used in child language acquisition studies, carefully transcribed data are useful and reliable. I also document the acquisition path of voicing contrasts in singleton onset plosives.

Chapter 4 - The Acquisition of Voicing Contrasts

4.1 Introduction

In recent years in the field of first language acquisition, there has been a lively debate on methodological considerations concerning the validity of transcription of child language production data as a reliable basis for research. Some linguists such as Scobbie (1998) argue that due to the phenomena of 'covert contrasts', i.e. linguistically-significant differences in speech sounds that are very difficult or impossible to perceive by the adult ear of even the most experienced transcribers, language acquisition data based solely on impressionistic transcriptions cannot be considered truly accurate. Such contrasts, however, can be acoustically measured in order to improve the quality of the transcriptions and, consequently, of the analyses that are based on these transcriptions. This line of argument suggests that a truly accurate account of child language development must include acoustic analyses, in order to detect the occurrence of potential covert contrasts.

In this chapter, I will challenge this argument and demonstrate that data transcribed carefully using a multiple-blind protocol are indeed useful and reveal a sufficient degree of detail to enable the analysis of production data. I will also discuss issues inherent to research based on acoustic analysis, especially with regard to the interpretation of acoustic data. While this chapter cannot be taken as a conclusive proof that transcription-based studies are always reliable, it will support the view that transcription data should not systematically be discarded as irrelevant for the study of language development. The general argument supporting my claim is based on a study of

voicing contrasts in singleton onset plosives [p, b, t, d, k, g]. In section 4.2, I discuss inter-transcriber reliability. Section 4.3 provides the results of my acoustic analysis of VOT of singleton onset plosives. In section 4.4, I discuss the relationship between the transcription based and acoustically measured data. Finally, in section 4.5, I investigate Sonya's acquisition of voicing contrasts in singleton onsets. This analysis is discussed in light of the recent work by Kager, van der Feest, Fikkert, Kerkhoff and Zamuner (in press).

4.2 Inter-transcriber Reliability

As mentioned above, the corpus used throughout this research consists of 3866 utterances, many of which contain two or more words. The transcription of these utterances followed a triple blind protocol, performed by three independent native English-speaking transcribers. Once the independent transcriptions were complete, they were validated by a team of two of the transcribers, who simultaneously assessed the competing transcriptions in order to attain the most accurate results possible. The transcription that was judged the most accurate was selected as the validated one. This transcription could be further modified whenever needed to ensure maximal accuracy as judged by the validation team. After completion of the validation process, the corpus was imported into a Microsoft Excel spreadsheet, which was used to perform a systematic comparison of the transcriptions, namely the individual transcriptions of each of the three transcribers involved, as well as the final, validated transcription that was attained by the validation team.

724 utterances containing stops in singleton onsets, both word-initially (WI; n=428) and word-medially (WM; n=296), separated according to position, and then ranked based on inter-transcriber agreement. This ranking process involved a four-way comparison of each utterance including each of the three separate (blind) transcriptions as well as the final validated transcription. When all three blind transcriptions of a given plosive had the same voicing as the corresponding plosive in the validated form, it was given a maximal rank of 3. If only two transcribers agreed with the voicing of the validated transcription, this token was given a rank of 2. Similarly, if only one transcriber agreed with the validated transcription on voicing, it was given a rank of 1. Finally, in only one case there was no agreement between the voicing of the validated form and any of the blindly-performed transcriptions. This exceptional token received a score of 0.

An example of this comparison is presented below, in (4.1), for which only two of the transcribers agreed on the voicing of [ɡ] in "go". In this example, and in further tables, the transcriptions of the three transcribers are labeled "Tr 1", "Tr 2" and "Tr 3", while the validated transcription is labeled "Validated". The orthography and target transcriptions are also provided.

(4.1) Agreement Rank of 2 for Consonant Voicing

Orthography	**Target**	**Tr 1**	**Tr 2**	**Tr 3**	**Validated**
go	[ɡow]	[ɡow]	[ɡow]	[kˌ]	[ˈɡɔ]

As we can see in the above example, transcribers 1 and 2 agreed on the voicing of [g] with the validated form.[2]

This classification provides strong evidence of inter-transcriber reliability, for both word-initial and word-medial singleton onset plosives, with overall agreement rates between 94% and 99%. The table in (4.2) provides a breakdown of the results.

(4.2) Inter-transcriber Reliability

Rank	**WI**	**WM**	**Total**
3	404	277	681
2	21	16	37
1	3	2	5
0	0	1	1
Total	428	296	724
Transcriber Reliability			
3/3	94.39%	93.58%	94.06%
2/3	99.30%	98.99%	99.17%

Out of the 724 singleton onset plosives sampled, all three transcribers agreed on the voicing of the transcribed plosive 94.06% of the time. Also, in 99.17% of the cases, at least 2 of the 3 transcribers agree on the voicing of the validated plosive. These values indicate that perceived voicing of plosives in onset positions, whether word-initial or word-medial, is highly reliable across transcribers. In only 6 instances, the inter-transcriber agreement is less than 2/3. These cases are listed in table (4.3) below. Five such examples received a score of 1, while only one case received a score of 0. This situation occurred during the validation process when the two transcribers listened

[2] The complete ranking for each token can be found in Appendix A.

simultaneously to the production. Both transcribers agreed that the voicing was incorrect in all three of the competing transcriptions, and both agreed to change the voicing in the newly validated transcription.

(4.3) Tokens for Which the Transcriber Agreement is Less Than 2/3

Ortho.	**Target**	**Tr 1**	**Tr 2**	**Tr 3**	**Validated**	**Rank**
dada	[ˈ**d**ædæ]	[ˈ**d**ɛdæʔ]	[ˈɛdæʔ]	[ˈ**t**ɛtɐʔ]	[ˈ**d**ɛdæʔ]	1
blanket	[ˈ**b**læŋkət]	[ˈ**b**ægij]	[ˈ**p**ædij]	[ˈaʲntʃˈ**p**æˌd͡zi]	[ʌjwãˈ**b**ædij]	1
blanket	[ˈ**b**læŋkət]	[ˈ**b**ædijː]	[ʌˈ**p**^{h}ædij]	[upˀˈ**p**ædʲiː]	[ɐ̃ʔˈ**b**ædiːj]	1
monkey	[ˈmʌŋ**k**ij]	[ˈmɪ**g**ij]	[ˈma**j****k**^{h}ij]	[ˈmɪkˀ**k**^{h}iʲ]	[ˈmejk.**g**ij]	1
apple	[ˈæ**p**əɬ]	[ˈæt^{h}æ**b**ɑ]	[ˈæt^{h}æ**t**ætˀ]	[ˈætæ**p**æʔ]	[ʔæt^{h}æ**b**æʔ]	1
cheapy	[əˈt͡ʃijpij]	[əˈt͡ʃijp^{h}ij]	[ʌˈt͡ʃijpij]	[ʔæˈʧipiː]	[ʔəˈt͡ʃijbij]	0

There are several issues that may have contributed to the exceptionally low agreement rates for each example above. The sound clip of the first example, “dada”, is very short, and the target sound [d] occurs almost immediately at the beginning of the clip, making it difficult to perceive. For both examples of “blanket”, background noise and static may have contributed to the low agreement amongst the transcribers. The example of “monkey” has a low agreement rate possibly because Sonya pauses briefly between syllables, as indicated by the period in the validated transcription, which made it difficult to perceive the correct voicing. The example of “apple” was uttered very quickly, making it difficult to perceive accurately. Finally, the example of “cheapy” also had background noise, which may have affected its perception.

In order to attain a more refined picture of which factors may have reduced inter-transcriber reliability, I also classified the rates of agreement based on segment and prosodic position. The results of these classifications are provided in (4.4).

(4.4) Total Inter-transcriber Agreement (3/3) per Segment and Prosodic Position

	WI-1	**WI-2**	**WI-U**	**WM-1**	**WM-2**	**WM-U**
[p]	99.18%	100%	100%	100%	94.44%	100%
[t]	100%	100%	100%	100%	100%	92.31%
[k]	99.24%	100%	100%	100%	100%	98.21%
[b]	93.44%	92.86%	95.83%	100%	91.67%	81.08%
[d]	96.76%	100%	95.45%	83.33%	75%	93.02%
[g]	92.68%	100%	71.43%	100%	100%	90.48%

(WI = word-initial; WM = word-medial; 1 = Primary Stress; 2 = Secondary Stress; U = unstressed)

The shaded areas in this chart indicate the few environments where the inter-transcriber agreement of 3/3 is less than 90%. As we can see, such situations occur only with voiced consonants. For the segment [d] in word-medial primary and secondary stressed positions, both lower agreement rates shaded in the chart come from only one score lower than 3/3. However, the agreement rate for both cases was still high at 2/3. Similar situations occur for [g] and [b] in unstressed positions. For the word-initial unstressed [g], the agreement is less than 3/3 in two of the seven tokens found, and, in those cases, the agreement is 2/3. Also, for the word-medial unstressed [b], there are 7 cases out of 37 where the inter-transcriber agreement is less than 3/3. For these cases, 5 have an agreement rate of 2/3, one utterance has an agreement of 1/3 and one example, discussed above, has 0/3 agreement. While the inter-transcriber agreement rates were very high overall, some segments such as [d], or positions such as word-initial unstressed, appear to negatively affect perception of voicing contrasts, if only in a marginal way.

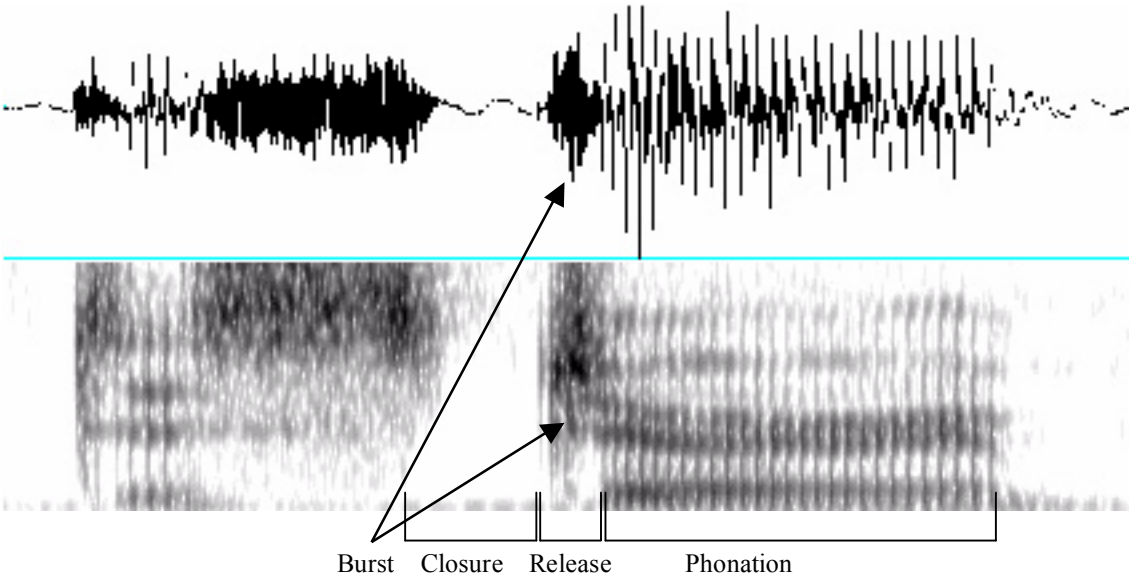
In order to further assess transcription reliability, I performed an acoustic analysis of the transcribed segments [p, b, t, d, k, g] in singleton onset position. This study is presented in the next section.

4.3 Acoustic Analysis of Transcribed Voicing

The second study conducted to investigate the issue of transcription reliability is based on acoustic measurements of those validated transcriptions that were used in the ranking for inter-transcriber reliability in section 4.2.

The acoustic cue that distinguishes voiced from voiceless stops is typically referred to as Voice Onset Time (VOT; e.g. Lisker and Abramson 1969). Taking a stop consonant+vowel sequence as an example, VOT is a value that represents the time period between the release of the stop consonant and the activation of the vocal folds required to produce voicing on the vowel. The diagram in (4.5) illustrates the visual cues associated with VOT. The closure phase is indicated by very drastic or total absence of spectral energy. The release phase is characterized by a burst in energy of relatively high frequency. Finally, the activation of the vocal folds in vowel production is indicated by semi-periodic vibrations whose various areas of intensity are observed through spectrographic formant structure.

(4.5) Measuring VOT on a Spectrogram



Each token was classified according to segment type ([p, b, t, d, k, g]), its position within the word (word-initial or word-medial), and stress (primary, secondary, unstressed). Segment type was based on the actual realization, not the target one, a method compatible with the goal of this portion of the study, which is to evaluate transcription accuracy using acoustic measurements of VOT.

Once the forms were collected and incorporated into separate Excel worksheets according to segment type, each token was measured for VOT using *Praat* (http://www.fon.hum.uva.nl/praat/), and the value, calculated in milliseconds, was entered in the corresponding worksheet, which can be found in Appendix B. After all of the measurements were complete, transcription accuracy was assessed quantitatively. The first step in this assessment consisted of extracting the mean and standard deviation of

VOT values per segment and prosodic position. The following table (4.6) illustrates the values according to each segment and prosodic position.

(4.6) Mean and Standard Deviation According to Segment and Position

	WI-1	**WI-2**	**WI-U**	**WM-1**	**WM-2**	**WM-U**
[p]	n = 122	n = 11	n = 4	n = 10	n = 18	n = 36
	m = 63	m = 51	m = 23	m = 51	m = 52	m = 49
	sd = 28	sd = 16	sd = 6	sd = 26	sd = 20	sd = 23
[t]	n = 135	n = 22	n = 9	n = 12	n = 6	n = 13
	m = 68	m = 65	m = 41	m = 71	m = 38	m = 51
	sd = 42	sd = 35	sd = 19	sd = 24	sd = 15	sd = 32
[k]	n = 131	n = 26	n = 13	n = 13	n = 13	n = 56
	m = 75	m = 57	m = 57	m = 72	m = 84	m = 60
	sd = 30	sd = 33	sd = 23	sd = 23	sd = 30	sd = 30
[b]	n = 122	n = 14	n = 24	n = 5	n = 12	n = 37
	m = 7	m = 5	m = 4	m = 6	m = 10	m = 6
	sd = 4	sd = 3	sd = 1	sd = 2	sd = 10	sd = 5
[d]	n = 185	n = 32	n = 44	n = 6	n = 8	n = 43
	m = 7	m = 7	m = 6	m = 6	m = 5	m = 6
	sd = 5	sd = 7	sd = 6	sd = 2	sd = 3	sd = 7
[g]	n = 41	n = 7	n = 15	n = 4	n = 1	n = 21
	m = 11	m = 5	m = 4	m = 6	m = 41	m = 7
	sd = 5	sd = 2	sd = 3	sd = 1	sd = n/a	sd = 3

(n = number of tokens; m = mean value; sd = standard deviation)

As we can see, the mean VOT for voiceless plosives is much higher than for voiced plosives. This is expected given that the range of VOT for a voiced plosive is close-ended; only a small degree of aspiration can be attained before a voiced stop begins to be perceived as voiceless. As opposed to this, the VOT for a voiceless plosive is virtually open-ended; both aspirated and strongly aspirated stops fall within the same, voiceless category. For the same reason, the standard deviation values for VOT of the voiceless

segments are much higher and more variable than those of the voiced segments. Finally, the shaded areas of the chart illustrate cases where the mean VOT stands apart from the mean VOT of the same segment for different positions. For example, the mean VOT for [p] in word-initial, unstressed position is 23 ms., which is much lower than the other mean values for [p] that are between 49 ms. and 63 ms. This value may have been obtained for a few of reasons. First of all, aspiration is typically lower in unstressed positions. Also, there are only 4 examples of [p] measured in this position, one of which falls in the "borderline" voicing category (see below), which may have affected the calculation of the mean. The next shaded example is of the plosive [g] in word-medial, secondary stressed position. Here, the mean VOT value is like that of a voiceless plosive. However, this is due to the fact that there was only one example of a transcribed word-medial, secondary stressed [g] in the sampled utterances, which had a VOT that was fairly high at 41 ms. This one occurrence represents a case of incorrect transcription (See discussion in section 4.4.3). Also, since there is only one example of a transcribed word-medial, secondary stressed [g], there is no standard deviation available. Other than these two problematic cases, the VOT measurements obtained look fairly consistent.

Now that the inter-transcriber agreement has been assessed, and the acoustic analysis of VOT is performed, the final step in determining transcription reliability is to document the relationship between transcription data and VOT values.

4.4 Relationship Between Transcription and VOT Values

To investigate the relationship between transcribed voicing and acoustically measured VOT values, the first step was to assign a standardized threshold to categorize the VOT values as being part of the voiceless or the voiced category. In order to determine what the arbitrary values should be, I first searched for normative data on VOT in English in the scientific literature. However, even though VOT is discussed at length in several books and articles, there is very little informative data on normative values for VOT in English. In addition, the few cases found yielded a situation that can be characterized as inconclusive at the very best. Ladefoged (2001: 127) states normative VOT for a stressed initial /p/ in English to be between 50-60 ms., while an initial /b/ should have a VOT of about 10 ms. This suggests that plosives whose VOT falls between 10 and 50 ms. have an undetermined status. In contrast to this, Shriberg and Kent (2003: 79) quote the normative English VOT values as less than 20 ms. for voiced stops, and between 30-80 ms. for voiceless stops, leaving the 20-30 ms. area unclear. Finally, Borden et al. (2003: 115) claim that English VOT values above 50 ms. represent voiceless stops, something similar to Ladefoged (2001), implicitly suggesting that values below 50 ms. will yield voiced plosives.

Given this rather unclear situation, and considering the fact that that VOT values are relative ones that are directly affected by factors such as stress, position, speech rate, emphasis, etc., I set arbitrary values that offer a compromise between the different standards proposed. These standards are discussed in section 4.4.1 below, followed by a

slightly revised set of standards in section 4.4.2. Finally, in section 4.4.3, I provide a comparison of transcription reliability and the acoustically measured data.

4.4.1 Initial VOT standards

The VOT standard values I first considered are as follows: VOT values equal or greater than 25 ms. are categorized as "voiceless"; values equal to or greater than 15 ms. and but lower than 25 ms. are categorized as "borderline"; VOT values below 15 ms. are categorized as "voiced". It is indeed understood that VOT is not a categorical value, but a gradient one. The "borderline" category is thus included to allow for a flexible approach to VOT data interpretation, which enables a more careful interpretation of the data. Table (4.7) below illustrates how the criteria for voicing categorization were implemented where "x" represents the acoustically measured VOT value.

(4.7) Criteria for Voicing Categorization

	Voicing Category		
	"Voiced"	**"Borderline"**	**"Voiceless"**
x = VOT value (ms.)	x < 15 ms.	15 ms. ≤ x < 25 ms.	x ≥ 25 ms.
e.g. [b] = 26 ms.			✓
e.g. [b] = 19 ms.		✓	
e.g. [b] = 10 ms.	✓		

The arbitrary values were then applied to every segment, in every prosodic position, in an effort to judge the accuracy of transcription. This was performed relative to transcription such that a transcribed [b] with a VOT value of 26 ms. was considered

"voiceless" and, therefore, transcribed incorrectly.[3] The table in (4.8) summarizes the results. The integers correspond to the number of tokens that fall in each category.

(4.8) Transcription Accuracy According to VOT Standards

	Voicing	**WI-1**	**WI-2**	**WI-U**	**WM-1**	**WM-2**	**WM-U**
[p]	Voiceless	111	10	1	10	17	33
	Borderline	7	1	3	0	1	3
	Voiced	4	0	0	0	0	0
[t]	Voiceless	130	22	6	12	5	10
	Borderline	5	0	3	0	1	2
	Voiced	0	0	0	0	0	1
[k]	Voiceless	127	25	13	13	13	49
	Borderline	3	1	0	0	0	3
	Voiced	1	0	0	0	0	4
[b]	Voiced	121	13	24	5	10	36
	Borderline	0	0	0	0	1	0
	Voiceless	1	1	0	0	1	1
[d]	Voiced	183	31	42	6	8	42
	Borderline	1	0	1	0	0	0
	Voiceless	1	1	1	0	0	1
[g]	Voiced	28	7	15	4	0	20
	Borderline	13	0	0	0	0	1
	Voiceless	0	0	0	1	0	0

These values can also be represented in terms of mean accuracy. In the following table (4.9), the accuracy is illustrated by percentage values. This includes the percentage of the transcriptions that were correctly transcribed according to the arbitrary values assigned,

[3] The complete set of corresponding data can be found in Appendix B.

as well as the percentage of transcriptions that were categorized as either correct or borderline.

(4.9) Transcription Accuracy Percentages

	Accuracy	**WI-1**	**WI-2**	**WI-U**	**WM-1**	**WM-2**	**WM-U**
[p]	Voiceless	90.98%	90.91%	25.00%	100%	94.44%	91.67%
	Voiceless + Borderline	96.72%	100%	100%	100%	100%	100.00
[t]	Voiceless	96.30%	100%	66.67%	100%	83.33%	76.92%
	Voiceless + Borderline	100%	100%	100%	100%	100%	92.31%
[k]	Voiceless	97.71%	96.15%	100%	100%	100%	87.50%
	Voiceless + Borderline	100%	100%	100%	100%	100%	92.86%
[b]	Voiced	99.18%	92.86%	100%	100%	83.33%	97.30%
	Voiced + Borderline	99.18%	92.86%	100%	100%	91.67%	97.30%
[d]	Voiced	98.92%	96.88%	95.45%	100%	100%	97.67%
	Voiced + Borderline	99.46%	96.88%	97.73%	100%	100%	97.67%
[g]	Voiced	68.29%	100%	100%	100%	0%	95.24%
	Voiced + Borderline	100%	100%	100%	100%	0%	100%

From the above data, it appears that transcription is least accurate in unstressed positions, both word-initially and word-medially. However, it must be noted that these results are based on the wrong premise that VOT perception is fixed irrespective of prosodic position. Indeed, it is often the case that VOT is lower in unstressed than in stressed positions (e.g. Fougeron and Keating 1997). It follows from this that the arbitrary VOT standards assigned should account for this observation. An example of this comes from an interview of Arthur Garfunkel during which he mentions the name of his band

Simon & Garfunkel. (*The Breakup*, Paul Simon *1964/1993* compilation box set.) In the production of the word 'Garfunkel', the word-initial, primary stressed and voiced [ɡ] has a VOT of 33 ms., which is larger than the word-medial, unstressed [k] at 24 ms. The consonants are however accurately perceived as [ɡ] and [k], respectively. This clearly illustrates the fact that the acoustic cue is not based solely on a fixed VOT value, rather that it interacts with prosodic position as well. This discussion continues in the following section.

4.4.2 Revised VOT standards

Building on the observations made in the previous section, I lowered all target VOT values for unstressed positions by 5 ms., in an attempt to take into account positional effects on VOT in my acoustic assessment. The revised target VOT values for categorizing plosives in unstressed position are thus as follows: a VOT value equal or greater than 20 ms. is categorized as "voiceless"; a value equal or greater than 10 ms., and less than 20 ms. is classified as "borderline"; those values less than 10 ms. are classified as "voiced". The classifications based on these new criteria are illustrated in table (4.10) below.

(4.10) Revised Criteria for Voicing Categorization

	Voicing Category		
	"Voiced"	**"Borderline"**	**"Voiceless"**
x = VOT value (ms.)	x < 10 ms.	10 ms. ≤ x < 20 ms.	x ≥ 20 ms.
e.g. [b] = 26 ms.			✓
e.g. [b] = 19 ms.		✓	
e.g. [b] = 9 ms.	✓		

By assigning these new value standards, the accuracy rate changed significantly. Table (4.11) below provides a comparison of the percentage of accuracy in unstressed position, according to both sets of VOT standards.

(4.11) Comparison of VOT Standards in Unstressed Positions

		Initial Targets		**Revised Targets**	
	Accuracy	**WI**	**WM**	**WI**	**WM**
[p]	Voiceless	25.00%	91.67%	75.00%	94.44%
	Voiceless + Borderline	100%	100.00	100%	100%
[t]	Voiceless	66.67%	76.92%	77.78%	84.62%
	Voiceless + Borderline	100%	92.31%	100%	100%
[k]	Voiceless	100%	87.50%	100%	89.29%
	Voiceless + Borderline	100%	92.86%	100%	96.43%
[b]	Voiced	100%	97.30%	100%	94.59%
	Voiced + Borderline	100%	97.30%	100%	97.30%
[d]	Voiced	95.45%	97.67%	95.45%	90.70%
	Voiced + Borderline	97.73%	97.67%	97.73%	97.67%
[g]	Voiced	100%	95.24%	86.67%	80.95%
	Voiced + Borderline	100%	100%	100%	100%

As can be seen in this table, the average accuracy shifts, at times quite drastically, with the new VOT target values. In fact, the revised values have both positive and negative impacts on the assessment scores, depending on the segments analyzed. For the voiceless segments, the new values have the positive effect of increasing accuracy as can certainly be seen word-initially for [p]. According to the initial target values, the accuracy of transcribing [p] correctly as "voiceless" was very low at 25%, however, with the new values, the accuracy increased to 75%. The new target values have the opposite effect on the voiced segments however. As with the transcribed [ɡ] as "voiced" in word-initial position, there was a transcription accuracy rate of 100% with the initial VOT targets. However, with the new targets, that accuracy has dropped to 86.67%. As we can see from this portion of the investigation, even the task of verifying transcription accuracy using acoustic measurements, a method which on the face of it appears to be methodologically reliable, yields a series of uncertainties in the interpretation of the results.

Two conclusions can be drawn from this. First, because of the issues raised in the above discussion, one cannot claim that impressionistic transcriptions should be considered methodologically inferior to that of using acoustic criteria, the latter requiring some degree of arbitrariness which directly affects the results. In contrast to this, given the high rates of inter-transcriber reliability demonstrated in section 4.1, it appears that the judgments obtained by transcribers do provide a sound basis for research, even if it does have its limitations. Second, because of the difficulties related to the provision of a clear criterion to assess voicing acoustically, this method also has problems which should not be neglected. VOT, like most acoustic parameters, can only be interpreted

dynamically while considering a series of interacting factors. Studies based on only one acoustic parameter are thus inherently limited, which poses problems for data interpretation that to a large extent, are comparable to those raised with impressionistic transcriptions.

4.4.3 Comparison of Transcription Reliability and VOT

Given the caveats discussed above, one of the most obvious solutions to the general methodological question discussed throughout this chapter is to combine transcription and acoustically-measured data. Such a combination would at least help in determining whether the contexts where difficulties are found (given either method) display some correlation. Following this line of thinking, I performed a comparison of inter-transcription agreement with VOT values. The logical assumption here is that the cases labeled as "borderline" in section 4.2 should be the cases where the most inter-transcriber disagreement occurs. However, this is not the case. As mentioned above, there are only six cases where the agreement is 1 or 0. In each of these cases, there are no "borderline" VOT values according to both the initial and revised sets of arbitrary VOT values discussed above. Table (4.12) below provides the results.

(4.12) Voicing Label and Inter-transcriber Agreement

Ortho.	Adult IPA	Child IPA	Rank	VOT(ms)	Label
dada	ˈ**d**ædæ	ˈ**d**ɛdæʔ	1	1.00	Voiced
apple	ˈæ**p**əɬ	ˈʔæt^{h}æ**b**æʔ	1	8.00	Voiced
blanket	ˈ**b**læŋkət	ˈ**b**ædiːj	1	7.00	Voiced
blanket	ˈ**b**læŋkət	ˈ**b**ædij	1	8.00	Voiced
monkey	ˈmʌŋ**k**ij	ˈmejk.**g**ij	1	41.00	Voiceless
cheapy	ˈt͡ʃijpij	ˈt͡ʃijbij	0	5.00	Voiced

The shaded examples in the above table represent unusual cases in the analysis. The example of "monkey" is shaded as the transcription was clearly incorrect. The incorrect perception, however, may have come from the fact that the child produced a geminate consonant broken into two halves by a short pause, something which is typically not allowed in the phonology of English and, as such, may have misled the transcribers. The second shaded example, the word "cheapy" received a rank of 0, as discussed in section 4.1 above. While the [b] in this word did receive a rank of 0, the validated process resulted in a transcription that corresponds to the VOT measurement in (4.12). In fact, apart from the example of "monkey", all of the validated forms have accurate voicing transcriptions according to the VOT values. While the inter-transcriber agreement was low for the voicing specification of the other plosives, the VOT values indicate accurate validation of the transcriptions.

Apart from the cases listed in (4.12), the vast majority of which support the claim that carefully performed impressionistic transcriptions are reliable, there are 32 cases word-initially, and 19 cases word-medially, where the VOT value falls in the "borderline" category, according to the new VOT standards listed in (4.10). Word-initially, the inter-transcriber reliability is 3/3 for 26 of 32 examples, for an average of

81%. The other 6 cases have an inter-transcriber agreement rate of 2/3. In word-medial position, 16 of the 19 examples (84%), have an inter-transcriber agreement rate of 3/3. The remaining 3 examples have an agreement rate of 2/3.

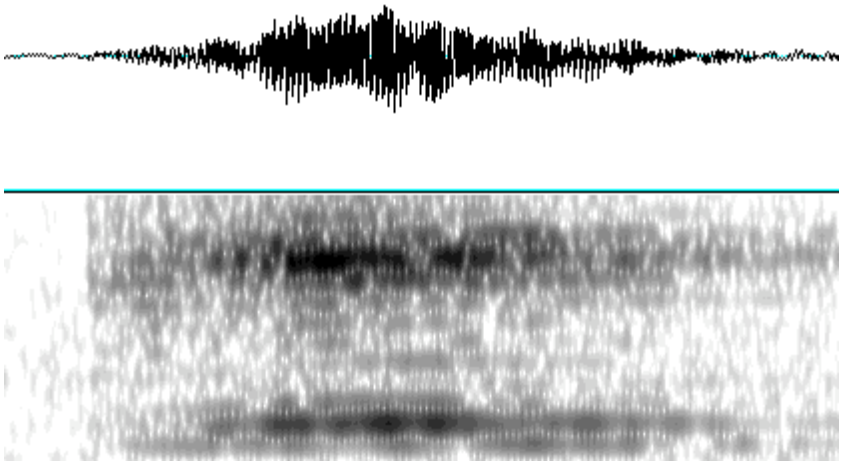
As can be concluded from the observations above, there are very few examples where the transcribed segment is incorrect (i.e., labeled voiceless but transcribed as voiced, and vice versa) according to the VOT targets. Word-initially, in primary stressed position, there are two such cases. The inter-transcriber agreements for these examples are 3/3 and 2/3, respectively. The following table (4.13) illustrates the cases of incorrect transcribed voicing word-initially, according to the voicing standards.

(4.13) Word-initial, Primary Stressed Examples of "Incorrect" Transcribed Voicing

	Age	**Ortho.**	**Adult IPA**	**Validated IPA**	**VOT (ms.)**	**Label**	**Rank**
[p]	1;10.10	peacock	ˈpʰi̞kʰɑk˺	ˈpʰij̞kʰɑkʰ	13	Vcd	3
[d]	1;09.11	that's a man	ðætsəmæn	dætʰam̩ˈmæ̃n	41	Vclss	2

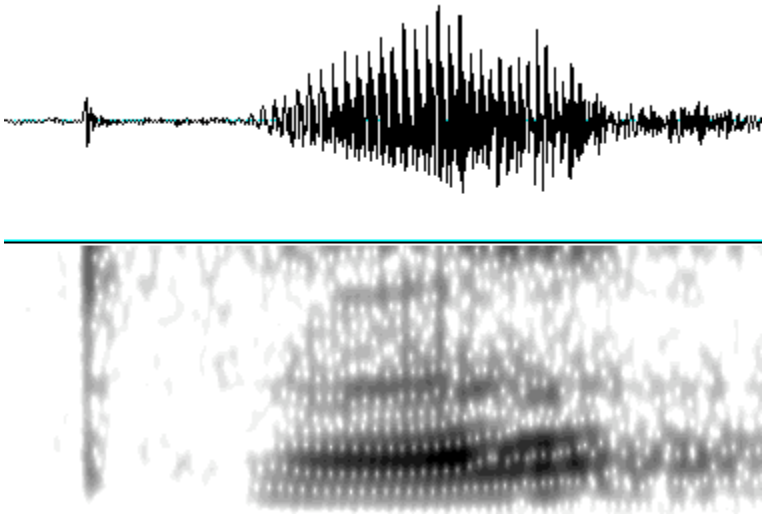
The first example, "peacock" was very difficult to measure. While the value decided on is 13 ms, additional attempts at measuring this example yielded other values. This is most likely due to noise that we can associate with a large quantity of saliva in Sonya's mouth during production, making for a pretty messy spectrogram, as can be seen with a screen shot illustrating the acoustic trace of the first syllable of this word below.

(4.14) Spectrogram of the First Syllable of ‘peacock’ (1;10.10)



As can be seen from this illustration, there is no clear visual cue that enables an unambiguous determination of the degree of aspiration in this example. In an attempt to further characterize this problematic case, two additional transcribers were asked to verify the voicing of the segment. Each of them concurred with the validated transcription, that the segment was indeed a voiceless [p]. I tentatively conclude from this that the apparent problem with this example actually emerges from the VOT measurement. For the second example, closer analysis of the spectrogram revealed that while the VOT of the segment is quite large at 41 ms, this time value is due to an apparent pause between the release of the stop and the initiation of phonation. What is particular about this relatively long pause is that there is no actual aspiration evident on the spectrogram. This virtually noise-free pause is represented in the spectrogram below.

(4.15) Spectrogram of the First Syllable of ‘that’s a man’ (1;09.11)



It is possible that this has misled the transcribers, who perceived a voiced [d] instead of [t].

Word-medially, there are three cases in which a segment is transcribed incorrectly according to the VOT standards. Of these examples, two have an inter-transcriber agreement rate of 2/3, and the final example has an agreement rate of 1/3. These examples are presented in (4.16).

(4.16) Word-medial Examples of “Incorrect” Transcribed Voicing

	Age	**Ortho.**	**Adult IPA**	**Validated IPA**	**VOT (ms.)**	**Label**	**Rank**
[b]	1;04.18	Peter	ˈpʰijt̬ɚ	ˈbʌˌbʊ.ɛʔ	38	Vclss	2
[b]	1;11.08	purple	ˈpʰɚ̬p̬l̬	ˈpʰʊbʌ	33	Vclss	2
[g]	1;08.11	monkey	ˈmʌŋki	ˈmejk.gij	41	Vclss	1

While no clear explanation can be provided for the first example, I hypothesize that it may originate from the fact that North American English speakers typically expect a flap for target [t] in this position, something which may have misled the transcription. While the second example is also incorrect, the transcription of the voiced [b] may be due to the high speed at which the word was uttered. which may have mislead the transcribers in perceiving a [b]. Finally, as discussed previously in section 4.4.3 above, the production of an unusual geminate consonant in "monkey" may have led the transcribers in perceiving a [g].

As we can see from the above tables (4.13) and (4.16), for the purposes of analyzing the acquisition of voicing based on transcription data, the occurrence of an incorrect transcription is pretty rare. Despite the one case where the inter-transcriber agreement was 3, the other instances of incorrect transcription have an agreement rate of 2 or 1. Given this observation, it makes sense to claim that transcription-based studies should make use of acoustic analysis as a tool to test the accuracy of transcription of the segments with low inter-transcriber agreement rates, as long as the problematic forms are recorded with sufficient clarity to prevent the generation of unreadable spectrograms.

The next section of this chapter focuses on Sonya's acquisition of voicing contrasts for plosives in singleton onsets. For the purposes of this next section, each of the examples of incorrect transcription in tables (4.13) and (4.16), as well as those in table (4.12), for which the inter-transcriber agreement is less than 2, are excluded from the analysis.

4.5 The acquisition of voicing contrasts for plosives in singleton onsets

One of the most substantial investigations of the acquisition of voicing contrasts to date comes from Kager, van der Feest, Fikkert, Kerkhoff and Zamuner (in press), who study the acquisition of voicing contrasts in three Germanic languages: Dutch, German and English. They conducted a cross-sectional study to investigate the issue in Dutch, using data from 11 monolingual Dutch children between the age ranges of 1;0 and 2;11. The findings from this portion of the study reveal that, overall, Dutch children acquire voicing contrasts at a late age, which the authors claim to be after 2;6, an age which corresponds to the end of their study but at which no clear evidence of voicing acquisition was found. Kager et al. also found that the children make more errors in producing voiceless segments in place of voiced segments word-initially. Note here that Dutch is a pre-voicing language, i.e. a language whose voiced consonants have negative VOT values, meaning that activation of the vocal folds occurs before the release of voiced plosives. Addressing this issue as a potential factor for the late acquisition of voicing contrasts, Kager et al. investigated the acquisition of contrasts in German, an aspiration language which, similar to English, displays positive VOT values for both voiced and voiceless consonants. To perform this portion of their investigation, they selected a longitudinal database from CHILDES (MacWhinney 1999) of a child named Kerstin (aged 1;3-3;4). They found that voicing errors come primarily from voiceless (aspirated) stops being realized as unaspirated (voiced) plosives. Despite this, the voicing contrast was acquired in initial position by the age of 2;0, i.e. much earlier than what could be observed from the Dutch corpus. Finally, Kager et al. studied the acquisition of

the voicing contrasts effects in English, a language similar to German by virtue of being an aspiration language, but which differs from German in that it does not have syllable-final voicing neutralization. The findings for English were in fact more complex than those for German. The authors found a high proportion of both voicing and devoicing errors in initial position. However, pushing further their investigation of this observation, they found that the initial devoicing errors were conditioned by a voiceless obstruent occurring later in the word, and that no such motivation occurred for the voicing errors.

Building on this study, I discuss, in the next section, Sonya's acquisition of voicing contrasts in singleton onset plosives. In section 4.4.1, I discuss the method used for this investigation. In section 4.4.2, I provide the results of this study. In section 4.4.3, I discuss these results and compare them to the ones from the Kager et al.'s (in press) study.

4.5.1 Method

The first step in investigating Sonya's acquisition of voicing contrasts of plosives in singleton onset position was to gather all utterances of target [p, b, t, d, k, g] contained in the corpus. This process was carried out by exporting all utterances into a Microsoft Excel worksheet, where they were sorted according to the position the singleton onset was in. During the second step, I labeled each utterance according to how the singleton onset plosive was realized in relation to the target form in terms of voicing. Each production had the option of being labeled in three different categories, "Target-like"

(TL), “Incorrect voicing” (Incorrect), and “Other”. Table (4.17) below provides illustrations of how these criteria were applied.

(4.17) Acquisition of Voicing Labels

Age	Ortho.	Target	Realization	TL	Incorrect	Other
1;04.18	cup	kʌp	ˈgʌʔ		✓	
1;04.18	Keesha	ˈkʰiʲʃə	ˈkʰijʃɪ	✓		
1;04.18	Babar	ˈbæbaɹ	ˈwɑwɑ			✓

In the above table, the target voiceless [k] is realized as voiced [ɡ], which is incorrect. In the second example, the voiceless [k] is realized as target-like. The final example illustrates the “other” category, in which the production of “Babar” as [wɑwɑ] does not resemble the target form’s singleton onset plosives in terms of voicing or manner of articulation in general.

Once the labeling of the singleton onset plosives was completed, quantitative analyses were conducted on the data in an attempt to document the acquisition path for Sonya. These results of the quantitative analysis are presented in the following section.

4.5.2 Results

Overall, Sonya appears to have acquired the voicing contrast at a very early age, even before the beginning of the recordings, at 1;04.18. This implies that Sonya acquired voicing contrasts in a much more precocious fashion than the Dutch, German and English children discussed by Kager et al. (in press). The general breakdowns for both word-initial and word-medial environments are presented in table (4.18) below.

(4.18) Mean Values for Voicing Contrasts

a) Word-initial

i) Attempted forms:	2156	
ii) Target-like:	2009	(93%)
iii) Incorrect:	33	(2%)
iv) Other:	114	(5%)

b) Word-medial

i) Attempted forms:	638	
ii) Target-like:	511	(80%)
iii) Incorrect:	35	(6%)
iv) Other:	92	(14%)

While her accuracy rate is very high for both positions from the initial recordings, her production varies slightly in word-initial, primary stressed, and word-medial, unstressed environments. In section 4.5.2.1 I will provide the results for all but these two positions. I will discuss these two positions in sections 4.5.2.2 and 4.5.2.3 respectively.

4.5.2.1 General observations

Excluding the word-initial, primary stressed and word-medial, unstressed positions, the remaining positions studied here display the same patterns. The rate of target-like production is very high, and the rate of incorrect voicing very low. I first provide a new chart, in (4.19), that illustrates the breakdown of production.

(4.19) Mean Values for Voicing contrasts, Excluding WI-1 and WM-U

a) Attempted forms:	109	
b) Target-like:	86	(79%)
c) Incorrect:	1	(1%)
d) Truncated forms	18	(17%)
e) Other:	4	(3%)

While it may appear that the accuracy rate is lower for these positions with target-like production at 79%, this value is a result of the high occurrence of "Truncated forms" at 17%. These truncated forms are all very systematic in that they all come from the deletion of word-initial, unstressed syllables (see Fikkert 1994 and Pater 1997 for additional discussion of truncation in child language). It is important to note that the rate of "incorrect" realization is very low, with only one occurrence at 1%. I provide relative examples of target-like production in table (4.20) below.

(4.20) Representative Examples of Target-like Production of Voicing Contrasts

Age	Orthography	Target	Realization	Position
1;05.00	gorilla	**g**əˈɹɪlə	ʊw**g**əˈwɛ.ə	WI-U
1;06.10	again	əˈ**g**ɛn	æˈ**g**ɛʔ	WM-1
1;08.22	guitar	gɪˈ**t**aɹ	ˈ**t**^{h}aː	WM-1
1;09.11	cucumber	ˈk^{h}jukʌmˌ**b**ə˞	ˈk^{h}ɐ̃ma**b**ɑː	WM-2
1;10.10	guitar	**g**əˈt^{h}aɹ	**g**əˈt^{h}ɑː	WI-U
2;00.04	reindeers	ˈɹeʲnˌ**d**iɹz	ˈɹejnˌ**d**ijʌdz	WM-2
2;05.12	Daniella	ˌ**d**ænˈjɛɬæ	ˌdæ̃nˈjɛlɑ	WI-2

As we can see from each of the above examples, Sonya produces each form with the correct voicing specification. Table (4.21) below provides representative examples of truncated forms.

(4.21) Truncation in Word-initial Unstressed Position

Age	Orthography	Target	Realization	Position
1;05.29	banana	**b**əˈnænə	ˈnæ̃n̩	WI-U
1;08.22	guitar	**g**ɪˈtaɹ	ˈtʰaː	WI-U
1;10.10	potato	**p**əˈtʰeˑjdow	ˈtʰejdow	WI-U

While positional effects are evident in word-initial position, with regard to truncation, this has no effect on voicing contrasts.

The remaining four forms that occur in the "other" category appear to be unsystematic mispronunciations. Table (4.22) below illustrates examples from the "other" category.

(4.22) Utterances in the "Other" Category for Voicing Contrasts

Age	Orthography	Target	Realization	Position
2;05.12	Daniella	ˌ**d**ænˈjɛlæ	nɛ̃nənɛʔˈjɛlɑ	WI-2
1;06.23	hippopotamus	ˌhɪpəˈpʰɑɾəmʌs	ˈwɛbʊtʰ	WM-1
2;03.17	about	əˈbawt	əˌwaw	WM-1
2;05.12	strawberries	ˈstɹɑˌbəɹiz	ˌtwɑwɛwij	WM-2

The example of "Daniella" appears to be a case where Sonya stutters while attempting to produce this word. This is the first time Sonya attempts this word in the corpus, and she appears to have some trouble with it. (Note however that in the corpus she immediately attempts the word again, and produces it accurately on her second attempt.) It appears that the example of "hippopotamus" may be a result of incorrect assignment of the orthographic form, since the realization resembles "rabbit" more than "hippopotamus". In any event, the actual form is so remote from the target one that no analysis can be based

on it. In the examples of "about" and "strawberry", the [b] is replaced by the sonorant [w], something that resembles another unsystematic pronunciation.

Finally, there is only one occurrence of an incorrect voicing realization. This occurs in the word-medial, primary stressed [t] of "guitar", at age 1;10.10. Example (4.23) illustrates the production.

(4.23) Incorrect Voicing in Word-medial Primary Stressed Position

Age	Orthography	Target	Realization
1;10.10	guitar	gə'**t**^{h}aɹ	gɛ'**d**ɑ

Since this is the only example in 109 attempts, of a production with the incorrect voicing, it should be considered an unsystematic mispronunciation. While there were a few mispronunciations of consonants illustrated above, the evidence clearly suggests that Sonya had already acquired voicing contrasts at the time when the first recordings of her speech took place.

The next section illustrates the findings for word-initial, primary stressed position. The data illustrates that the number of errors is relatively higher in this context, but the errors do show some degree of systematicity.

4.5.2.2 Word-initial primary stressed position

As stated in (4.24) below, the overall pattern of production for singleton onsets in word-initial, primary stressed position yields target-like voicing at a rate of 94%. We can see as well from these data that Sonya produced 33 voicing errors in this position. These errors

do not indicate that the voicing contrast has not been acquired, however. These errors are in fact scattered around the entire length of the corpus, thus not indicating a unique acquisition period. This fact suggest that Sonya has acquired the contrast in this position, despite some unsystematic productions, which only account for 2% of the overall data.

(4.24) Mean Values for Voicing Contrast in Word-initial Primary Stressed Position

a) Attempted forms:	2123	
b) Target-like:	1994	(94%)
c) Incorrect:	33	(2%)
d) Other:	96	(4%)

Of the 33 productions with incorrect voicing, 25 (76%) are voiceless targets realized as voiced, while the remaining eight display the opposite pattern. The table in (4.25) provides examples of such cases.

(4.25) Voiceless Targets Realized as Voiced in Word-initial, Primary Stressed Position

Age	Orthography	Target	Realization
1;04.18	cup	ˈ**k**ʌp	ˈ**g**ʌʔ
1;06.10	pig	ˈ**p**^{h}ɪg	ˈ**b**ij
1;09.26	tail	ˈ**t**^{h}eɹ̩ɬ	ˈ**d**ejəɬ
1;11.27	cozy	ˈ**k**^{h}owzi	ˈ**g**ɔd͡ʒij
2;03.03	turtle	ˈ**t**^{h}ɚ˞ɾɬ	ˈ**d**ɔdɑ

Each of the target voiceless, word-initial plosives [p, t, k] are realized as their voiced counterparts [b, d, ɡ]. This matches the observation made about voicing errors by Kager et al. (in press). Concerning the remaining eight examples, while Kager et al. found that the errors of devoicing a target voiced consonant were the result of a voicing harmony

pattern, no such conditioning was evident in devoicing errors from Sonya's corpus. Table (4.26) lists all of the occurrences of devoicing errors.

(4.26) Voiced Targets Realized as Voiceless in Word-initial Primary Stressed Position

Age	Orthography	Target	Realization
1;06.10	go	ˈ**g**ow	ˈ**k**^{h}oːw
1;07.27	bicycle	ˈ**b**ajsɪˌkl̩	ˈ**p**^{h}owˌt^{h}ʌ
1;09.11	diaper	ˈ**d**ajpɚ	ˈ**t**^{h}ɛpɛʔ
1;11.27	daddy	ˈ**d**ædi	ˈ**t**^{h}æ̃nij
1;11.27	guys	ˈ**g**ajz	ˈ**k**aj
1;11.27	guy	ˈ**g**aj	ˈ**k**^{h}ʌs
2;02.03	barn	ˈ**b**aɹn	ˈ**p**^{h}ɑ̃ːn
2;06.02	do	ˈ**d**uw	ˈ**t**^{h}uw

As we can see, except for the examples of "bicycle" and "diaper" above, there are no indications that voicing harmony is involved.

There is an additional situation occurring word-initially with the labeled "other". As we can see from the above numbers in (4.24), there are a total of 94 productions in this category. These productions are in this category for various reasons. In several productions, the target consonant is omitted, while, in others, it is substituted by a sonorant consonant. The following chart (4.27) provides representative examples of such productions.

(4.27) Representative Examples of Productions in the "Other" Category

Age	Orthography	Target	Realization
1;06.10	bean	**b**ijn	ˈʔɪj
1;08.06	cow	**k**^{h}aw	ˈhɑw
1;09.11	boat	**b**owt˺	ˈwowt^{h}
1;10.10	give to mom	gɪv**t**əmɑm	ˈgɪvəˌmɑ̃mij
1;10.24	cat	**k**^{h}æt˺	ˈæt^{h}
2;03.17	don't wanna	**d**ownʔwɑnə	ʔõwʔˈwɑ̃nə

Note as well that function words such as "to", "do", and "don't" ended up in this category quite often. I attribute this observation to the immature syntax of the child at the time of recording, which also correlates with the fact that these positions are often reduced in adult speech.

In the next section, I discuss the patterns found in word-medial, unstressed position.

4.5.2.3 Word-medial unstressed position

There are a total of 565 productions in word-medial unstressed onsets, 441 of which are target-like. However, there are several productions that are not target-like, many of which have the incorrect voicing label, or fall in the 'other' category. The relative proportions of each of these categories are provided in table (4.28) below.

(4.28) Mean Values for Production in Word-medial Unstressed Position

a) Attempted forms:	565	
b) Target-like:	441	(78%)
c) Incorrect:	35	(6%)
d) Other:	89	(16%)

As the above table indicates, the attempted word-medial, unstressed singleton onset plosives are realized as target-like in 78% of the productions. Sonya realizes the plosive with incorrect voicing in 35 utterances (6%), or in some unsystematic fashion in 89 utterances (16%). I will discuss each production type in turn, first by illustrating examples of target-like production in table (4.29) below.

(4.29) Target-like Production in Word-medial Unstressed Position

Age	**Orthography**	**Target**	**Realization**
1;04.18	dada	ˈdæ**d**æ	ˈdɛ**d**æʔ
1;04.18	Babar	ˈbæ**b**aɹ	ˈbæ**b**ʌʔ
1;05.29	apple	ˈæ**p**ɨ	ˈ**p**^{h}ʌ
1;06.23	monkey	ʌˈmʌŋ**k**ij	ˈʊʔˌmɐ̃ŋ**k**^{h}ej
1;08.06	purple	ˈp^{h}ɚ˞**p**ɨ	ˈp^{h}ʌˌ**p**ʊ
1;08.22	newspaper	ˈnuwzˌp^{h}eʲ**p**ɚ˞	ˈɔwp^{h}ɑ**p**^{h}ɑ
1;09.11	crocodile	ˈk^{h}ɹɑ**k**^{h}əˌdajəɬ	ˈk^{h}ɑ**k**^{h}əˌdajvə
1;09.11	mango	ˈmæŋ**g**ow	ˈmɛ̃**g**ow
1;09.26	working	maʲwɚ˞**k**ɪŋ	ˈmajˌwʊ**k**^{h}ɪ̃nə
2;00.04	chicken	ˈtʃɪ**k**n̩	ˈt͡ʃɪ**k**^{h}ɪ̃

As we can see in the table above, the word-medial unstressed plosive in each of these words was realized with target-like voicing, even at the beginning of the corpus at 1;04.18. However, as mentioned above, there are 35 examples in which voicing is incorrectly produced. Similar to the incorrect voicing realizations for word-initial primary stressed position, the majority of these, 33, are voiceless targets that are realized as voiced when produced. Table (4.30) below illustrates representative examples of incorrect voicing realization.

(4.30) Voiceless Targets Realized as Voiced in WM-U

Age	Orthography	Target	Realization
1;08.11	blanket	ˈaʲwɑntˀˌblæŋ**k**ɪt	ʌjwãˈbæ**d**ij
1;08.22	Mikey	ænˈmaʲ**k**i	ɛtˀˈnaj**g**ij
1;09.11	hippo	ðætsəhɪ**p**ow	dæsaˈbɐ̃mˌ**b**ow
1;11.08	purple	ˈpʰəˑ**p**ɬ̩	ˈpʰʊ**b**ʌ
2;02.03	Ichobad	ˈɪ**k**əbɑd	ɪ**g**əˈbɑːd
2;03.27	pickle	ˈpʰɪ**k**ɬ	ˈpʰɪ**g**ow
2;05.25	paper	ˈpʰej**p**əˑ	əˈpʰij**b**a
2;05.25	chicken	ˈtʃɪ**k**n̩	əˌt͡ʃɪˈ**g**ĩn
2;05.25	a cakey	ˈkʰej**k**ij	ʌˈkʰejˌ**g**ij

Notice that a large number of the examples of incorrect voicing actually originate from a handful of words. Indeed, the [k] in "blanket" is realized as [ɡ] three times, the word-medial [p] in "purple" is realized as [b] five times, and the [p] in "hippo" is realized as [b] eight times. The latter example, "hippo" appears to be a special case that Sonya frequently produces as either [ˈbɐ̃mˌbow] or [ˈpʰɐ̃mˌbow]. This observation suggest that this particular example should probably be attributed to a misrepresentation of the word in the child's lexicon, as opposed to an incorrect rendition of an accurately-represented contrast.

Finally, there are quite a few productions that are classified in the 'other' category. The words classified in this category are affected by processes such as syllable truncation, flapping, substitution, or deletion. I list each pattern, provide its relative proportion and realization in table (4.31) below.

(4.31) Patterns of Production in the "Other" Category in WM-U

Pattern	**Number**	**Target**	**Realization**
Substitution	17 (19%)	*dada* [ˈdæ**d**æ]	[ˈdɛˌ**l**ø]
Plosive Deletion	17 (19%)	*sugar* [ˈʃʌ**g**ɚ]	[ˈdʊˌow]
Truncation	16 (18%)	*teddy bear* [ˈtɛ**d**iˌbɛɹ]	[əˈtʰejðɑ]
Hypochoristic	15 (17%)	*noodles* [ˈnu**d**əɬz]	[ˈnuwˌnuw]
Flapping	12 (13%)	*dada* [ˈdæ**d**æ]	[ˈdæ**ɾ**æ]
Other	11 (12%)	*dragonfly* [ˈdɹægənflaj]	[ˈɛmɪhĩ]

In this set of exceptional data, 15 examples of hypochoristic forms are attested, eight of which are of the word "noodles", which she regularly produces as [nuwnuw]. There are also 12 examples of flapping, which is common for coronal plosives in word-medial unstressed position. Example utterances from this category include "dada", "ladder", "feeding", and "party". Finally, there are several unclassifiable examples that were put in the other category. Examples of this type include the realization of "dragonfly" above being realized as [ˈɛmɪhĩ].

We can conclude from all of the observations above that, overall, Sonya is very efficient in producing the correct voicing specification, not only in word-medial, unstressed position, but in all of the other positions covered in this chapter as well. While Sonya has a slightly higher error rate in word-initial, primary stressed position and word-medial, unstressed position, she appears to have acquired the contrast since the beginning of the corpus, even in these positions

In the next section, I summarize and discuss the results obtained in the various sub-parts of the investigation presented in this chapter.

4.6 Discussion

In sections 4.2 through 4.4, I provided a reflection in which impressionistic versus acoustic methods of analysis are confronted. I demonstrated that while many researchers assume that acoustic investigations are essentially more reliable methodologically, methods of acoustic analysis also have their challenges, especially in data interpretation. In section 4.2, I illustrated that a multiple-blind method of data transcription, when combined with a team-based method of data validation, does provide a reliable transcription-based empirical foundation for research in phonological development. In section 4.3, I demonstrated that challenges related to the interpretation of the acoustically-measured VOT, which include the need for an arbitrary threshold to classify the data on voicing contrasts, may directly affect the interpretation of the results. In section 4.4, I demonstrated that while we expect a correlation between borderline VOT values and low inter-transcriber agreement, this is not the case. However, the segments that were transcribed incorrectly, according to the VOT standards, generally have inter-transcriber rates that are less than 3/3. This implies that further investigations based on impressionistic transcriptions should rely on acoustic methods to verify the tokens that receive a low inter-transcriber reliability.

The results of my investigation confirm the general findings from Kager et al. (in press) that English-learning children acquire voicing contrasts much earlier than Dutch-learning children. Kager et al. also provide evidence that voicing contrasts in German, an aspiration language like English, are acquired earlier than in Dutch, a pre-voicing language.

We could conclude from this that that voicing contrasts are acquired earlier in aspiration languages such as English and German than in non-aspiration languages such as Dutch. This generalization, however would require further investigation before any firm conclusion can be drawn. Such an investigation would require studies of other non-aspirated languages such as French and Spanish, for example, or of languages that have a three-way voicing contrast (plain voiceless, voiceless aspirated and voiced) such as Hindi or Thai. Only with such studies will one be in a position to make strong claims concerning the factors that drive acquisition of voicing contrasts in child language.

Chapter 5 - Phonological Development of Branching Onsets and s+C Clusters

5.1 Introduction

In this chapter, I investigate the issue of positional effects from the perspective of phonological development. More specifically, I study the development of onset clusters in different prosodic positions in an attempt to detect positional effects. As we will see, however, this aspect of the study will turn in very few results, primarily due to a lack of data from most of the potentially relevant positions listed in 3.1. Despite this unfortunate outcome, this chapter provides an account of Sonya's phonological development from the perspective of the development of branching onsets and s+C clusters which, raises interesting theoretical questions. As we will see throughout this chapter, Sonya's acquisition path for branching onsets is different from that of s+C clusters. This general finding is in line with other works on the development of onset clusters (e.g. Fikkert 1994, Barlow 1997, Bernhardt and Stemberger 1998, Goad and Rose 2004). At the stages during which she cannot achieve production of the clusters in an adult-like way, she displays various cluster reduction strategies, all of which are documented with the necessary detail in the next sections.

This chapter is organized as follows. I first discuss the phonological structure of branching onsets and s+C clusters in section 5.2. This discussion is followed by a presentation of the data extraction and compilation methods in section 5.3. In sections 5.4 through 5.10, I discuss Sonya's acquisition path for each of the different types of

branching onsets and s+C clusters in the corpus. Finally, I provide a discussion of each of the different types of clusters in relation to each other in section 5.11.

5.2 The Structure of Branching Onsets and s+C Clusters

There are two main theoretical assumptions adopted for this portion of the thesis. The first is that branching onsets are defined as obstruent-initial, maximally binary and left-headed clusters (e.g. Kaye, Lowenstamm and Vergnaud 1990). This structure is illustrated in (5.1a) below. As opposed to these, s+C clusters are syllabified as an appendix followed by a singleton onset (e.g. Levin 1985) as illustrated in (5.1b). Following Goad and Rose (2004), I assume that this classification of /s/-initial clusters as appendix initial holds, even for the /s/-initial clusters that rise in sonority, (i.e. that have a sonority profile similar to that of branching onsets).

(5.1) Structure of a Branching Onset and an s+C cluster

a. Branching onset b. s+C cluster

In English, branching onsets must obey the minimal distance constraint of at least two. This means that the consonants that make up a branching onset must be two sonority

levels apart. The sonority scale assumed is defined in (5.2), from lowest to highest levels of sonority.

(5.2) Sonority Scale (Clements 1990)

Obstruent > Nasal > Liquid > Glide > Vowel

From this scale, we can infer that a sequence formed by an Obstruent+Nasal (i.e. *pn) cannot form a branching onset, because there is only one degree of sonority distance between these two types of consonants. However, an Obstruent+Rhotic cluster, as in example (5.1a) above, can form a branching onset in English since they meet the minimal sonority distance requirement.

While the s+Lateral and s+Glide clusters could potentially be considered as branching onsets with respect to rising sonority only, I am analyzing them as s+C clusters following Goad and Rose's (2004) hypothesis. This thesis will provide a test case for this hypothesis. Indeed, if the s+L and s+N clusters were to pattern similar to other s+C clusters, the results would support Goad and Rose. As opposed to this, if these clusters were to pattern similar to other branching onsets, the results would undermine their analysis as s+appendix clusters. As we will see, my findings, in fact, support Goad and Rose in that branching onsets develop independently from all types of s+C clusters, irrespective of the sonority of the latter. Also, both target structures show different patterns during development.

A complete list of the possible branching onsets in English is provided in table (5.3) below.

(5.3) Possible Branching Onsets in English (From Goad and Rose 2004)

Branching Onset	**Possible combinations**
Obs+L	pl, bl, kl, gl, fl
Obs+R	pr, br, tr, dr, kr, gr, fr, θr, ʃr
Obs+G	tw, dw, kw, gw, pj, bj, kj

Clusters in English such as [sp] in a word like "spin" or [sn] in a word like "snow" violate the conditions regulating the sonority relations within branching onsets in English. Observations such as this as well as considerations based on distributional restrictions and constraints related to place of articulation have led researchers such as Levin (1985) to posit that the [s] is syllabified as an appendix to the syllable node, rather than a constituent of the onset node. As mentioned in section 5.1.1 above, I assume that all /s/-initial clusters are syllabified as appendix-initial, regardless of the sonority pattern. A complete list of all /s/-initial clusters for English is provided in (5.4) below.

(5.4) Possible /s/-initial Clusters in English (From Goad and Rose 2004)

s+C cluster type	**Possible combinations**
s+Obs	sp, st, sk, sf
s+N	sn, sm
s+L	sl
s+G	sw

In the sections below, we will see that branching onsets and s+C clusters follow the expectations that I alluded to above in that they neither display the same developmental paths nor undergo the same types of reduction strategies at the stages when Sonya is unable to produce them in a target-like fashion. However, before discussing the data, I first introduce the main methodological aspects of the study in the next section.

5.3 Data extraction

The compilation of the two different types of onset clusters for this study involved making use of the program Phon (Rose et al. 2006) to extract every example of branching onsets and s+C clusters attempted by Sonya. In accordance with the description provided above, the branching cluster types searched for in *Phon* were Obstruent+Lateral (Obs+L), Obstruent+Rhotic (Obs+R), and Obstruent+Glide (Obs+G). The s+C cluster types that were searched for were s+Obstruent (s+Obs), s+Nasal (s+N), s+Lateral (s+L), and s+Glide (s+G).

Once the examples were extracted, they were imported into Microsoft Excel spreadsheets for compilation. The tokens were coded according to how they were realized and patterns of production were identified.[4] During the coding, eight different types of productions were identified. These production types are illustrated with the hypothetical examples of the word "blue", [bluw] in table (5.5) below.

[4] See Appendix C for the complete coding compilation.

(5.5) Coding for Branching Onsets

	Production	**Code**	**Description**
a.	[bluw]	TL	Target-like production
b.	[βluw]	C1Mod	Modification of the first target consonant
c.	[bwuw]	C2Mod	Modification of the second target consonant
d.	[fwuw]	CCMod	Modification of both target consonants
e.	[luw]	C1Del	Deletion of the first target consonant
f.	[buw]	C2Del	Deletion of the second target consonant
g.	[uw]	CCDel	Deletion of both target consonants
h.	[fij]	Other	Realization does not fall in any other category

In (5.5a), the [bl] cluster is realized as target-like. In (5.5b), the first consonant (C1), is modified in production, and realized as [β]. In (5.5c), the second consonant (C2), is modified is production and realized as [w]. (5.5d) illustrates the situation of both consonants (CC) being modified, with [bl] realized as [fw]. In (5.5e), C1 is deleted, while in (5.5f), it is C2 that is deleted. (5.5g) illustrates CC deletion, and, finally, (5.5h) illustrates those productions that fall in the "other" category, which will be used for all unclassifiable cases. For example, in (5.5h), the realized form does not resemble the target form, nor to any of the forms found in the other modification categories.

The patterns that were identified for each different cluster are used to define specific stages of phonological development. The clusters were acquired at different ages depending on the consonants involved. In the following sections, I discuss the acquisition stages for each individual cluster type.

5.4 Obstruent+Lateral Onset Clusters

In Sonya's acquisition of Obstruent+Lateral (Obs+L) onset clusters, there appear to be three distinct stages of development, each of which is characterized by distinctive patterns of production. In this section, I describe these stages from both qualitative and quantitative perspectives.

5.4.1 Stage 1: C2Del (1;04.18 - 1;09.26)

The first stage of Sonya's acquisition of Obs+L clusters is attested to for approximately five and a half months, from the beginning of recordings, at Sonya's age of 1;04.18, until the age of 1;09.26. The relative proportion of each process attested during this stage is provided in (5.6) below.

(5.6) Mean Values for Obs+L clusters (1;04.18 - 1;09.26)

a. Attempted forms:	70	
b. C2Del:	50	(71%)
c. C2Mod:	7	(10%)
d. Target-like:	4	(6%)
e. CCMod:	2	(3%)
f. C1Del:	1	(1%)
g. Other:	6	(9%)

The numbers above clearly suggest that the main characteristic of this stage is the deletion of the lateral consonant (C2Del), which accounts for 71% of the data set. The second most prominent process, C2 modification, also suggests that even when the lateral is produced, it generally cannot be uttered in a target-like fashion. Indeed, target-like productions only account for 6% of the data at this stage.

Also, during the first month of this stage, Sonya's productions display no distinct pattern. There are only eight attempted productions of Obs+L onset clusters during this month, four of which are categorized in the "Other" category because they do not fall into any of the remaining categories. As seen in (5.7), which provides a listing of all of the productions attested during this first month, these examples are in fact fairly remote from the target forms. The other four productions do not yield any clear pattern. Two display deletion of C2, and the other two show modification of C2, the first pattern being the leading one during the initial five and a half month stage.

(5.7) Obs+L Attempts (1;04.18 - 1;05.29)

Age	**Orthography**	**Realization**	**Code**
1;04.18	blue	ˈbuw	C2Del
1;05.29	blue	ˈbuw	C2Del
1;05.00	blue	əˈbwuːw	C2Mod
1;05.29	butterfly	ˈfwɑ	C2Mod
1;05.29	plate	hʊˈwɛː	Other
1;05.29	dragonfly	ˈɛ̃gmijtʰə	Other
1;05.29	dragonfly	ˈɛmɪhĩ	Other
1;05.29	airplane	ˈɛ̃fʊ	Other

As mentioned above, the leading pattern found during this stage is deletion of C2. The following table (5.8) provides representative examples of this pattern.

(5.8) C2Del in Obs+L Clusters (1;04.18 - 1;09.26)

Age	Orthography	Realization
1;06.10	blue	ˈbuw
1;06.10	plate	ˈpʰæː
1;06.10	plate	ɐ̃ˈpʰæː
1;08.22	clock	ˈkʰɑkʰ
1;09.11	glasses	ˈgæʃə
1;09.26	clothes	ˈkʰʌəd

While it is clear that the main pattern during this stage is C2 deletion, the data was re-examined to determine whether this pattern is prosodically determined. However, the distribution of the available examples does not enable us to verify this possibility. First, most of the examples (55 out of 70) come from a unique context, that of word-initial, primary stressed syllables. Second, the only other context available at this stage is the word-medial, secondary stressed syllables, in which 15 clusters were attempted but do not display any observable positional effects. Of these cases, one underwent C2 modification, four fell into the "other" category, while the remaining 10 underwent C2 deletion. It should also be noted that all of these patterns emerge from only three words: "dragonfly", "butterfly", and "airplane". Finally, while there is C2 deletion in 67% of the word-medial examples as opposed to 71% in the word-initial position, this difference cannot be taken as significant enough to deserve further attention.

5.4.2 Stage 2: Inter-stage (1;10.10 - 1;1.08)

The second stage in Sonya's acquisition of Obstruent+Lateral clusters occurs between the ages of 1;10.10 and 1;11.08, and can be categorized as a one-month inter-

stage during which Sonya begins to realize two consonants in a cluster. While Sonya does not systematically realize two consonants during this inter-stage, she does realize them 46% of the time, in addition to two target-like forms, and 11 forms with modification of C2. During this stage, the most common patterns for Sonya are to delete or to modify C2. The quantitative data for this stage is provided in (5.9) below.

(5.9) Mean Values for Obs+L Clusters (1;10.10 - 1;11.08)

a. Attempted forms:	28	
b. C2Del:	13	(46%)
c. C2Mod:	11	(39%)
d. Target-like:	2	(7%)
e. CCDel:	1	(4%)
f. Other:	1	(4%)

We can see from the above chart that Sonya is at an inter-stage. There is only a difference of two occurrences where Sonya deletes C2 instead of modifying it. The following chart (5.10) provides representative examples of the productions during this stage.

(5.10) Obs+L Attempts (1;10.10 - 1;11.08)

Age	Orthography	Realization	Code
1;10.10	plate	ˈpʰejt˺	C2Del
1;10.24	airplane	ˈʔɛˌpʰẽj	C2Del
1;11.08	blue	ˈbuw	C2Del
1;10.10	black	mˌˈbwækʰ	C2Mod
1;10.24	plate	ˈpʰwejt	C2Mod
1;11.08	blue	ˈbwuw	C2Mod
1;11.08	flowers	ˈawʌs	CCDel
1;10.10	black one	ˈblækʰwʌ̃n	TL
1;10.24	uh, blow	ʌ̃ˈfuw	Other

Similar to the limitation encountered at Stage 1, potential effects of prosodic position could not be verified at this stage, due to a lack of relevant data. Indeed, Sonya is still only attempting Obs+L onsets in word-initial primary stressed and word-medial secondary stressed positions. Obs+L clusters undergo C2 deletion and C2 modification in both positions. The few examples that depart from these most prominent patterns (deletions of the entire cluster, target-like productions or other unclassifiable patterns) also occur regardless of position.

5.4.3 Stage 3: CC Production (1;11.27 - 2;06.02)

The final stage in Sonya's acquisition of Obs+L onset clusters emerges at the age of 1;11.27 and extends until the end of the data recording period at 2;06.02. This stage is a natural extension of the inter-stage described in the previous section and is characterized by a general mastery of the cluster. Indeed, starting at 1;11.27, Sonya has

acquired the Obs+L cluster, however only from the perspective of syllable structure. Indeed, while she generally produces both consonants of the target cluster, thereby forming a branching structure in onset, she continues to modify the liquid in most cases. This modification is attested in 54% of the clusters during this stage. Table (5.11) below provides a summary of the patterns found during this stage.

(5.11) Mean Values for Obs+L Clusters (1;11.27 - 2;06.02)

a. Attempted forms:	107	
b. C2Mod:	57	(53%)
c. Target-like:	24	(22%)
d. C2Del:	10	(9%)
e. C1Del:	4	(4%)
f. CCMod:	4	(4%)
g. C1Mod:	1	(1%)
h. Other:	7	(6%)

The above chart illustrates how Sonya is realizing her Obstruent+Lateral clusters. During this stage, she produces both consonants of the target cluster in 81% of the forms attempted. Although she continues to modify C2, and, in some instances, C1 or CC, she rarely deletes one of the consonants. This marginal pattern only represents 13% of the data. Table (5.12) below provides representative examples of Sonya's productions during this stage.

(5.12) Obs+L Attempts (1;11.27 - 2;06.02)

Age	Orthography	Realization	Code
2;04.29	**cl**aws	ˈ**w**ɑz	C1Del
2;03.17	**fl**ashing	ˈ**pl**æʃij	C1Mod
2;02.03	**bl**ue	ˌ**b**uw	C2Del
1;11.27	**pl**ates	ˌ**pw**ejts	C2Mod
2;02.22	**gl**asses	ˈ**kw**æθɪz	CCMod
2;00.04	**cl**eaning	ˌ**ɬ**ijə	Other
2;03.03	**bl**ack	ˈ**bl**æk^{h}	TL

In the first example above, is of deletion of the first consonant, as Sonya deletes the initial [k] of "claws" The second example, "flashing" undergoes modification of the first consonant, as [f] is realized as [p]. The third example is of C2 deletion: Sonya deletes the target [l] from her production. The fourth example is of C2 modification as Sonya modifies the [l] in "plates" to [w]. The next example, "glasses", undergoes modification of both consonants of the cluster: [gl] is realized as [kw]. The example of "cleaning", falls in the "other" category as Sonya seemingly fuses both the [kl] together and produces [ɬ] in its place. The final example, "black" is realized as target-like. Sonya does begin to produce target-like segments during this stage, at a rate of 21%. These examples, precursors of the following stage, are not grouped near the beginning or end of the stage; they are scattered throughout the time period.

Finally, as noted for previous stages, there do not appear to be positional effects during Stage 3. Sonya attempts Obstruent+Lateral clusters in word-initial primary stressed, word-medial secondary stressed, and word-medial unstressed (WM-U)

positions. However there is no distinctive pattern of production according to position could be detected.

In the next section. I provide a compilation of the data on the acquisition of Obstruent+Rhotic (Obs+R) onset clusters. Overall, the acquisition path for this type of cluster is very similar to the acquisition of the Obstruent+Lateral cluster discussed above.

5.5 Obstruent+Rhotic Onset Clusters

Similar to the above, Sonya's acquisition path for Obstruent+Rhotic takes place during three stages, in the same order, and at ages similar to the ones observed for the acquisition of Obstruent+Lateral clusters. In addition, each of these stages is characterized by patterns of production similar to the ones seen with the Obstruent+Lateral clusters. Following the same method as the section above, I describe the stages of Obstruent+Rhotic acquisition from both qualitative and quantitative perspectives.

5.5.1 Stage 1: C2Del (1;04.18 - 1;09.26)

The first stage in Sonya's acquisition of Obstruent+Rhotic clusters is attested for approximately five and a half months, which is the same amount of time as Stage 1 of Obstruent+Lateral cluster acquisition. This occurs between Sonya's age of 1;04.18 until 1;09.26. This stage, like Stage 1 in the acquisition of Obstruent+Lateral clusters, is mainly characterized by a large amount of second consonant deletion (C2Del). The relative proportion of each process attested at this stage is provided in (5.13) below.

(5.13) Mean Values for Obs+R Clusters (1;04.18 - 1;09.26)

a. Attempted forms:	68	
b. C2Del:	49	(72%)
c. C2Mod:	3	(4%)
d. Target-like:	3	(4%)
e. CCMod:	2	(3%)
f. C1Mod:	1	(1%)
g. Other:	10	(15%)

The values listed above indicate that the acquisition path for Obstruent+Rhotic onset clusters is very similar to that of Obstruent+Lateral onsets. The main characteristic of this stage is indeed the deletion of the rhotic consonant, which accounts for 72% of the data. Table (5.14) below provides representative examples of the main process found during this stage.

(5.14) C2Del in Obs+R Clusters (1;04.18 - 1;09.26)

Age	Orthography	Adult IPA	Realization
1;06.10	brown	ˈbɹawn	ˈbɑkˀ
1;08.06	tree	ˈtɹij	ˈkʰij
1;08.22	green	ˈgɹijn	ˈgẽjn
1;09.11	crocodile	ˈkɹɑkədajəɫ	ˈkʰɑkʰəˌdajvə
1;09.26	brush	ˈbɹʌʃ	ˈbas

Unlike the acquisition of Obstruent+Lateral clusters, the second most prominent category noted is, unexpectedly, “Other”. There are 10 unclassifiable examples during this first stage. These examples are listed in table (5.15) below.

(5.15) Obs+R Attempts in the "Other" Category (1;04.18 - 1;09.11)

Age	Orthography	Target	Realization
1;04.18	Gabriella	ˈgæ**bɹ**ijˌɛła	ˈʃɛzłæ
1;04.18	Gabriella	ˈgæ**bɹ**ijˌɛła	ˈhɛðæ
1;05.29	dragonfly	ˈ**dɹ**ægənˌflaj	ˈɛ̃gmijtʰə
1;05.29	dragonfly	ˈ**dɹ**ægənˌflaj	ˈɛmɪhĩ
1;07.27	tractor(?)	ˈ**tɹ**æktəɹ	ə̃nnʊəˈkʰijm
1;07.27	gran	ˈ**gɹ**æn	ˈʔõnɑ
1;08.06	tree	ˈ**tɹ**ij	ˈʃijʔ
1;08.11	truck	ˈ**tɹ**ʌk	ˈʃɑʔ
1;09.11	fridge	ˈ**fɹ**ɪd͡ʒ	ˈpʰ̃ɪmpʰ
1;09.11	drive	ˌ**dɹ**ajv	ˌdəʁajf

As we can see from this chart, the first two words "Gabriella" and "dragonfly" fall into this category because the redundant syllables of the forms attempted have been truncated. The form "tractor" is not realized close to the target form. However, as indicated by the question mark next to the orthographic form, it is possible that "tractor" is not actuality the target form in this case. The other two forms containing a [tr] cluster seem to be realized as a merger between both consonants, resulting in the consonant [ʃ]. In the final example, Sonya does produce both consonants, however, she epenthesizes [ə] between the two consonants.

If we look past the relatively large number of forms from the "Other" category, we find the next most prominent type of production to be that characterized by C2 modification, as it was in Stage 1 of Obstruent+Lateral acquisition. Just as the attempted laterals in Stage 1 cannot be realized as target-like, neither can the rhotics during this stage. Also, as in Stage 1 of Obstruent+Lateral acquisition, Sonya produced target-like

productions of the cluster without modification of any consonant in 6% of the data at this stage.

While the main pattern during this stage is C2 deletion, which occurs 72% of the time, the data was re-examined to determine whether this pattern is prosodically-determined. Unfortunately, similar to the distribution of Obstruent+Lateral clusters, the distribution of the available Obstruent+Rhotic examples do not enable us to investigate this possibility. The main reason for this is that the majority of examples (65/69) occur in word-initial, primary stressed syllables, and undergo a variety of processes. The remaining four examples occur word-medially, in secondary stressed positions, and do not display any noticeable positional effects. Of these 4 examples, two undergo the main process of C2 deletion, while the other two fall into the "other" category.

5.5.2 Stage 2: Inter-stage (1;10.10 - 1;11.27)

The second stage in Sonya's acquisition of Obstruent+Rhotic clusters, is, again, very much comparable to Stage 2 in the acquisition of Obstruent+Lateral clusters. Sonya appears to be using a variety of strategies to utter the target cluster. While she continues to delete C2 in many of the occurrences, she exhibits other processes such as C2 modification and CC modification during this stage as well. This stage is labeled as an "inter-stage" as Sonya is beginning to prosodify the cluster correctly and to produce two consonants, even if she is not systematic in doing this. The relative prominence of each process during this stage is provided in table (5.16) below.

(5.16) Mean Values for Obs+R Clusters (1;10.10 - 1;11.27)

a. Attempted forms:	28	
b. C2Del:	12	(43%)
c. C2Mod:	11	(39%)
d. CCMod:	3	(11%)
e. CCDel:	1	(4%)
f. Other:	1	(4%)

It is clear from the above data that Sonya is at an inter-stage. Her productions undergo C2 deletion or C2 modification in near-equal proportions. While Sonya deletes one or both cluster consonants in 13 occurrences (47%), she also produces two consonants, even in modified forms, in 14 occurrences (50%). There are however, no occurrences during this stage, of Sonya producing a fully target-like cluster. Table (5.17) below provides representative examples of Sonya's productions during this stage.

(5.17) Obs+R Attempts (1;04.18 - 1;09.26)

Age	Orthography	Target	Realization	Code
1;11.27	ground	ˈ**gɹ**awnd	ˌ**g**awn	C2Del
1;11.08	bruise	ˈ**bɹ**uwz	ˈ**bw**uwd	C2Mod
1;10.10	grapes	ˈ**gɹ**ejps	ˈɛgst^{h}	CCDel
1;10.10	three	ˈ**θɹ**ij	ˌ**fw**ij	CCMod
1;10.10	truck	ˈ**tɹ**ʌk	**t^{h}ə**ˈ**ɹ**ʌk^{h}	Other

The first example above, illustrates C2 deletion as Sonya produces deletes the [r] in "ground". In the second example, "bruise", Sonya realizes the cluster with C2 modification by producing the [r] of [br] as [w]. In the next example, "grapes", Sonya omits both consonants in the word-initial onset. The fourth example, Sonya produces two consonants in the cluster, even if she modifies both of them, producing [fw] for [θr]. The

final example is in the "other" category; Sonya realizes both consonants of the cluster correctly, however, she epenthesizes [ə] in the cluster.

Similar to the previous stages discussed for both Obstruent+Lateral and Obstruent+Rhotic clusters, the potential effect of prosodic position on cluster realization could not be investigated here either. Again, the majority of the examples (26 in 29) come from word-initial, primary stressed positions. While the final three examples come from word-medial, unstressed environments, all of which underwent C2 deletion, there is not enough data to fully investigate or make any conclusions about possible positional effects during this stage.

5.5.3 Stage 3: CC Production (2;00.04 - 2;06.02)

The third and final stage in Sonya's acquisition of Obstruent+Rhotic clusters begins at the age of 2;00.04 and lasts until the end of recording at 2;06.02. During this time, Sonya makes a leap from C2 deletion to primarily C2 modification or target-like productions. While she still has not perfectly mastered the Obstruent+Rhotic cluster, she definitely appears to have acquired the branching onset structure. Table (5.18) below provides the relative proportions of production during this stage.

(5.18) Mean Values for Obs+R Clusters (2;00.04 - 2;06.02)

a. Attempted forms:	146	
b. C2Mod:	69	(47%)
c. Target-like:	32	(22%)
d. C2Del:	19	(13%)
e. CCMod:	12	(8%)
f. C1Del:	7	(5%)
g. C1Mod:	4	(3%)
h. Other:	3	(2%)

The most prominent process observed at this stage is C2 modification. However, an analysis of the other types of processes reveals that Sonya produces two consonants together in a cluster quite regularly. To combine all examples where two consonants are produced in a cluster, with C2 modification, target-like productions, CC modification, and C1 modification, the total number of occurrences with CC production is 117 (80%). This value indicates that even though she still makes mistakes in production, the overall pattern is prosodically accurate in that a cluster is being produced. Target-like clusters occur at a rate of 22%, and are spread out fairly evenly over the time period covered by this stage. These values are quite similar to those found in Stage 3 of Obstruent+Lateral acquisition, as seen in (5.11) above. Representative examples of production during this stage are provided in (5.19) below.

(5.19) Obs+R Attempts (2;00.04 - 2;06.02)

Age	Orthography	Target	Realization	Code
2;02.22	gran	ˈgɹæn	ˈgwæ̃ːn	C2Mod
2;03.03	dry	ˈdɹaj	ˈdɹaj	TL
2;00.04	cream	ˈkɹijm	k^{h}ij	C2Del
2;05.12	green	ˈgɹijn	ˌkwijp	CCMod
2;03.17	frogs	ˈfɹɑgz	ˈwɑ	C1Del
2;03.27	try	ˈtɹaj	ˈfɹaj	C1Mod
2;02.03	trucks	ˈtɹʌks	ˈt^{h}ə̆ɹʌks	Other

In the first example, the word “gran”, is produced with C2 modification as Sonya modifies the [r] in the [ɡr] cluster to a [w]. The second example, the word “dry”, is produced in a target-like fashion, while in the third example, Sonya produces the word “cream” with C2 deletion as she deletes the [r] from the [kr] cluster. The fourth example is of CC modification in the word “green” as Sonya replaces both consonants in the cluster [ɡr] with [kw]. The next example of the word “frogs” is produced with C1 deletion. The word “try” undergoes C1 modification, and the final form of the word “trucks”, falls in the “other” category as Sonya epenthesizes a [ə] between the [tr] cluster.

Finally, as discussed for the previous stages, there do not appear to be any positional effects during this stage. Sonya produces 124 examples of Obstruent+Rhotic clusters in word-initial, primary stressed position. However, she produces only one form in word-medial, primary stressed position as well as one form in word-medial, secondary stressed position. There are also 16 examples of Obstruent+Lateral cluster production in word-medial, unstressed positions, however, no positional patterns could be determined from these examples.

In the next section, I discuss the acquisition path for Obstruent+Glide onset clusters. As we will see, however, there were very little data from the production of these types of clusters. It is therefore difficult to determine the course of development in some of the cases.

5.6 Obstruent+Glide Onset Clusters

The cluster investigated in this section is Obstruent+Glide, such as the one in " "queen" [kwiːn]. Unlike the stages uncovered in the previous sections, however, no stages could be identified for this cluster type, as there were only nine examples of attempted production. The following table (5.20) provides a complete list of all of the occurrences of this type of onset cluster.

(5.20) Obs+G Attempts (1;11.27 - 2;06.02)

Age	Orthography	Target	Realization	Code
1;11.27	penguin	ˈpɛŋ**gw**ɪn	ˈpʰɛ̃ŋˌwʌ̃n	C1Del
2;02.03	penguin	ˈpɛŋ**gw**ɪn	ˈpʰɛ̃ŋwĩn	C1Del
2;02.22	penguins	ˈpɛŋ**gw**ɪnz	ˈpʰɛ̃ŋwĩnz	C1Del
2;03.03	penguin	ˈpɛŋ**gw**ɪn	ˈpʰɛ̃ŋwĩn	C1Del
1;09.11	vacuum	ˈvæ**kj**uwm	ˈbækʰĩnʌ̃	C2Del
1;09.11	cucumber	ˈ**kj**uwkʌmbəɹ	ˈkʰʌ̃mabɑː	C2Del
1;08.22	vacuum	ˈvæ**kj**uwm	ˈvækjuw	TL
2;00.04	so cute	sowˈ**kj**uwt	səʔsʊˈkʰjɨowtʰ	TL
2;06.02	square	ˈs**kw**ɛɹ	ˌkwɛ	TL

At first glance, it may appear that Sonya has not acquired the Obstruent+Glide cluster, and that the main process throughout production is C1 deletion. This is however not the case. By looking at all four occurrences of C1 deletion, we can see that they all occur in the word "penguin". This is most likely a special case that arises from the nasal+consonant sequence in which the nasal shares the place of articulation of the (deleted) consonant. An additional piece of evidence that supports this claim is that Sonya does not delete C1 in any other attempted form. For the remaining five examples, Sonya does display some degree of accuracy. She produces the Obstruent+Glide cluster as target-like in three words "vacuum", "cute" and "square". There are two examples of C2 deletion that occur very early, at the age of 1;09.11, in the production of the word "vacuum" as [ˈbækʰ̃ĩnʌ̃] and "cucumber" as [ˈkʰʌ̃mabɑ:]. Notice that in both cases, the deleted glide is [j]. Davis and Hammond (1995) argue that Obstruent+Glide clusters in English involve different structures depending on the glide involved. They claim that an obstruent+[w] cluster forms a branching onset, while an obstruent+[j] sequence is syllabified as a singleton onset followed by an on-glide in the nucleus. Given these considerations, and given that I do not have sufficient data to make firmer observations, I cannot draw any conclusions about the acquisition of Obstruent+Glide clusters or absence thereof.

Similar to above, the potential effects of position on acquisition patterns were not attested, as the data was very limited. The majority of utterances (6 in 9) contained Obstruent+Glide clusters in word-medial, unstressed position, while the remaining three

examples were in word-initial, primary stressed position. None of these positions display any particular effects.

While there cannot be any conclusions drawn about the acquisition of Obstruent+Glide branching onsets, there is certainly a clear path for both Obstruent+Lateral and Obstruent+Rhotic. Both of these types of branching onsets were acquired in three stages at approximately the same age. Stage 2, the inter-stage showing partial evidence of mastery, started at the same age for both cluster types at 1;10.10. Also, the mastery stage for Obstruent+Rhotic clusters was attained just two weeks (2;00.04) after the Obstruent+Lateral cluster (1;11.27). Given potential effects related to data sampling and data density, it is plausible that both types of branching onsets were indeed acquired simultaneously. Coming back to the Obstruents+Glide clusters, the meager evidence available does not allow us to confirm or undermine the possibility that this cluster type was acquired at the same time as the other branching onsets.

Now that each of the branching onsets has been discussed, I move on to an analysis of the acquisition path of s+C onset clusters. An investigation of possible positional effects was not possible with these cluster types for two main reasons. First of all, the majority of data are of s+C clusters in word-initial position. In fact, there are only nine instances of s+C clusters in word-medial position, a situation which does not enable any conclusive analysis. Second, word-medial clusters should not be considered in any event, because they do not involve the appendix+onset structure required in the syllabification of word-initial s+C clusters. The analysis of word-initial s+C clusters remains relevant, however, in order to provide a comparison with the acquisition of

branching onsets from the perspective of the development of word-initial syllable structure. In the next section, I begin my discussion of these clusters with s+Obstruent clusters.

5.7 s+Obstruent Onset Clusters

In this section, I discuss the acquisition path for s+Obstruent clusters. As we will see, Sonya has not acquired this type of clusters during the time span covered by the recording. As with the other onset clusters, I attempted to find stages in Sonya's development of s+Obstruent clusters. However, there were no identifiable stages in the data; as Sonya continuously and regularly deletes C1, [s], from the production of such clusters, across the entire corpus. There were exceptional instances where Sonya made use of other processes such as C1 modification, and even some target-like productions. These realizations were however very scarce and displayed no systematicity. The following table (5.21) provides the relative proportions of each process throughout the entire corpus.

(5.21) Mean Values for s+Obstruent Clusters (1;04.18 - 2;06.02)

a. Attempted forms:	67	
b. C1Del:	59	(88%)
c. Target-like:	1	(1.5%)
d. C2Mod:	1	(1.5%)
e. Other:	6	(9%)

These values indeed indicate that Sonya has not acquired the s+Obstruent onset cluster, which is true even towards the end of the recording sessions. She deletes the [s] regularly

throughout recording at a rate of 88%. The second leading data category is, in fact, the "other" category, which accounts for 9% of the productions. There is only one occurrence (1.5%) that is target-like, and a single example (1.5%) of C2 modification. Table (5.22) below provides representative examples from the data.

(5.22) s+Obstruent Attempts (1;04.18 - 2;06.02)

Age	Orthography	Target	Realization	Code
1;05.29	spoon	ˈ**sp**uwn	ˈpʰũːw	C1Del
1;11.08	spoon	ˈ**sp**uwn	smuw	C2Mod
2;03.03	stubbed	ˈ**st**ʌbd	ˈstʰʌb˥	TL
1;04.18	Steve	ˈ**st**ijv	ˈt͡ʃiːj	Other

The majority of the cases above occur near the beginning of recording, and include situations when Sonya would delete the entire syllable containing the cluster, or sometimes merge the target sounds into one. The following table (5.23) provides a complete list of the occurrences in the "other" category.

(5.23) s+Obstruent Attempts in the "Other" Category (1;04.18 - 2;05.12)

Age	Orthography	Target	Realization
1;04.18	uh, Steve	ʌˈ**st**ijv	ʌəˈt͡ʃiːj
1;05.29	stroller	ˈ**st**ɹowləɹ	ˈ**h**ɜtʰʌ
1;05.29	stroller	ˈ**st**ɹowləɹ	əˈ**d͡ʒ**ɛphũ
2;02.03	stroller	ˈ**st**ɹowləɹ	ˈt͡ʃɹʌlɑ
2;03.17	standing	ˌ**st**ændɪŋ	ˈ**ð**æwij
2;05.12	store	ˈ**st**ɔɹ	ˌ**θ**ɔwa

As we can see from the above table, the majority of clusters falling into this category involve [st]. For five of the utterances, Sonya merges the [s] and [t] in some way to produce one sound. We see that in the first word, "Steve", she produces a [t͡ʃ], as she does for the third example of "stroller" at 2;02.03. She also produces the [st] of "stroller" as [d͡ʒ] at 1;05.29, showing some degree of (unsystematic) variability in the voicing of her affricated outputs. In the final two forms, "standing" and "store", she produces an inter-dental fricative, either [ð] or [θ] for the cluster. For the example of "stroller" at 1;05.29, Sonya produces an [h] word-initially. However, as this cluster involves three consonants, which combines the complexity of an s+C cluster with that of a branching onset. This may have had an effect on Sonya's performance in her production of this cluster.

In the next section, I discuss the acquisition path for s+Nasal onset clusters. Unlike the acquisition of s+Obstruent clusters, Sonya does display acquisition of this type of cluster.

5.8 s+Nasal Onset Clusters

There are a limited amount of attempts at forms containing s+Nasal onset clusters. However, out of the 11 occurrences found, patterns of acquisition were noticeable. The first of these is characterized by Sonya's deletion of the [s] whereas, in the second, Sonya shows mastery of the structure, despite some distortion in the production of the consonants. I discuss each stage in turn in the next subsections.

5.8.1 Stage 1: C1Del (1;08.22 - 1;09.11)

From the beginning of recordings until age 1;09.11, Sonya only attempts two forms with an s+Nasal onset cluster. In both of these attempts, she deletes the first consonant ([s]). While two occurrences may not seem sufficient to un-controversially identify a stage, note as well that both examples display the same process and that there are no occurrences after 1;09.11 where Sonya deletes C1 again. In table (5.24) below, I provide both examples from this stage

(5.24) s+Nasal Attempts (1;08.22 - 1;09.11)

Age	Orthography	Target	Realization	Code
1;08.22	snow	ˈ**sn**ow	ˈnow	C1Del
1;09.11	snail	ˈ**sn**ejɫ	ˈmij	C1Del

In the first example of "snow", Sonya simply deletes the [s]. In the second example, "snail", Sonya continues to delete the [s] (and realizes the [n] as [m] for no clear reason).

5.8.2 Stage 2: CC Acquired (2;00.04 - 2;05.25)

During the second stage, nine attempts at an s+Nasal obstruent cluster are attested. In all nine attempts, Sonya successfully produces two consonants together in a cluster. While she produces target-like clusters in five attempts (56%), she modifies C1 in the other four attempts (44%). In three of the latter cases, the /s/ is still produced as a coronal fricative. Thus, even though Sonya can only produce s+Nasal clusters in a target-

like fashion in 56% of her attempts, she accurately produces the CC cluster in 100% of the attempts. I provide each occurrence in table (5.25) below.

(5.25) s+Nasal Attempts (2;00.04 - 2;05.25)

Age	Orthography	Target	Realization	Code
2;00.04	smoke	ˈ**sm**owk	ˈθmowkʰ	C1Mod
2;03.17	snowy	ˈ**sn**owij	ˈhnowij	C1Mod
2;05.25	snake	ˈ**sn**ejk	ˈθnej	C1Mod
2;05.25	small	ˈ**sm**ɑł	ˈθmɑ	C1Mod
2;02.03	smaller	ˈ**sm**ɑləɹ	ˈsmajɐ̃	TL
2;03.03	small	ˈ**sm**ɑł	ˌsmɑł	TL
2;03.03	snow	ˈ**sn**ow	ˈsnowə	TL
2;03.17	snowy	ˈ**sn**owij	ˈsnowĩŋ	TL
2;05.12	small	ˈ**sm**ɑł	ˈsmɑł	TL

In the next section, I provide an analysis of the s+Lateral onset cluster. As we will see, Sonya appears to have acquired this type of cluster sooner than she acquired the s+Nasal onset cluster, and earlier than any other cluster type discussed thus far.

5.9 s+Lateral Onset Clusters

There is only one stage of development evident in Sonya's acquisition of the s+Lateral onset cluster. From the beginning of attempted s+Lateral clusters at 1;08.11, Sonya produces target-like clusters in the majority (68%) of attempts. The following table (5.26) provides the relative proportions of production.

(5.26) Mean Values for s+Lateral Clusters (1;08.11 - 2;06.02)

a. Attempted forms:	15	
b. Target-like:	12	(68%)
c. CCMod:	1	(5%)
d. C1Mod:	1	(5%)
e. C1Del:	1	(5%)
f. C2Del:	1	(5%)
g. Other:	3	(14%)

While Sonya correctly produces the s+Lateral onset cluster as target-like in 68% of the utterances, she actually produces two consonants in a cluster for 77% of the cases. This value combines each of the occurrences that are target-like or undergo CC or C1 modification. While the largest category of data is of the "other" category, we can see by looking at these particular utterances that they are more target-like than they initially appear. First, consider the three examples in table (5.27) that I classified in the "other" category.

(5.27) s+Lateral Attempts in the "Other" Category (1;09.11 - 2;03.03)

Age	Orthography	Target	Realization
1;09.11	slide	ˌslajd	ˌɬajtʰ
2;00.04	sleepy	ˈslijpij	ˈɬijpʰij
2;03.03	slide	ˌslajd	t͡saj

As we can see from these examples, in each of these three productions, Sonya produces outputs that are highly characteristic of a fusion process, merging the two target sounds together into a single one. In the first two examples, she produces a consonant which keeps the fricative manner of [s] and the laterality of the [l] whereas, in the last example,

she produces an affricate which could easily be interpreted as a version of the same sound which underwent a higher degree of closure in the vocal tract. Sonya produces these same words as target-like throughout the remainder of the data. Table (5.28) below provides representative data of s+Lateral attempts.

(5.28) s + Lateral Attempts (1;08.11 - 2;06.02)

Age	**Orthography**	**Target**	**Realization**	**Code**
1;08.22	slide	ˈ**sl**ajd	ˈ**sl**ajtʰ	TL
2;03.27	sleep	ˈ**sl**ijp	**sl**ijp˺	TL
2;02.22	slide	ˈ**sl**ajd	ˈ**l**aːjtʰ	C1Del
1;08.11	slide	ˈ**sl**ajd	ˈ**θl**aj	C1Mod
2;03.17	sleep	ˈ**sl**ijp	ˈ**z**ejpʰ	C2Del
2;06.02	slide	ˈ**sl**ajd	ˈ**fw**ajd	CCMod

In the first examples of "slide" and "sleep" are produced as target-like. In the third example, "slide" Sonya deletes C1, and in the fourth example, modifies C1 by producing a [θ] instead of [s]. In the fifth example, "sleep", Sonya deletes C2, and the final example undergoes CC modification, as the [sl] cluster is realized as [fw].

In the next section, I outline the acquisition path for s+Glide onset clusters. As with the acquisition of s+Lateral clusters, the evidence suggests that Sonya has acquired the structure required to syllabify this cluster type fairly early.

5.10 s+Glide Onset Clusters

Similar to s+Lateral onset clusters, Sonya acquires the s+Glide cluster at an early stage. There is only one stage of development visible from the recorded data, during which Sonya has apparently already acquired the cluster. Unlike the acquisition of s+Lateral clusters, the majority (63%) of production for s+Glide clusters undergo C1 modification, while only 17% were target-like. Table (5.29) below provides the relative proportions of each pattern affecting s+Glide onset clusters.

(5.29) Mean Values for s+Glide Clusters (1;08.06 - 2;06.02)

a. Attempted forms:	30	
b. C1Mod:	19	(63%)
c. Target-like:	5	(17%)
d. C1Del:	5	(17%)
e. Other:	1	(3%)

From the above breakdown, we can see that the combined average for CC production is 80%. This value certainly indicates that while Sonya does not accurately pronounce the cluster, she has acquired the structure required for its production.

Concerning the cases of C1 modification, a significant pattern emerges from the examples. In all but one occurrence where C1 is modified, this consonant is realized as a labial consonant. The specific consonant varies between [p, f, ɸ], but regardless, it remains labial. The single example where this did not occur was the first production of [sw] at 1;08.06, where the [sw] was realized as [hw]. Sonya appears to have difficulties producing the [s] when followed by the labial glide [w]; therefore, she modifies the [s] as

a labial consonant for ease of articulation. Table (5.30) below provides representative examples of production.

(5.30) s + Glide Attempts (1;08.06 - 2;06.02)

Age	Orthography	Target	Realization	Code
1;08.06	swing	ˈ**sw**ɪŋ	ˈpwijn	C1Mod
1;08.22	swing	ˈ**sw**ɪŋ	ˈɸwĩŋ	C1Mod
2;05.25	sweepy	ˈ**sw**ijpij	ˈfwɪðbij	C1Mod
2;06.02	swing	ˈ**sw**ɪŋ	əˈfwĩŋ	C1Mod
1;08.11	swing	ˈ**sw**ɪŋ	ˈʍĩŋ	C1Del
1;11.08	swim	ˈ**sw**ɪm	ˌswɛ̃m	TL
2;00.04	swimming	ˈ**sw**ɪmɪŋ	ˌswĩmĩŋ	TL

In the first example above, the [s] is realized as the labial [p] through C1 modification. The second example is again of C1 modification in “swing”. In the third example, C1 is modified from [s] to the labial [f], and again C1 modification occurs in the fourth example. The next example of “swing” illustrates the only instance of C1 deletion, while in the final two examples of “swim” and “swimming”, Sonya produces the [sw] as target-like. While the examples illustrated above may suggest that she has not acquired the cluster, the main point here is that she seems to have acquired it from the perspective of syllable structure, even though she shows variable realizations of C1, which undergoes labial assimilation in a majority of the cases

There appears to be a unique acquisition path relevant to s+C clusters, that is not attested to in branching onsets. For s+C clusters, the larger the sonority distance is

between the [s] and the following consonant, the earlier the cluster is acquired. As we saw in the data above, the first s+C cluster type to be acquired was the s+Glide cluster, which had the furthest distance in sonority. The next s+C cluster acquired was the s+Lateral with a sonority distance of two, which was acquired at age 1;08.11. Next, the cluster s+Nasal, with a sonority distance of one, was acquired a little later at 2;00.04. Finally, the cluster s+Obstruent, having a sonority distance of zero, was never acquired during the time of this corpus which ended at 2;06.02.

In the next section, I will provide a discussion of the findings from throughout this chapter.

5.11 Discussion

While an investigation of potential positional effects was not possible because of a lack of relevant data, this study has offered insight into the development of these two types of onset clusters. The results of this study indicate that branching onsets and s+C clusters do indeed develop differently, and exhibit different patterns of production. The following table (5.31) illustrates the ages of acquisition between branching onsets and s+C clusters.

(5.31) A Comparison of the Age of Acquisition of Branching Onsets and s+C Clusters

Branching Onset	**Age of Acquisition**	**s+C Cluster**	**Age of Acquisition**
Obs+L	1;11.27	s+G	1;08.06
Obs+R	2;00.04	s+L	1;08.11
Obs+G	inconclusive	s+N	2;00.04
		s+Obs	after 2;06.02

As we can see from the above table, an increase in the sonority distance between [s] and the following consonant results in earlier acquisition of the cluster. However, this situation is not observed for the branching onsets. This difference, in addition to the different dates assigned for each stage, illustrates the independent development of these two types of clusters. Also, while it may appear that Obstruent+Lateral clusters are acquired earlier than Obstruent+Rhotic clusters, the data strongly suggests that these two clusters were actually acquired simultaneously. These results support the claim by Goad and Rose (2004) that the two cluster types are indeed different structures.

However, while s+C clusters in general should, according to Goad and Rose (2004), share a unique structure, their acquisition across multiple stages does not support this claim. Without directly undermining a structural-based account, the patterning of these clusters strongly suggests that sonority constraints such as the ones discussed in Prince and Smolensky (1993), Gnanadesikan (2004) and Goad and Rose (2004) are playing a central role in the surface realization of these clusters. This issue, however, goes beyond the scope of this paper, and is left for future research.

Chapter 6 - Conclusion

In this final chapter, I provide a summary of the thesis and discuss some of implications of my study. The main observations from chapters 4 and 5 are summarized and discussed in section 6.1. In section 6.2, I address some of the limitations of this study, offering suggestions for further investigations in this area of research.

6.1 Thesis Summary

The intent of this thesis was to study the issue of positional effects, and determine whether or not these effects are generalized or limited to specific children. The data available from Sonya's corpus do not yield any clear indication that positional effects manifest themselves across-the-board in developing phonologies. This lack of any conclusive results may come from the objects studied in the thesis; however, it is possible that positional effects do exist in the child's system, but not for the objects or contexts covered in the preceding chapters. Despite the lack of evidence toward positional effects in this study, this thesis has raised a number of issues with regard to methods of investigation of child language phonology, and has yielded results with regard to the phonological development of onset clusters, further documenting this topic from a longitudinal perspective.

In chapter 4, I demonstrated that despite common assumptions that acoustic investigations are inherently more reliable from a methodological perspective, these computer-assisted methods also present challenges, especially in terms of data interpretation, which should not be neglected. On the one hand, the difficulties in

interpreting acoustic data include the level of arbitrariness required to classify the measurements along a continuum, something which directly affects the interpretation of the results. On the other hand, the high rates of inter-transcriber reliability uncovered in section 4.1 provide a basis to support the claim that the multiple-blind method of data transcription, when combined with a team-based method of data validation, provide a reliable empirical foundation for research in phonological development.

As part of this study, I also investigated the development of voicing contrasts in plosives. The results of this portion of the study were compared with recent work by Kager, van der Feest, Fikkert, Kerkhoff and Zamuner (in press). My findings indicate that voicing contrasts in English are acquired very early, presumably before the beginning of the period covered by Sonya's corpus, at 1;04.18. This finding supports the claim made by Kager et al., that English-learning children acquire the voicing contrast earlier than Dutch-learning children. My results yielded results similar to those from Kager et al. in terms of voicing errors as well. Kager et al. found voicing errors to be quite complex. They also demonstrate that in the data they considered, the devoicing errors are motivated by voicing harmony with another voiceless plosive in the word. The errors made through voicing a target voiceless consonant, however, are not motivated by such harmony. My results were simpler in that the majority of errors made were of inaccurate voicing of a target voiceless consonants, and no patterns of harmony was detected to predict the occurrence of such errors. The combined research from Kager et al. and this thesis suggests that more research needs to be done on the development of voicing contrasts across languages, and that, concerning English in particular, this research should be

conducted on a fairly young population, and presumably extend into experimental settings involving children who are still at the babbling stage.

In addition to the methodological considerations discussed in this thesis, the data uncovered by my study yields some significant findings in the area of phonological (prosodic) development. More specifically, concerning the development of onset clusters, I found that sonority plays a role in the development of Sonya's s+C clusters, a situation that was not matched in the development of branching onsets. In sum, a high sonority distance between an [s] and following consonant (e.g. [sw]) favored earlier acquisition, while a low sonority distance (e.g. [sp]) caused the clusters to be acquired at a later time. This finding has two main implications. First of all, with regard to the acquisition of onset clusters in general, these findings suggest that because they behave in different ways, the two cluster types, branching onsets and s+C clusters, require a different syllable structure, an observation that supports Goad and Rose's (2004) general hypothesis. Second, the development of these clusters, especially the s+C clusters in the context of my study, may be affected differently by constraints such as those regulating the sonority profile within the cluster.

In the next section, I discuss the limitations of my study, and provide suggestions for future research in this area.

6.2 Discussion

In this thesis, I have presented and discussed a number of observations made from a case study on the acquisition of English phonology. These findings have implications

from methodological, empirical and theoretical perspectives. First of all, this study investigates the productions of only one child. This situation has its limitations, mainly because the findings from this child were not directly compared to those from other children. This, in turn, limits the analysis by referring to the observations as specific to one child instead of making broad observations about English-learning children in general. Another limitation of this study comes from the contexts under investigation. Because of time and, especially, gaps in the coverage of the phonological contexts documented in the corpus, not every phonological context could be investigated in this thesis. For example, no word-final clusters were studied, and a number of word-medial clusters had to be left out of the analysis. Also, at times there were not enough data across contexts to draw any firm observation on the possibility that there could have been subtle effects related to positions in Sonya's phonological development. Indeed, the vast majority of utterances studied in this thesis were in word-initial, primary stressed position. Positions such as word-initial secondary stressed and word-medial primary stressed were insufficiently represented in the corpus.

Another perspective on these issues is that it may be the case as well that this particular child did not in fact display any positional effects. This possibility is reinforced by the fact that some of the positional effects found in other studies (e.g. Rose 2000, Kehoe and Hilaire-Debove 2003) come from studies that were fairly comparable to the current one from a methodological standpoint. Also, these findings appear to be difficult to reproduce across studies (Kehoe and Hilaire-Debove 2003).

Building on these issues, several suggestions can however be made to improve the method of investigation of positional effect in future studies. The first suggestion would be to first obtain data with higher-density sampling, and, the second, would be to collect data from children at an earlier age. Higher-density sampling, as well as the integration of an experimental component probing phonological contexts that are infrequent in the language, would probably result in production of more of the contexts that were poorly represented in this corpus. In addition, as we saw in the results for the acquisition of voicing contrasts, the contrasts appear to be acquired before the start of the corpus, thus preventing a look at the possibility of positional effects. If the recording of the corpus had begun earlier, an investigation of possible positional effects may have been possible before the contrast was fully acquired. A longitudinal study involving more children would also enhance the odds of yielding more conclusive results. Such an approach, similar to that taken, for example, by Fikkert (1994) and Levelt (1994) in their respective studies on the development of Dutch phonology, facilitate cross-child comparisons that could enable us to yield conclusions regarding the generality or specificity of the patterns observed in child productions. Furthermore, if such an approach could be extended to integrate data from more than one target language, then the results and, especially, the relative prominence of the phenomena observed within and across the populations of learners, could also be discussed in light of their universal versus language-specific origins. Indeed, as alluded to in chapter 4 in light of Kager et al.'s (in press) study on the acquisition of voicing contrasts, cross-linguistic studies do yield important results which can in turn contribute to the development of a better understanding of the factors

enhancing or hindering language acquisition. From this understanding, better theoretical models could be proposed and used in both formal and applied fields related to phonological development.

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Appendix Legend

Ortho.	Utterance Orthography
Rec. #	Record Number
WI-1S	Word-initial Primary Stressed Position
WI-2S	Word-initial Secondary Stressed Position
WI-U	Word-initial Unstressed Position
WM-1S	Word-medial Primary Stressed Position
WM-2S	Word-medial Secondary Stressed Position
WM-U	Word-medial Unstressed Position
Label	Voicing Label
TL	Target-like
CCMod	Modification of Both Consonants in the Cluster
C1Mod	Modification of the First Consonant in the Cluster
C2Mod	Modification of the Second Consonant in the Cluster
C1Del	Deletion of the First Consonant in the Cluster
C2Del	Deletion of the Second Consonant in the Cluster
CCDel	Deletion of Both Consonants in the Cluster
Oth	"Other" Category

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1	cup	[ˈkʌp]	[ˈkʰʌ]	[ˈkʌʔ]	[kˣɐːʔ]	[ˈkʰʌʔ]	3.00	
4	dada	[ˈdædæ]	[ˈdɛdæʔ]	[ˈɛdæʔ]	[ˈtɛtɐʔ]	[ˈdɛdæʔ]	1.00	2.00
5	papa	[ˈpapa]	[ˈpʰʌˌpʰɑ]	[ˈpʰʌpˌpʰaʔ]	[ˈkʰʌˈpʰɐʔ]	[ˈpʰʌpˌpʰɑʔ]	3.00	3.00
19	dada	[ˈdædæ]	[əˈdædɛ]	[ʌˈdædɛ]	[ʊˈdædɛʔ]	[ʌˈdædɛ]	3.00	3.00
20	dada	[ˈdædæ]	[ʌˈdædɛ]	[ʌˈdædæ]	[ʌˈdʲædæʔ]	[ʌˈdædæ]	3.00	3.00
22	cup	[ˈkʰʌp]	[ˈgʌʔ]	[ˈgʊpʰ]	[gʷʌʔf]	[ˈgʌʔ]	3.00	
23	Peter	[ˈpʰijəɹ]	[ˌbʌˈbʊʔ]	[ˈbʌplɛ]	[ˈbɐːˈɬæʔ]	[ˈbʌˌbʊ.ɛʔ]	3.00	2.00
24	dada	[ˈdædæ]	[ˈdæˌdæ]	[ˈdæʔdæʔ]	[ˈtætɐʔ]	[ˈdæˌdæ]	2.00	2.00
25	dada	[ˈdædæ]	[ˈdæˌdɛ]	[ˈdædæʔ]	[ˈdædɐʔ]	[ˈdæˌdɛ]	3.00	3.00
27	Booboo	[ˈbuwbuw]	[ˌbʊˈbʊːʔ]	[ˈbʊbʊː]	[bʊˈbʊə]	[ˌbʊˈbʊː]	3.00	3.00
30	Keesha	[ˈkʰijʃa]	[ˈkʰijʃɪ]	[ˈkʰijʃɛ]	[ˈkiʃɛʔ]	[ˈkʰijʃɪ]	3.00	
43	Babar	[ˈbæbaɹ]	[ˈbæbʊ]	[ˈbæbə]	[ˈbæˈβʌʔ]	[ˈbæbʌʔ]	3.00	3.00
45	Babar's dada	[ˌbæbaɹzˈdædæ]	[ˈgowˌdædæ]	[ˌbawˈdædæ]	[ˌbaʊʷʔ ˈdɛdæʔ]	[ˈbowˌdædæ]	3.00	3.00
45	Babar's dada	[ˌbæbaɹzˈdædæ]	[ˈgowˌdædæ]	[ˌbawˈdædæ]	[ˌbaʊʷʔ ˈdɛdæʔ]	[ˈbowˌdædæ]	3.00	
46	a book...cup	[əˈbʊk...ˈkʌp]	[əˈbʊ..kʰɪˌkʰʌp˺]	[əˈbʊk˺...kʰə̟kʰʌp]	[ɛˈbʊːʔ...kʲç...kʰʌːp˺]	[əˈbʊk˺...kʰɪ̟kʰʌp˺]	3.00	
46	a book...cup	[əˈbʊk...ˈkʌp]	[əˈbʊ..kʰɪˌkʰʌp˺]	[əˈbʊk˺...kʰə̟kʰʌp]	[ɛˈbʊːʔ...kʲç...kʰʌːp˺]	[əˈbʊk˺...kʰɪ̟kʰʌp˺]	3.00	
47	apple	[ˈæpəɬ]	[ˈpʰuw]	[pʰuw]	[kʰʊb˺]	[ˈkʰuw]	3.00	
48	apple	[ˈæpəɬ]	[ˈpʰuw]	[pʰuw]	[pʰʊʷ]	[ˈpʰuw]	3.00	
49	apple	[ˈæpəɬ]	[ˌʌˈpʰɑ]	[ʌˈpʰa]	[ʌˈpʰæːʔ]	[ˌʌˈpʰɑ]		3.00
50	apple	[ˈæpəɬ]	[ˈpʰɑ]	[ˈpʰæ]	[ˈpʰɛæʔ]	[ˈpʰɑ]	3.00	
54	apple	[ˈæpəɬ]	[ˈpʰɑʔ]	[pʰæʔ]	[pʰæːʔ]	[ˈpʰɑʔ]	3.00	
58	car	[ˈkɑɹ]	[ˈkʰow]	[ˈkʰʌw]	[kʰœːʷ hə]	[ˈkʰʌw]	3.00	
59	colour	[ˈkʌləɹ]	[ˈkʰowjæʔ]	[kʰʊˈjæʔ]	[ˈkʰʊjæʔ]	[ˈkʰʌwjæʔ]	3.00	
60	colour	[ˈkʌləɹ]	[ˈkʰʌlʌ]	[ˈkʰʌlə]	[ˈkʰʊjəʔ]	[ˈkʰʌlə]	3.00	
61	blue	[ˈbluw]	[ˈbuw]	[ˈbuw]	[buː]	[ˈbuw]	3.00	
67	apple	[ˈæpəɬ]	[ˈpʰʊʔow]	[ˈpʰʌʔʌ]	[ˈpʰʊʔə]	[ˈpʰʊʔʌ]	3.00	
69	dada	[ˈdædæ]	[ˈdæˌdʌ]	[ˈdædæ]	[ˈdæˈdɐʔ]	[ˈdæˌdæ]	3.00	3.00
70	dada	[ˈdædæ]	[ˈdædʌ]	[ˈdædæʔ]	[ˈdɛdæʔ]	[ˈdædʌ]	3.00	3.00

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
73	cat	[ˈkæt]	[ˈkʰæʔ]	[ˈkʰæt̚]	[tʰæʔ]	[ˈkʰæʔ]	3.00	
79	keys	[ˈkijz]	[ˈkʰij]	[ˈhij]	[kʰiʲ]	[ˈkʰij]	3.00	
80	Peter	[ˈpʰijtəɹ]	[ˈpʰʌbʊʔ]	[ˈbʌbʌʔə]	[ˈbəbʊʔ]	[ˈbʊbʊ]	2.00	3.00
81	keys	[ˈkijz]	[ˈkʰij]	[ˈkij]	[kʰiːʲ]	[ˈkʰij]	3.00	
83	keys	[ˈkijz]	[ˈkʰij]	[ˈkʰij]	[kʰiː]	[ˈkʰijʔ]	3.00	
84	dada	[ˈdædæ]	[ˈdɛdæ]	[ˈdɛdæʔ]	[ˈdɛˈdæʔ]	[ˈdɛdæ]	3.00	3.00
108	cat	[ˈkæt]	[...ˈkʰɛ]	[ʊdɛˈkʰæ]	[ʊdə ˈkʰæːʔhə]	[ˈkʰæ]	3.00	
113	dada	[ˈdædæ]	[ˈdædɛ]	[ˈdædə]	[ˈdædə]	[ˈdæˌdɛ]	3.00	3.00
114	Keesha	[ˈkijʃa]	[ˈkʰijʃij...]	[ˈkʰijʃɪ]	[ˈhiʃihəh]	[ˈkʰijʃɪ]	3.00	
115	baby	[ˈbejbij]	[...ˈbejˌbij]	[bijʔˈbejbi]	[bi ˈbeʲbi]	[bijʔˈbejˌbij]	3.00	3.00
116	baby	[ˈbejbij]	[uwˈbejbej]	[ˈbejbɛ]	[m̥ ˈbejbi]	[ˈbejbɪ]	3.00	3.00
118	baby	[ˈbejbij]	[ˈbejbej]	[ˈbejbɪ]	[ˈbeʲbi]	[ˈbejbɪ]	3.00	3.00
119	apple	[ˈæpəɬ]	[hʊˈpʰʊ]	[huwˈpʰʌ]	[ʊˈpʰahə]	[hʊˈpʰʌ]		3.00
120	baby	[ˈbejbij]	[ˈbɛbij]	[ˈbejbij]	[beʲˈbi]	[ˈbɛbij]	3.00	3.00
123	pig	[ˈpʰɪg]	[ˈpʰij]	[ˈpʰɪg]	[pʰeʔ]	[ˈpʰej]	3.00	
124	pig	[ˈpʰɪg]	[ˈpʰej]	[ˈpʰej]	[pʷʰiː]	[ˈpʰej]	3.00	
127	keys	[ˈkijz]	[əˈkʰej]	[ˈkʰɛ]	[ʔkʰeʲ]	[əˈkʰɪʔ]	3.00	
136	dada cookie	[ˈdædæˌkʊkij]	[gʌʔˈdædʌˈkʰɪhʊ]	[dʌʔɪdædæˈkʰʊkij]	[ʔdʌʔ ˈdædæ ˈkʰiçi]	[gʌʔˈdʌdʌˈkʰɪhʊɪ]	3.00	3.00
136	dada cookie	[ˈdædæˌkʊkij]	[gʌʔˈdædʌˈkʰɪhʊ]	[dʌʔɪdædæˈkʰʊkij]	[ʔdʌʔ ˈdædæ ˈkʰiçi]	[gʌʔˈdʌdʌˈkʰɪhʊɪ]	3.00	3.00
149	tail	[ˈtejɬ]	[ɐ̃ˈtʰɛlij]	[ʊnˈtʰɛlij]	[ʊntʰeˈlih]	[õˈtʰɛlij]	3.00	
156	dada	[ˈdædæ]	[ˈdɛdæ]	[ˈdædæ]	[ˈdæˈdæ]	[ˈdɛdæ]	3.00	3.00
158	cookie	[ˈkʊkij]	[uwˈtʰejkʰej]	[huwəˈkʰejkɪ]	[uʷɪˈkʰeʲkʰeʲ]	[huwəˈtʰejkʰɪʔ]	3.00	3.00
159	oh, cookie	[owˈkʊkij]	[ˈowˌtʰejkʰɛ]	[ojˈkʰejkɛ]	[oʲˈkʰɛʲkʰeʲ]	[ˈowəˌtʰejkʰɛ]	3.00	3.00
163	cat	[ˈkæt]	[əˈkʰɛ]	[əˈkʰæ]	[ʔkʰeʔhd]	[əˈkʰɛ]	3.00	
168	bear(?)	[ˈbɛɹ]	[ˌkʰowˈbɑː]	[kowˈbɑː]	[koʷˈbɑːː]	[ˌkʰowˈbɑː]	3.00	
175	bird	[ˈbɜɹd]	[ˈbow]	[ˈbow]	[boʷ]	[ˈbow]	3.00	
177	cookie	[ˈkʊkij]	[...ˈtʰɪ́tʃej]	[hɪmojˈtʰijkɪ]	[ˈhʷʊmˈtʃiˌkʰej]	[hɪmojˈtʰejkʰɪʔ]	3.00	3.00
178	cookie	[ˈkʊkij]	[ˈkʰɪkʰɪ]	[kʰɪˈkʰɪ]	[ˈkʰɪˈkʰɪ ʔəh]	[ˈkʰɪˈkʰɪ]	3.00	3.00
183	colour	[ˈkʌləɹ]	[ĩnˈkʰʌlʊ]	[ŋˈkʰaj.jɔ]	[ʊŋkʰɑːˈjøʔ]	[ĩŋˈkʰʌlʊ]	3.00	
188	turtle	[ˈtɜɹtəɬ]	[ˈtʰɪrtʰæ̃]	[ˈtʰuwtʰĩn]	[ˈtʰuːtʰə]	[ˈtʰg̰ːtʰɛ̃]	3.00	3.00
194	ball	[ˈbɑɬ]	[ˈbɑɐ̃ʔ]	[ˈbɑɬ]	[ˈbɑːəɬ]	[ˈbɑ.əʔɐ̃]	3.00	

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
204	lion king	[ˈlajənˌkɪŋ]	[ˈsawˌkʰɛ]	[ˈlʌjkʰɛ]	[ˈdɛlʲjkʰeː]	[ˈzɛwˌkʰɛ]	3.00	
209	lion king	[ˈlajənˌkɪŋ]	[ˈlajˌkʰɛ̃]	[ˈlajˌkʰɪ̃]	[ˈlaʲˌkʰɪ̃]	[ˈlajˌkʰɛ̃]	3.00	
260	shoe	[ˈʃuw]	[ˈʒuw]	[ˈkʰəʒuw]	[ˈθɪjuʷ]	[ˈkʰəʒuw]	2.00	
273	turtle	[ˈtɜɹtəɬ]	[ˈtʰɪrtʰuw]	[ˈtʰʌjtʰuw]	[ˈtʲʰyʲjtʲʰuː]	[ˈtʰɜˌtʰuw]	3.00	3.00
279	monkey	[ˈmʌŋkij]	[hejˈkʰij]	[ˈejˌkʰij]	[meʲˈkʰɪkˀ]	[hejˈkʰij]		3.00
280	duck	[ˈdʌk]	[ˈdʌ]	[ˈdæ]	[da]	[ˈda]	3.00	
292	bean ... noodles	[ˈbijnˌnuwdəɬz]	[ˈbij...ˈnuwˌnuw]	[ˈbĭjuwəkʰaˌnuwluw]	[ˈbiðˈkʰɔf nũð]	[ˈbĭjuwəkʰaˌnuwnuw]	3.00	
300	garbage truck	[ˈgaɹbədʒ͡ˌtɹʌk]	[ˈbejt͡ʃʌ]	[ˈbejt͡ʃʌʔ]	[ˌbeʲˈʧʌʔ]	[ˈbejt͡ʃʌ]	3.00	
303	oh, garbage truck	[owˈgaɹbədʒ͡ˌtɹʌk]	[ˈowbɪʃɛ]	[ˌowbejˈʃæ]	[ˌoːʷ beʲˈʃæ]	[ˌoːwbejˈʃæ]	3.00	
304	...key, key	[ˈkijˌkij]	[...ˈkʰijˌkʰij]	[.....kijkij]	[wə ˈwʌ ʔʌ wa ˌkʰiˈkʰiʲ]	[.....ˈkʰijˌkʰij]	3.00	3.00
321	lion king	[ˈlajənˌkɪŋ]	[ˈlʌkʰæ]	[ˈlʊˌkʰæ]	[ˈlʏˌkʰækˀ]	[ˈlʊˌkʰæ]	3.00	
323	lion king	[ˈlajənˌkɪŋ]	[ˈlejkʰæ̃]	[ˈlijˌkʰæ̃]	[ˈleʲˌkʰæ̃]	[ˈlijˌkʰæ̃]	3.00	
324	lion king	[ˈlajənˌkɪŋ]	[ˈlejkʰɛ]	[ˈlɛˌkæ]	[ˈʎeˌkæʔh]	[ˈlɛˌkʰæ]	3.00	
327	cat	[ˈkæt]	[ˈkʰæ]	[ˈkʰæʔ]	[kʰætˀ]	[ˈkʰæʔ]	3.00	
330	lion king	[ˈlajənˌkɪŋ]	[ˈlʊkʰɛ]	[ˈlʊˌkʰɛʔ]	[ˈuˌkʰɛ̃ʔ]	[ˈlʊˌkʰɛʔ]	3.00	
332	heart	[ˈhɑɹt]	[owˈkʰɑ]	[ˈka]	[əʷˈkʰaʔ]	[owˈkʰɑ]	3.00	
334	lion king	[ˈlajənˌkɪŋ]	[ˈlajkʰɛʔ]	[ˈlejˌkʰɛ]	[ˈleʲˌkʰəʔ]	[ˈlʊˌkʰɛʔ]	3.00	
351	keys	[ˈkijz]	[ˈkʰij]	[ˈkʰij]	[kʰi]	[ˈkʰij]	3.00	
363	towel	[ˈtɑwəɬ]	[ˈkʰɤ̃mij]	[ˈkʰɑməwej]	[kʰaːˈmuʔ]	[ˈkʰɤ̃məwɪ]	3.00	
386	again	[əˈgɛn]	[ˈægɛʔ]	[ˈægɛʔ]	[ˈʔæˈgɛʔ]	[ˈægɛʔ]		3.00
388	again	[əˈgɛn]	[ˈʌgæʔ]	[æˈgɛʔ]	[æˈgɛʔ]	[æˈgɛʔ]		3.00
396	again	[əˈgɛn]	[ˈʌgæʔ]	[ˈægæʔ]	[æˈgeʔ]	[ˈʌjgæʔ]		3.00
399	again	[əˈgɛn]	[ʌˈgæʔ]	[ˈʌjgæʔ]	[ʔʌˈgæʔ]	[ʌjˈgæʔ]		3.00
400	again	[əˈgɛn]	[ɛˈgæʔ]	[ɛˈgæ]	[ɛˈgæʔ]	[ɛˈgæʔ]		3.00
404	two, three, go	[ˌtuwˌθɹijˈgow]	[ˌtʰuwːˌfwajːˈgowːː]	[ˌtʰuwˌfwajˈgow]	[ˌtʰuʷˌfwaʲˈgaʊʷ]	[ˌtʰuːwˌfwaːjˈgoːw]	3.00	
405	again	[əˈgɛn]	[ɛˈgæʔ]	[æˈgæʔ]	[æˈgæʔ]	[ɛˈgæʔ]		3.00
414	uh, monkey	[ʔʌˈmʌŋkij]	[ʊpˀˈmɤ̃ŋkʰej]	[ˈʌʔˌmʌŋkij]	[ˌɯpˀmɤ̃ŋˈkeʲ]	[ˈʊʔˌmɤ̃ŋkʰej]		3.00

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
421	lion king	[ˈlajənˌkɪŋ]	[əˈlawkʰʊ]	[ʌˈlʊkʰɛ]	[ʊˈlʌʲkʰəʔ]	[əˈlawkʰɛ]	3.00	
422	lion king	[ˈlajənˌkɪŋ]	[ˈlajˌkʰɛ]	[əˈlajkʰæ]	[uˈlaʲkʰæ]	[əˈlajkʰɛ]	3.00	
423	lion king	[ˈlajənˌkɪŋ]	[ˈlajˌkʰæ]	[ˈlajkʰæ]	[ˈlaʲkʰæʔ]	[ˈlajˌkʰæ]	3.00	
424	uh, car	[ʔʌˈkɑɹ]	[ɐ̃ʔɐ̃ʔəˈkʰɑ]	[ʌʔʌʔɛkʰɑː]	[ˈʔʊˈʔʌʔeʲˈkʰaːʔ]	[ɐ̃ʔʌʔejˈkʰɑː]	3.00	
425	car	[ˈkɑɹ]	[əˈkʰɑː]	[ˈkʰɑː]	[ˈkʰaː]	[ˈkʰɑː]	3.00	
426	car	[ˈkɑɹ]	[uwˈkʰɑ]	[əʔˈkʰɑ]	[ʔukʰaːpˀ]	[uwˈkʰɑ]	3.00	
427	oh, car	[owˈkɑɹ]	[owˈkʰɑ]	[owˈkʰɑ]	[ʔo̰ʲkʰa]	[owˈkʰɑ]	3.00	
428	lion king	[ˈlajənˌkɪŋ]	[ˈlɛkʰɛ]	[ˈlɛkʰɛ]	[ˈlɛkʰɛ]	[ˈlɛkʰɛ]	3.00	
430	lion king	[ˈlajənˌkɪŋ]	[ˈlajkʰɛ]	[ˈzʌjkʰɛ]	[ˈzʌʲkʰɛkˀ]	[ˈlajkʰɛ]	3.00	
432	car	[ˈkɑɹ]	[ˈkʰʊʌ]	[ˈkʰʌː]	[kʰɯaː]	[ˈkʰʌː]	3.00	
433	lion king	[ˈlajənˌkɪŋ]	[lʊˈkʰɛ]	[ˈlʌjkʰɛ]	[ˈlʌʲkʰɛkˀ]	[ˈlajkʰɛ]	3.00	
446	potato head	[pəˈtejtowˌhɛd]	[ˈtʰɛˌhɑr]	[ˈtʰejhʌ]	[ˈtʰeʲhʌʔ]	[ˈtʰejˌhɑɹʔ]	3.00	
448	okay	[ˈowkej]	[ʌˌkʰej]	[ˈʌkej]	[ˈɐ̃keʲ]	[ʌˌkʰej]		3.00
461	turtle	[ˈtɜɹtəɬ]	[ˈtʰʊtʰʌ]	[ˈtʰʊtʰʌ]	[ˈtʰɔtʰɔ]	[ˈtʰʊtʰʌ]	3.00	3.00
462	uh, cow	[ʔʌˈkaw]	[õʔɐ̃mˈkʰaw]	[ʌmˈkaw]	[ʌ̃ːmˈkaʊ]	[õʔɐ̃mˈkʰaw]	3.00	
467	garbage truck	[ˈgaɹbəd͡ʒˌtɹʌk]	[ˈbæˌt͡ʃɛkʰ]	[bæˈt͡ʃɛkʰ]	[ˈbæˈtʃɛkʰʲː]	[bæˈt͡ʃɛkʰ]	3.00	
469	a big cow	[əˌbɪgˈkaw]	[ʌæɛːˈbijˌkʰaw]	[ʌæˌbijˈkʰɑw]	[ʔʌ ˈæʔɛ ˌbikˀˈkʰaʷ]	[ʌ.æ.ɛːˈbijˌkʰɑw]	3.00	
469	a big cow	[əˌbɪgˈkaw]	[ʌæɛːˈbijˌkʰaw]	[ʌæˌbijˈkʰɑw]	[ʔʌ ˈæʔɛ ˌbikˀˈkʰaʷ]	[ʌ.æ.ɛːˈbijˌkʰɑw]	3.00	
470	peacock	[ˈpijkɑk]	[ˈpʰijˌkʰɑ]	[ˈpʰijka]	[ˈkʰikʰaː]	[ˈpʰijˌkʰɑ]	3.00	3.00
471	peacock	[ˈpijkɑk]	[pʰijˈkʰɑ]	[ˌpʰijˈkʰaː]	[ˌpʰɪˈkʰaː]	[pʰijˈkʰɑː]	3.00	3.00
472	apple	[ˈæpəɬ]	[ˈæpʰɑː]	[ˈæˌpɑ]	[ˈæˌpɑ̃ː]	[ˈæˌpʰɑː]		3.00
473	uh, peacock	[ʔʌˈpijkɑk]	[ʌõʌ̃əˌpʰijˈkʰɑ]	[ʌʔʌʔʌˌpʰijˈkɑ]	[ʌʌʌˌpʰiˈkʰɑ]	[ɐ̃ʔɐ̃ʔɐ̃ʔəˌpʰijˈkʰɑ]	3.00	3.00
474	uh, cow	[ʔʌˈkaw]	[ɐ̃ʔəˈkʰawː]	[ʌʔˈkʰɑw]	[ɐ̃ʔʌˈkʰaʊ]	[ɐ̃ʔəˈkʰɑːw]	3.00	
476	cat	[ˈkæt]	[ˈkʰætʰ]	[ˈkʰæk]	[ˈqækʰ]	[ˈkʰɑtʰ]	3.00	
478	cow	[ˈkaw]	[ˈkʰɑawː]	[ˈkʰɑw]	[kʰaːu]	[ˈkʰɑːw]	3.00	
481	uh, tractor(?)	[ʔʌˈtɹæktəɹ]	[ɛðnʊˈtʃij]	[ənt̚nəˈkijm]	[ʔən nəˈtʃʲiːm]	[ɐ̃n.nʊ.əˈkʰijm]	3.00	
483	monkey	[ˈmʌŋkij]	[ˈmajkʰij]	[ˈmækij]	[ˈmæ̃kʰi]	[ˈmækʰij]		3.00
490	cookie	[ˈkʊkij]	[ˌkʰijˈkʰij]	[ˈkɪkij]	[ˈkʰɪˈkʰiʲ]	[ˈkʰɪˈkʰij]	3.00	3.00

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
493	monkey	[ˈmʌŋkij]	[ˈmækʰijː]	[ˈmækij]	[ˈmækʰiː]	[ˈmækʰiːj]		3.00
496	cat tail	[ˈkætˌtejɬ]	[ˈkʰæʔˌtʰejʌ]	[ˈkʰæʔˌtʰijæ]	[ˈkʰæʔˌtʲɪʲæ]	[ˈkʰæʔˌtʰijʌ]	3.00	
496	cat tail	[ˈkætˌtejɬ]	[ˈkʰæʔˌtʰejʌ]	[ˈkʰæʔˌtʰijæ]	[ˈkʰæʔˌtʲɪʲæ]	[ˈkʰæʔˌtʰijʌ]	3.00	
499	uh, key	[ʔʌˈkij]	[ˈɐ̃ʔˌkʰij]	[ˈʌʔəˌkij]	[ˈʌˌkʰi]	[ˈɐ̃ʔəˌkʰij]	3.00	
500	candle	[ˈkændəɬ]	[ˈkʰæːdɑː]	[ˈkʰæːdæː]	[ˈkʰæːdaː]	[ˈkʰæːdaː]	3.00	3.00
501	cookie	[ˈkʊkij]	[ˈkʰijkʰij]	[ˈkʰɪkʰij]	[ˈkʰɪʰiʲ]	[ˈkʰɪkʰij]	3.00	3.00
502	monkey	[ˈmʌŋkij]	[ˈmɛˌkʰij]	[ˈmɛˌkʰij]	[ˈmɛ̃ˌkʰi]	[ˈmɛˌkʰij]		3.00
504	cookie	[ˈkʊkij]	[ˈkʰijkʰij]	[ˈkɪkij]	[ˈkʰɪkʰiʲ]	[ˈkʰijˌkʰij]	3.00	
512	bicycle	[ˈbʌjsɪkəɬ]	[ˈpʰʊtʰʌ]	[ˈpowˌtʰʊ]	[ˈpoˌtʰɔʔ]	[ˈpʰowˌtʰʌ]	3.00	3.00
513	bicycle	[ˈbʌjsɪkəɬ]	[wɛɪˈpʰʊˌtʰʊ]	[ˌbɛʔjəˈpʰʊtʰə]	[ˌbɛʔəˈpʰʊˌtʰə]	[ˌbɛʔjəˈpʰʊtʰʌ]	3.00	3.00
523	um, uh, dada	[ʔʌmʌˈdædæ]	[õmõnˈdædæ]	[ˌʊmʔʊˈdædæ]	[ˌʊmˌʔõ dæˈdæʔ]	[mˌʔõnˈdædæ]	3.00	3.00
526	car	[ˈkɑɹ]	[ˈkʰɑː]	[ˈkʰaː]	[kʰaː]	[ˈkʰɑː]	3.00	
533	...Cathy ... paper	[ˈkæθijˌpejpəɹ]	[...ˈkʰæʃejˈpʰɑpʰɑ]	[ˈkʰæʃɛˈpʰaˌpʰa]	[ˈkʰæe̞ɛ...ˈpʰʌˌpʰʌ]	[...ˈkʰæʃejˈpʰɑpʰɑ]	3.00	
534	Cathy	[ˈkæθij]	[...əˈkʰæθʌ]	[ˈkʰæθæ]	[...əˈkʰæθæ]	[...əˈkʰæθa]	3.00	
541	dada	[ˈdædæ]	[ˈdɛdæ]	[ˈdædæ]	[ˈdɛda]	[ˌdɛˈda]	3.00	3.00
551	keys	[ˈkijz]	[hɐ̃ˈkʰij]	[hæˈkij]	[ˌhæʔˈkʰiʲ]	[hɐ̃ˈkij]	3.00	
553	purple	[ˈpɜɹpəɬ]	[ˈpʰʌbow]	[ˈpʰʌˌpʊ]	[ˈbʌˌpʰu]	[ˈpʰʌˌpʊ]	2.00	2.00
558	cat	[ˈkæt]	[ˈkʰætʰ]	[ˈkʰæt]	[kʰætˀ]	[ˈkʰætˀ]	3.00	
561	cat	[ˈkæt]	[ˈkʰætʰ]	[ˈkʰætʰ]	[tʰætʰ]	[ˈkʰætʰ]	3.00	
562	...up high	[ʔʌpˈhaj]	[...ʌˈpʰaj]	[həˈpʰaj]	[....hʊˈpʰaʲ]	[həˈpʰaj]	3.00	
563	apple	[ˈæpəɬ]	[ˈæpʰɑ]	[ˈæˌpʰa]	[ˈʔæˌpʰa]	[ˈʔæˌpʰɑ]		3.00
630	make castle	[ˌmejkˈkæsəɬ]	[ʊwɐ̃nˌmejkʰəˈkʰæʃuw]	[ʌˌmejkʔɐ̃ˈkʰæʃuw]	[əʷˈmeʲkʲʰˈʔʊ̃ˈkʰæθuː]	[ʊwɐ̃ˌmejkʰʔɐ̃ˈkʰæʃuw]	3.00	
635	cow	[ˈkaw]	[ˈkʰɑw]	[ˈkʰɑw]	[kʰɑw]	[ˈkʰɑw]	3.00	
639	cat...tail	[ˌkætˈtejɬ]	[ˈkʰækʰəˌtʰejə]	[ˌkʰæʔəˈtʰejə]	[ˌkʰæʔ kʰ ʊˈtʰeʲə]	[ˈkʰæʔkʰə̤ʔəˌtʰejə]	3.00	
639	cat...tail	[ˌkætˈtejɬ]	[ˈkʰækʰəˌtʰejə]	[ˌkʰæʔəˈtʰejə]	[ˌkʰæʔ kʰ ʊˈtʰeʲə]	[ˈkʰæʔkʰə̤ʔəˌtʰejə]		3.00
647	airplane	[ˈɛɹplejn]	[ˈɛpʰejn]	[ˈɛpʰejʔuw]	[ˈɛpʰeʲlu̯]	[ɛˈpʰẽjn]	3.00	
649	apple	[ˈæpəɬ]	[ˈæpʰʌ]	[ˈæˌpʰæ]	[ˈæˌpʰæ]	[ˈʔæˌpʰa]		3.00
650	apple	[ˈæpəɬ]	[ˈæpʰʊːlə]	[ˈæpʰuwa]	[ˈæpʰuʷæ]	[ˈʔæˌpʰuwə]		3.00
666	dada	[ˈdædæ]	[ˈdædɛ]	[ˈdædæ]	[ˈdædæʔ]	[ˈdædæ]	3.00	3.00
669	dada	[ˈdædæ]	[ˈdædæ]	[ˈdædæ]	[ˈdædæ]	[ˈdædæ]	3.00	3.00
673	bird	[ˈbɜɹd]	[ˈbʌ]	[ˈʌ.æ]	[mʊatˀ]	[ˈbʌ.æ]	3.00	

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Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
677	cow	[ˈkaw]	[ˈkʰaw]	[ˈkʰaw]	[kʰaʷ]	[ˈkʰɑw]	3.00	
678	tractor	[ˈtɹæktəɹ]	[ˈkʰæt͡ʃɑ]	[ˌkʰʌtˈɬaʔ]	[ˌkʰæˈt͡ʃʌʔ]	[ˈkʰæt͡ʃˌɬɑ]	3.00	
680	cat	[ˈkæt]	[ˈkʰæ]	[ˈkʰæ]	[kʰætˀ]	[ˈkʰæ]	3.00	
690	painting	[ˈpejntɪŋ]	[ˈpʰejtʰij]	[ˈpʰejˌtʰij]	[ˈpʰeʲˌtʰi]	[ˈpʰejˌtʰij]	3.00	3.00
693	I want blanket	[ˌajwantˈblæŋ kət]	[ajwɑ̃ˈbægij]	[ʌwantˈpædij]	[ˈaʲnt͡ʃˈpæˌd͡ʒi]	[ʌjwɑ̃ˈbædij]	1.00	3.00
695	want blanket	[wantˈblæŋkə t]	[õʔˈbædijː]	[ʌˈpʰædij]	[upˀˈpædʲiː]	[ɑ̃ʔˈbædiːj]	1.00	3.00
696	guitar	[gəˈtaɹ]	[ɪˈtʰæ]	[əˈtʰaː]	[iˈtʰæ]	[əˈtʰæ]	3.00	
700	teddybear	[ˈtɛdijˌbɛɹ]	[ˈtʰejbʌ]	[ˈtʰejbɑʔ]	[ˈtʰeʲˌbɑʔ]	[ˈtʰejˌbʌʔ]	3.00	3.00
704	garden(?)	[ˈgaɹdən]	[əˈgɑrdʌ]	[ˌɪzˈgɑdə]	[ˌðɪθˈgɑkæ̰ʔ]	[əˈgɑˌdʌ]	3.00	2.00
706	carrot	[ˈkɛɹət]	[ˈkʰeɪɪ]	[ˈkʰejɹɪtˀ]	[ˈkʰeʲˌɹɪtˀ]	[ˈkʰɛɹɪʔ]	3.00	
707	potato(?)	[pəˈtejtow]	[ˈt̪͡ʃuwdij]	[ˈtʰuwdij]	[t̪͡ʃˈtʃuˈdi]	[tʰʊˈdij]	3.00	3.00
711	airplane	[ˈɛɹplejn]	[uwˈpʰɛ̃ːn]	[ɜ̃ˈpɛ̃jn]	[ɪˈpeˌn̩]	[ʊˈpʰɛ̃n]	3.00	
712	a castle	[əˈkæsəɬ]	[uwˈkʰæʃuw]	[əˈkʰæsjuw]	[uˈkʰæʃju]	[ʊˈkʰæʃjuw]	3.00	
717	monkey	[ˈmʌŋkij]	[ˈmɪˌgij]	[ˈmajkʰij]	[ˈmɪkˀkʰiʲ]	[ˈmejk.gij]		1.00
728	bicycle	[ˈbʌjsɪkəɬ]	[ˌbawːsˈtʰʌtʰʌ]	[ˌbwawsˈtʰʌtʰʌpʰ]	[ˌbʷɑ̃ʷˈθtʰoˌtʰʌpˀ]	[ˌbʷawsˈtʰʌtʰʌ]	3.00	3.00
728	bicycle	[ˈbʌjsɪkəɬ]	[ˌbawːsˈtʰʌtʰʌ]	[ˌbwawsˈtʰʌtʰʌpʰ]	[ˌbʷɑ̃ʷˈθtʰoˌtʰʌpˀ]	[ˌbʷawsˈtʰʌtʰʌ]	3.00	
729	cake	[ˈkejk]	[ˈkʰejkʰ]	[ˈkʰejkʰ]	[kʰæjkʲʰ]	[ˈkʰejkʰ]	3.00	
734	kip, cup	[ˈkɪpˌkʌp]	[ˈkʰɪpʰˌkʰʌpʰ]	[ˈkʰɪpʰˌkʰʌpʰ]	[ˈkʰepʰˌkʰʌpʰ]	[ˈkʰɪpʰˌkʰʌpʰ]	3.00	
734	kip, cup	[ˈkɪpˌkʌp]	[ˈkʰɪpʰˌkʰʌpʰ]	[ˈkʰɪpʰˌkʰʌpʰ]	[ˈkʰepʰˌkʰʌpʰ]	[ˈkʰɪpʰˌkʰʌpʰ]	3.00	
737	...cookie	[ˈkukij]	[...ˈkʰɪkʰij]	[ˈkʰɪkij]	[...ˈkʰʲɪkʰʲi]	[...ˈkʰijkʰij]	3.00	3.00
746	cat	[ˈkæt]	[ˈkʰæ]	[ˈkʰæ]	[kʰætˀ]	[ˈkʰæ]	3.00	
761	uh, apple	[ʔʌˈʔæpəɬ]	[ʌˈæpʰuw]	[əˈʔæpʰuw]	[ʊˈʔæˌpʰuʷ]	[ɛ̃ˈʔæˌpʰuw]		3.00
767	moo-cow	[ˈmuwˌkaw]	[nəˈmuwˌkʰaw]	[ˈmuwkʰɑw]	[mˌˈmuʷkʰʌʷ]	[nəˈmuwˌkʰʌw]	3.00	
769	cow	[ˈkaw]	[ˈkʰaw]	[ˈkʰaw]	[kʰaʷ]	[ˈkʰɑw]	3.00	
785	cookie	[ˈkʊkij]	[ˈkʰejkʰij]	[ˈkʰejkij]	[ˈkʰæʲkʰi]	[ˈkʰejkʰij]	3.00	3.00
790	a cow	[əˈkaw]	[əˈkʰawːə]	[əˈkʰaw]	[əˈkʰaʷw]	[əˈkʰɑːwə]	3.00	
792	cat	[ˈkæt]	[ˈkʰætʰ]	[ˈkʰætʰ]	[kʰæt]	[ˈkʰætʰ]	3.00	
794	wheelbarrow	[ˈwijɬˌbɛɹow]	[oˈwejbɪbɑ]	[owˈwajbɛbɑ]	[oʷˈwaʲbɛbɑʔ]	[owˈwejbɛbɑ]		3.00
804	oh, purple...	[owˈpɜɹpəɬ]	[owˈpʰɪrpʰəˌwɑ̃n]	[ɑ̃ˈpʰʊpʰʊˌwʌn]	[owˈpʰʊpʰʊˌwæŋ]	[owˈpʰɜpʰʊˌwɑ̃n]	3.00	3.00
805	squeeze	[ˈskwijz]	[ˈkʰejːf]	[ˈt͡ʃejf]	[tʃeʲɸ]	[ˈkʰeːjv]	3.00	

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
810	okay	[ˈowkej]	[owˌkʰej]	[owˈkʰej]	[oʷˈkʰe̞ʔe]	[owˈkʰɛʔɛ]	3.00	
819	okay	[ˈowkej]	[ʌˌkʰej]	[ˈʌˌkʰej]	[ˌʔɔˈkʰeʲç]	[ˈʔʌˌkʰej]		3.00
821	okay	[ˈowkej]	[əˈkʰej]	[ˌʌˈkʰʌj]	[ˌɔˈqʰɛʲ]	[ʌˈkʰɸj]	3.00	
822	Cathy	[ˈkæθij]	[uwˈkʰæʃij]	[əˈkʰæˌʂij]	[uˈkʰæˌʃi]	[uwˈkʰæˌʂij]	3.00	
837	clock	[ˈklɑk]	[ˈkʰɑkʰ]	[ˈkʰɑkʰ]	[kʰɑːkʰ]	[ˈkʰɑkʰ]	3.00	
840	hippo	[ˈhɪpow]	[ˈhʌbowæ]	[ˈhɛɬpowa]	[ˈhɛlˌpwoʔæ]	[ˈhʌpʰowæ]		3.00
847	apple	[ˈæpəɬ]	[ˈæpʰuw]	[ˈæpuw]	[ˈæpʷ̬]	[ˈʔæˌpʰuw]		3.00
854	pail	[ˈpejɬ]	[ˈpʰejæ]	[ˈpʰeja]	[ʊˈpʰeʲæ]	[ˈpʰeˌja]	3.00	
861	newspaper	[ˈnuwzˌpejpəɹ]	[ˈowpʰɑpʰɑ]	[ˈtʰowˌpʰæpʰæ]	[ˈtʰoʷˌpapa]	[ˈowpʰɑpʰɑ]	3.00	3.00
867	elephant ... bicycle	[ˈɛləfɪntˌbʌjsɪk əɬ]	[ænəˈɛləfɛ...pʰʌtʰæ]	[ɐ̃ˈɛ̃ɬfʌˈpʰʌtʰæ]	[ʌˈʔæɬfʌɑ ə ʔɛçɪ mˌˈpʰʊtʰæ]	[ænəˈɛɬfɛ̃...ˈpʰʌtʰæ]	3.00	3.00
868	aligator on bicycle	[ˌæləgejtəɹ.ɑnˈbʌjsɪkəɬ]	[mˌˈælgələɐ̃ʔõnpʰʌtʰhɑ]	[ˈægɛləʔʌʔʌnˌpʰʊtɛʔ]	[mˌˈʔægɛðə ʔɐ̃ʔũnˈpʰʊtʰɛʔ]	[mˌˈægɛləʔɐ̃ʔõnˌpʰʌtʰɑ]	3.00	3.00
873	teddybear (?)	[ˈtɛdijˌbɛɹ]	[əˈtʰɛˌbɑː]	[ˈtʰɛˌbɑː]	[ˈtʰɛˌbɑː]	[əˈtʰɛˌbɑː]	3.00	3.00
874	cake	[ˈkejk]	[ˈkʰejːkʰ]	[ˈkʰejkʰ]	[kʰɛʲk]	[ˈkʰejkʰ]	3.00	
876	cup	[ˈkʌp]	[ˈkʰʌpʰʌ]	[ˈkʰʌpʰʊ]	[ˈkʰʌˌpʰʊʷ]	[ˈkʰʌˌpʰʌ]	3.00	
890	eating..... ...	[ˈijtɪŋ]	[ˈejtʰĩn...]	[ˈejtʰẽ]	[əˈʔeʲtʰeʔəˈdænəpfrədæt]	[ˈʔejtʰĩ...]		3.00
900	window	[ˈwɪndow]	[wĩnˌdowːn]	[ˈwɪnˌdown]	[ˈʔĩnˌdõːn]	[ˈwĩnˌdowən]		3.00
902	cook	[ˈkʊk]	[ˈkʰʊkʰ]	[ˈkʰʊkʰ]	[kʰʊkʰ]	[ˈkʰʊkʰ]	3.00	
903	that's a cow	[ˌðætsəˈkaw]	[tʰɐ̃tʰəˈkʰawə]	[ˌtʰʌtʔʌˈkʰɑwɑ]	[ˌtʰʊtʔʌˈkʰæwɑ]	[tʰɐ̃tʰəʔʌˈkʰɑwa]	3.00	
905	cat	[ˈkæt]	[ˈkʰætʰ]	[ˈkʰætʰ]	[kʰæːtʰ]	[ˈkʰætʰ]	3.00	
906	that's a piggy	[ˌðætsəˈpɪgij]	[ˈpʰætʰəˌpʰɪgij]	[ˈtʰætæˌpʰɪgij]	[ˈtʰætæˌpʰɪgiʲ]	[ˈtʰætʰaˌpʰɪgij]	3.00	3.00
906	that's a piggy	[ˌðætsəˈpɪgij]	[ˈpʰætʰəˌpʰɪgij]	[ˈtʰætæˌpʰɪgij]	[ˈtʰætæˌpʰɪgiʲ]	[ˈtʰætʰaˌpʰɪgij]	3.00	3.00
915	daddy duck	[ˈdædijˌdʌk]	[dætʰənõmˈdætʰej]	[ˌdæhajmˌˈdʌgej]	[ˌdæhaʲũmːˈdʌgeʲ]	[dæθajnõmˈdʌgej]	3.00	2.00
925	book	[ˈbʊk]	[ˈbʊkʰ]	[ˈbʊkʰ]	[bʊk]	[ˈbʊkʰ]	3.00	
926	clock	[ˈklɑk]	[ˈkʰɑkʰ]	[ˈkʰɑkʰ]	[kʰɑk]	[ˈkʰɑkʰ]	3.00	

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
932	what's that	[wʌtsˈðæt]	[huwnˈdæt^{h}]	[huwˈdæː]	[hu^{w}ˈdæt]	[ʔuwnˈdæt˺]	3.00	
934	crocodile	[ˈkɹɑkədajəɬ]	[ˈk^{h}ɑk^{h}ədajlə]	[ˈk^{h}ɑk^{h}ɑˌdæwə]	[ˈk^{h}ɑk^{h}ɑˌdæðə]	[ˈk^{h}ɑk^{h}əˌdajvə]	3.00	3.00
934	crocodile	[ˈkɹɑkədajəɬ]	[ˈk^{h}ɑk^{h}ədajlə]	[ˈk^{h}ɑk^{h}ɑˌdæwə]	[ˈk^{h}ɑk^{h}ɑˌdæðə]	[ˈk^{h}ɑk^{h}əˌdajvə]		3.00
936	guitar	[gəˈtaɹ]	[ɐ̃ŋˈt^{h}ɛɑ]	[ɐ̃nˈt^{h}ɛː]	[a^{j}n^{j}ˈt^{h}ɛaː]	[ɐ̃ŋˈt^{h}ɛ.a]		3.00
937	cat	[ˈkæt]	[ˈk^{h}æt^{h}æ̃nˈduwĩn]	[ˈk^{h}ætaduwijɛn]	[hætəˌdujənə]	[ˈk^{h}æt^{h}a˷duwijɛn]	3.00	
945	apple	[ˈæpəɬ]	[ˈæp^{h}ʊ]	[ˈæpʊ]	[ˈʔæpʊ]	[ˈʔæp^{h}ʊ]		3.00
947	apple	[ˈæpəɬ]	[ˈæp^{h}ʊ]	[ˈæpwʊ]	[ˈʔæpwʊ^{l}]	[ˈʔæp^{h}ʊ]	3.00	
949	that's a carrot	[ˌðætsəˈkɛɹət]	[dæsəˈk^{h}ɛɹæ]	[ˌdæsɪˈk^{h}æwæ]	[ˌdz̪æt̪sɪˌk^{h}æˈɹæ]	[ˌdæsɨˈk^{h}ɛɹæ]	3.00	
956	water	[ˈwɑtəɹ]	[ˈwɑdʊ]	[ˈwʌdə]	[ˈwʌˌdʌ]	[ˈwʌdʊ]		3.00
957	boat ... drive	[ˈbowtˌdɹajv]	[ˈbowt^{h}ʌwɑ̃nədəˈdrajv]	[ˈbowt^{h}ədəˈdwajv]	[ˈbo^{w}tə ʔə̃ːdˌəˈdˌɻa^{j}f]	[ˈbowt^{h}əʔɐ̃wɑ̃nədəˈdɹajv]	3.00	
961	hippo	[ˈhɪpow]	[ajmˈp^{ʰ}ɪ̃mbow]	[ajɪmˈp^{h}ʌmˌbow]	[a^{j}ɪmˈp^{ʰ}ɪ̃mˌbo^{w}]	[ajmˈp^{ʰ}ĩmˌbow]	3.00	3.00
962	that's a hippo	[ˌðætsəˈhɪpow]	[dæsəˈbʌ̃mˌbow]	[dæsæˈbʌmˌbow]	[ˈdæθæˈbʌmˌbo^{w}]	[dæsaˈbʌ̃mˌbow]	3.00	3.00
967	blue and red and purple too	[bluwənɹɛdənˈpɜɹpəɬˌtuw]	[wuwɑ̃nəwɛdɑ̃nˈp^{h}ɪrp^{h}ʌˌt^{h}uw]	[ˌwuwænəˈwɛdə̃ˈp^{h}ʊpʌˈt^{h}uwə]	[ˈwuˌːənəˈʁɛdʔə̃nˈp^{h}up˺ɸəlˈt^{h}uːə]	[ˌwuwɑ̃nəˈwɛdʔɑ̃nˈp^{h}ɜp^{h}ʌˌt^{h}uwə]	3.00	3.00
967	blue and red and purple too	[bluwənɹɛdənˈpɜɹpəɬˌtuw]	[wuwɑ̃nəwɛdɑ̃nˈp^{h}ɪrp^{h}ʌˌt^{h}uw]	[ˌwuwænəˈwɛdə̃ˈp^{h}ʊpʌˈt^{h}uwə]	[ˈwuˌːənəˈʁɛdʔə̃nˈp^{h}up˺ɸəlˈt^{h}uːə]	[ˌwuwɑ̃nəˈwɛdʔɑ̃nˈp^{h}ɜp^{h}ʌˌt^{h}uwə]		3.00
969	kite	[ˈkajt]	[ˈk^{h}ajt^{h}]	[ˈk^{h}ajt]	[k^{h}a^{j}t^{h}]	[ˈk^{h}ajt^{h}]	3.00	
970	monkey	[ˈmʌŋkij]	[ˈmajˌk^{h}ijː]	[ˈmajʔˌk^{h}ij]	[ˈma^{j}ʔˌt^{h}iː]	[ˈmajʔˌk^{h}iːj]		3.00
974	airplane	[ˈɛɹˌplejn]	[ˈɐ̃mp^{h}ejn]	[ˈʔʌmp^{h}ɛ̃jn]	[ˈʔʌmˌp^{h}æ^{j}n]	[ʔɐ̃mˈp^{h}ɛ̃jn]	3.00	
976	vacuum	[ˈvækjuwm]	[ˈbæk^{h}ijnʌ]	[ˈvæk^{ʰ}ɪ̃nɐ̃]	[ˈfæk^{h}ɪjõ]	[ˈbæk^{ʰ}ɪ̃nɐ̃]	2.00	
978	...monkey and hippo	[ˌmʌŋkijənˈhɪpow]	[...əˈmɛk^{h}ijɐ̃nˌp^{h}ɐ̃mbow]	[ˌmajk^{h}ijʔɐ̃ˈp^{h}ʌmbow]	[k^{h}apa õ bəˌˌɪˌma^{j}k^{h}i^{j}õˈp^{h}ə̃mbo^{w}]	[...əˈmɛk^{h}ijʔɐ̃nˈp^{h}ɐ̃mˌbow]	3.00	3.00
978	...monkey and hippo	[ˌmʌŋkijənˈhɪpow]	[...əˈmɛk^{h}ijɐ̃nˌp^{h}ɐ̃mbow]	[ˌmajk^{h}ijʔɐ̃ˈp^{h}ʌmbow]	[k^{h}apa õ bəˌˌɪˌma^{j}k^{h}i^{j}õˈp^{h}ə̃mbo^{w}]	[...əˈmɛk^{h}ijʔɐ̃nˈp^{h}ɐ̃mˌbow]		3.00

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
979	paper	[ˈpejpəɹ]	[ˈpʰejpʰʌ]	[ˈpʰejˌpʰʊ]	[ˈheʲˌpʷɑ]	[ˈpʰejˌpʰʊ]	3.00	3.00
987	...crocodile	[ˈkɹɑkədajəɬ]	[...ˈhɑkʰɛdə]	[ˈhajkʰædə]	[ˈhaʲkʰædə]	[ˈhajkʰɛdə]		3.00
987	...crocodile	[ˈkɹɑkədajəɬ]	[...ˈhɑkʰɛdə]	[ˈhajkʰædə]	[ˈhaʲkʰædə]	[ˈhajkʰɛdə]		3.00
990	candle	[ˈkændəɬ]	[ˈkʰæ̃nʊ]	[ˈkænɔ]	[ˈkænʲʊl]	[ˈkʰæ̃ˌnõw]	3.00	
991	eating cookie	[ˌijtɪŋˈkʊkij]	[ajˈejtʰɪ̃ɪnəˈkʰijkʰij]	[ajˌẽjfɪ̃ʔɑ̃ˈkɪkʰij]	[aʲˌeʲfɪ̃ʔəˈkʲikʲiʲj]	[ʔajʔə̃ˈejtʰɪ̃ʔəˈkʰijkʰij]	3.00	3.00
993	cookie	[ˈkʊkij]	[əˈkʰɪkʰijs]	[ˈkʰɪˌkʰijs]	[ʊˈk̃ʰiˌkʰiʲs]	[əˈkʰɪˌkʰijs]	3.00	3.00
1002	airplane	[ˈɛɹˌplejn]	[ˈɛpʰ̰ejn]	[ˈɛˌpwejn]	[ˈʔæˌpʰẽʲn]	[ˈʔɛˌpʰẽjn]	3.00	
1006	doggie	[ˈdɑgij]	[ˈbijkʰˌdɑgij]	[ˈdejkˌdɑgij]	[ˈdeʲkʲˌdɑgiʲiʲç]	[ˈbɪkʰˌdɑgij]	3.00	3.00
1006	doggie	[ˈdɑgij]	[ˈbijkʰˌdɑgij]	[ˈdejkˌdɑgij]	[ˈdeʲkʲˌdɑgiʲiʲç]	[ˈbɪkʰˌdɑgij]	3.00	
1012	hippo like it	[ˈhɪpowˌlajkɪt]	[ɐ̃mˈpʰɐ̃ːmbowˌlajkʰɪtʰ]	[ɐ̃ˈpʰʌmbowˌlajkɪnt]	[ɐ̃ˈpʰʌmboʷˌʎaʲkɪt]	[ʔɐ̃mˈpʰɐ̃mˌbowˈlajkʰɪtʰ]	3.00	3.00
1016	green one	[ˈgɹijnwʌn]	[ˈg̃ĩnwɐ̃n]	[ˈgɪŋˌwæn]	[ˈgɪŋˌmæn]	[ˈgɪ.uw.ˌwɐ̃n]	3.00	
1020	hippo	[ˈhɪpow]	[ˈbɐ̃ːmˌbowː]	[ˈbʌmˌbow]	[ˈmʌmˌbɔʷ]	[ˈbɐ̃mˌboːw]	3.00	3.00
1021	going ... car	[ˌgowɪŋˈkɑɹ]	[gowijn....ˈkʰɑr]	[ˌgowɪnawʔəpʰo̰ʔʌʔəˈkʰɑ]	[ˌgowɪna əpʰə̰ ə̃ əˈkʰɑ]	[ˌgowijnawʔəpʰo̰ʔʌʔəˈkʰɑ]	3.00	
1021	going ... car	[ˌgowɪŋˈkɑɹ]	[gowijn....ˈkʰɑr]	[ˌgowɪnawʔəpʰo̰ʔʌʔəˈkʰɑ]	[ˌgowɪna əpʰə̰ ə̃ əˈkʰɑ]	[ˌgowijnawʔəpʰo̰ʔʌʔəˈkʰɑ]	3.00	
1027	monkey drive	[ˈmʌŋkijˌdɹajv]	[ˈmɛkʰijˌd͡ʒaj]	[ˈmækʲ̃ijˌd͡ʒajvˀ]	[ˈmækʰiːˌʤaʲ]	[ˈmɛkʰijˌd͡ʒaj]		3.00
1028	hippo drive	[ˈhɪpowˌdɹajv]	[ɐ̃ʔˈpʰɪ̃ːmbowːˌdrajf]	[ẽʔəˈpømbõwĩdəʁajf]	[ẽʔˈpʊmːbõwĩdɪˌʁaʲf]	[ɐ̃ʔəˈpʰẽmbowĩˌdəʁajf]	3.00	3.00
1029	hippo drive	[ˈhɪpowˌdɹajv]	[mˌˈpʰɪ̃ːmbowˌd͡ʒajv]	[mˌˈpʰʌmˈbowɐ̃ˌd͡ʒaj]	[ẽʔˈpʊmːbõʷldɪˌʁaʲ]	[mˌˈpʰẽmˈbowɐ̃ˌd͡ʒaj]	3.00	3.00
1035	I like cookies	[ajˈlajkˌkʊkijz]	[ɑlajˈkʰuwkʰijs]	[jælajkˀˈkʰɪʔkʰijs]	[ˈælaʲˈkʰɪʔkʰiʲs]	[ˌlalajˈkʰɪʔkʰijs]	3.00	3.00
1042	hippo ... towel ... toys	[hɪpowtɑwəɬtojz]	[əˈθɪ̃ːmbow...ˈtʰowʌ...ˈtʰɔjs]	[əˈθɪmbowəˌtʰʌwɑˈtʰojs]	ə̃mˈt͡sɪm[boʷ ʔɛˌtʰalaˈnæʲʔʊˌtʰʌwɑɛ̃ ˌʌθəzə ˌʔæ̃s ɛ mˌpˀ ʔeˈtʰɔʲsʲ]	[əˈθɪ̃mbow...ˈtʰʌwa...ˈtʰɔjs]	3.00	

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1042	hippo ... towel ... toys	[hɪpowtɑwəɬtojz]	[ə‘θĩːmbow...‘tʰowʌ...‘tʰɔjs]	[ə‘θɪmbowəˌtʰʌwɑ ‘tʰojs]	ə̃m‘ʦɪm[boʷ ʔɛˌtʰala‘næʲʔʊˌtʰʌwɑ ɛ̃ ˌʌθəzə ˌʔæ̃s ɛ mˌpˀ ʔe‘tʰɔʲsʲ]	[ə‘θĩmbow...‘tʰʌwa...‘tʰɔjs]		3.00
1043	monkey	[‘mʌŋkij]	[majˌt͡ʃʲij]	[‘majˌkij]	[‘maʲˌtʃʲiː]	[‘majˌkʰij]		3.00
1047	okay	[‘owkej]	[owˌkʰej]	[‘owkʰej]	[oʷ‘kʰɛʲʎ]	[ʔow‘kʰej]		3.00
1048	cutting knife	[‘kʌtɪŋˌnajf]	[‘kʰʌtʰə‘najfwɪf]	[ˌkʰʌtə‘nejfˌwɪθ]	[ˌkʰʌtə‘nʲaʲfˌwɪθ]	[‘kʰʌtʰə‘najfwɪf]	3.00	3.00
1058	...apple	[‘æpəɬ]	[....‘æpʰow]	[‘æpˌhɔ]	[....‘ʔæpoʷ]	[....‘ʔæpʰow]		3.00
1062	...that's a daddy one	[ˌðætsə‘dædijˌwʌn]	[...dædə‘dædijˌwɐ̃n]	[dædə‘dædijwʌn]	[ˌdaʔn̩‘teɾi ‘dætə‘dæɾiwʌn]	[...dædə‘dædijˌwɐ̃n]	3.00	3.00
1063	that's a tiny one	[ˌðætsə‘tajnijˌwʌn]	[dætʰə‘tʰajnijˌwɐ̃n]	[ˌdætɛn‘tʰajnijwɛn]	[ˌdætʊn‘tʰaʲniwɛn]	[dætʰə‘tʰajnijˌwɐ̃n]	3.00	
1064	I wanna turn page	[‘ajwɑnəˌtɜɹnpejd͡ʒ]	[ʌ‘mɐ̃nˌtʰuwːpʰejd]	[ɐ̃‘mɐ̃ntʰjuwəpʰejt]	[ə‘mɑnθɬuʷəpeʲtʃ]	[ɐ̃‘mɐ̃nˌtʰuːwpʰejd]	3.00	
1064	I wanna turn page	[‘ajwɑnəˌtɜɹnpejd͡ʒ]	[ʌ‘mɐ̃nˌtʰuwːpʰejd]	[ɐ̃‘mɐ̃ntʰjuwəpʰejt]	[ə‘mɑnθɬuʷəpeʲtʃ]	[ɐ̃‘mɐ̃nˌtʰuːwpʰejd]	3.00	
1068	lot of pictures...look a	[‘lɑtəvˌpɪktʃəɹzˌlʊkə]	[lɑʌpʰɪ...‘lʊkʰətʰʌ]	[lɑʔɑ‘pʰɪ.ɐ̃‘ʃuwdɛ̆n‘tʰɛɬ‘lʌkʌˌtʰɛ]	[lɑʔɑ‘pʰɪ...ɜ̃‘ʃuʷdɛn‘tʰɛɬ‘lʌkʌˌtʰɛ]	[lɑʔɑ‘pʰɪʔɐ̃‘ʃuwdɛ̆n‘tʰɛ‘lʊkʰʌˌtʰɛ]	3.00	
1073	oh cat, hi cat	[ow‘kætˌhajkæt]	[ɐ̃‘kʰætʰɐ̃‘hajˌkʰætʰ]	[ow‘kʰætʰɐ̃‘hajʲ‘kʰæʔtʰ]	[ˌõʷˌkʰætˌʔɐ̃‘haʲkʰæʔtʰ]	[õ‘kʰætʰɐ̃‘hajˌkʰæʔtʰ]	3.00	
1073	oh cat, hi cat	[ow‘kætˌhajkæt]	[ɐ̃‘kʰætʰɐ̃‘hajˌkʰætʰ]	[ow‘kʰætʰɐ̃‘hajʲ‘kʰæʔtʰ]	[ˌõʷˌkʰætˌʔɐ̃‘haʲkʰæʔtʰ]	[õ‘kʰætʰɐ̃‘hajˌkʰæʔtʰ]	3.00	
1074	cat	[‘kæt]	[‘kʰʌtʰ]	[‘kʰʌt]	[kʰʌtʰ]	[‘kʰʌtʰ]	3.00	
1077	...cat	[‘kæt]	[dæsə‘kʰætʰ]	[‘kʰæt]	[‘ðavə‘kʰætʰ]	[ˌdæzə‘kʰætʰ]	3.00	
1078	call phone	[‘kɑɬˌfown]	[əˌkʰɑɬ‘fownə]	[əˌkʰɑl‘ɸwownə]	[ˌkʰɑˡ‘hwoʷnə]	[əˌkʰɑɬ‘ɸownə]	3.00	
1084	that's a man	[ˌðætsə‘mæn]	[dætʰə‘mæ̃n]	[dætæmˌ‘mæn]	[tætæmˌ‘mæn]	[dætʰamˌ‘mæ̃n]	2.00	
1085	cat	[‘kæt]	[‘kʰætʰ]	[‘kʰæt]	[kʰæt]	[‘kʰæt̚]	3.00	
1086	couch	[‘kawt͡ʃ]	[mˌ‘pʰɐ̃nt͡ʃ]	[mˌ‘pʰʌnt͡ʃ]	[mˌ‘pɐ̃mtʰ]	[mˌ‘pʰɐ̃nt͡ʃ]	3.00	

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1091	colour, colouring	[ˌkʌləɹˈkʌləɹɪŋ]	[ˈkʰʌləɤ̃mˌˈkʰʌlɪr̃ŋɪtˀ]	[ˈkʰʌlɑʔaʔə̃ˈkʰʌlʌɪˌnĩ]	[ˈkʰʌlɑ ʔe̞ŋˈkʰʌlʌʲɪˌnɛ̃]	[ˈkʰʌlɑʔə̃ʔə̃ˈkʰʌlʌ̃ˌnɛ̃]	3.00	
1091	colour, colouring	[ˌkʌləɹˈkʌləɹɪŋ]	[ˈkʰʌləɤ̃mˌˈkʰʌlɪr̃ŋɪtˀ]	[ˈkʰʌlɑʔaʔə̃ˈkʰʌlʌɪˌnĩ]	[ˈkʰʌlɑ ʔe̞ŋˈkʰʌlʌʲɪˌnɛ̃]	[ˈkʰʌlɑʔə̃ʔə̃ˈkʰʌlʌ̃ˌnɛ̃]	3.00	
1093	that's a purple	[ˌðætsəˈpɜɹpəɬ]	[ðætsəˌpʰɔrpʰʊ]	[ˌætæˈpʰʊˌpʰʊ]	[ˌʔæt̪sæˈpʰoˌpʰʌ]	[ˌʔætʰaˈpʰɜˌpʰʊ]	3.00	3.00
1097	that's a blue and a purple	[ðætsəˌbluwɛndəˈpɜɹpəɬ]	[ˈdætʰəbluwæ̃nəˈpʰɔrpʰʌ]	[əˈdætʰʌˌbuwənəˈbuwpə]	[ˌməmə əˈdætʰʌˌbuːənənˈpupə]	[əˈdætʰʌˌbuwə̃nəˈbɔpʰʌ]	2.00	3.00
1098	...a cat, a boy	[əˌkætʔəˈboj]	[...əˈkʰætʰəˈbɔjʌ]	[əˈkʰæpʰʔɤ̃ˈbojɑ]	[əˈkʰæpʰə əˈboɹʲɑh]	[...əˈkʰætʰəʔɤ̃ˈbɔjʌ]	3.00	
1098	...a cat, a boy	[əˌkætʔəˈboj]	[...əˈkʰætʰəˈbɔjʌ]	[əˈkʰæpʰʔɤ̃ˈbojɑ]	[əˈkʰæpʰə əˈboɹʲɑh]	[...əˈkʰætʰəʔɤ̃ˈbɔjʌ]	3.00	
1103	little baby	[ˌlɪtəɬˈbejbij]	[ɬejˈbijbij]	[ˌlejˈbijbij]	[lɛˈpiʲpi]	[ˌlejˈbijbij]	2.00	2.00
1106	baby	[ˈbejbij]	[ˈbejbij]	[ˈbejbij]	[ˈpeʲpi]	[ˈbejbij]	2.00	2.00
1107	diaper	[ˈdaɹpəɹ]	[ˈtʰɛpʰɛkʰ]	[ˈtʰɛpe]	[ˈtʰɛpek]	[ˈtʰɛpɛʔ]	3.00	3.00
1109	high chair	[ˈhajˌt͡ʃɛɹ]	[ɳˈdætʰˌd͡ʒɛr]	[ɳˈdɛtʰˌɪdɛ]	[nˈdɛtʰˌt͡ʒɛəˑ]	[ənˈdætʰˌɪdɛ.ə]	3.00	
1111	...man cooking	[ˌmænˈkʊkɪŋ]	[...ˈmæ̃nˈkʰʊkʰijn]	[ˌmænɤ̃ˈkʰʌkɪŋə]	[mæn ə ʊ̃ˈmænʌmˈkʰukʰɪŋə]	[...ˌmæ̃nɤ̃ˈkʰʊkʰɪŋə]	3.00	3.00
1124	carrot	[ˈkɛɹɪət]	[ˈkʰɛrwɛ]	[ˈkʰɛˌvæ]	[ˈkʰɛjˌvæ]	[ˈkʰɛˌvæ]	3.00	
1129	apple	[ˈæpəɬ]	[ˈætʰæbɑ]	[ˈætʰætætˀ]	[ˈætæpæʔ]	[ˈʔætʰæbæʔ]		1.00
1131	mango	[ˈmæŋgow]	[ˈmejgow]	[ˈmɛgow]	[mɛˈgoʷ]	[ˈmɛ̃gow]		
1132	that	[ˈðæt]	[ɳˌdæ]	[ɳˈðæ]	[uʷˈdæʷ]	[ɳˈdæ]	2.00	
1133	cracker,cheese, ice cream	[ˌkɹækəɹˌt͡ʃijzˈʔajskɹijm]	[dætəˈkʰɔrkʰɤ̃dætəˈt͡ʃijʌejkʰij]	[dæta‘kʰɔkətædənˈt͡ʃijəˈɪkʰij]	[ˈkʰɔkəːˈtætənˈʧiːə̃ːˈʔijkʰiːʲ]	[dætʰaˈkʰɔkʰɤ̃ˌdædənˈt͡ʃijʔʌˌɪkʰij]	3.00	3.00
1136	putting that	[ˌpʊtɪŋˈðæt]	[mˌpʰɪdɛ̃nˈdætʰ]	[mˌpʰɪtʰɛnˈdæd]	[mˌpʰetənˈdæt̪n]	[mˌpʰɪtʰɛ̃nˈdæd]	3.00	2.00
1137	spoon cook	[spuwnˈkʊk]	[əˈpʰuwnɛ̃nkʰʊ]	[ˌpʰuwənˈkʰʊkə]	[ˈpʰuʷənˈkʰʊkˀ]	[əˈpʰuwɛ̃nˈkʰʊkə]	3.00	

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1137	spoon cook	[spuwn‘kʊk]	[ə‘pʰuwnɛ̃nkʰʊ]	[ˌpʰuwən‘kʰʊkə]	[‘pʰuʷən‘kʰʊk˞]	[ə‘pʰuwɛ̃n‘kʰʊkə]	3.00	
1141	clock	[‘klɑk]	[‘kʰɑkʰ]	[‘kʰɑk]	[kʰɑk]	[‘kʰɑkʰ]	3.00	
1146	that's a baby and thats' a lady	[ðætsəˌbejbijɛ ndðætsə‘lejdij]	[‘ðæsɑbejbijĩnðæs ə‘lejdijˌkʰr̥ɪkʰɪtʰ]	[ˌæsæ‘bejbijə̃ˌtæs æˌlejdij‘kɹɪkət]	[ˌθætə‘beʲbi ʔɪ ˌtætæˌleʲdi ‘kwiket]	[ˌðæsɑ‘bejbijʔə̃tʰæ sə‘lejdij‘kʰɹɪkʰɪtʰ]	3.00	3.00
1146	that's a baby and thats' a lady	[ðætsəˌbejbijɛ ndðætsə‘lejdij]	[‘ðæsɑbejbijĩnðæs ə‘lejdijˌkʰr̥ɪkʰɪtʰ]	[ˌæsæ‘bejbijə̃ˌtæs æˌlejdij‘kɹɪkət]	[ˌθætə‘beʲbi ʔɪ ˌtætæˌleʲdi ‘kwiket]	[ˌðæsɑ‘bejbijʔə̃tʰæ sə‘lejdij‘kʰɹɪkʰɪtʰ]		3.00
1147	dada	[‘dædæ]	[mˌ‘dædɛ]	[ʌm‘dædæ]	[ʌm‘dætæ]	[ɐ̃m‘dæda]	3.00	2.00
1149	that's a ... purple	[ˌðætsə‘pɜɹpəɬ]	[‘ðæsʌ...‘pʰɔrpʰʌ]	[ˌdætshʊˌdætɛn‘pʰ ʊpʰwʌ]	[ˌdæθʊˌðætɛn‘pʰʊp ʰəʷ]	[ˌðætshɐ̃ˌdætʰɛn‘pʰ ɔpʰwʌ]	3.00	3.00
1154	apple	[‘æpəɬ]	[‘æpʰow]	[‘æpʰow]	[‘æpʰɬ]	[‘ʔæpʰow]		3.00
1167	cat	[‘kæt]	[‘kʰætʰ]	[‘kʰæt]	[kʰæt]	[‘kʰætʰ]	3.00	
1179	clothes	[‘klowðz]	[kʰɪ‘kʰʊds]	[‘kʰʌ.əd]	[ki‘kʰɔəd˞t]	[‘kʰʌ.əd]	3.00	
1181	airplane	[‘ɛɹˌplejn]	[‘ɛpʰejlə]	[‘ɛ̃ˌplɛ̃jʌ]	[‘ʔɛˌpʰɛ̃jl]	[‘ʔɛ̃ˌpʰɛ̃jlə]	3.00	
1186	cats	[‘kæt]	[‘kʰætʰ]	[‘kʰæt]	[kʰæt̚ʰ]	[‘kʰæt˞]	3.00	
1189	peacock	[‘pijˌkɑk]	[‘pʰejˌkʰɑkʰ]	[‘pʰejˌkʰɑkʰ]	[‘pʰeʲˌkʰɑkʰ]	[‘pʰejˌkʰɑkʰ]	3.00	3.00
1196	whiskers	[‘wɪskəɹz]	[ɪʔˌtʰɛ]	[‘ɪʔˌkʰɛ]	[‘ekˌtʰɛ]	[ʔɪk˞‘tʰɛ]	3.00	
1202	purple	[‘pɜɹpəɬ]	[mˌ‘pʰʌpʰʌ]	[mˌ‘pʰʊpʊ]	[mː‘pʰʊpʰʊ]	[mˌ‘pʰʌpʰɔ]	3.00	3.00
1204	slippers	[‘slɪpəɹz]	[‘tʃɪpʰɛ]	[ʃɪ‘pʰɛ̃]	[ʧɪ‘pʰɛ]	[‘tʃɪpʰɛ]		3.00
1206	cat too	[‘kætˌtuw]	[əˌkʰæ‘tʰuw]	[ʌ‘kʰæˌtʰuw]	[əkʰæ‘tʰuː]	[əˌkʰæ‘tʰuw]	3.00	
1206	cat too	[‘kætˌtuw]	[əˌkʰæ‘tʰuw]	[ʌ‘kʰæˌtʰuw]	[əkʰæ‘tʰuː]	[əˌkʰæ‘tʰuw]	3.00	
1207	cat hair	[‘kætˌhɛɹ]	[‘kʰæt˞ɐ̃ʔˌhaw]	[ˌkʰætʌʔ‘haw]	[ˌkʰæt˞ ʔʌʔ‘haʷ]	[‘kʰæt˞ʔɐ̃‘haw]	3.00	
1217	rabbit	[‘ɹæbɪt]	[ə‘ræpʰʌtʰ]	[ʌ‘wæpʰɛtʰ]	[ʌ‘ɹæpʰætθ]	[ə‘wæˌpʰʌtʰ]		3.00
1219	piggy too	[‘pɪgijˌtuw]	[ə‘pʰɪgijˌtʰuw]	[ʌˌpʰɪgij‘tʰuw]	[ʌˌpʰɪgi‘tʰuʷ]	[ə‘pʰɪgijˌtʰuw]	3.00	3.00
1219	piggy too	[‘pɪgijˌtuw]	[ə‘pʰɪgijˌtʰuw]	[ʌˌpʰɪgij‘tʰuw]	[ʌˌpʰɪgi‘tʰuʷ]	[ə‘pʰɪgijˌtʰuw]	3.00	
1220	Cathy, a horse	[ˌkæθijʔə‘hɔɹs]	[əˌkʰæʃijɐ̃ə‘hɔjs]	[ʌˌkʰæʃijʔʌʔʌ‘hojs]	[ʌˌkʰæθiʔʌʔʌ‘hoʲʃʲ]	[əˌkʰæʃijʔɐ̃ʔə‘hɔjs]	3.00	
1225	guitar	[gə‘taɹ]	[gɛ‘tʰɑ]	[gʌ‘tʰɑː]	[gɛ‘tʰɑː]	[gɛ‘tʰɑ]	3.00	3.00
1227	comb mama	[‘kowmˌmama]	[‘kʰʌmajˌhow]	[kʰajˌmajˈhɑ]	[kʰæʲˌmɐ̃nɛ̃‘kʰɑː]	[ˌkʰʌj‘majˌhɔ]	3.00	

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Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1236	corn	[ˈkɔɹn]	[ˈkʰɶ̃n]	[ˈkʰɔn]	[kχɔn]	[ˈkʰɔ̃n]	3.00	
1238	apple	[ˈæpəɬ]	[ˈʌpʰʊ]	[ˈʌpɔ]	[ˈʔæpʰoʷ]	[ˈʌpʰɔ]		3.00
1239	mm, potato	[m̩pəˈtejtow]	[m̩ˈtʰejdow]	[m̩ˈtʰejdow]	[mːˈtʰeʲˌdoʷ]	[m̩ˈtʰejdow]	3.00	3.00
1245	guitar	[gəˈtaɹ]	[ˈtʰɑː]	[ˈtʰɑː]	[tʰɑː]	[ˈtʰɑː]	3.00	
1250	piggy	[ˈpɪgij]	[ˈpʰɪgijʃ]	[ˈpʰɪgijˌ̪s]	[ˈpʰɯgiˌ̪s]	[ˈpʰɪgijˌ̪s]	3.00	3.00
1253	cat	[ˈkæt]	[ˈkʰætʰ]	[ˈkʰætʰ]	[kʰætʰ]	[ˈkʰætʰ]	3.00	
1257	my working on a tie-dye	[majˌwɜɹkɪŋɑn əˈtajˌdaj]	[...majwɪrkʰ̪ɪŋɶ̃nəˈtʰajdaj]	[ˌmajnwʊkɪnɑnˈtʰajdaj]	[ˌmaʲnwʊkɪnənəˈtʰaʲdaʲ]	[ˌmɶ̃jwɜkʰ̪ijnɶ̃nɶ̆ˈtʰajdaj]	3.00	3.00
1257	my working on a tie-dye	[majˌwɜɹkɪŋɑn əˈtajˌdaj]	[...majwɪrkʰ̪ɪŋɶ̃nəˈtʰajdaj]	[ˌmajnwʊkɪnɑnˈtʰajdaj]	[ˌmaʲnwʊkɪnənəˈtʰaʲdaʲ]	[ˌmɶ̃jwɜkʰ̪ijnɶ̃nɶ̆ˈtʰajdaj]		3.00
1263	apple	[ˈæpəɬ]	[ˈæpʰow]	[ˈæpʰow]	[ˈæpʰoʷ]	[ˈʔæpʰow]		3.00
1264	piggy come	[ˈpɪgijkʌm]	[ˌpʰɪgijˈkʰɶ̃mnɑ]	[ˈpʰɪgijˌkʰʌmə]	[ˈpʰɪgiˌkʰʌmmə]	[ˌpʰɪgijˈkʰɶ̃mna]	3.00	3.00
1264	piggy come	[ˈpɪgijkʌm]	[ˌpʰɪgijˈkʰɶ̃mnɑ]	[ˈpʰɪgijˌkʰʌmə]	[ˈpʰɪgiˌkʰʌmmə]	[ˌpʰɪgijˈkʰɶ̃mna]	3.00	
1265	carrots	[ˈkɛɹəts]	[ˈkʰɛɾæ]	[ˈkʰɛwæʔ]	[ˈkʰɛɹæʔ]	[ˈkʰɛɹæʔ]	3.00	
1266	...my working ...	[ˌmajˈwɜɹkɪŋ]	[...majwʊrkʰ̪ɪŋ...]	[ˈmajwʊkɪn]	[maʲwʊkɪn...]	[...ˈmajwʊkʰ̪ɪnə]		3.00
1269	my working ...	[majˈwɜɹkɪŋ]	[ˈmajwʊrkʰ̪ɪŋ...]	[majˈwʊkɪŋ]	[maʲˈwʊkiŋ ˈtæɾæ]	[majˈwʊkʰ̪ɪŋ]		3.00
1270	birdies	[ˈbɜɹdijz]	[ˈbʌdijz]	[ˈbʌdejz]	[ˈmɑdeʲʃ]	[ˈbʌdejz]	3.00	3.00
1271	apples	[ˈæpəɬz]	[ˈæpʰɔjz]	[ˈæpʌjz]	[ˈæpɔʲsʲ]	[ˈʔæpʰɔjs]		3.00
1272	chicken	[ˈt͡ʃɪkən]	[ˈt͡ʃɪkʰijn]	[ˈt͡ʃɪkijn]	[ˈʧikiŋ]	[ˈt͡ʃɪʔkʰijn]		3.00
1277	cat	[ˈkæt]	[ˈkʰætʰ]	[ˈkʰæːt]	[kʰætʰ]	[ˈkʰætˀ]	3.00	
1281	Cathy	[ˈkæθij]	[əˈkʰætʰij]	[ˈkæɬij]	[kʰæθɬi]	[əˈkʰæʧij]	3.00	
1283	two rabbits	[tuwˈɹæbɪts]	[tʰuwʔˈræbɛtʰ]	[tʰuwʔˈwæbɛt]	[tʰuʔˈwæˌbɛtʰ]	[tʰuwʔˈwæbɛtˀ]	3.00	3.00

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1292	turtle	[ˈtɜɹtəɬ]	[ˈtʰɪɾtʰəɬ]	[ˈtʰʊˌtow]	[ˈtʰɔˌtʰɔʷ]	[ˈtʰʊˌtʰow]	3.00	3.00
1300	piggy	[ˈpɪgij]	[ˈpʰɪgij]	[ˈpɪgij]	[ˈpɪgɪdˀ]	[ˈpʰɪgij]	3.00	3.00
1301	piggy	[ˈpɪgij]	[pʰɪːgijː]	[ˈpʰɪˌgij]	[ˈpʰɪˌgiː]	[ˈpʰɪgiːj]	3.00	3.00
1307	knife	[ˈnajf]	[kʰəˈnajf]	[kəˈnajf]	[kˈnaʲf]	[kʰəˈnajf]	3.00	
1325	no want that kind	[nowˈwantðætˌkajnd]	[nowɑˈdæˌkʰajn]	[nowɑˈdæʔkʰajn]	[noʷɑˈdæʔˌkʰaʲn]	[nowɑˈdæʔkʰajn]	3.00	
1329	I want ... a popsicle	[ajˌwantəˈpɑpsəkʌɬ]	[ʌwɜ̃...əˈpʰɑkʰʌ]	[awã.ajwɑntʰɛdədtʰe̞.ɛðəʔɛnˈpʰɑˌkʰɑ]	[ɑwən aˈwɑ̃tʰɛɾedtʰ ẽnə̃ æˈpʰɑˌkʰɑ]	[ʌwɜ̃ʔawɑ̃tʰɛdədtʰe̞ʔɛðəʔɛnˈpʰɑˌkʰʌ]	3.00	3.00
1331	want popsicle on my plate	[wantˈpɑpsəkʌɬɑnmajˌplejt]	[ʌnˌpʰɑkʰəĩnmajˈphajtʰ]	[ãˈpɑkə.ə̃majˈpʰajt]	[ə̃ˈpɑkənəmaʲˈpʰaʲt̚s]	[ɾ̃ˌpʰɑkʰəʔĩmajˈpʰajtʰ]	3.00	3.00
1331	want popsicle on my plate	[wantˈpɑpsəkʌɬɑnmajˌplejt]	[ʌnˌpʰɑkʰəĩnmajˈphajtʰ]	[ãˈpɑkə.ə̃majˈpʰajt]	[ə̃ˈpɑkənəmaʲˈpʰaʲt̚s]	[ɾ̃ˌpʰɑkʰəʔĩmajˈpʰajtʰ]	3.00	
1340	and corn pie	[ɛndˈkɔɹnˌpaj]	[æ̃nˌkʰɔrnˈpʰaj]	[ə̃ˌkʰowmˈpʰaj]	[kʊmˈpʰaʲ]	[æ̃nəˌkʰə̃mˈpʰaj]	3.00	
1340	and corn pie	[ɛndˈkɔɹnˌpaj]	[æ̃nˌkʰɔrnˈpʰaj]	[ə̃ˌkʰowmˈpʰaj]	[kʊmˈpʰaʲ]	[æ̃nəˌkʰə̃mˈpʰaj]	3.00	
1341	my cooking	[majˈkʊkɪŋ]	[ˈmajkʰʊˌkʰɛ̃n]	[mˌˈmajkʊˌkɛn]	[mːˈmaʲkʰʊˌkʰɛn]	[əˈmajkʰʊˌkʰɛ̃n]	3.00	3.00
1345	potato	[pəˈtejtow]	[ˈtʰejdow]	[ˈtʰejdow]	[ˈtʰeʲˌdowʷ]	[ˈtʰejdow]	3.00	3.00
1346	...cook a duck	[ˌkʊkəˈdʌk]	[ˌkʰʊkəˈdækʰ]	[ˌkʰʊkəˈdakʰ]	[wʊtədeɾiˌkʰʊkæˈdakˀ]	[ˌkʰʊkʰəˈdækʰ]	3.00	
1346	...cook a duck	[ˌkʊkəˈdʌk]	[ˌkʰʊkəˈdækʰ]	[ˌkʰʊkəˈdakʰ]	[wʊtədeɾiˌkʰʊkæˈdakˀ]	[ˌkʰʊkʰəˈdækʰ]	3.00	
1347	cook a chicken	[ˌkʊkəˈt͡ʃɪkən]	[əˈkʰʊkʰəˌt͡ʃɪkɪ̃n]	[ʌˌkʰʌkʰəˈt͡ʃɪkɪ̃jn]	[əˌkʰʊkʰəˈʧɪkɪ̃ː]	[əˈkʰʊkʰəˌt͡ʃɪkɪ̃n]	3.00	3.00
1348	cook a chicken	[ˌkʊkəˈt͡ʃɪkən]	[ɐ̃ˈkʰʊkʰəˈt͡ʃɪkɪ̃n]	[ˌkʰʊkəˈt͡ʃɪkɪn]	[ˌkʰoʁkˀʔəˈʧɪken]	[ɐ̃ˈkʰʊkʰəˈt͡ʃɪkɪ̃n]	3.00	3.00
1349	cook a chicken	[ˌkʊkəˈt͡ʃɪkən]	[əˌkʰʊkʰəˈt͡ʃɪkɪ̃nʊˈwɐ̃n]	[ʌˌkʰʌkəˈt͡ʃɪkɪnə]	[ʌˌkʰʌkəˈʧɪkɪnə]	[əˌkʰʊkʰəˈt͡ʃɪkɪ̃nəˈwɐ̃n]	3.00	3.00

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1357	...they're eating their food	[ðɛɹˌʔijtɪŋðɛɹˈfuwd]	[ðɪrijdɪŋðɪrˈfuwdə]	[dejˌijɾɪŋdəˈfuwdə]	[ðeʲˌiɾɪŋgeʲˈfuʷdə]	[ðɪʔijdɪŋðɪˈfuwdə]	3.00	
1383	turtle	[ˈtɜɹtəɬ]	[ˈtʰɪrtʰʌ]	[ˈtʰʊˌtʰɑ]	[ˌtʰʊˈtʰɑ]	[ˈtʰʊˌtʰʌ]	3.00	3.00
1389	doggie, mom read that	[ˌdɑgijˌmɑmˈrijdðæt]	[dɑgijˈmɑ̃mwijˌdæ]	[ˌdɑgijəˈmɑɹijˌdæ]	[ˌdɑːgijɪˈmɑɹiˌdætˀ]	[ˌdɑgijəˈmɑ̃ɹijˌdæ]	3.00	3.00
1395	birdies	[ˈbɜɹdijz]	[ˈbʊdij]	[ˈbʊˌdij]	[ˈbɔˌdiʲə]	[ˈbʊˌdij]	3.00	3.00
1397	tractor	[ˈtɹæktəɹ]	[ˈkʰɑ́ʃɑ̃m]	[ˈkʰǽʃʌm]	[ˈkʰæʧʌm]	[ˈkʰɑ́ʃɑ̃m]	3.00	
1405	no my take knife	[nowˈmajtejkˌnajf]	[nowˈmajtʰɛkʰˌnajf]	[nowˈmajətʰɛkʰˌn̩nejf]	[noʷˈmaʲɪtʰɛkʰˌnːɛʲf]	[nowˈmajətʰɛkʰˌnejf]	3.00	
1406	piggy, two piggy	[ˌpɪgijˈtuwpɪgij]	[ˈpʰɪgijtʰuwˌpʰijgij]	[ˈpʰɪgijtʰuwˌpʰijgij]	[ˈpʰigitʰuʷˌpʰigi;]	[ˈpʰɪgijtʰuwˌpʰijgij]	3.00	3.00
1406	piggy, two piggy	[ˌpɪgijˈtuwpɪgij]	[ˈpʰɪgijtʰuwˌpʰijgij]	[ˈpʰɪgijtʰuwˌpʰijgij]	[ˈpʰigitʰuʷˌpʰigi;]	[ˈpʰɪgijtʰuwˌpʰijgij]	3.00	3.00
1408	carrots	[ˈkɛɹəts]	[ˈkʰɛrɛts]	[ˈkʰɛɹɛts]	[ˈkʰɛˌɹɛts]	[ˈkʰɛɹɛts]	3.00	
1424	elbow	[ˈɛɬbow]	[ˈæbow]	[ˈæbow]	[ˈæbo]	[ˈʔæbow]		3.00
1433	a guitar, guitar	[agəˈtaɹgəˌtaɹ]	[ðægəˈtʰɑːrgæˈbɑ]	[ɛgɪˈtʰɑːgɛˌtʰɑː]	[dɛgɪˈtʰɑːdɛˌgɑː]	[ðægəˈtʰɑː.gɛˈdɑ]	3.00	2.00
1433	a guitar, guitar	[agəˈtaɹgəˌtaɹ]	[ðægəˈtʰɑːrgæˈbɑ]	[ɛgɪˈtʰɑːgɛˌtʰɑː]	[dɛgɪˈtʰɑːdɛˌgɑː]	[ðægəˈtʰɑː.gɛˈdɑ]	3.00	3.00
1434	peacock	[ˈpijkɑk]	[ˌpʰiˈkʰɑːkʰ]	[ˈpʰijˌkʰɑkʰ]	[ˈkiˌkʰɑkʰ]	[ˈpʰijˌkʰɑkʰ]	3.00	3.00
1436	wheelbarrow	[ˈwijɬˌbɛɹow]	[ˈwijbəˌlow]	[ˈwijbʌ.ow]	[ˈwiboˌoʷ]	[ˈwijbʌ.ow]		3.00
1444	kids like toast	[ˈkɪdzlajkˌtowst]	[ˈkʰɪdəˈlajkˀˌtʰows]	[ˌkʰɪdəˈlajkˀˈtʰows]	[ˌkʰɛɾəˈlaʲkˀˈtʰoʷeʔ]	[ˈkʰɪdəˈlajkˀˌtʰows]	3.00	
1444	kids like toast	[ˈkɪdzlajkˌtowst]	[ˈkʰɪdəˈlajkˀˌtʰows]	[ˌkʰɪdəˈlajkˀˈtʰows]	[ˌkʰɛɾəˈlaʲkˀˈtʰoʷeʔ]	[ˈkʰɪdəˈlajkˀˌtʰows]	3.00	
1445	kids like toast	[ˈkɪdzlajkˌtowst]	[kʰɪdˈlajkˀˌtʰows]	[kʰɪdˈlajktʰows]	[kʰedˈlaktʰoʷs]	[kʰɪdˈlajkˀˌtʰows]	3.00	
1445	kids like toast	[ˈkɪdzlajkˌtowst]	[kʰɪdˈlajkˀˌtʰows]	[kʰɪdˈlajktʰows]	[kʰedˈlaktʰoʷs]	[kʰɪdˈlajkˀˌtʰows]	3.00	

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Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1448	doggies	[ˈdɑgijz]	[ˈdɑgijæ]	[ˈdɑgija]	[ˈdɑkijæ]	[ˈdɑgija]	3.00	3.00
1450	potato	[pəˈtejtow]	[ənʊˈtʰejːdow]	[ˈtʰejdow]	[ˈtʰæʲdoʷ]	[ənʊˈtʰeːjdoːw]	3.00	3.00
1457	Cathy	[ˈkæθij]	[ˈkʰæːt͡ʃij]	[ˈkæt͡ʃɪ]	[ˈqæʧɪ]	[ˈkʰæt͡ʃij]	3.00	
1460	potato	[pəˈtejtow]	[ˈtʰejdow]	[ˈtʰejdʌ]	[ˈtʰædoʷ]	[ˈtʰejdow]	3.00	3.00
1461	give it mom, to Cathy	[gɪvɪt.tuwˌmɑ mtuwˈkæθij]	[ɣ̃gɛvɪəˈmɯ̃mdəˈkʰæːtʰij]	[gɪʊəˌmã.əˈkætijə]	[əˈgevaˈmãː ʔəˈkʰæʲθji]	[ɣ̃gɛvɪ.əˈmɯ̃ʔəˈkʰæs.tʰijə]	3.00	3.00
1461	give it mom, to Cathy	[gɪvɪt.tuwˌmɑ mtuwˈkæθij]	[ɣ̃gɛvɪəˈmɯ̃mdəˈkʰæːtʰij]	[gɪʊəˌmã.əˈkætijə]	[əˈgeva ˈmãː ʔəˈkʰæʲθji]	[ɣ̃gɛvɪ.əˈmɯ̃ʔəˈkʰæs.tʰijə]	3.00	
1462	give it Cathy	[ˌgɪvɪtˈkæθij]	[ˈgɪvɪˈkʰæt͡ʃij]	[ˈgɪvəˌkætij]	[ˈgeðəˈkʰætʲji]	[ˈgɪvɪˈkʰætʰij]	3.00	3.00
1462	give it Cathy	[ˌgɪvɪtˈkæθij]	[ˈgɪvɪˈkʰæt͡ʃij]	[ˈgɪvəˌkætij]	[ˈgeðəˈkʰætʲji]	[ˈgɪvɪˈkʰætʰij]	3.00	
1478	a rabbit	[əˈɹæbɪt]	[əˈræbɛtʰ]	[ʌdˈwæbɪt]	[æˈgɹæˌvetʰh]	[ədˈɹæbɛtʰ]		3.00
1480	airplane	[ˈɛɹˌplejn]	[ˈɛrˌpʰej]	[ˈɛpʰejn]	[ˈæpʰʷeʲj]	[ˈʔɛˌpʰẽj]		3.00
1483	airplane	[ˈɛɹˌplejn]	[ɪrˌpʰejn]	[ˈhɤ̃pʰejn]	[pəˑpfʷəj]	[ˈhɜˌpʰẽj]		3.00
1494	heart	[ˈhɑɹt]	[ˈkʰɔrɛ]	[ˈkʰʊˌɪ]	[ˈkʰoɛ]	[ˈkʰɔ.ɛ]	3.00	
1504	pig	[ˈpɪg]	[ˈpʰɪtʰ]	[ˈpɪk]	[pɪkʰ]	[ˈpʰɪkʰ]	3.00	
1507	that guy ... purple	[ˈðætgajˌpɜɹpəɬ]	[dæˈgajːɛt̚ˈõnˌpʰɪrpʰɬ]	[dæt̚ˈgʌjəʔɤ̃ʔˌpʰʊpʰə]	[dat̚ˈgʊaj ʔɛʔə ʔ pəəˑpʰəʷ]	[dæˈgajʔɛt̚ʔõnˌpʰɜɹpʊ]	3.00	
1511	...somebody coming sit down	[sʌmbɑdijˈkʌmɪŋsɪtˌdawn]	[ˈmɯ̃mijɛæ̃ndˌsɤ̃mbʌɾijˈkʰɤ̃mijnæ̃nʃijˈdawn]	[ˌsʌmbajˈkʌmɪnə̃sɪˈdawn]	[ˈmami ʔə ʔəˈθɤ̃mbəɾi̥ kʰʌmɪnətʲidʌʷn]	[ˈmɯ̃mijʔɛʔæ̃ndəˌsɤ̃mbʌ.ijˈkʰɤ̃mijnæ̃nʃijˈdawn]	3.00	
1511	...somebody coming sit down	[sʌmbɑdijˈkʌmɪŋsɪtˌdawn]	[ˈmɯ̃mijɛæ̃ndˌsɤ̃mbʌɾijˈkʰɤ̃mijnæ̃nʃijˈdawn]	[ˌsʌmbajˈkʌmɪnə̃sɪˈdawn]	[ˈmami ʔə ʔəˈθɤ̃mbəɾi̥ kʰʌmɪnətʲidʌʷn]	[ˈmɯ̃mijʔɛʔæ̃ndəˌsɤ̃mbʌ.ijˈkʰɤ̃mijnæ̃nʃijˈdawn]	3.00	
1511	...somebody coming sit down	[sʌmbɑdijˈkʌmɪŋsɪtˌdawn]	[ˈmɯ̃mijɛæ̃ndˌsɤ̃mbʌɾijˈkʰɤ̃mijnæ̃nʃijˈdawn]	[ˌsʌmbajˈkʌmɪnə̃sɪˈdawn]	[ˈmami ʔə ʔəˈθɤ̃mbəɾi̥ kʰʌmɪnətʲidʌʷn]	[ˈmɯ̃mijʔɛʔæ̃ndəˌsɤ̃mbʌ.ijˈkʰɤ̃mijnæ̃nʃijˈdawn]		3.00

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1512	mama is cooking	[ˌmamaʔɪzˈkʊ kɪŋ]	[ˌmɑ̃məĩnˈkʰʊkʰ̃ɪŋ]	[ˌmɑmɑə̃ˈkʰʊkʰijŋ]	[ˈmama ʔe ˈkʰukʰiŋ]	[ˌmɑ̃məʔĩnˈkʰʊkʰ̃ijnə]	3.00	3.00
1513	...mama cooking, somebody eat to	[mamaˌkʊkɪŋˌsʌmbɑdijˈʔijt.tuw]	[ˈmɑ̃mijtʰejɛ̃nʌːˌmɑ̃mijˈtʰɛkʰɪtˀʌʒʌ̃mbʌɾijʌijˈtʰuw]	[mɑmɛtʰijkʰə.əsʌm ˈbɑdijə̃.ə̃ʔijˌtʰuw]	[ˈmami tʰə ə̃ ə ˈmamieˌtʰɪʲkə ˌt͡sʌmbaɾieˈɛʲtˀˌtʰu]	[ˈmɑ̃mijtʰejʔɛ̃nʌː ˌmɑ̃mijˈtʰɛkʰɪtˀʌʒʌ̃mbʌ.ijʔʌ̃ʔijˈtʰuw]	3.00	3.00
1513	...mama cooking, somebody eat to	[mamaˌkʊkɪŋˌsʌmbɑdijˈʔijt.tuw]	[ˈmɑ̃mijtʰejɛ̃nʌːˌmɑ̃mijˈtʰɛkʰɪtˀʌʒʌ̃mbʌɾijʌijˈtʰuw]	[mɑmɛtʰijkʰə.əsʌm ˈbɑdijə̃.ə̃ʔijˌtʰuw]	[ˈmami tʰə ə̃ ə ˈmamieˌtʰɪʲkə ˌt͡sʌmbaɾieˈɛʲtˀˌtʰu]	[ˈmɑ̃mijtʰejʔɛ̃nʌː ˌmɑ̃mijˈtʰɛkʰɪtˀʌʒʌ̃mbʌ.ijʔʌ̃ʔijˈtʰuw]	3.00	
1526	carrots	[ˈkɛɹəts]	[əˈkʰɛrɛtʰ]	[ˈkɛvɛts]	[ˈkʰeˌvetθ]	[əˈkʰɛvɛtʰ]	3.00	
1528	wagon	[ˈwægɪn]	[ˈwɛgĩn]	[ˈwægɪn]	[ˈmægen]	[ˈwægĩn]		3.00
1537	I wanna... Bean in blanket	[ajwɑnəˈbijnɪ nˌblæŋkət]	[ʌˈwɑ̃nəbijndɪblɛ̃ŋ kʰɪtʰbɛ̃nĩnˌbɛ̃ŋkʰɛ̃n tˀ]	[ˈawənəˈbɛŋgəˌbwejkejˈbɛ̃jkɪn]	[ˈaʷənəˈbɛŋgɪˌbʷeʲkɪt eːʲˈbɛ̃nkɪn̩]	[ʌˈwɑ̃nəbĩŋdɪbwɛ̃ŋkʰɪtʰʔɛ̃nĩˌbɛ̃ŋkʰɛ̃n tˀ]	3.00	3.00
1537	I wanna... Bean in blanket	[ajwɑnəˈbijnɪ nˌblæŋkət]	[ʌˈwɑ̃nəbijndɪblɛ̃ŋ kʰɪtʰbɛ̃nĩnˌbɛ̃ŋkʰɛ̃n tˀ]	[ˈawənəˈbɛŋgəˌbwejkejˈbɛ̃jkɪn]	[ˈaʷənəˈbɛŋgɪˌbʷeʲkɪt eːʲˈbɛ̃nkɪn̩]	[ʌˈwɑ̃nəbĩŋdɪbwɛ̃ŋkʰɪtʰʔɛ̃nĩˌbɛ̃ŋkʰɛ̃n tˀ]	3.00	
1538	blanket	[ˈblæŋkət]	[ˈbɾejkʰɪtʰ]	[ˈbwejkɪn]	[bɹɛʲkĩθ]	[ˈbwejkʰɪn]		3.00
1546	walking ... Bean	[ˌwɑkɪŋˈbijn]	[ˈwɑkijnɑ̃nɑːˌbijn]	[ˈwækɪnə̃ʔəˌbijn]	[ˈwɔkɪŋʌˌʔhʌˈbĩŋ]	[ˈwɑkʰijnɑ̃ʔɑːˌbijn]	3.00	3.00
1548	turtle	[ˈtɜɹtəɬ]	[ˌʌˈtʰɔrtʰɪɬ]	[ʌʔˈtʰʊtʰə]	[õ ʈɔʈʰɬa]	[ˌʌˈtʰɔtʰɪ]	3.00	3.00
1566	can't find cow	[ˌkæntfajndˈkaw]	[ˌkʰæ̃ntʰfajnˈhaw]	[kæ̃nfɑ̃jˈhaw]	[ˌkʰæ̃rˈfɑ̃j ˈhaʷ]	[ˌkæ̃.fɑ̃jˈhaw]	3.00	
1586	Cathy ... too	[ˈkæθijˌtuw]	[ʊlɑːˈkʰæʔijðæwɑˈtʰuw]	[ˌkæʔij...ˈtʰuw]	[ˈhæθʲi ... tʰuʷ]	[ˌkʰæʔij...ˈtʰuw]	3.00	
1586	Cathy ... too	[ˈkæθijˌtuw]	[ʊlɑːˈkʰæʔijðæwɑˈtʰuw]	[ˌkæʔij...ˈtʰuw]	[ˈhæθʲi ... tʰuʷ]	[ˌkʰæʔij...ˈtʰuw]	3.00	
1592	country	[ˈkʌntɹij]	[ˈowhɪrkʰɾ̃nt͡ʃij]	[ˈkʌnt͡ʃij]	[ˈaɔʷ ˌkənˈtʃiʲ]	[ˈkʰɾ̃nt͡ʃij]	3.00	
1604	that's a cow	[ˌðætsəˈkaw]	[ˈðætəˌkʰawː]	[ˈdætʰəˌkaw]	[ˈʔætsəkʰɑː]	[ˈðætəˌkʰaw]	3.00	
1616	can't find my spoon	[kantˌfajndmajˈspuwn]	[ˌkʰɛ̃nˈfwajmajsmuw]	[kʰæˈfɑ̃jmajmuw]	[kʰæˈfɑ̃jmaʲˌspʷu]	[ˌkʰɛ̃ˈfwajmajsmuw]	3.00	
1625	o.k.	[ˈowkej]	[owˈkʰej]	[owˈkʰej]	[ʔoˈkʰeʲh]	[owˈkʰej]		3.00

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1642	cutting	[ˈkʌtɪŋ]	[ˈkʰʌtʰijn]	[ˈkʌtʰɪnə]	[ˈkʌˌtiŋ̩ə]	[ˈkʰʌtʰijn]	3.00	3.00
1643	haircut	[ˈhɛɹkʌt]	[ˈhɛrkʰɛtʰ]	[ˈhækʌtʰ]	[ˈhæʲɟ͡ʰætʰ]	[ˈhɛkʰætʰ]	3.00	
1647	windy	[ˈwɪndij]	[əwĩnˈdij]	[əˈwɪndijə]	[ˈə̃nˈdih]	[əwĩnˈdij]		3.00
1654	baby chicks	[ˌbejbijˈtʃɪks]	[ˌbejbijˈtʃɪks]	[ˌbejbijˈtʃɪks]	[ˌpʲɛʲbiˈʧɛkˀs]	[ˌbejbijˈtʃɪks]	2.00	3.00
1657	yucky	[ˈjʌkij]	[]	[ˈlɛkʰij]	[ˌʎaˈkʰiʲ]	[ˈlɛkʰij]		2.00
1658	that's yucky	[ˌðætsˈjʌkij]	[ˈðæd͡ʒʌpʰij]	[ˈðætˌjʌkij]	[ˌðæˈtɑki]	[ˈðæˌdjʌpʰij]		3.00
1668	airplane	[ˈɛɹˌplejn]	[ˈɛpʰejn]	[ˈɛpʰejn]	[ˈʔæʲpɛʲn]	[ˈɛpʰẽjn]		3.00
1669	purple	[ˈpɜɹpəɬ]	[ˈpʰʊrbʌ]	[ˈpʰʊpʰə]	[ˈpʰupɑ]	[ˈpʰʊbʌ]	3.00	2.00
1678	they're waking up	[ðɛɹˌwejkɪŋˈʔʌp]	[ɪrwejkʰijnˈʌpʰ]	[əˌwejkɪnˈʔʌp]	[ʔəˌˌʔeʲkɪŋˈapʰ]	[ʔœwejkʰijnˈʔʌpʰ]		3.00
1684	racoons	[ɹæˈkuwnz]	[wæˈkʰuwns]	[wæˈkʰuwnz]	[maʲˈkʰuːns]	[wæˈkʰuwns]		3.00
1688	rabbits	[ˈɹæbɪts]	[ˈræbɪts]	[ˈɹæbɪts]	[ɹæˈbeʔt̪s̪]	[ˈɹæbɪts]		3.00
1691	cats	[ˈkæts]	[ˈkʰætʰ]	[ˈkʰæts]	[kʰæt̪s̪]	[ˈkʰætʰ]	3.00	
1701	yogurt	[ˈjowgəɹt]	[ˈjʌgɛtʰ]	[ˈlʌgɛtʰ]	[ˈdɔgætʰ]	[ˈjʌgɛtʰ]		3.00
1704	telephone	[ˈtɛləfown]	[tʰɛləˈfawn]	[tɛɬəˈfæwn]	[ˈtʰɛ̃mfæõn]	[tʰɛləˈfɛwn]	3.00	
1723	I want the puppets	[ajˌwantðəˈpʌpəts]	[ãndəˈpʰʌpʰʌts]	[wãndəˈpʰʌˌpʰɪts]	[wõtəˈpʰʌpʰɪt̪s̪]	[wũndəˈpʰʌpʰʌjts]	3.00	3.00
1726	we'll eat something	[wijɬˈʔijtˌsʌmθɪŋ]	[wəˈijsʌ̃mpʰijŋ]	[ʌˈʔijtˌsʌmpʰɪŋ]	[wiˈʔeʲtˌsa̰mθiŋˌgə]	[wəˈʔijtˀsʌ̃mpʰijnə]		3.00
1730	o.k. I get a pillow	[ˌowkejʔɑjˌgɛtəˈpɪlow]	[ʊkʰejˈajgɛrəˌpʰɛluw]	[owkejˌajgɛrəˈpʰɛluw]	[æʷˈkʰɛʲ ˈaʲgɔ̃rəˈpʰɪloʷ]	[ʌkʰejˈʔajgɛrəˌpʰɛluw]	3.00	3.00
1730	o.k. I get a pillow	[ˌowkejʔɑjˌgɛtəˈpɪlow]	[ʊkʰejˈajgɛrəˌpʰɛluw]	[owkejˌajgɛrəˈpʰɛluw]	[æʷˈkʰɛʲ ˈaʲgɔ̃rəˈpʰɪloʷ]	[ʌkʰejˈʔajgɛrəˌpʰɛluw]	3.00	
1771	daddy	[ˈdædij]	[ˈdædij]	[ˈdædij]	[ˈdædi]	[ˈdædij]	3.00	3.00
1775	dancing	[ˈdænsɪŋ]	[ˈdæ̃ntʰɪ̃ŋ]	[ˈdæntʰɪŋ]	[ˈdæntʰɪŋ]	[ˈdæ̃ntʰɪ̃ŋ]	3.00	3.00
1777	upside down	[ˌʔʌpsajdˈdawn]	[sajˈdawn]	[ˌfaˈdawn]	[ˌfaʲˈdaʷn]	[sajˈdawn]	3.00	
1795	other house	[ˈʔʌðəɹˌhaws]	[ʌdʌˈhaws]	[ˌʌdʌˈhaws]	[ˌʌdeɹˈhæʷs]	[ʔʌdʌˈhaws]		3.00

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1796	want the puppet	[ˌwantðəˈpʌpə t]	[ˈɑ̃dəˈpʰʌpʰɪtʰ]	[ˌʌdɪˈpʰʌˌpʰɛtʰ]	[ˌʔʌɾəˈˈpʰʌˌpʰɛtʰ]	[ʔɑ̃dəˈpʰʌpʰɛtʰ]	3.00	3.00
1811	cat go	[ˈkætˌgow]	[ˈkʰæˌdow]	[ˈkʰætˈdow]	[ˈkʰætˈˌdoʷ]	[ˈkʰæˌdow]	3.00	
1811	cat go	[ˈkætˌgow]	[ˈkʰæˌdow]	[ˈkʰætˈdow]	[ˈkʰætˈˌdoʷ]	[ˈkʰæˌdow]	3.00	
1823	I'll get doggy	[ˌajɬgɛtˈdɑgij]	[ʌɬˈgɛtˈˌdɑgij]	[ˌagɛʔˈdɑˌgij]	[ˌaʔˌgɛʔˈdɑˌgʲi]	[aˈgɛtˈˌdɑgij]	3.00	3.00
1823	I'll get doggy	[ˌajɬgɛtˈdɑgij]	[ʌɬˈgɛtˈˌdɑgij]	[ˌagɛʔˈdɑˌgij]	[ˌaʔˌgɛʔˈdɑˌgʲi]	[aˈgɛtˈˌdɑgij]	3.00	
1834	okay	[ˈowkej]	[ˈʌˌkʰej]	[ˈʌˌkʰej]	[ˈɔˌkʰeʲ]	[ˈʌˌkʰej]		3.00
1839	cut its, cut its	[ˌkʌtɪtsˈkʌtɪts]	[ˈkʰɛɾætsˈkʰɛɾæt˺]	[ˌkʰɪɾætsˈkʰɪɾæts]	[kʰɪˌɾæsˈkʰɪɾæs]	[ˈkʰɛɾætsˈkʰɛɾæt˺]	3.00	
1839	cut its, cut its	[ˌkʌtɪtsˈkʌtɪts]	[ˈkʰɛɾætsˈkʰɛɾæt˺]	[ˌkʰɪɾætsˈkʰɪɾæts]	[kʰɪˌɾæsˈkʰɪɾæs]	[ˈkʰɛɾætsˈkʰɛɾæt˺]	3.00	
1840	I want go, something a cookie	[ajwantgowˌs ʌmθɪŋəˈkʊkij]	[ɑ̃gowə̃nˈsʌ̃mpʰ˜ɪŋ ejˈkʰʊˌkʰij]	[ˌʌmgowˌ̃d͡ʒʌmpɪne jˈkʰʌkij]	[ˌʌmðoʷˌθʌmpɪnɛʲˈ kʰɔkʰi]	[ˌʔɑ̃mgowə̃ˌd͡ʒɑ̃mpʰ ˜ɪnejˈkʰʌkʰij]	3.00	3.00
1840	I want go, something a cookie	[ajwantgowˌs ʌmθɪŋəˈkʊkij]	[ɑ̃gowə̃nˈsʌ̃mpʰ˜ɪŋ ejˈkʰʊˌkʰij]	[ˌʌmgowˌ̃dʒʌmpɪne jˈkʰʌkij]	[ˌʌmðoʷˌθʌmpɪnɛʲˈ kʰɔkʰi]	[ˌʔɑ̃mgowə̃ˌdʒɑ̃mpʰ ˜ɪnejˈkʰʌkʰij]	3.00	
1841	I want chocolate	[ˌajwantˈt͡ʃʊkl ət]	[ʌˌwuwnˈt͡ʃʊkʰɑtʰ]	[ʌwɔnˈt͡ʃɑˌkatʰ]	[ʌw̥ənˈʧɑˌkʰʌtʰ]	[ʌˌwɑ̃nˈt͡ʃʊkʰɑtʰ]		3.00
1844	a turtle	[əˈtɜɹtəɬ]	[əˈtʰɔrdʌɬ]	[aˈtʰʊdɑɬ]	[æˈtʰoɹdɑɬh]	[əˈtʰɔdɑɬ]	3.00	3.00
1846	another turtle	[əˈnʌðəɹˌtɜɹtəɬ]	[ɛ̃ntʰɔrʔəˈnʌˌtʰɔrdɬ]	[əˈnʌˌtʰʊdow]	[ənˌtʰɔ əˈnæˌtʰoɾɑɬh]	[ɛ̃ntʰɔʔəˈnaˌtʰɔdo w]	3.00	3.00
1849	a ducky	[əˈdʌkij]	[əˈdʌkʰij]	[ʌˈdʌkʰij]	[əd˺ˈdʌˌkʰeʲ]	[əˈdʌkʰij]	3.00	3.00
1856	another rabbit	[əˈnʌðəɹˌɹæbɪt]	[ˌnʌˈræbɪt˺]	[ˈlʌvˌɹæbɪtʰ]	[ˈlʌvˌɹæbɪt]	[ˈnʌvˌɹæbɪtʰ]		3.00
1857	a ducky	[əˈdʌkij]	[əˈdʌkʰij]	[əˈdʌkʰij]	[æˈdʌˌkʰiʲ]	[əˈdʌkʰij]	3.00	3.00
1883	wash the cookie	[ˌwɑʃðəˈkʊkij]	[ajwɪɬˈæpjuwɑʃðə ˈkʰʊkʰij]	[ˌwʌsdɪˈkʰʊkij]	[ˌʔɐwʊˈˈʔaviː ˌɔçðeˈkʰʊʷkʰiʲ]	[wɑʃðəˈkʰʊkʰij]	3.00	3.00

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Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
1893	rabbits	[ˈɹæbɪts]	[ˈwæbɛtʰ]	[ˈwæbɪtʰ]	[ˈɹæbɛt̪θ]	[ˈwæbɛtʰ]		3.00
1902	came back	[kejmˈbæk]	[ˈkʰejmˌbæːkʰ]	[ˈkʰejmˌbæːkʰ]	[ˈkʰeʲmˌbækʰ]	[ˈkʰejmˌbæːkʰ]	3.00	
1902	came back	[kejmˈbæk]	[ˈkʰejmˌbæːkʰ]	[ˈkʰejmˌbæːkʰ]	[ˈkʰeʲmˌbækʰ]	[ˈkʰejmˌbæːkʰ]	3.00	
1904	come	[ˈkʌm]	[ˈkʰɐ̃m]	[ˈkʰʌm]	[kʰʌm]	[ˈkʰɐ̃m]	3.00	
1912	monkey	[ˈmʌŋkij]	[dəˈmɐ̃nkʰij]	[əˈmɐ̃kʰij]	[ɪˈmʌˌk̟ʰi]	[dəˈmɐ̃kʰij]		3.00
1936	...cookie	[ˈkʊkij]	[ˈæ̃nəˈkʰʊkʰij]	[ˈkʰʊkij]	[...ˈkʰʊki]	[...ˈʔæ̃nəˈkʰʊkʰij]	3.00	3.00
1946	making a quesadilla	[ˌmejkɪŋəˌkejsəˈdijə]	[ˈwejkʰĩŋəˌkʰijsəˈdijɑ]	[ˌʊkɪnəˌkʰijsəˈdijæ]	[ˌlʊkɪnəˌkʰiʃəˈdijæ]	[ˈwejkʰĩnəˌkʰijsəˈdija]	3.00	3.00
1946	making a quesadilla	[ˌmejkɪŋəˌkejsəˈdijə]	[ˈwejkʰĩŋəˌkʰijsəˈdijɑ]	[ˌʊkɪnəˌkʰijsəˈdijæ]	[ˌlʊkɪnəˌkʰiʃəˈdijæ]	[ˈwejkʰĩnəˌkʰijsəˈdija]		3.00
1958	getting more	[ˌgɛtɪŋˈmɔɹ]	[gɪɾ̃ɪŋˈmɔːr]	[gɛdijnˈmɑː]	[tɛɾiˈmɑː]	[gɪɾ̃ɪˈmɔː]	2.00	3.00
1961	eating the	[ˈijtɪŋðə]	[ˈijtʰĩɪŋnɛ]	[ˈijtʰɪŋnɛ]	[ˈitiŋˌnɛdˀ]	[ˈʔijtʰĩɪŋnɛ]		3.00
1963	here a quesadilla	[hɛɹəˌkejsəˈdijə]	[ˈhijɑːˌkʰejsəˈdijæ]	[ˌhijɑːkʰijsəˈdijæ]	[ˌhijɑːkʰiʲθəˈd̪ɪjæ]	[ˈhijɑːˌkʰijsəˈdija]	3.00	3.00
1979	this guy happy	[ˌðɪsgajˈhæpij]	[dɪsgʌˈhæpʰij]	[ˌdɪʔgajˈhæpij]	[ˌdɪʔkaʲˈhæpi]	[dɪsgʌˈhæpʰij]	2.00	
1979	this guy happy	[ˌðɪsgajˈhæpij]	[dɪsgʌˈhæpʰij]	[ˌdɪʔgajˈhæpij]	[ˌdɪʔkaʲˈhæpi]	[dɪsgʌˈhæpʰij]	3.00	
1979	this guy happy	[ˌðɪsgajˈhæpij]	[dɪsgʌˈhæpʰij]	[ˌdɪʔgajˈhæpij]	[ˌdɪʔkaʲˈhæpi]	[dɪsgʌˈhæpʰij]		3.00
1980	happy	[ˈhæpij]	[ˈæpʰij]	[ˈæpij]	[ˈhæpi]	[ˈʔæpʰij]		3.00
2000	rabbits	[ˈɹæbɪts]	[ˈwæbɛtˀ]	[ˈwæbɛts]	[ˈɹæˌbɛtˀs]	[ˈwæbɛts]		3.00
2004	and that rabbit	[ɛndˈðætˌɹæbɪt]	[uwɜ̃nˈðæwæbɪθej]	[uwˈnædæðæsʌ]	[ˈuʷəˈnæbˌɹæbetʌ]	[uwʔɜ̃ˈðæˌwæbɪθʌ]		3.00
2005	eating	[ˈijtɪŋ]	[ˈijdijn]	[ˈijdijn]	[ˈiˌɾiŋəʔ]	[ˈʔijdijnə]		3.00
2010	water	[ˈwɑtəɹ]	[ˈwɑdɑ]	[ˈwɑdɑː]	[ˈwɑɾɑx]	[ˈwɑdɑː]		3.00
2014	cleaning water	[ˈklijnɪŋˌwɑtəɹ]	[ˈkʰɬ̥ijəwɑdə]	[ˌkʰɬ̥ijˈwɑdɑ]	[ˌdiʲˈwɔɾɑ]	[ˌɬijəˈwɑdɑ]		3.00

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
2017	all the rabbits	[ˌɑɬðəˈɹæbɪts]	[ɑɬˈwæbɛts]	[ˌɑɬˈwæbɪts]	[ˌɑɬˈlæˌbɐʔtsː]	[ʔɑɬˈwæbɛt]		3.00
2020	racoons	[ɹæˈkuwnz]	[wɑˈkʰuwnz]	[æˈkʰuwnzə]	[ʷæˈkʰyʷnzə]	[wæˈkʰuwnzə]		3.00
2039	sweeping	[ˈswɨjpɪŋ]	[swəˈpʰɨjdə]	[wɪˈpʰɨjdə]	[twɪˈpʰiɾʌ]	[fwɪˈpʰɨjdə]	3.00	
2046	rattle	[ˈɹætəɬ]	[ˈwɛdɬ]	[ˈwædɔ]	[ˈwæˌɾɑːɬh]	[ˈwædɔɬ]		3.00
2048	the baby	[ðəˈbejbij]	[dɪˈbejbij]	[ˈdɪʔbejbij]	[ˈtɪʔˌpeʲpi]	[dɪˈbejbij]	2.00	2.00
2051	apple	[ˈæpəɬ]	[ˈæpʰɬ]	[ˈæpʌɬ]	[ˈæpʌˡ]	[ˈʔæpʰʌɬ]		3.00
2059	apple	[ˈæpəɬ]	[ˈæpʰɬ]	[ˈæpɔ]	[ˈʔæpoʷ]	[ˈʔæpʰɔɬ]		3.00
2062	banana	[bəˈnæna]	[bəˈnæ̃nɑ]	[bʌˈnæ̃næ]	[ʔʌˈnænah]	[bəˈnæ̃na]	2.00	
2063	radish	[ˈɹædɪʃ]	[ˈwædow]	[ˈwædow]	[ˈæɾoʷ]	[ˈwædow]		3.00
2065	and a pear and a apple	[ɛndəˌpɛɹɛndəˈʔæpəɬ]	[æ̃ndəˈpʰɛɾæ̃ndˈæpʰɬ]	[ʌnəˌpʰæʔændəˈʔæpʌɬ]	[ˌæ̃nəˈpʰæʔænˈʔæˌqoɬ]	[æ̃nəˌpʰæʔæ̃ndəˈʔæpʰʌɬ]	3.00	3.00
2094	doggie	[ˈdɑgij]	[ˈdɑgij]	[ˈdɑgij]	[ˈʔɑgi]	[ˈdɑgij]	2.00	3.00
2098	bus	[ˈbʌs]	[ˈbɪs]	[ˈbɪs]	[pɪʃ]	[ˈbɪs]	2.00	
2101	zebra	[ˈzijbɹa]	[ˈzijbɑ]	[ˈzijba]	[ˈziba]	[ˈzijba]		3.00
2110	all sleepy	[ɑɬˈslijpɨj]	[ˈɑɬs̪lijpʰij]	[ˌaɬˈhlijpʰijnə]	[ɑɬˈθliːtʰiˌiə]	[ˌʔɑɬˈɬijpʰijnə]		3.00
2111	candle	[ˈkændəɬ]	[ˈkʰændijdə]	[ˈkʰændijdə]	[ˈkʰændiðə]	[ˈkʰæ̃ndijðə]	3.00	3.00
2142	a rabbit	[əˈɹæbɪt]	[əˈræbɪt̚]	[ˈɹæbɪt̚]	[ˈɹæˌbet̚]	[əˈɹæbɪt̚]		3.00
2166	potato	[pəˈtejtow]	[ˈtʰejdow]	[ˈtʰejdow]	[ˈtʰeʲɾoʷ]	[ˈtʰejdow]	3.00	3.00
2167	pickles	[ˈpɪkəɬz]	[ˈpʰɪkʰɬs]	[ˈpʰɪkowɬs]	[pʰɪˈkɔɬt̪s]	[ˈpʰɪkʰɔɬs]	3.00	3.00
2195	a rabbit	[əˈɹæbɪt]	[əˈwæbɪtʰ]	[əˈwæbɪt]	[əˈwæbɪt]	[əˈwæbɪtʰ]		3.00
2198	turtle	[ˈtɜɹtəɬ]	[ˈtʰɔrrɬ]	[ˈtʰʊdɑɬ]	[ˈtʰɔɾɑ̰ɬ]	[ˈtʰɔdʌɬ]	3.00	3.00
2199	a zebra	[əˈzijbɹa]	[əˈd̠ʒijbəə̃n]	[əˈʒijbɑ]	[əˈʒibɑː]	[əˈʒijbəʔə̃n]		3.00
2200	beetle	[ˈbijtəɬ]	[ˈbijdɬ]	[ˈbijdɑɬ]	[ˈbiɾɑ̰l]	[ˈbijdʌɬ]	3.00	3.00
2205	and a panda	[ɛndəˈpændɑ]	[æ̃nəˈpʰæ̃ndɑ]	[æ̃nəˈpʰænda]	[ænɛ ˈpʰæ̃da]	[ʔæ̃nəˈpʰæ̃ndɑ]	3.00	3.00
2207	and a caterpillar	[ɛndəˈkætəpɪlə ɹ]	[ˈæːndəkʰærəpʰɪlə]	[æːnəˈkʰælˌəpʰɪlʌ]	[æːnɪˈkʰæɾɪˌpʰɪɾʌx]	[ʔæ̃ːnəˈkʰælˌəpʰɪlʌ]	3.00	3.00
2208	and a hippopotamus	[ɛndəˈhɪpowpɑtəmɪs]	[ˈæ̃ːnhɪpʰowpʰɑʌ]	[æːnˈhɪpowˈpɑːʌ]	[ˈæ̃ːŋ ˌhɪpoˈpɑːʌ]	[ˈæ̃ːnhɪpʰowˈpʰɑ.ʌ]		3.00

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
2208	and a hippopotamus	[ɛndəˈhɪpowpɑtəmɪs]	[ˈæ̃ːnhɪpʰowpʰɑʌ]	[æːnˈhɪpowˈpɑːʌ]	[ˈæ̃ːŋ ˌhɪpoˈpɑːʌ]	[ˈæ̃ːnhɪpʰowˈpʰɑ.ʌ]		3.00
2218	he's eating chicken	[ˌhijzijtɪŋˈtʃɪkən]	[hijˌijɾ̃ɪŋtʃɪkɪ̃n]	[hijʔijːˈʃɪkn̩]	[hrʲˌʔiɾiˈʃʲœkin]	[hijˌʔijɾ̃ɪŋˈʃɪkɪ̃n]		3.00
2232	Ichobod	[ɪkəˈbɑd]	[ɪgəˈbɑːd]	[ˈɪgəbɑːd]	[ˈɪgəbɑːd]	[ɪgəˈbɑːd]		3.00
2232	Ichobod	[ɪkəˈbɑd]	[ɪgəˈbɑːd]	[ˈɪgəbɑːd]	[ˈɪgəbɑːd]	[ɪgəˈbɑːd]		3.00
2246	rabbits	[ˈɹæbɪts]	[ˈwæbɪts]	[ˈwæbɪts]	[ˈwæbɪts]	[ˈwæbɪts]		3.00
2254	they're not eating	[ˌðɛɹnɑtˈʔijtɪŋ]	[ˈdijrnɑʔˌijdɪ̃ŋ]	[ˌðejnɑʔˈijdɪŋ]	[ðeˈˌnɑʔˈiːɾiŋ]	[ˈðijnɑʔˌijdɪ̃ŋ]		3.00
2262	purple	[ˈpɜɹpəɬ]	[ˈpʰɪrpʰəɬ]	[ˈpʰʌpʰɔ]	[ˈpʰəpoʷ]	[ˈpʰʌpʰɔ]	3.00	3.00
2268	and the duckies	[ɛndðəˈdʌkijz]	[ɛ̃ndəˈdʌkʰijs]	[ənəˈdʌkijz]	[ənəˈdʌʔkiʲˌs]	[ʔɛ̃nəˈdʌkʰijs]	3.00	
2270	he's a turtle	[ˌhijzəˈtɜɹtəɬ]	[ʔ̃ĩnəˈtʰɔrdɬ̩]	[ɪnəˈtʰɔɹdow]	[ijəˈtʰɔjoʷh]	[ʔ̃ĩnəˈtʰɔɹdow]	3.00	
2279	get	[ˈgɛt]	[ˈgɪtʰ]	[ˈgɪt]	[gɯt]	[ˈgɪtʰ]	3.00	
2280	everybody in	[ˈɛvɹijbɑdijʔɪn]	[ʌˈbajˌ̃ĩn]	[ˈʌbajˌɪn]	[ˈʌpaˌjen]	[ʔʌˈbajˌ̃ĩn]	2.00	
2281	and the rabbit	[ɛndðəˈɹæbɪt]	[ɛ̃ndə̥ˌwæˈbɪtʰ]	[ɛnəˈɹæˈbɛt]	[ɛnəˈɹæˈbɛkʰ]	[ʔɛ̃ndə̥ˌwæˈbɛtʰ]		3.00
2290	the turtle needs help	[ðəˌtɜɹtəɬnijdzˈhɛɬp]	[dɪˈtʰɔrdənijdhɛlpˀ]	[dɪˈtʰʊdʌnijzˌhɛwp]	[dɪˈtʰɔdʌniʲˌheʷpˀ]	[dɪˈtʰɔdənijzˌhɛɬpˀ]	3.00	3.00
2295	pickles	[ˈpɪkəɬz]	[ˈpʰɪkʰɬs]	[ˈpʰɪkəɬs]	[ˈpʰɪkʊɬs]	[ˈpʰɪkʰəɬs]	3.00	3.00
2299	chicken	[ˈtʃɪkən]	[ˈt͡ʃɪkʰɛ̃n]	[ˈtʃɛkən]	[ˈtʲʰɪkenh]	[ˈtʃɪkʰɛ̃n]		3.00
2304	I'm just making his	[ajmˌd͡ʒʌstˈmejkɪŋhɪz]	[ˀ̃mˈdɪsmejkɪ̃ŋɪz]	[ˌumdɪsˈmejkɪns]	[ˈumdʌt̪sɪˈmẽʲkʰɪnʲus]	[ˀ̃mˈdɪsmejkʰ͡ʰĩnəz]	3.00	3.00
2316	something spicy	[ˌsʌmθɪŋˈspajsij]	[ˌsɐ̃mpʰ͡ʰĩŋˈpʰajsij]	[ˈsʌmpʰɪŋˈpʰʌjsij]	[ˈsʌmɸɪŋˈpʰʌʲθiʲ]	[ˌsɐ̃mpʰ͡ʰĩŋˈpʰajsij]	3.00	3.00
2317	cappucino	[ˌkæpəˈt͡ʃijnow]	[ˈkʰæpʰətʰijnow]	[ˌkʰæpɛˈkijnow]	[ˌkʰæpɛˈkɪnoʷ]	[ˌkʰæpʰəˈkʰijnow]	3.00	3.00

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2317	cappucino	[ˌkæpəˈʧijnow]	[ˈkʰæpʰətʰijnow]	[ˌkʰæpɛˈkijnow]	[ˌkʰæpɛˈkɪnoʷ]	[ˌkʰæpʰəˈkʰijnow]		3.00
2328	turtle	[ˈtɜɹtəɬ]	[ˈtʰɪrlduwd]	[ˈtʰʌduwd]	[ˈtʰʌʷɾənd]	[ˈtʰʌɬduwd]	3.00	3.00
2332	a rabbit	[əˈɹæbɪt]	[əˈwæbɪ]	[əˈwæbɪtˀ]	[ʔˈwæbɪ]	[əˈwæbɪʔ]		3.00
2342	cut	[ˈkʌt]	[ˈkʰʌtʰ]	[ˈkʰʌtʰ]	[kʰʌtʰ]	[ˈkʰʌtʰ]	3.00	
2368	apple	[ˈæpəɬ]	[ˈæbow]	[ˈæʔbow]	[ˈæpˀpoʷɬ]	[ˈʔæpˀbow]		2.00
2383	they're eating	[ˌðɛɹˈʔijtɪŋ]	[dɛˈijtʰɪ̃ŋ]	[dɛʔˈijdɪŋ]	[dɛʔˈiɾiŋ]	[dɛˈʔijd̃ɪŋ]	3.00	2.00
2395	this marker's not working	[ðɪsˌmɑɹkəɹznɑtˈwɜɹkɪŋ]	[dɪsˈmɑrkʰənɑʔˌwʌrkʰijn]	[dɪsˌmʌkʌnɑʔˈwʌkijn]	[dɪʔˌmɑkənʌʔˈwɔkin]	[dɪsˈmɑkʰənɑʔˌwʌkʰ̃ijn]	3.00	3.00
2395	this marker's not working	[ðɪsˌmɑɹkəɹznɑtˈwɜɹkɪŋ]	[dɪsˈmɑrkʰənɑʔˌwʌrkʰijn]	[dɪsˌmʌkʌnɑʔˈwʌkijn]	[dɪʔˌmɑkənʌʔˈwɔkin]	[dɪsˈmɑkʰənɑʔˌwʌkʰ̃ijn]		3.00
2398	apples	[ˈæpəɬz]	[ˈæpʰʊɬ]	[ˈæpʊɬ]	[ˈæfoɬ]	[ˈʔæpʰʌɬ]		3.00
2402	a cheapy	[əˈtʃijpij]	[əˈtʃijpʰij]	[ʌˈtʃijpij]	[ʔæˈʧipiː]	[ʔəˈtʃijbij]		0.00
2403	strawberries	[ˈstɹaˌbɛɹijz]	[ˈtʰwɑːbɛijs]	[ˈtʃɹaˌbɛjz]	[ˈʧɹabɛʲʦ]	[ˈtʰwɑːbejz]		3.00
2407	painting	[ˈpejntɪŋ]	[ˈpʰejntʰijn]	[ˈpejtʰijn]	[ˈpɛʲnˌtʰ̃ɪŋ]	[ˈpʰẽjntʰ̃ijn]	3.00	3.00
2421	a wagon	[əˈwægɪn]	[əˈwɛgæ̃n]	[əˈwægɛn]	[əˈwæʲgʲen]	[əˈwejgɛ̃n]		3.00
2424	kangaroo	[ˌkæŋəˈɹuw]	[ˈkʰwɛ̃ŋgəuwː]	[ˌkwæŋgɛjˈuw]	[ˌkwæŋgiˈɹʲuʷ]	[ˈkʰwɛ̃ŋgəuw]		3.00
2427	peacock	[ˈpijkɑk]	[ˈpʰijkʰɑ]	[ˈpʰijkɑ]	[pʰiˈkɔʔ]	[ˈpʰijkʰɑ]	3.00	3.00
2436	you my baby	[juwmajˈbejbij]	[juwˌmajˈbejbij]	[juwmajʔːˈbejbij]	[juˌmaʲʔ ˈbeʲbiː]	[juwˌmajʔˈbejbij]	3.00	3.00
2441	the wacky witches	[ðəˌwækijˈwɪtʃ͡ɪz]	[ðəˌwækʰijˈwɪtʃ͡ɛz]	[dəˌwækijˈwɪtʃ͡əz]	[ðəˌwækiˈwɪʧedˀs]	[ðəˌwækʰijˈwɪtʃ͡ɛz]		3.00
2450	other baby	[ˈʌðəɹˌbejbij]	[ˈʌðəˌbejbij]	[ˈʌdəˌbejbij]	[ˈæɾəbeʲˌbi]	[ˈʔʌðəˌbejbij]	3.00	3.00
2455	a lot of people	[əˌlɑtʌvˈpijpəɬ]	[lɑɾəˈpʰijpʰɬ̩]	[ˌɑlɑˈpʰijpʊɬ]	[ˌbɑlɑˈpʰipʊɬ]	[lɑɾəˈpʰijpʰʌɬ]	3.00	3.00

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2471	You open the door and see here	[juwˌʔowpɪnðəˈdɔɹɛndsijˌhɪɹ]	[juwˈowpʰr̃ndəˌdɔrəsijhijr]	[juwˌʔowpəndəˌdowæsijˈhijæ]	[juʔˌɔʷpəndəˌdowæsiˈheæ]	[juwˈʔowpʰr̃ndəˌdɔ.əsijhija]	3.00	
2471	You open the door and see here	[juwˌʔowpɪnðəˈdɔɹɛndsijˌhɪɹ]	[juwˈowpʰr̃ndəˌdɔrəsijhijr]	[juwˌʔowpəndəˌdowæsijˈhijæ]	[juʔˌɔʷpəndəˌdowæsiˈheæ]	[juwˈʔowpʰr̃ndəˌdɔ.əsijhija]		3.00
2478	that's a nice bottle	[ðætsəˈnajsˌbɑtəɬ]	[dæsənajˈbɑdəɬ]	[ˌdæzænajsˈbɑdʊɬ]	[ˌdæsænaʲsˈbɑɾɔ̰l]	[dæsənajəˈbɑdʌɬ]	3.00	3.00
2481	bacon	[ˈbejkən]	[ˈbejkʰr̃in]	[ˈbejˌkɪn]	[ˈbeʲˌkɪn]	[ˈbejˌkʰr̃in]	3.00	3.00
2483	baby cat	[ˈbejbijˌkæt]	[ˈbejbijˌpʰætʰ]	[ˈbejbijˌpʰæt]	[ˈbeʲbiˌkʰæt]	[ˈbejbijˌpʰætʰ]	3.00	3.00
2483	baby cat	[ˈbejbijˌkæt]	[ˈbejbijˌpʰætʰ]	[ˈbejbijˌpʰæt]	[ˈbeʲbiˌkʰæt]	[ˈbejbijˌpʰætʰ]	3.00	
2487	a pickle	[əˈpɪkəɬ]	[əˈpʰɪkʰow]	[æˈpʰɪkʊɬ]	[æˈkʰɪkoɬ]	[əˈpʰɪkʰow]	3.00	3.00
2492	I want the wacky witches	[ajwanṭðəˌwækijˈwɪtʃ͡ʃəz]	[ʌ̹wɑ̃nðəˌwɑkʰijˈwɪtʃ͡ʃəz]	[ˌwɑnt̚dəˌwækijˈwɪtʃ͡ʃəz]	[ˌwɑntəˌwɔk̚kiˈwɪt͡ʃʃed̚]	[ʌ̹wɑ̃nðəˌwɑkʰijˈwɪt͡ʃəz]		3.00
2494	is this one happy?	[ɪzˌðɪswʌnˈhæpij]	[ɪˈðɪswʌnˌhæpʰij]	[ɪˈdɪswʌnˌhæ̃pij]	[ɪˈzɪswʌnˌhæpi]	[ɪˈðɪswɑ̃ŋˌhæ̃pʰij]		3.00
2504	gum	[ˈgʌm]	[ˈgɤ̃m]	[ˈgʌm]	[kʌm]	[ˈgɤ̃m]	2.00	
2555	purple	[ˈpɜɹpəɬ]	[ˈpʰɔɪrpʰɬ]	[ˈpʰɔpʌɬ]	[ˈpʰaɹpʌɬ]	[ˈpʰɔpʰɔɬ]	3.00	3.00
2586	something else	[ˌsʌmθɪŋˈʔɛls]	[tʰɤ̃mpr̃ŋˈɛls]	[kʰʌmpəˈnɛɬts]	[kʰʌmgɪˈnɛɬs]	[ˌkʰɤ̃mhəˈnɛɬs]	3.00	
2615	puppet	[ˈpʌpət]	[ˈpʰʌpʰɪt̚]	[ˈpʰʌpʰɪt]	[ˈpʌpet̚]	[ˈpʰʌpʰɪt̚]	3.00	3.00
2889	O.K., they	[ˈowkejˌðej]	[kʰejˈðej]	[ˈkʰejðej]	[ˈkʰejðeʲ]	[kʰejˈðej]		3.00
2913	going, wanna eat	[gowɪŋˌwɑnəˈʔijt]	[ˈgowr̃ntʰijˌwɑ̃nəˈijt̚]	[gowɪnsijˌwɑnəˈʔijt]	[ˈgowɪn hiˌwɑnəˈʔit]	[ˈgowr̃nsijˌwɑ̃.əˈʔijt̚]	3.00	

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
2984	get the keys, I'm coming in	[ˌgɛtðəˈkijzʔajmˌkʌmɪŋˈʔɪn]	[ˈgɪðətʰkʰijzajmˌkʰɤ̃mĩŋˈĩn]	[gɛdəʔˈkʰijzajmkʰʌmɪnˌɪm]	[gɛdˀdəʔˈtʰkʰizaʲmkʰʌmiˌnɪn]	[ˈgɪðətʰəkʰijzajmˌkʰɤ̃mĩ.ˈĩn]	3.00	
2984	get the keys, I'm coming in	[ˌgɛtðəˈkijzʔajmˌkʌmɪŋˈʔɪn]	[ˈgɪðətʰkʰijzajmˌkʰɤ̃mĩŋˈĩn]	[gɛdəʔˈkʰijzajmkʰʌmɪnˌɪm]	[gɛdˀdəʔˈtʰkʰizaʲmkʰʌmiˌnɪn]	[ˈgɪðətʰəkʰijzajmˌkʰɤ̃mĩ.ˈĩn]	3.00	
2984	get the keys, I'm coming in	[ˌgɛtðəˈkijzʔajmˌkʌmɪŋˈʔɪn]	[ˈgɪðətʰkʰijzajmˌkʰɤ̃mĩŋˈĩn]	[gɛdəʔˈkʰijzajmkʰʌmɪnˌɪm]	[gɛdˀdəʔˈtʰkʰizaʲmkʰʌmiˌnɪn]	[ˈgɪðətʰəkʰijzajmˌkʰɤ̃mĩ.ˈĩn]	3.00	
3034	that all done?	[ˌðætɑɬˈdʌn]	[ˈdæɑɬˌdɤ̃n]	[ˌgaʔɑɬˈdʌn]	[ˌdæʔɑˈlran]	[ˈgaʔɑɬˌdɤ̃n]	3.00	
3038	cup of tea	[ˌkʌpʌvˈtij]	[ˈkʰʌpʰˌtʰij]	[ˈkʰʌpʰˌtʰij]	[ˈkʰʌpʰˌtʰiʲj]	[ˈkʰʌpʰˌtʰij]	3.00	
3038	cup of tea	[ˌkʌpʌvˈtij]	[ˈkʰʌpʰˌtʰij]	[ˈkʰʌpʰˌtʰij]	[ˈkʰʌpʰˌtʰiʲj]	[ˈkʰʌpʰˌtʰij]	3.00	
3092	Cathy, can you lift this up?	[ˌkæθijkænjuwˌlɪftðɪˈsʌp]	[ˈkʰæθij:kə̃njuw:lɪfdɪsˌʌpʰ]	[ˌkʰæθijkɪnˈlɪfdɪsˌʌp]	[ˌkʰæθikɪnj:ˈlɪfdɪˌzʌp]	[ˈkʰæθijkʰə̃nlɪfdɪˌzʌpʰ]	3.00	
3092	Cathy, can you lift this up?	[ˌkæθijkænjuwˌlɪftðɪˈsʌp]	[ˈkʰæθij:kə̃njuw:lɪfdɪsˌʌpʰ]	[ˌkʰæθijkɪnˈlɪfdɪsˌʌp]	[ˌkʰæθikɪnj:ˈlɪfdɪˌzʌp]	[ˈkʰæθijkʰə̃nlɪfdɪˌzʌpʰ]	3.00	
3168	curb fall	[ˈkɜɹbfɑɬ]	[ˌkʰʊrˈfɑɬ]	[kʰʊbˈfɑɬ]	[kʰʊɾʊbˈfɑɬ]	[kʰʊɾəbˈfɑɬ]	3.00	
3221	put some more	[ˌpʊtsʌˈmɔɹ]	[pʰəsə̃ˈmɔrə]	[pəsəˈbuwæ]	[pʊsəˈbʷua]	[pʰəsə̃ˈbɔ.a]	3.00	
3436	get it	[ˈgɛtɪt]	[ˈgɪɾɛtˀ]	[ˈgɛɾɛt]	[ˌgɐ̯ːˈɾɐ̯ʔ]	[ˈgɪɾɛʔ]	3.00	
3444	I can't cut it	[ajˌkæntˈkʌtɪt]	[kæ̃ʔˈkʰʌɾɪtʰ]	[ə̃kʰæ̃tˈkʰʌdɪt]	[kĩɾˈkʰɑɾit]	[kæ̃ʔˈkʰʌɾɪtʰ]	3.00	
3444	I can't cut it	[ajˌkæntˈkʌtɪt]	[kæ̃ʔˈkʰʌɾɪtʰ]	[ə̃kʰæ̃tˈkʰʌdɪt]	[kĩɾˈkʰɑɾit]	[kæ̃ʔˈkʰʌɾɪtʰ]	3.00	
3495	to call us	[tuwˈkɑɬʌs]	[ˈkʰɑɬʌs]	[ˈkʰowʌs]	[ˈkɑlɑs]	[ˈkʰɑwʌs]	3.00	
3530	coffee	[ˈkɑfij]	[ˈkʰɑfij]	[ˈkʰavij]	[ˈkʰɑfi]	[ˈkʰɑfij]	3.00	

Appendix A - Ranking for Inter-transcriber Reliability

Rec #	Ortho.	Target	Transcriber 1	Transcriber 2	Transcriber 3	Validated Transcription	Score WI	Score WM
3587	cats	[ˈkæts]	[ˈkʰætʰ]	[ˈkʰæts]	[kætˀs]	[ˈkʰætʰ]	3.00	
3597	cats	[ˈkæts]	[ˈkʰæts]	[ˈkʰæts]	[kʰætˀθː]	[ˈkʰæts]	3.00	
3639	go	[ˈgow]	[ˈgow]	[ˈgow]	[kˌ]	[ˈgɔ]	2.00	
3640	stop	[ˈstɑp]	[ˈstɑpʰ]	[ˈtɑpˀ]	[tɔpˀ]	[ˈtʰɑpʰ]	3.00	
3642	stop	[ˈstɑp]	[ˈtʰɑpˀ]	[tɑpˀ]	[tɑpˀ]	[ˈtʰɑpˀ]	3.00	
3663	ok, lets keep this there	[owkejˌlɛtskij pˈðɪsðɛɹ]	[kʰejlɛsˈkʰijpdʌsˌðɛr]	[kʰejwəsˈkʰijpˈdɪθnɛ]	[ˈoʷəˈkʰitʊdˈðɛ]	[kʰejlɛsˈkʰijpdʌθˌðɛ]	3.00	3.00
3712	guy	[ˈgaj]	[ˈgajij]	[ˈgʌʔaj]	[qɑˈʕɑj]	[ˈgʌʔaj]	2.00	
3722	paintings	[ˈpejntɪŋz]	[ˈpʰejntʰijn]	[ˈpʰɛ̃jntʰijn]	[ˈpʰɐʲntʰiŋ]	[ˈpʰɛ̃jntʰ̃ijn]	3.00	3.00
3819	Kathy met P.J.?	[ˌkæθijmɛtˈpij d͡ʒej]	[ˈkæðijmɛʊˌpʰijˈd͡ʒij]	[ˌkʰæθijmɛtˈpʰijd͡ʒij]	[ˈkʰæθiˌmɛɾoʷˈpʰiˌd͡ʒiː]	[ˈkʰæθijmɛ.əˌpʰijˈd͡ʒij]	3.00	
3819	Kathy met P.J.?	[ˌkæθijmɛtˈpij d͡ʒej]	[ˈkæðijmɛʊˌpʰijˈd͡ʒij]	[ˌkʰæθijmɛtˈpʰijd͡ʒij]	[ˈkʰæθiˌmɛɾoʷˈpʰiˌd͡ʒiː]	[ˈkʰæθijmɛ.əˌpʰijˈd͡ʒij]	3.00	
3828	to drink	[tuwˈdɹɪŋk]	[ˈtʰuwˌdw̃ɪŋkʰ]	[tʰəˈdɥɪŋkʰ]	[keʲˈdwɪŋkʰ]	[kʰɛ̃ˈdw̃ɪŋkʰ]	3.00	
							WI	WM
						3	404	277
						2	21	16
						1	3	2
						0	0	1
							428	296
						3 of 3	94.39%	93.58%
						2 of 3	99.30%	98.99%
							Total	724
								94.06%
								99.17%

Appendix B - VOT and Initial Voicing Labels
Word-initial [p]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0005	papa	[ˈpʰɑpə]	[ˈpʰʌpˌpʰɑʔ]	105.00	Voiceless				
0048	apple	[ˈæpˌɫ]	[ˈpʰuw]	115.00	Voiceless				
0050	apple	[ˈæpˌɫ]	[ˈpʰɑ]	36.00	Voiceless				
0054	apple	[ˈæpˌɫ]	[ˈpʰɑʔ]	103.00	Voiceless				
0067	apple	[ˈæpˌɫ]	[ˈpʰʊʔʌ]	111.00	Voiceless				
0123	pig	[pʰɪg]	[ˈpʰej]	62.00	Voiceless				
0124	pig	[pʰɪg]	[ˈpʰej]	55.00	Voiceless				
0141	pillow	[ˈpʰɪɬoʷ]	[ˈɤ̃ʔˌaw‘pʰʊluw]	60.00	Voiceless				
0152	pen	[pʰɛn]	[mˌˈpʰæ]	80.00	Voiceless				
0153	pen	[pʰɛn]	[ˈpʰæ]	56.00	Voiceless				
0186	apple	[ˈæpˌɫ]	[ˈpʰʌ]	66.00	Voiceless				
0216	pig	[pʰɪg]	[əˈpʰij]	99.00	Voiceless				
0224	spoon	[spʰuʷn]	[ˈpʰũːw]	73.00	Voiceless				
0235	spoon	[spʰuʷn]	[ˈpʰuw]	56.00	Voiceless				
0276	plate	[pʰleʲt]	[ˈpʰæː]	105.00	Voiceless				
0282	pig	[pʰɪg]	[ˈpʰiːj]	80.00	Voiceless				
0289	plate	[pʰleʲt]	[ɤ̃ˈpʰæː]	123.00	Voiceless				
0315	mama, I wanna poo	[ˌmɑməaʲwɑ nəˈpʰuʷ]	[ˈmɤ̃məˈʔajwʌn əhˈpʰʊ]	77.00	Voiceless				
0372	pig	[pʰɪg]	[ˈpʰiːj]	110.00	Voiceless				
0392	uh, push	[ʔʌˈpʰʊʃ]	[hɤ̃ʔˈpʰʊx]	67.00	Voiceless				
0471	peacock	[ˈpʰikɑkˀ]	[pʰijˈkʰɑː]					24.00	Borderline
0473	uh, peacock	[ʌˈpʰikɑkˀ]	[ɤ̃ʔɤ̃ʔɤ̃ʔəˌpʰijˈkʰɑ]	6.00	Voiced				
0486	pee	[pʰiʲ]	[ˈpʰiːj]	26.00	Voiceless				
0512	bicycle	[ˈbaʲsɪˌkˌɫ]	[ˈpʰowˌtʰʌ]	47.00	Voiceless				
0517	papa	[ˈpʰɑpɑ]	[ˈpʰɑpʰə]	64.00	Voiceless				
0533	...Cathy ... paper	[ˈkʰæθi...ˈpʰeʲpəˑ]	[...ˈkʰæʃej...ˈpʰɑpʰɑ]	30.00	Voiceless				
0557	pig	[pʰɪg]	[ˈpʰij]	62.00	Voiceless				
0562	...up high	[ʌpˀhaʲ]	[həˈpʰaj]	88.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [p]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0621	park	[pʰaɹkˀ]	[ə‘pʰow]	94.00	Voiceless				
0657	park	[pʰaɹkˀ]	[‘pʰɑkʰ]	99.00	Voiceless				
0690	painting	[‘pʰeʲntɪŋ]	[‘pʰejˌtʰij]	81.00	Voiceless				
0691	paint	[pʰeʲntˀ]	[əˌpʰʊd‘pʰejtʰ]	95.00	Voiceless	56.00	Voiceless		
0692	new page	[‘nuʷpʰeʲdʒ]	[mˌ‘pʰɪdʒ]	41.00	Voiceless				
0705	pea(?)	[pʰiʲ]	[‘pʰij]	96.00	Voiceless				
0713	shovel(?)	[‘ʃʌvɬ]	[‘pʰʊˌhʌʔ]	92.00	Voiceless				
0719	fish	[fɪʃ]	[‘pʰijʃ]	56.00	Voiceless				
0791	piggy	[‘pʰɪgi]	[‘pʰɪgij]	93.00	Voiceless				
0827	painting	[‘pʰeʲntɪŋ]	[‘pʰejˌtʃ̌ɪŋ]	66.00	Voiceless				
0831	painting	[‘pʰeʲntɪŋ]	[ɛ̃.aj‘pʰejθ̃ɪŋ]	70.00	Voiceless				
0832	swing	[swɪŋ]	[‘pʰɛg]	44.00	Voiceless				
0854	pail	[pʰeʲɬ]	[‘pʰeˌja]	23.00	Borderline				
0857	fish	[fɪʃ]	[‘pʰɪʃ]	54.00	Voiceless				
0868	aligator on bicycle	[ˌæɬigeʲɾəˑɑn‘baʲdsɪkɬ]	[mˌ‘ægɛləʔɪ̃ʔõnˌpʰʌtʰɑ]	31.00	Voiceless				
0889	uh, page	[ʌ‘pʰeʲdʒ]	[ɪ̃‘pʰejt̀s]	28.00	Voiceless				
0893	fridge	[fɹɪdʒ]	[‘pʰ̃ɪmpʰ]	32.00	Voiceless				
0896	spoon	[spʰuʷn]	[‘pʰõw]	34.00	Voiceless				
0906	that's a piggy	[ðætsə‘pʰɪgi]	[‘tʰætʰaˌpʰɪgij]			34.00	Voiceless		
0908	hen?	[hɛn]	[‘pʰɛ̃ʔ]	71.00	Voiceless				
0920	uh, paint	[ʌpʰeʲntˀ]	[ɪ̃jə‘pʰejntʰ]	98.00	Voiceless				
0921	paint	[pʰeʲntˀ]	[ɪ̃‘pʰejntʰɪ̃]	34.00	Voiceless				
0927	page	[pʰeʲdʒ]	[ʔɪ̃‘pʰejt̀ʃ̀]	26.00	Voiceless				
0950	peas	[pʰiz]	[‘pʰijʃ]	35.00	Voiceless				
0954	...paint	[pʰeʲntˀ]	[...‘pʰɛ̃jntʰ]	59.00	Voiceless				
0963	pail	[pʰeʲɬ]	[ʔɪ̃‘pʰejʌɬ]	84.00	Voiceless				
0967	blue and red and purple too	[‘bluːən‘ɹɛdən‘pəɹpəltuː]	[ˌwuwɑ̃nə‘wɛdʔɑ̃n‘pʰɜpʰʌˌtʰuwə]	42.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [p]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0971	pull that	[pʰʊɬðæt˺]	[ˈpʰʊɬə̃nəˈdætʰ]	80.00	Voiceless				
0974	airplane	[ˈɛɹpleʲn]	[ʔɤ̃mˈpʰẽjn]	62.00	Voiceless				
0979	paper	[ˈpʰeʲpəˑ]	[ˈpʰejˌpʰʊ]	45.00	Voiceless				
0982	no, want page	[noʷwɑnʔˈpʰeʲdʒ]	[ˌnowˌˌwɤ̃ˈpʰejt͡ʃ]	57.00	Voiceless				
0988	new page	[ˈnuʷˌpʰeʲdʒ]	[mˌˈpʰejt͡ʃ]	76.00	Voiceless				
1000	pink	[pʰɪŋk˺]	[ˈpʱɪŋkʰ]	129.00	Voiceless				
1064	I wanna turn page	[aʲwɑnətʰəˑn pʰeʲdʒ]	[ɤ̃ˈmə̃nˌtʰuːwpʰejd]					21.00	Borderline
1067	lot of pictures	[lɑɾəvˈpʰɪktʃəˑz]	[əˈlɑʔaˈpʰɪtʃʌkʰ]	61.00	Voiceless				
1068	lot of pictures...look a	[lɑɾəvpʰɪktʃəˑz...lʊkə]	[lɑʔɑˈpʰɪʔɤ̃ˈʃuwdɛ̆nˈtʰɛˈlʊkʰʌˌtʰɛ]	20.00	Borderline				
1075	cat	[kʰæt˺]	[ˈpʰæt˺]	52.00	Voiceless				
1090	page	[pʰeʲdʒ]	[õmˈpʰejt͡ʃ]	60.00	Voiceless				
1093	that's a purple	[ðætsəˈpʰəˑpɬ]	[ˌʔætʰaˈpʰɜˌpʰʊ]	32.00	Voiceless				
1096	paint	[pʰeʲnt˺]	[ɛ̃nəˈpʰẽjntʰ]	37.00	Voiceless				
1110	want page	[wɑnt˺pʰeʲdʒ]	[mˌˈpʰejt͡ʃ]	35.00	Voiceless				
1123	peas	[pʰiz]	[ˈpʰijʃ]	56.00	Voiceless				
1136	putting that	[ˌpʰʊɾɪŋˈðæt˺]	[mˌpʰɪtʰɛ̃nˈdæd]			63.00	Voiceless		
1137	spoon cook	[ˈspʰuʷnˈkʰʊk]	[əˈpʰuwɛ̃nˈkʰʊkə]	114.00	Voiceless				
1149	that's a ... purple	[ðætsə...ˈpʰəˑpɬ]	[ˌðætshɤ̃ˌdætʰɛnˈpʰɔpʰwʌ]	24.00	Borderline				
1161	purple...	[ˈpʰəˑpɬ...]	[ˈpʰʊpʰʌʔ...]	63.00	Voiceless				
1173	cow	[kʰaʷ]	[ˈpʰaw]	117.00	Voiceless				
1188	fish	[fɪʃ]	[ˈpʰɪʃ]	98.00	Voiceless				
1189	peacock	[ˈpʰiˌkʰɑk˺]	[ˈpʰejˌkʰɑkʰ]	51.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [p]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1202	purple	[ˈpʰəˑpɬ]	[mˌˈpʰʌpʰɔ]	70.00	Voiceless				
1219	piggy too	[ˈpʰɪgitʰuʷ]	[əˈpʰɪgijˌtʰuw]	51.00	Voiceless				
1226	paint	[ˈpʰeʲntˀ]	[ˈpʰẽjn]	26.00	Voiceless				
1250	piggy	[ˈpʰɪgi]	[ˈpʰɪgijˌ]	19.00	Borderline				
1264	piggy come	[ˈpʰɪgitʰuʷ]	[ˌpʰɪgijˈkʰɤ̃mna]			58.00	Voiceless		
1291	keys	[kʰiʲz]	[ˈpʰijs]	90.00	Voiceless				
1301	piggy	[ˈpʰɪˌgi]	[ˈpʰɪgiːj]	42.00	Voiceless				
1305	plate	[pʰleʲt]	[ˈpʰejtˀ]	92.00	Voiceless				
1306	spoon	[spʰuʷn]	[ˈpʰũw]	87.00	Voiceless				
1329	I want ... a popsicle	[aʲwɑntˀ...əˈpʰɑpsɪkɬ]	[ʌwãʔawũtʰɛdədtʰə̰ʔɛðəʔɛnˈpʰɑˌkʰʌ]	91.00	Voiceless				
1331	want popsicle on my plate	[wɑntˀˈpʰɑpsɪkəlɑnmaʲˌpʰleʲt]	[ɤ̃ˌpʰɑkʰəʔĩmajˈpʰajtʰ]	82.00	Voiceless	18.00	Borderline		
1365	giant peach	[dʒajn̩tˀpʰiʲtʃ]	[ˌd̠ʒajəˈpʰijt̠ʃ]	47.00	Voiceless				
1366	giant peach	[dʒajn̩tˀpʰiʲtʃ]	[ˌdajəˈpʰij]	62.00	Voiceless				
1367	...giant peach	[dʒajn̩tˀpʰiʲtʃ]	[ˈajməˈd̠ʒãjˌpʰiːj]			70.00	Voiceless		
1369	giant peach	[dʒajn̩tˀpʰiʲtʃ]	[ˌdajəˈpʰeːjs]	73.00	Voiceless				
1370	giant peach	[dʒajn̩tˀpʰiʲtʃ]	[d̠ʒãjˈpʰiːjts]	82.00	Voiceless				
1372	giant peach	[dʒajn̩tˀpʰiʲtʃ]	[ˌdajˈpʰiːj]	62.00	Voiceless				
1406	piggy, two piggy	[pʰɪgitʰuʷpʰɪgi]	[ˈpʰɪgijtʰuwˌpʰijgij]	86.00	Voiceless	54.00	Voiceless		
1432	there's a spoon	[ˈðɛɹzəˌspʰuʷn]	[ˈbɛzɛˌpʰuwŋ]			69.00	Voiceless		
1434	peacock	[ˈpʰiˌkʰɑkˀ]	[ˈpʰijˌkʰɑkʰ]	13.00	Voiced				
1463	spoon	[spʰuʷn]	[ˈpʰũwə]	54.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [p]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1473	and spoon and knife	[ɛn‘spʰuʷnən ‘nʌʲf]	[ɑ̃‘pʰuwnʔəʔɑ̃ʔ‘najf]	104.00	Voiceless				
1497	pigs	[pʰɪgz]	[‘pʰɪkʰ]	27.00	Voiceless				
1504	pig	[pʰɪg]	[‘pʰɪkʰ]	21.00	Borderline				
1507	that guy ... purple	[ðætˀgaʲ...pʰəˑpɬ]	[dæ‘gajʔɛtˀʔðn̩ pʰɜɹpʊ]			40.00	Voiceless		
1519	corn pie	[kʰɔɹnpʰiʲ]	[kʰɔ̃‘pʰaj]	87.00	Voiceless				
1544	paint	[pʰeʲntˀ]	[ə‘pʰẽjntʰ]	94.00	Voiceless				
1588	pig	[pʰɪg]	[‘pʰɪkˀ]	95.00	Voiceless				
1606	pigs	[pʰɪgz]	[‘pʰɪk]	46.00	Voiceless				
1618	I have a pig	[aʲhævəpʰɪg]	[ʌ‘hɛwə̩pʰɪk]			40.00	Voiceless		
1637	put it on my hair	[ˌpʰʌɾɪɾɑnmaʲ ‘hɛɹ]	[pʰʊdəʔə̃‘maˌhaw]					30.00	Voiceless
1690	pigs	[pʰɪgz]	[‘pʰɪks]	67.00	Voiceless				
1709	pillow	[‘pʰɪɬoʷ]	[‘pʰɪlow]	67.00	Voiceless				
1712	pillow	[‘pʰɪɬoʷ]	[‘pʰɪlow]	74.00	Voiceless				
1749	peas	[pʰɪʲz]	[‘pʰijdə]	115.00	Voiceless				
2078	potty	[‘pɑɾi]	[‘pʰɑdij]	74.00	Voiceless				
2330	pig	[pʰɪg]	[‘pʰɪg]	53.00	Voiceless				
2401	peas	[pʰiz]	[‘pʰijð]	62.00	Voiceless				
2425	penguins	[‘pʰɛŋ̩gʷɪnz]	[‘pʰɛ̃ŋwɪ̃ns]	59.00	Voiceless				
2427	peacock	[‘pʰikɑkˀ]	[‘pʰijkʰɑ]	70.00	Voiceless				
2555	purple	[‘pʰəˑpɬ]	[‘pʰɔpʰɔɬ]	24.00	Borderline				
2570	pink	[pʰɪŋk]	[‘pʱɪŋkʰ]	60.00	Voiceless				
2602	penguin	[‘pʰɛŋgʷɪn]	[‘pʰɛ̃ŋwɪ̃n]	54.00	Voiceless				
2615	puppet	[‘pʰʌpətˀ]	[‘pʰʌpʰɪtˀ]	18.00	Borderline				
2673	Mog	[mɑg]	[‘pʰɑg]	58.00	Voiceless				
2705	spoon	[spuʷn]	[‘pʰuw]	33.00	Voiceless				
2734	Panda	[‘pʰændə]	[‘pʰæ̃nda]	28.00	Voiceless				
2781	purple	[‘pʰəˑpɬ]	[‘pʰʊbəɬ]	77.00	Voiceless				
2805	purple	[‘pʰəˑpɬ]	[‘pʰʊbʌɬ]	86.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [p]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
3094	pink	[pʰɪŋk]	[ˈpʱɪŋkʰ]	47.00	Voiceless				
3221	put some more	[pʰʊtˈsəˈmɔɹ]	[pʰəsʌ̃ˈbɔ.a]					15.00	Borderline
3299	purple and blue	[ˌpəɹɪpələnˈbluː]	[ˌpʰɔpʰə.æ̃nˈwuw]			56.00	Voiceless		
3325	pink	[pʰɪŋk]	[ˈpʱɪŋkʰ]	56.00	Voiceless				
3331	purple	[ˈpʰəˑpɬ]	[ˈpʰʊpəɬ]	66.00	Voiceless				
3681	people wear hats	[ˈpʰijpəɬwɛɹˌhæts]	[ˈpʰijpʰʌʔwɛˌhætˀ]	48.00	Voiceless				
3685	spill	[ˈspɪɬ]	[ˈpʰɪ.ʌɬ]	31.00	Voiceless				
3722	paintings	[ˈpʰeĩnfĩŋz]	[ˈpʰẽjntʱijn]	16.00	Borderline				
			Voiceless		112		10		1
			Borderline		8		1		3
			Voiced		2		0		0

Appendix B - VOT and Initial Voicing Labels
Word-initial [b]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0015	Peter	[ˈpʰiʲɾɚ]	[ˈbowɑʔ]	10.00	Voiced				
0023	Peter	[ˈpʰiʲɾɚ]	[ˈbʌˌbʊ.ɛʔ]	19.00	Borderline				
0027	Booboo	[ˈbuʷbuʷ]	[ˌbʊˈbʊː]			8.00	Voiced		
0043	Babar	[ˈbæbaɹ]	[ˈbæbʌʔ]	9.00	Voiced				
0045	Babar's dada	[ˌbəbaɹzˈdædæ]	[ˈbowˌdædæ]	8.00	Voiced				
0046	a book...cup	[ʌˈbʊkˀ...kʰʌpˀ]	[əˈbʊkˀ...kʰɪˈkʰʌpˀ]	2.00	Voiced				
0055	uh, ball	[ʌʔbɑɬ]	[ˌbɐ̃mˈbɑː]	10.00	Voiced				
0061	blue	[bluː]	[ˈbuw]	15.00	Borderline				
0072	moo	[muʷ]	[ˈbʊː]	9.00	Voiced				
0080	Peter	[ˈpʰiʲɾɚ]	[ˈbʊbʊ]	16.00	Borderline				
0082	Peter	[ˈpʰiʲɾɚ]	[bəˈwɛʔ]					4.00	Voiced
0093	book	[bʊkˀ]	[ˈbʌʔ]	3.00	Voiced				
0099	bib	[bɪb]	[ˈbɪʔ]	8.00	Voiced				
0115	baby	[ˈbeʲbi]	[bijʔˈbejˌbij]	9.00	Voiced			3.00	Voiced
0116	baby	[ˈbeʲbi]	[ˈbejbɪ]	13.00	Voiced				
0118	baby	[ˈbeʲbi]	[ˈbejbɪ]	6.00	Voiced				
0120	baby	[ˈbeʲbi]	[ˈbɛbij]	4.00	Voiced				
0166	book	[bʊkˀ]	[ˈbʌʔ]	7.00	Voiced				
0168	bear(?)	[bɛɹ]	[ˌkʰowˈbɑː]	3.00	Voiced				
0170	beans(?)	[biʲnz]	[owˈbij]	2.00	Voiced				
0175	bird	[bɚd]	[ˈbow]	15.00	Borderline				
0194	ball	[bɑɬ]	[ˈbɑ.əʔɐ̃]	17.00	Borderline				
0198	ball	[bɑɬ]	[ˈbɑː]	9.00	Voiced				
0213	boat	[boʷtˀ]	[ˈbow]	9.00	Voiced				
0220	sheep, moo	[ʃiʲpˀmuʷ]	[ˈʃijpʰˌbuw]			1.00	Voiced		
0225	bean	[biʲn]	[bejˈvij]					3.00	Voiced
0234	ball	[bɑɬ]	[ˈdɪˌbɑː]			3.00	Voiced		
0257	ball	[bɑɬ]	[ˈbʌ]	10.00	Voiced				
0274	brown(?)	[bɹaʷn]	[əˈbɑkˀ]	2.00	Voiced				
0284	oh, ball	[oʷbɑɬ]	[ˌowˈbɑ]	1.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [b]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0292	bean ... noodles	[biʲnz...nuʷdɬz]	[ˈbĩjuwəkʰaˌnuwnuw]	17.00	Borderline				
0293	bean	[biʲn]	[ˈbij]	10.00	Voiced				
0300	garbage truck	[ˈɡɑɹbədʒˌtʃɹʌk]	[ˈbejt͡ʃʌ]	2.00	Voiced				
0303	oh, garbage truck	[oʷˈɡɑɹbədʒˌtʃɹʌk]	[ˌoːwbejˈʃæ]					2.00	Voiced
0335	oh, teddy bear	[oʷˈtʰɛdibɛɹ]	[owəˈdɛːwɛ]					5.00	Voiced
0336	bib	[bɪb]	[ˈbij]	5.00	Voiced				
0338	oh, pig	[oʷˈpʰɪɡ]	[ɔʔˈbij]	4.00	Voiced				
0343	ball	[bɑɬ]	[ˈbɑ]	8.00	Voiced				
0349	blue	[bluː]	[əˈbuwə]	4.00	Voiced				
0352	blue	[bluː]	[ˈbuw]	9.00	Voiced				
0355	blue	[bluː]	[ˈbuw]	13.00	Voiced				
0364	bath	[bæθ]	[ˈbæ]	13.00	Voiced				
0366	box(?)	[bɑks]	[ˈbɑ]	4.00	Voiced				
0383	oh, on the bed	[oʷˌɑnðəˈbɛd]	[uwʔˌɑ̃nəˈbæː]	6.00	Voiced				
0464	ball	[bɑɬ]	[ˈbɑ]	6.00	Voiced				
0467	garbage truck	[ˈɡɑɹbədʒˌtʃɹʌk]	[bæˈt͡ʃɛkʰ]					2.00	Voiced
0468	uh, dada	[ʌˈdædæ]	[bʊˈdæɾæ]					4.00	Voiced
0469	a big cow	[əbɪɡkʰaʷ]	[ʌ.æ.ɛːˈbijˌkʰɑw]	9.00	Voiced				
0489	bath	[bæθ]	[...ˈbæ]	8.00	Voiced				
0494	boot	[buʷt̚]	[ˈbuːwtʰ]	10.00	Voiced				
0505	balloon	[bəˈluʷn]	[dʌˈbaː]	9.00	Voiced				
0513	bicycle	[ˈbaʲsikɬ]	[ˌbɛʔjəˈpʰʊtʰʌ]			2.00	Voiced		
0529	ball	[bɑɬ]	[ˈbɑː]	3.00	Voiced				
0547	ball	[bɑɬ]	[ˈbɑ]	10.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [b]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0548	mama ... ball	[mɑməˑ..bɑɬ]	[nɛˈmɑ̃mɑ̃.... hɛkəˈbɑ]	5.00	Voiced				
0572	ball	[bɑɬ]	[ˈbɑ]	9.00	Voiced				
0573	ball	[bɑɬ]	[uwˈbɑː]	6.00	Voiced				
0574	Ernie Bert	[əˑnibəˑtˀ]	[ˈẽjmɪˌbʊ]			6.00	Voiced		
0605	boat	[boʷtˀ]	[əˈbowtʰ]	1.00	Voiced				
0617	ball	[bɑɬ]	[ʌ̃ʔəˈba]	3.00	Voiced				
0624	boy	[boʲ]	[ˈbuwij]	11.00	Voiced				
0646	ball	[bɑɬ]	[luwˈbɑː]	4.00	Voiced				
0673	bird	[bəˑd]	[ˈbʌ.æ]	15.00	Borderline				
0681	bird	[bəˑd]	[mˌˈbɑː]	9.00	Voiced				
0682	bird	[bəˑd]	[ˈbɑː]	8.00	Voiced				
0693	I want blanket	[ˈaʲwɑntˀˌblæŋkɪt]	[ʌjwãˈbædij]	8.00	Voiced				
0695	want blanket	[wɑntˀˈblæŋkɪt]	[ʌ̃ʔˈbædiːj]	7.00	Voiced				
0710	boat	[boʷtˀ]	[ˈbow]	6.00	Voiced				
0742	little ball	[lɪɾɬbɑɬ]	[ˌlɛˈbʌ]	4.00	Voiced				
0743	little ball	[lɪɾˌɬbɑɬ]	[ˈlɪˌbʌ̃]	5.00	Voiced				
0748	big tail	[bɪgtʰeʲɬ]	[bɪˈtʰejʌ]					3.00	Voiced
0778	um, brown	[əmˈbɹaʷn]	[ʌ̃mˈbawn]	2.00	Voiced				
0779	big tail	[bɪgtʰeʲɬ]	[ˈbɪgˈtʰeja]	8.00	Voiced				
0800	bird	[bəˑd]	[ˈbʊ.ət]	4.00	Voiced				
0815	blue	[bluː]	[ˈbuw]	3.00	Voiced				
0850	rake	[ɹeʲkˀ]	[ʌ̃ʔəˈbejkʰ]	6.00	Voiced				
0852	boat	[boʷtˀ]	[ˈboːwtʰ]	12.00	Voiced				
0856	.....beach	[.....bitʃ]	[.....ˈbijtʃ]	4.00	Voiced				
0859	bird	[bəˑd]	[ˈbɔ.ətʰ]	4.00	Voiced				
0867	elephant ... bicycle	[ɛɬəfənt...ˈbaʲsɪkˌɬ]	[æ̃nəˈɛɬfɛ̃...ˈpʰʌtʰæ]	25.00	Voiceless				
0881	blue	[bluː]	[ˈbuw]	10.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [b]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0904	big tail	[bɪgtʰeʲɬ]	[bɪ‘tʰejəɬ]					3.00	Voiced
0912	bird	[bɚd]	[‘bʌs]	12.00	Voiced				
0916	big tail	[bɪgtʰeʲɬ]	[bɪʔ‘tʰejʌː]					4.00	Voiced
0917	that's a big slide	[‘ðætsə‘bɪg‘slaʲd]	[‘dætʰəbɪˌɬajtʰ]					2.00	Voiced
0923	blue	[bluː]	[‘buwə]	10.00	Voiced				
0925	book	[bʊk˺]	[‘bʊkʰ]	17.00	Borderline				
0957	boat ... drive	[boʷt˺...d͜ʒɹaʲv]	[‘bowtʰəʔɑ̃wɑ̃nədə‘dɹajv]	15.00	Borderline				
0972	that's a bird	[ðætsə‘bɚd]	[n̩‘dætʰə‘bɑ̃ntʰ]	3.00	Voiced				
0976	vacuum	[‘vækjuʷm]	[‘bækʰɪ̃nɑ̃]	11.00	Voiced				
0997	...blue one	[‘bluːwʌn]	[...‘buw.wɑ̃nə]	4.00	Voiced				
1001	box	[bɑks]	[‘bɑ]	2.00	Voiced				
1003	boat	[boʷt˺]	[‘bowtʰ]	3.00	Voiced				
1004	?little bear	[lɪɾɬbɛɹ]	[ˌlɪ‘bɛ.ə]	6.00	Voiced				
1006	doggie	[dɑgi]	[‘bɪkʰˌdɑgij]	3.00	Voiced				
1014	...shoe, boot on	[ʃuʷbuʷɾɑn]	[ʃuwʔə‘buwʔɑ̃n]	6.00	Voiced				
1020	hippo	[‘hɪpoʷ]	[‘bɑ̃mˌboːw]	3.00	Voiced				
1024	that's a big shoe	[ðætsəbɪg‘ʃuʷ]	[ˌdætʰaʔɛ̃nˌbɪtʰij‘ʃuwə]			13.00	Voiced		
1039	I'm crying in bed	[aʲmˌkʰɹajɪŋɪn‘bɛd]	[ɛ̃nɑ̃ˌmajuw‘kʰwãjnɑ̃‘bɛtʰ]	4.00	Voiced				
1041	bath	[bæθ]	[‘bætʰ]	10.00	Voiced				
1060	big tail	[bɪgtʰeʲɬ]	[bɪ‘tʰejow]					5.00	Voiced
1083	boy	[boʲ]	[‘bɔj]	4.00	Voiced				
1097	that's a blue and a purple	[ˌðætsə‘bluːændə‘pəɹpəl]	[ə‘dætʰʌˌbuwə̃nə‘bɔpʰʌ]	10.00	Voiced	1.00	Voiced		
1098	...a cat, a boy	[ə‘kʰæɾə‘boʲ]	[...ə‘kʰætʰəʔɑ̃‘bɔjʌ]	2.00	Voiced				
1100	...bed	[bɛd]	[...‘bætʰ]	2.00	Voiced				
1102	...bib	[bɪb]	[ɑ̃ˌmãj‘bɪbə]	4.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [b]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1103	little baby	[lɪɾ̩beʲbi]	[ˌlejˈbijbij]	2.00	Voiced				
1106	baby	[ˈbeʲbi]	[ˈbejbij]	7.00	Voiced				
1152	...big tail	[bɪgtʰeɻ̩t]	[bijˈtʰejow]					3.00	Voiced
1164	garbage	[ˈgaɹbɪdʒ]	[ɐ̃ˈbægəˈkʰɹow]	2.00	Voiced				
1180	ball	[bɑɫ]	[ˈboːw]	8.00	Voiced				
1182	boats	[boʷts]	[ˈbowtʰ]	7.00	Voiced				
1190	birds	[bəˠdz]	[ˈbʊdɪ]	10.00	Voiced				
1195	big tail too	[bɪgtʰeɻ̩tʰuʷ]	[əbɪˌtʰejəˈtʰuw]					5.00	Voiced
1199	brush	[bɹʌʃ]	[ɐ̃ˈbas]	4.00	Voiced				
1222	big eyes	[bɪgaʲz]	[bijˈʔaj]					5.00	Voiced
1223	big toes	[bɪgtʰoʷz]	[bɪʔˈtʰows]					4.00	Voiced
1230	mm, butter	[m̩ˈbʌɾəˠ]	[m̩ˈbʌdæ]	4.00	Voiced				
1232	honey and butter too	[hʌnijənbʌɾəˠtʰuʷ]	[ˈhæ̃nijʔə̃ˌbʌ.aˈtʰuw]			6.00	Voiced		
1249	boats	[boʷts]	[ˈbowt͡ʃ]	12.00	Voiced				
1256	boat	[boʷtˀ]	[ˈbowtʰ]	11.00	Voiced				
1261	back...house	[bækˀ...haʷs]	[ˌbækʰəʔəˈbækʰəˈhaws]	3.00	Voiced	4.00	Voiced		
1334	no, the big one	[noʷðəbɪgwʌn]	[ˌnowdəˈbɛgwɛ̃n]	2.00	Voiced				
1377	bang	[bæŋ]	[ˈbæ̃ŋ]	6.00	Voiced				
1378	bang	[bæŋ]	[ˈbɛ̃ŋ]	12.00	Voiced				
1379	lady bang	[leʲdibæŋ]	[ˌnejˈbɛŋ]	3.00	Voiced				
1384	...baby some	[beʲbisʌm]	[ˈbejbijˌsɐ̃m]	3.00	Voiced				
1517	a bike	[əˈbaʲkˀ]	[uwəˈbɛjkʰ]	5.00	Voiced				
1533	get bean	[gɛtˀˈbiʲn]	[ˌgɛtˈbijn]	5.00	Voiced				
1535	where did bean go	[wɛɹdɪdbiʲngoʷ]	[əwəˈbɛŋˌgow]	4.00	Voiced				
1537	I wanna... Bean in blanket	[ˈaʲwɑnə...ˌbiːnɪnˈblæŋkɪt]	[ʌˈwɑ̃nəbĩŋdɪbwɛ̃ŋkʰɪtʰʔɛ̃mĩˌbɛ̃ŋkʰɛ̃ntˀ]					3.00	Voiced

Appendix B - VOT and Initial Voicing Labels
Word-initial [b]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1546	walking ... Bean	[wɑɬkɪŋ...biʲn]	[ˈwɑkʰijnɑ̃ʔɑːˌbijn]			7.00	Voiced		
1549	a bum	[əˈbʌm]	[əˈbɑ̃m]	6.00	Voiced				
1553	bye	[baʲ]	[ˈbaj]	13.00	Voiced				
1584	beef hearts	[ˈbiʲˌfhaɹts]	[ˈbijˌhɑ.ət̚]	13.00	Voiced				
1617	no ball	[noʷbɑɬ]	[ˌnowˈbɑːɬ]	5.00	Voiced				
1654	baby chicks	[ˈbeʲbiˌtʃɪks]	[ˌbejbijˈt͡ʃɪks]			6.00	Voiced		
1662	boats	[boʷts]	[ˈbowtʰ]	9.00	Voiced				
1842	bear	[bɛɹ]	[ˈbɛʔɑ]	6.00	Voiced				
1877	be careful	[biˈkʰɛɹfˌɬ]	[bɪˈkʰɛfʌɬ]					4.00	Voiced
2022	bear	[bɛɹ]	[ˈbɛː]	13.00	Voiced				
2031	boats	[boʷts]	[ˈbʌwt]	5.00	Voiced				
2074	clock	[kʰlɑk]	[buwˈhɑ]					3.00	Voiced
2092	bugs	[bʌgz]	[ˈbʊdz]	6.00	Voiced				
2098	bus	[bʌs]	[ˈbɪs]	15.00	Borderline				
2156	blue	[bluː]	[bəˈjʊ]					3.00	Voiced
2211	butterfly	[ˈbʌɾəˌˌflaʲ]	[ˈbʌˌfwaj]	6.00	Voiced				
2358	bib	[bɪb]	[ˈbɛb]	9.00	Voiced				
2365	book	[bʊk̚]	[ˈbʊkʰ]	7.00	Voiced				
2448	baby	[ˈbeʲbi]	[ˈbejbij]	3.00	Voiced				
2460	B,what B for?	[biwʌʔbifɔɹ]	[bijˌʔɾ̃ˈbijfɔ.a]					2.00	Voiced
2481	bacon	[ˈbeʲkn̩]	[ˈbejˌkʰ̃in]	10.00	Voiced				
2631	trucks	[tʃɹʌks]	[ˈbʌkʰ]	4.00	Voiced				
2635	bottle	[ˈbɑɾɬ]	[ˈbɑdəɬ]	7.00	Voiced				
2692	black	[blæk]	[bəˈwækʰ]					4.00	Voiced
2733	big ducks	[ˌbɪgˈdʌks]	[ˈbɪʔˈdʌks]	7.00	Voiced				
2752	for these	[fəˈðiz]	[bʌˈdij]					2.00	Voiced
2759	boats	[boʷts]	[ˈbowʔ]	8.00	Voiced				
2804	bother Dad	[bɑðəˈdæd]	[ˌbɑðʌˈdæd]			5.00	Voiced		
2969	brought the hat	[ˌbɹɑtðəˈhæt]	[ˌbɑtdaˈhæt̚]			6.00	Voiced		

Appendix B - VOT and Initial Voicing Labels
Word-initial [b]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
3001	bubbles	[ˈbʌbɬz]	[ˈbʌbəɬ]	6.00	Voiced				
3111	baby	[ˈbeˌbi]	[ˈbejbij]	8.00	Voiced				
3330	brown	[bɹaʷn]	[ˈbə̃wn]	7.00	Voiced				
3384	bottle for a meal	[ˌbɑtəɬfɔɹəˈmijɬ]	[ˌbɑɬfʌˈmijəɬ]			7.00	Voiced		
3585	boats	[ˈbowts]	[ˈbowts]	5.00	Voiced				
3743	boats	[ˈbowts]	[ˈbowʔs]	2.00	Voiced				
3864	build something	[ˈbɪɬdˌsʌmθɪŋ]	[ˈbɪɬdˀˌsə̃mpʰⁿ̥ɪŋ]	4.00	Voiced				
			Voiceless		1		0		
			Borderline		0		0		
			Voiced		122		14		23

Appendix B - VOT and Initial Voicing Labels
Word-initial [t]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0053	toy	[tʰoʲ]	[ˈtʰɔʔ]	35.00	Voiceless				
0063	toe	[tʰoʷ]	[ˈtʰʌ]	89.00	Voiceless				
0064	toe	[tʰoʷ]	[ˈtʰuw]	37.00	Voiceless				
0066	toy	[tʰoʲ]	[ˈtʰʊʔ]	73.00	Voiceless				
0071	toy	[tʰoʲ]	[ˈtʰʌw]	53.00	Voiceless				
0074	keys	[kʰi̯ʲz]	[n̥ˈtʰiːj]	137.00	Voiceless				
0087	keys	[kʰi̯ʲz]	[ˈtʰij]	45.00	Voiceless				
0106	cat	[kʰæt̚]	[tʰəˈkʰæt̚]					41.00	Voiceless
0107	cat	[kʰæt̚]	[...ˈtʰɛ̃]	74.00	Voiceless				
0145	cat	[kʰæt̚]	[n̥ˈtʰɛ]	53.00	Voiceless				
0147	tail	[tʰeɹ̝]	[ˈtʰɛlij]	52.00	Voiceless				
0149	tail	[tʰeɹ̝]	[õˈtʰɛlij]	24.00	Borderline				
0158	cookie	[ˈkʰʊki]	[huwəˈtʰejkʰɪʔ]	56.00	Voiceless				
0159	oh, cookie	[oʷkʰʊki]	[ˈowəˌtʰejkʰɛ]	77.00	Voiceless				
0160	uh, chair	[ʌʔˈtʃɛɹ]	[ʊˈtʰɑ]	47.00	Voiceless				
0177	cookie	[ˈkʰʊki]	[hɪmojˈtʰejkʰɪʔ]	55.00	Voiceless				
0187	turtle	[ˈtʰəˠɾ̥]	[ˈtʰɛ̃]	45.00	Voiceless				
0188	turtle	[ˈtʰəˠɾ̥]	[ˈtʰɜ̹ːtʰɛ̃]	59.00	Voiceless				
0231	toy	[tʰoʲ]	[ˈtʰʊej]	63.00	Voiceless				
0247	cat	[kʰæt̚]	[ˈtʰɛː]	71.00	Voiceless				
0261	toys	[tʰoʲz]	[ˈtʰɔj.ij]	39.00	Voiceless				
0273	turtle	[ˈtʰəˠɾ̥]	[ˈtʰɜˌtʰuw]	42.00	Voiceless				
0325	oh, cat	[oʷkʰæt̚]	[ʊwəˈtʰæ]	83.00	Voiceless				
0384	two, three, go	[ˌtʰuʷˌθɹiˈgoʷ]	[ˌtʰuːwˌfwajˈgoːw]			33.00	Voiceless		
0385	two,two, five	[ˌtʰuʷ... ˈtʰuʷˌfaʲv]	[ˌt͡ʃuːwˈtʰuːwˌfaːj]	57.00	Voiceless				
0394	two, five, three	[ˌtʰuʷˌfaʲvˌθɹiʲ]	[ˌtʰuwˈfaːjˌhɔwij]			153.00	Voiceless		
0401	two, five, go	[ˌtʰuʷˌfaʲvˈgoʷ]	[ˌtʰuːwˌfwaːjˈgɑʔ]			144.00	Voiceless		

Appendix B - VOT and Initial Voicing Labels
Word-initial [t]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0403	two, three, go	[ˌtʰuʷˌθɹiˈgoʷ]	[ˌtʰuːwˌhwaːjˈgoːw]			115.00	Voiceless		
0404	two, three, go	[ˌtʰuʷˌθɹiˈgoʷ]	[ˌtʰuːwˌfwaːjˈgoːw]			31.00	Voiceless		
0408	two, three, go	[ˌtʰuʷˌθɹiˈgoʷ]	[ˌtʰuːwˌlaːjˈgoːw]			42.00	Voiceless		
0411	turtle	[ˈtʰəˤɾ̩]	[ˈtʰɪtʰʌ]	34.00	Voiceless				
0416	cat	[kʰæt˞]	[ˈtʰæʔ]	90.00	Voiceless				
0446	potato head	[pəˈtʰeɪɾoʷhɛd]	[ˈtʰejˌhɑɹʔ]	52.00	Voiceless				
0456	mama ... toy	[mɑmɑ...tʰoʲ]	[ˈmʌ̃mɑ...ˈtʰɔj]	90.00	Voiceless				
0459	tail	[tʰeɪ̯ɬ]	[ˈtʰejʌ]	61.00	Voiceless				
0461	turtle	[ˈtʰəˤɾ̩]	[ˈtʰʊtʰʌ]	76.00	Voiceless				
0482	turtle	[ˈtʰəˤɾ̩]	[ˈtʰʊˌsʊ]	42.00	Voiceless				
0495	tail	[tʰeɪ̯ɬ]	[ˈtʰijæ]	45.00	Voiceless				
0496	cat tail	[ˈkʰæt˞ˌtʰeɪ̯ɬ]	[ˈkʰæʔˌtʰijʌ]			61.00	Voiceless		
0515	telephone	[ˈtʰɛɬəfoʷn]	[ˈtʰɑhow]	100.00	Voiceless				
0543	tail	[tʰeɪ̯ɬ]	[n̩ˈtʰeːjʌ]	93.00	Voiceless				
0544	cat...tail	[kʰæt˞...tʰeɪ̯ɬ]	[ʊˌkʰætʰəʔəˈtʰiːjʌ]	64.00	Voiceless				
0550	duck tail	[ˈdʌk˞ˌtʰeɪ̯ɬ]	[ɪˌdʌk˞ˈtʰejʌ]	91.00	Voiceless				
0608	tail	[tʰeɪ̯ɬ]	[ˈtʰeːjə]	41.00	Voiceless				
0633	...tail	[...tʰeɪ̯ɬ]	[ʊnˈtʰejʌ]	63.00	Voiceless				
0634	it's a tail	[ɪtsəˈtʰeɪ̯ɬ]	[ɪsəˈtʰejʌ]	77.00	Voiceless				
0640	dada...tail	[dædæ...tʰeɪ̯ɬ]	[ˌdædaʔɪnˈtʰeja]	65.00	Voiceless				
0656	rabbit...tail	[ˈɹæbɪt˞...tʰeɪ̯ɬ]	[n̩ˈwæ.ə.ɪ̃nˌtʰejə]	83.00	Voiceless				
0670	on top	[ɑntʰɑp˞]	[ɛ̃nˈʔʌp˞ˈtʰɑpʰ]	83.00	Voiceless				
0676	toast	[tʰoʷst˞]	[ˈtʰow]	86.00	Voiceless				
0684	treehouse	[ˈtɹiːhaʷs]	[ˈtʰijˌhʌw]	77.00	Voiceless				
0700	teddybear	[ˈtʰɛdibɛɹ]	[ˈtʰejˌbʌʔ]	68.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [t]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0722	phone(?)	[foʷn]	[ˈtʰɑ]	441.00	Voiceless				
0724	I want sofa	[aʲwɑnʔˈsoʷfɑ]	[owˈtʰuwvə]	50.00	Voiceless				
0738	toy	[tʰoʲ]	[dəˈʔowtʰowˌtʰɔj]			56.00	Voiceless		
0740	...toy	[...tʰoʲ]	[ɐ̃ʔˈtʰɔj]			27.00	Voiceless		
0744	candle	[ˈkʰændɬ̩]	[ˈtʰæ̃nʌ]	40.00	Voiceless				
0745	candle	[ˈkʰændɬ̩]	[ˈtʰæ̃n.nə]	51.00	Voiceless				
0748	big tail	[bɪgtʰeɪɬ]	[bɪˈtʰejʌ]	62.00	Voiceless				
0779	big tail	[bɪgtʰeɪɬ]	[ˈbɪgˈtʰejə]	39.00	Voiceless				
0787	mm, toast	[m̩ːˈtʰoʷstˀ]	[ənˈtʰowtʰ]	36.00	Voiceless				
0788	toast	[tʰoʷstˀ]	[ˈtʰows]	78.00	Voiceless				
0809	...teddy bear	[...ˈtʰɛdibɛɹ]	[ˈnowəˈtʰejˌbɛ]	65.00	Voiceless				
0820	cat hair ... cat	[kʰætˀhɛɹ...kʰætˀ]	[ɐ̃ˈtʰæhjɔ...ˈkʰætˀ]	72.00	Voiceless				
0825	one, two	[wʌntʰuʷ]	[ˌwɪnˈtʰuːw]	62.00	Voiceless				
0841	guitar	[gɪˈtaɹ]	[ˈtʰaː]	77.00	Voiceless				
0865	telephone	[ˈtʰəɬəfoʷn]	[ˈtʰʌˌfwõːw]	31.00	Voiceless				
0873	teddybear(?)	[ˈtʰɛdibɛɹ]	[əˈtʰɛˌbɑː]	19.00	Borderline				
0879	two	[tʰuʷ]	[ˈtʰuwə]	103.00	Voiceless				
0894	toast	[tʰoʷstˀ]	[ˈtʰows]	85.00	Voiceless				
0895	toaster	[ˈtoʷsɾɚ]	[...ˈtʰows.sij]	55.00	Voiceless				
0903	that's a cow	[ðætsəkʰaʷ]	[tʰɐ̃tʰəʔʌˈkʰɑwə]					19.00	Borderline
0904	big tail	[bɪgtʰeɪɬ]	[bɪˈtʰejəɬ]	40.00	Voiceless				
0916	big tail	[bɪgtʰeɪɬ]	[bɪʔˈtʰejʌː]	62.00	Voiceless				
0919	...mommy's on the swing too	[ˈmamizɑnðəswɪŋˈtʰuʷ]	[...mɐ̃mijʌvəˌfwɐ̃ŋəˈtʰuwə]	39.00	Voiceless				
0928	...tiny stairs	[ˈtʰaʲniʲˈstʰɛɹz]	[....ˈtʰɐ̃jˈtʰɛjə]	60.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [t]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0928	...tiny stairs	[ˈtʰaʲniʲˈstʰɛɹz]	[....ˈtʰãjˈtʰɛjə]	65.00	Voiceless				
0930	tiny stairs	[ˈtʰaʲniʲˈstʰɛɹz]	[ˈtʰajnˌtʰɛ]	61.00	Voiceless	75.00	Voiceless		
0967	blue and red and purple too	[ˈbluːənˈɹɛdənˈpəɹpəltuː]	[ˌwuwɑ̃nəˈwɛdʔɑ̃nˈpʰɜpʰʌˌtʰuwə]			63.00	Voiceless		
0985	...TV	[tʰiˈviʲ]	[...ˈtʰijˈvij]	65.00	Voiceless				
0998	...two balloons	[ˌtʰuʷbəˈluʷnz]	[ˈtʰuwɐ̃næˈbuw.wɐ̃nə]	56.00	Voiceless				
1013	...tiny one like it ice cream	[ˌtʰaʲniːwʌnlaʲkɪˈɹaʲskɹiːm]	[...tʰajnijwɐ̃ːʔəˌlajkʰɪθʔæ̃nəˈejkʰij]	31.00	Voiceless				
1032	tiny dog	[tʰaʲnidɑg]	[ˈtʰajnijˌdɑkʰ]	39.00	Voiceless				
1042	hippo ... towel ... toys	[ˈhɪpoʷ...ˈtʰæwɬ...tʰoʲz]	[əˈθĩmbow...**ˈtʰ**ʌwa...ˈtʰɔjs]	37.00	Voiceless				
1042	hippo ... towel ... toys	[ˈhɪpoʷ...ˈtʰæwɬ...tʰoʲz]	[əˈθĩmbow...ˈtʰʌwa...**ˈtʰɔ**js]	51.00	Voiceless				
1049	toast	[tʰoʷstˀ]	[õˈtʰʌws]	68.00	Voiceless				
1050	toast	[ˈtʰoʷst]	[ʔõˈtʰowəʃ]	123.00	Voiceless				
1051	mine toast too	[maʲntʰoʷstʰuʷ]	[ˈmajˈtʰɔjsˌtʰuːw]	61.00	Voiceless				
1052	and tea	[ænˈtʰi]	[nˌˈtʰeːj]	67.00	Voiceless				
1063	that's a tiny one	[ðætsətʰaʲniwʌn]	[dætʰəˈtʰajnijˌwɐ̃n]	17.00	Borderline				
1080	two	[tʰuʷ]	[ˈtʰuwa]	146.00	Voiceless				
1099	tape	[tʰeʲpˀ]	[ˈtʰeːj]	67.00	Voiceless				
1107	diaper	[ˈdaʲpəˑ]	[ˈtʰɛpɛʔ]	73.00	Voiceless				
1134	cheese and ice cream too	[ˌʧiːzənˈaʲskɹiːmˈtʰuː]	[ˌt͡ʃijɐ̃ˈʔɛkʰijʔijˈtʰuwə]	78.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [t]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1143	I want blow	[ˈaʲwɑnt˺ˌblo ʷ]	[ɑ̃ˈwɑ̃ːbow]	25.00	Voiceless				
1144	two	[tʰuʷ]	[ˈtʰuwɛ̃nə]	29.00	Voiceless				
1160	turtle	[ˈtʰɚɾɬ]	[ˈtʰʊdʌ]	95.00	Voiceless				
1170	two	[tʰuʷ]	[ˈtʰuw]	93.00	Voiceless				
1171	two	[tʰuʷ]	[ˈtʰuw]	96.00	Voiceless				
1184	two	[tʰuʷ]	[ˈtʰuːw]	107.00	Voiceless				
1195	big tail too	[bɪgtʰeʲɬtʰuʷ]	[əbɪˌtʰejəˈtʰuw]	60.00	Voiceless	70.00	Voiceless		
1196	whiskers	[wɪskɚz]	[ʔɪk˺ˈtʰɛ]	37.00	Voiceless				
1206	cat too	[kʰæt˺tʰuʷ]	[əˌkʰæˈtʰuw]	70.00	Voiceless				
1210	...duck too	[dʌk˺tʰuʷ]	[ʌwɑ̃ˈdɪk˺ˌtʰuw]			43.00	Voiceless		
1211	apple too	[ˈæpɬtʰuʷ]	[ˈæbʊˌtʰuw]			66.00	Voiceless		
1214	turtle too	[ˈtʰɚɾɬtʰuʷ]	[...**ˈtʰʌ**ˈtʰʌˈtʰɛ]	28.00	Voiceless				
1219	piggy too	[ˈpʰɪgitʰuʷ]	[əˈpʰɪgijˌtʰuw]			64.00	Voiceless		
1223	big toes	[bɪgtʰoʷz]	[bɪʔˈtʰows]	30.00	Voiceless				
1229	toast	[tʰoʷst˺]	[ˈtʰowəs̥]	74.00	Voiceless				
1231	want toast mommy	[wɑnʔtʰoʷst˺ mɑmi]	[ɑ̃ˈtʰowtʰəˈmaj]	44.00	Voiceless				
1239	mm, potato	[mmpəˈtʰeʲɾ oʷ]	[m̩ˈtʰejdow]	61.00	Voiceless				
1245	guitar	[giˈtʰaɹ]	[ˈtʰɑː]	45.00	Voiceless				
1257	my working on a tie-dye	[maʲwɚkɪŋɑ nəˈtʰaʲdaʲ]	[ˌmãjwɜkʰ̃ijnɑ̃n ə̃ˈtʰajdaj]	47.00	Voiceless				
1275	want toy	[wɑntʰoʲ]	[ʌ̃wɑ̃ˈtʰɔjz]	105.00	Voiceless				
1276	mama take it	[mɑmɑtʰeʲkɪt ˺]	[ˌmɑ̃mɑˈtʰejkʰɛ d]	52.00	Voiceless				
1278	two ducks	[tʰuʷˈdʌks]	[ˈtʰuwˌdækʰ]	44.00	Voiceless				
1282	two	[tʰuʷ]	[ˈtʰuw]	116.00	Voiceless				
1284	two horse	[tʰuʷhɔɹs]	[ˈtʰuwˌfɔj.ɪs]	50.00	Voiceless				
1294	a tiny one...	[əˈtʰeʲniwʌn]	[əˈtʰæ̃nijwĩn]	53.00	Voiceless				
1299	two brush	[ˈtuːbɹʌʃ]	[ˈtʰuwbwɛː.ˌʃtʰ]	113.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [t]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1302	one two	[wʌntʰuʷ]	[hɐ̃nˈtʰow]	67.00	Voiceless				
1312	it's mama toast	[ɪts mɑmɑmtʰoʷs tˀ]	[ɪʃʔɪʃɑˌmɑma.əˈtʰows]	70.00	Voiceless				
1345	potato	[pəˈtʰeʲdoʷ]	[ˈtʰejdow]	71.00	Voiceless				
1352	toast	[tʰoʷstˀ]	[əˈtʰows]	52.00	Voiceless				
1353	toast	[ˈtʰoʷstˀ]	[ajˈtʰows]	142.00	Voiceless				
1356	duck some too	[dʌksʌmtʰuʷ]	[n̩ˈdæksɐ̃mˌtʰuw]			61.00	Voiceless		
1401	two cats	[tʰuʷkʰæts]	[ˈtʰʊˌkʰæs]	75.00	Voiceless				
1402	another cat too	[ənʌðəˌkʰætʰuʷ]	[əˈnɐ̃nəkʰæˈtʰuw]	106.00	Voiceless				
1405	no my take knife	[noʷmaʲtʰeʲknaʲf]	[nowˈmajətʰɛkʰˌnejf]					21.00	Borderline
1419	stand up	[stʰænˈdʌp]	[uwˈtʰæ̃mʌpʰ]	38.00	Voiceless				
1420	teeth	[tʰiʲθ]	[ˈtʰij]	74.00	Voiceless				
1442	toast	[ˈtʰoʷstˀ]	[ˈtʰows]	83.00	Voiceless				
1445	kids like toast	[kʰɪdzlaʲktʰoʷstˀ]	[kʰɪdˈlajkˀˌtʰows]			29.00	Voiceless		
1450	potato	[pəˈtʰeʲdoʷ]	[ənʊˈtʰeːjdoːw]			84.00	Voiceless		
1451	...steaming	[ˈstiʲmɪŋ]	[ˈtʰijˈmijnə]	60.00	Voiceless				
1460	potato	[pətʰeʲdoʷ]	[ˈtʰejdow]	53.00	Voiceless				
1468	toys	[tʰoʲz]	[ˈtʰɔjs]	66.00	Voiceless				
1498	two	[tʰuʷ]	[ˈtʰuw]	113.00	Voiceless				
1503	two hearts	[tʰuʷhaɹts]	[ˈtʰuwˌhɑ.ɛtˀ]	87.00	Voiceless				
1508	one two three five	[wʌntʰuʷθɹifaʲv]	[dəˈwɐ̃nˌtʰuwfwijfjætʰ]			87.00	Voiceless		
1556	two rabbits	[tʰuʷˈɹæbɪts]	[ˌtʰuwˈwæwɛts]			36.00	Voiceless		
1586	Cathy ... too	[kʰæθi...tʰuʷ]	[ˌkʰæʔij...ˈtʰuw]	87.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [t]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1601	one, two, three	[wʌntʰuʷθɹi]	[ˈwɐ̃nˈtʰuwˈfwij]	92.00	Voiceless				
1638	I have a big knot	[aʲhævəbɪgn ɑtˀ]	[tʰaˈbɪʔˌnɑtʰ]					48.00	Voiceless
1696	tea	[tʰiʲ]	[ˈtʰija]	97.00	Voiceless				
1704	telephone	[ˈtʰɛɬəfoʷn]	[tʰɛləˈfɛwn]					15.00	Borderline
1897	too high	[tʰuʷˈhaʲ]	[ˈtʰuwhaj]	102.00	Voiceless				
1898	too high	[tʰuʷˈhaʲ]	[tʰuwˈhaj]					43.00	Voiceless
1988	two	[tʰuʷ]	[ˈtʰuw]	112.00	Voiceless				
2329	it's a rabbit	[ɪtsəˈɹæbɪtˀ]	[ˈtʰuw.wæbɪtˀ]	34.00	Voiceless				
2366	two books	[ˈtʰuʷbʊks]	[tʰuwˈbʊks]					63.00	Voiceless
2516	take it off	[ˌtʰeʲkɪˈɾɑf]	[ˌtʰejkʰɪˈdɑf]			39.00	Voiceless		
2605	tiger	[ˈtʰaʲgəˠ]	[ˈtʰajgə]	37.00	Voiceless				
2677	two names	[tʰuʷneʲmz]	[ˈtʰuwˌnejm]	38.00	Voiceless				
2707	turtle	[ˈtʰəˠɾɬ]	[ˈtʰʊɬɹuw]	82.00	Voiceless				
2749	to the train	[tʰuðəˈʧɹeʲn]	[tʰuwðəˈtwejn]					63.00	Voiceless
2751	those guys	[ˈðoʷgaʲz]	[ˈtʰowˌgaj]	32.00	Voiceless				
3072	these guys gotta	[ˈðizgaʲzgɑɾə]	[dɪˈgajˌgɑɾə]	112.00	Voiceless				
3361	two cookies	[ˈtuwˌkʊkijz]	[tʰuwˈkʰʊkʰijs]					56.00	Voiceless
3558	turn it	[ˈtɜɹnɪt]	[ˈtʰɜnij]	52.00	Voiceless				
3569	turn the page	[ˌtɜɹnðəˈpejʤ]	[ˌtʰɜnˈpʰejpʰ]			50.00	Voiceless		
3640	stop	[ˈstɑp]	[ˈtʰɑpʰ]	22.00	Borderline				
3642	stop	[ˈstɑp]	[ˈtʰɑpˀ]	16.00	Borderline				
3785	tail	[ˈtejɬ]	[ˈtʰejʌɬ]	59.00	Voiceless				
			Voiceless		130		22		6
			Borderline		5		0		3
			Voiced		0		0		0

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0004	dada	[ˈdædæ]	[ˈdɛdæʔ]	1.00	Voiced				
0019	dada	[ˈdædæ]	[ʌˈdædɛ]	7.00	Voiced				
0020	dada	[ˈdædæ]	[ʌˈdædæ]	15.00	Borderline				
0024	dada	[ˈdædæ]	[ˈdæˌdæ]	8.00	Voiced				
0025	dada	[ˈdædæ]	[ˈdæˌdɛ]	6.00	Voiced				
0037	Joe (?)	[dʒoʷ]	[əˈdow]	5.00	Voiced				
0038	Joe (?)	[dʒoʷ]	[əˈdow]	11.00	Voiced				
0039	Joe	[dʒoʷ]	[ˈdɜʔ]	9.00	Voiced				
0041	Joe	[dʒoʷ]	[ˈdow]	9.00	Voiced				
0045	Babar's dada	[ˌbəbaɹzˈdædæ]	[ˈbowˌdædæ]			6.00	Voiced		
0052	duck	[dʌk̚]	[ˈdæʔ]	8.00	Voiced				
0056	dada	[ˈdædæ]	[ˈdædɑ]	4.00	Voiced				
0057	dada	[ˈdædæ]	[ˈdɛdæ]	7.00	Voiced				
0069	dada	[ˈdædæ]	[ˈdæˌdæ]	5.00	Voiced				
0070	dada	[ˈdædæ]	[ˈdædʌ]	6.00	Voiced				
0084	dada	[ˈdædæ]	[ˈdɛdæ]	13.00	Voiced				
0090	dada	[ˈdædæ]	[dʌˈdæ]					2.00	Voiced
0105	dish	[dɪʃ]	[ˈdij]	4.00	Voiced				
0113	dada	[ˈdædæ]	[ˈdæˌdɛ]	7.00	Voiced				
0131	dada	[ˈdædæ]	[ʌ̰ˈdædɛ]	3.00	Voiced				
0132	dada	[dædæ]	[dæˈdæ]					2.00	Voiced
0134	dada	[dædæ]	[ˈdædɛ]	9.00	Voiced				
0136	dada cookie	[dædæˈkʰʊki]	[gʌʔˈdʌdʌˈkʰɪhʊɪ]	5.00	Voiced				
0140	dada	[dædæ]	[ˈdawd̥ʒɑ]	8.00	Voiced				
0156	dada	[dædæ]	[ˈdɛdæ]	7.00	Voiced				
0200	duck	[dʌk̚]	[ˈdʌː]	10.00	Voiced				
0214	dada	[dædæ]	[n̥ˈdɛdɛ]	2.00	Voiced				
0298	duck	[dʌk̚]	[ˈdæ]	5.00	Voiced				
0308	Peter	[ˈpiɾɚ]	[ˈdʌdæ]	7.00	Voiced				
0438	d, dada	[didædæ]	[ˌɛʔowˈdæɾæ]	4.00	Voiced				
0458	dada	[ˈdædæ]	[ˈdædæ]	7.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0463	duck	[dʌk̚]	[ˈdʌkʰ]	9.00	Voiced				
0468	uh, dada	[ʌˈdædæ]	[bʊˈdæɾæ]	6.00	Voiced				
0484	dog	[dɑg]	[ˈdɑːkʰ]	6.00	Voiced				
0506	dada	[ˈdædæ]	[ˈdædæ]	10.00	Voiced				
0523	um, uh, dada	[ʌmʌˈdædæ]	[m̩ʔə̃nˈdædæ]	14.00	Voiced				
0531	dada	[ˈdædæ]	[ˈdɛ̟lø]	9.00	Voiced				
0538	dada	[ˈdædæ]	[dɛˈdæ]					5.00	Voiced
0541	dada	[ˈdædæ]	[̟dɛˈda]			5.00	Voiced		
0554	uh, dog	[ʌdɑg]	[ɐ̃nˈdɑ]	3.00	Voiced				
0560	dog	[dɑg]	[ˈdɑkʰ]	11.00	Voiced				
0567	dog	[dɑg]	[ˈdɑ]	11.00	Voiced				
0636	mama	[mɑmə]	[dæt̚ˈmɐ̃mɐ̃]					7.00	Voiced
0668	dada	[dædæ]	[ũwˈdɛdɛ]	5.00	Voiced				
0669	dada	[dædæ]	[ˈdædæ]	9.00	Voiced				
0754	duck, a tail	[dʌkətʰeɻ]	[ˈdʌkʰʔɛ̟̃tʰejɑ]	5.00	Voiced				
0771	duck	[dʌk̚]	[n̩ˈdɛkʰ]	5.00	Voiced				
0783	oh, dog	[oʷdɑg]	[ˈow̟dɑkʰ]			13.00	Voiced		
0813	that	[ðæt̚]	[ɐ̃wəˈdætʰ]	8.00	Voiced				
0835	a slide... wee, down	[əˈslaʲdˈwiːdaʷn]	[əˈslajdɐ̃dəˈwiːjˈdɑwn]	5.00	Voiced				
0839	dance	[dæns]	[ˈdɛ̃nt͡ʃ]	10.00	Voiced				
0883	that's a dog	[ðætsədɑg]	[ˈdædə**ˈdɑ**gij]	3.00	Voiced				
0883	that's a dog	[ðætsədɑg]	[ˈ**dæ**dəˈdɑgij]	5.00	Voiced				
0888	dogs	[dɑgz]	[ˈdɑkʰ]	6.00	Voiced				
0891	uh, that's a ??	[ʌðætsə]	[ɐ̃ːʔə̃nˈdætʰə]	2.00	Voiced				
0892	juice	[dʒuʷs]	[ˈduw̟s̪]	3.00	Voiced				
0907	duck	[dʌk̚]	[...ˈdʌtʰ]	7.00	Voiced				
0909	that's a dog	[ðætsədɑg]	[̟dætʰɐ̃ʔəˈdɑkʰ]	6.00	Voiced	6.00	Voiced		
0910	that horsie	[ðætˈhɔɹsi]	[dæʔˈhɔs̪ij]					5.00	Voiced

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0911	that, who's that	[ðæthuʷzðætˀ]	[ˈdɛstʰʌʔɾ̃ˈdæð]	8.00	Voiced				
0914	duck	[dʌk]	[ˈdʌkʰ]	9.00	Voiced				
0915	daddy duck	[dædidʌkˀ]	[dæθajnɵ̃mˈdʌgej]	11.00	Voiced			6.00	Voiced
0917	that's a big slide	[ˈðætsəˈbɪgˈslaʲd]	[ˈdætʰəbɪˌɬajtʰ]	6.00	Voiced				
0922	?dog	[dɑg]	[ɾ̃ˈdætʰ]	4.00	Voiced				
0931	dance	[dænʃ]	[ɾ̃nˈdajs]	2.00	Voiced				
0932	what's that	[wʌtsðætˀ]	[ʔuwnˈdætˀ]	9.00	Voiced				
0933	that's an elephant	[ðætsənˈɛɬəfəntˀ]	[ˈdæˌdaʔɑʔɛ̃fĩhɛ̃ˌpʰɛ̃]	4.00	Voiced				
0935	what's that	[wʌtsðætˀ]	[ʔɾ̃ˈdætʰ]	2.00	Voiced				
0937	cat	[kʰætˀ]	[ˈkʰætʰaˇduwijɛn]					2.00	Voiced
0938	dog	[dɑg]	[ˈdɑkʰ]	5.00	Voiced				
0941	grass	[gɹæs]	[n̥ˈdæs]	2.00	Voiced				
0948	...that's a...	[ðætsə]	[m̥ˌdæsəʔəˈbɑɬ]	3.00	Voiced				
0949	that's a carrot	[ðætsəˈkʰɛɹət]	[ˌdæsɨˈkʰɛɹæ]			11.00	Voiced		
0951	what's that	[wʌtsðætˀ]	[n̥ˈdætʰ]	4.00	Voiced				
0952	what's that	[wʌtsðætˀ]	[n̥ˈdætʰ]	3.00	Voiced				
0953	this one	[ðɪswʌn]	[ˈdɛsˌ∑ɾ̃n]	9.00	Voiced				
0962	that's a hippo	[ðætsəhɪpoʷ]	[dæsaˈbɾ̃m̥ˌbow]					8.00	Voiced
0966	what's that	[wʌtsðætˀ]	[ɾ̃ˈdætʰ]	4.00	Voiced				
0971	pull that	[pʰʊɬðætˀ]	[ˈpʰʊɬɬənəˈdætʰ]	7.00	Voiced				
0972	that's a bird	[ðætsəˈbəˠd]	[n̥ˈdætʰəˈbɾ̃ntʰ]	3.00	Voiced				
0977	dog	[dɑg]	[ˈdɑkʰ]	8.00	Voiced				
1006	doggie	[dɑgi]	[ˈbɪkʰˌdɑgij]			3.00	Voiced		
1010	eating that	[ˌiɾɪŋˈdætˀ]	[ɛ̃nəˌʔejdɦŋɛ̃ʔəˈdætʰ]	4.00	Voiced				
1011	eating that	[ˌiɾɪŋˈðætˀ]	[ʔɛ̃ˌʔejdɦjnəˈdætʰ]	7.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1024	that's a big shoe	[ðætsəbɪgˈʃuʷ]	[ˌdætʰaʔɛ̃nˌbɪtʰijˈʃuwə]			4.00	Voiced		
1030	and dog	[ænˈdɑg]	[ʔə̃ʔɐ̃nˈdɑkʰ]	2.00	Voiced				
1031	that's a dog	[ðætsədɑg]	[ɐ̃ˈdætʰɪˌdɑkʰ]	8.00	Voiced	3.00	Voiced		
1032	tiny dog	[tʰaʲnidɑg]	[ˈtʰajnijˌdɑkʰ]			2.00	Voiced		
1059	duck	[dʌk˺]	[ˈdʌkʰ]	11.00	Voiced				
1062	...that's a daddy one	[ðætsədædiwʌn]	[...dædəˈdædijˌwɐ̃n]	5.00	Voiced			3.00	Voiced
1063	that's a tiny one	[ðætsətʰaʲniwʌn]	[dætʰəˈtʰajnijˌwɐ̃n]					16.00	Borderline
1076	dancing	[ˈdænsɪŋ]	[ˈdæ̃ʃijnə]	4.00	Voiced				
1077	...cat	[kʰæt˺]	[ˌdæzəˈkʰætʰ]			9.00	Voiced		
1084	that's a man	[ðætsəmæn]	[dætʰaṃˈmæ̃n]					41.00	Voiceless
1088	a dog	[əˈdɑg]	[nɐ̃ˈdɑkʰ]	5.00	Voiced				
1089	dog	[dɑg]	[ˈdɑkʰ]	9.00	Voiced				
1097	that's a blue and a purple	[ˌðætsəˈbluːændəˈpəɹpəl]	[əˈdætʰʌˌbuwə̃nəˈbɔpʰʌ]	3.00	Voiced				
1105	...what's that	[wʌtðæt˺]	[...owˈdætʰ]	7.00	Voiced				
1109	high chair	[ˈhaʲtʃɛɹ]	[ənˈdætʰɪˌdɛ.ə]	5.00	Voiced	11.00	Voiced		
1112	uh, that	[ʌðæt˺]	[ṇˈdætʰ]	4.00	Voiced				
1113	that's a fish	[ðætsəfɪʃ]	[ˌdæzʔɐ̃ṇˈfɪʃ]			9.00	Voiced		
1114	that's meat	[ðætsmit˺]	[ˌdæzəˈmijtʰ]			4.00	Voiced		
1116	that	[ðæt˺]	[ṇˈdætʰ]	2.00	Voiced				
1120	that	[ðæt˺]	[ɐ̃nˈdæt˺]	4.00	Voiced				
1122	that is a red ???	[ˌðæɪɪzəˌɹɛd....]	[ˌdæʔɪʔəˌwɛdˈʃɪ.uw]			6.00	Voiced		
1126	that	[ðæt˺]	[ɐ̃nˈdæ]	4.00	Voiced				
1127	that	[ðæt˺]	[ɐ̃nˈdætʰ]	2.00	Voiced				
1128	that's a ???	[ðætsə]	[ɐ̃ˌdætʰɛˈnæ̃.æ̃ʔ]	5.00	Voiced				
1132	that	[ðæt˺]	[ṇˈdæ]	2.00	Voiced				
1136	putting that	[ˌpʰʊɾɪŋˈðæt˺]	[mˌpʰɪtʰɛ̃nˈdæd]	9.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1150	that's a blue one	[ˌðætsəˈbluːwʌn]	[ˌdætʰəˈbuwɐ̃n]			7.00	Voiced		
1158	duck	[dʌk̚]	[ˈdakʰ]	5.00	Voiced				
1177	dog	[dɑg]	[əˈdɑkʰ]	10.00	Voiced				
1178	dog	[dɑg]	[ˈdakʰ]	3.00	Voiced				
1183	what that	[wʌʔðæt̚]	[owˈdætʰ]	2.00	Voiced				
1210	...duck too	[dʌk̚tʰuʷ]	[ʌwɐ̃ˈdɪk̚ˌtʰuw]	3.00	Voiced				
1235	mama that	[ˌmɑməˈðæt̚]	[mɐ̃.ɐ̃ˈdætʰ]	2.00	Voiced				
1280	ducks	[dʌks]	[ˈdʌt̚]	6.00	Voiced				
1322	...dinner, want dinner	[dɪnəˑwɑntdɪnəˑ]	[wɛ̃ntʰd̪ĩnʌˌwɐ̃ˈd̪ĩnʌ]	4.00	Voiced				
1323	cutting cutting that knife	[kʰʌɾɪŋkʰʌɾɪŋðætnaʲf]	[ajkʰʌtʰɪdˈkʰʌtʰr̃ĩnˈdætʰənajf]	5.00	Voiced				
1346	...cook a duck	[ˌkʰʊkəˈdʌk]	[ˌkʰʊkʰəˈdækʰ]	5.00	Voiced				
1356	duck some too	[dʌksʌmtʰuʷ]	[n̩ˈdæksɐ̃mˌtʰuw]	3.00	Voiced				
1366	giant peach	[dʒajn̩t̚pʰiʲtʃ]	[ˌdajɐ̃ˈpʰij]			5.00	Voiced		
1369	giant peach	[dʒajn̩t̚pʰiʲtʃ]	[ˌdajəˈpʰeːjs]			6.00	Voiced		
1372	giant peach	[dʒajn̩t̚pʰiʲtʃ]	[ˌdajˈpʰiːj]			3.00	Voiced		
1389	doggie, mom read that	[dɑgimɑmɹɛdðæt]	[ˌdɑgijəˈmɐ̃ɹijˌdæ]			5.00	Voiced		
1409	doggie	[ˈdɑgi]	[ˈdɑgij]	9.00	Voiced				
1429	...sit down	[sɪtdaʷn]	[ɐ̃wɐ̃ntʰɪ.ʃ.sɪˌdawn]			10.00	Voiced		
1448	doggies	[ˈdɑgiz]	[ˈdɑgija]	10.00	Voiced				
1511	...somebody coming sit down	[sʌmbʌdikʰʌmɪŋsɪʔdaʷn]	[ˈmɐ̃mijʔɛʔæ̃ndəˌsɐ̃mbʌ.ijˈkʰɐ̃mijnæ̃nʃijˈdawn]	6.00	Voiced				
1527	uh, dad	[ʌdæd]	[ɐ̃ˈdædə̆]	4.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1550	that's a bum too	[ðætsəbʌmtʰuʷ]	[ˈdæzəˌbɐ̃mˈtʰuw]	9.00	Voiced				
1551	that bum	[ðætˀbʌm]	[ˈdæˌbɐ̃m]	7.00	Voiced				
1554	duck	[dʌkˀ]	[ˈdʌkʰ]	4.00	Voiced				
1587	that heart too	[ðæʔhaɹtˀtʰuʷ]	[ˌdæhɑˈtʰuw]			5.00	Voiced		
1589	duck	[dʌkˀ]	[ˈlʊkʰəwɑˌdɛ]			6.00	Voiced		
1591	ducks	[dʌks]	[ˈdʌks]	11.00	Voiced				
1595	duck	[dʌkˀ]	[ˈdʌtʰ]	11.00	Voiced				
1596	duck swim back	[ˈdʌkˀswɪmˈbækˀ]	[ˌdʌkswejˈbækˀ]			5.00	Voiced		
1600	that's a horse	[ˌðætsəˈhɔɹs]	[ˈdætʰəˌhɔ.ɛ]	11.00	Voiced				
1614	that's for Cathy	[ˌðætsfəˑˈkʰæθi]	[ˈdætʰəˌkʰæː]	6.00	Voiced				
1664	that guy driving a	[ˈðætˀgaʲˌdʒɹaʲvɪŋə]	[dæˈgajˌdwajvijnʌʔ]					6.00	Voiced
1666	that drives	[ðætˀˈdʒɹaʲvz]	[dæˈdwajv]					7.00	Voiced
1698	this has tea?	[ðɪshæstʰi]	[ˈdɪshʌzˌtʰij]	8.00	Voiced				
1724	that's the ground	[ˌðætsðəˈgɹaʷnd]	[ˈdæzəˌgawn]	7.00	Voiced				
1761	that's all my toys	[ðætsɑɬmaʲtʰoʲz]	[ˈdætsɑˈmajˌtʰɔjs]	6.00	Voiced				
1771	daddy	[ˈdædi]	[ˈdædij]	11.00	Voiced				
1775	dancing	[ˈdænsɪŋ]	[ˈdæ̃ntʰɪŋ]	4.00	Voiced				
1818	these guys	[ðizgaʲz]	[ˌdijˈgajs]			8.00	Voiced		
1820	these guys	[ðizgaʲz]	[ˈdijgaj]	4.00	Voiced				
1828	daddy, I want	[dædijaʲwɑntˀ]	[ˈdædijˌʔʌwɐ̃]	6.00	Voiced				
1833	this?	[ðɪs]	[ˈdɪs]	9.00	Voiced				
1847	dots	[dɑts]	[ˈdɑts]	8.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1906	this way	[ˈðiswe^{j}]	[ˈdɪθˌwej]	9.00	Voiced				
1925	eating corn	[iɾɪŋk^{h}ɔɹn]	[dijðəˈklɔwən]					3.00	Voiced
1937	the white one	[ðəˈwa^{j}twʌn]	[dəˈwajfˌwɐ̃n]					5.00	Voiced
1939	this guy	[ðɪsga^{j}]	[ˈdɪsˌgaj]	8.00	Voiced				
1940	that one is not me	[ˌðæʔwʌnɪzˌnɑʔˈmi^{j}]	[ˌdæʔwɐ̃nɪˌnaʔˈmĩjn]			6.00	Voiced		
1942	this guy	[ðɪsga^{j}]	[ˈdɪsˌgaj]	9.00	Voiced				
1944	this rabbit	[ðɪsˈɹæbɪt˺]	[ˈdɪsˌɹæbˌɪt^{h}]	9.00	Voiced				
1985	this guy	[ˈðɪsˌga^{j}]	[ˈdɪsˌgaj]	9.00	Voiced				
2029	the little one is swimming	[ðəˈlɪɾɬwʌnɪzˈswɪmɪŋ]	[dəˈlɪɬwɐ̃nˌswĩmĩŋ]					5.00	Voiced
2080	this big book	[ðɪsbɪgbʊk˺]	[ˈdɪθbɪgˌbʊk^{h}]	8.00	Voiced				
2083	down there	[da^{w}nˈðɛɹ]	[dawˈnɛː]					5.00	Voiced
2085	don't move	[do^{w}nt˺mu^{w}v]	[dõwt˺ˈmjuwv]					6.00	Voiced
2091	doggies	[ˈdɑgiz]	[ˈdɑgij]	10.00	Voiced				
2094	doggie	[ˈdɑgi]	[ˈdɑgij]	8.00	Voiced				
2117	this man	[ˈðɪsmæn]	[ˈdɪθˌmæ̃ːn]	7.00	Voiced				
2118	that man	[ˈðæt˺mæn]	[ˈdɑʔˌmæ̃ːn]	6.00	Voiced				
2122	duck	[dʌk˺]	[ˈdʌk^{h}]	5.00	Voiced				
2178	ducks	[dʌks]	[ˈdʌʔs]	10.00	Voiced				
2260	dark out	[ˈdaɹka^{w}t˺]	[ˈdɑɹˌk^{h}awt^{h}]	10.00	Voiced				
2273	the horse don't swim	[ðəˈhɔɹsdo^{w}nt˺ˈswɪm]	[dəˈhɔləˌfwĩm]					5.00	Voiced
2274	this is the ground	[ˌðɪsɪzðəˈgɹa^{w}nd]	[ˌdɪzəˈgwawn̥t]			4.00	Voiced		
2290	the turtle needs help	[ðət^{h}əˈɾɬnidsheɬp˺]	[dɪˈt^{h}ɔdənijzˌheɬp˺]					7.00	Voiced
2309	don't drip it	[ˌdo^{w}nt˺ʤɹɪpɪt˺]	[ˈdownˌdɹɛp^{h}ɪt^{h}]	10.00	Voiced				
2340	the cat got a tail	[ðək^{h}æt˺gɑɾət^{h}eɨɬ]	[dəˈk^{h}æguðəˌt^{h}ejəɬ]					3.00	Voiced

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
2348	this guy yellow	[ˈðɪsgaʲˌjɛɬoʷ]	[ˈdɪsgajˌlɛɥow]	3.00	Voiced				
2375	this yours	[ðɪsjɔɹz]	[ˈdɪsɔwas]	9.00	Voiced				
2378	that sock	[ðæʔsɑkˀ]	[ˈdæsɑkʰ]	9.00	Voiced				
2387	this guy needs this	[ˌðɪsgaʲnidsˈðɪs]	[ˌdɪsgajnijˈdɪs]			7.00	Voiced		
2391	the little duck	[ðəlɪɾɬdʌk]	[dəˌlɪ.əˈdʌkʰ]					6.00	Voiced
2396	this one	[ˈðɪswʌn]	[ˈdɪswɐ̃n]	6.00	Voiced				
2405	dogs	[dɑgz]	[ˈdɑkˀ]	7.00	Voiced				
2451	the other baby	[ðəˈjʌðəˌbeʲbi]	[dəˈʔʌðəˌbejbij]					6.00	Voiced
2457	D for Dada	[difəˑdædæ]	[dijfaˈdæɾɑ]					5.00	Voiced
2477	don't like it	[doʷnʔˈlaʲkɪtˀ]	[ˈdõwʔˌlajkˀdɪtʰ]	8.00	Voiced				
2482	those guys	[ˈðoʷzˌgaʲz]	[ˈdowsˌgajtʰ]	7.00	Voiced				
2510	this Mowgli's gum	[ðɪsˌmoʷgɬɪzˈgʌm]	[ˈdɪsmowgijˌgɐ̃m]	5.00	Voiced				
2517	just getting more gum	[dʒəsgɛɾɪŋˈmɔɹgʌm]	[ˌdʌsgɛðɪŋˈmɔɹgɐ̃m]			8.00	Voiced		
2526	turtle	[ˈtʰəˑɾɬ]	[ˈdɔdɑ]	8.00	Voiced				
2574	them animals	[ðɛmˈmɑnəmˌɬz]	[dɛ̃mˈʔæ̃nəwʌɬs]					5.00	Voiced
2620	doggies	[ˈdɑgiz]	[ˈdɑgijs]	6.00	Voiced				
2640	don't like it	[doʷnʔˈlaʲkɪtˀ]	[dõwʔˈlajgɛtˀ]					7.00	Voiced
2644	the bowl	[ðəˈboʷɬ]	[dəˈbowʌɬ]					4.00	Voiced
2711	Is that you bib?	[ɪsðætˀjuʷbɪb]	[ˈdæjɔˌbɛpʰ]	8.00	Voiced				
2722	there's keys	[ðɛɹsˈkʰiz]	[dɪsˈkʰij]					5.00	Voiced
2738	they're running away	[ðɛɹʌnɪŋəˈweʲ]	[dɛwɐ̃nˌijəˈwej]					6.00	Voiced

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
2739	there's his hat	[ðɛɹzhɪz‘hæt˺]	[dɛshɪz‘hæːʔ]					3.00	Voiced
2740	these guys	[‘ðizgaʲz]	[‘dijˌgaj]	14.00	Voiced				
2741	that	[ðæt˺]	[‘dɛ]	5.00	Voiced				
2742	do you like these?	[duʷjuʷlaʲk‘ðɪz]	[‘duwjuwlajk˺ˌdijð]	7.00	Voiced				
2744	dog	[dɑg]	[‘dɑj]	9.00	Voiced				
2747	that guy	[ðæt˺gaʲ]	[‘dæʔˌgaj]	9.00	Voiced				
2787	she got mad on this page?	[ʃɪgɑt˺ˌmadɑn‘ðɪspeʲdʒ]	[dɔnɑt˺‘mædɑ̃nˌðɪθ‘pʰejt͡ʃ]					3.00	Voiced
2807	they're boys	[ðɛɹboʲz]	[‘dæˌbɔjz]	8.00	Voiced				
2808	that guy	[ðæt˺gaʲ]	[‘dæʔˌgaj]	8.00	Voiced				
2819	those guys	[ðoʷzgaʲz]	[ˌdows‘gaj]			5.00	Voiced		
2833	they got soup	[ðeʲgɑʔ‘suʷp˺]	[dejgɑt˺‘suwpʰ]					3.00	Voiced
2844	they like pickles	[ðeʲlaʲk‘pʰɪkɬz]	[dɛˌlajk˺‘pʰɪkʰəɬ]					5.00	Voiced
2846	that spoon	[ðæt˺‘spuʷn]	[‘dæt˺ˌpʰuwn]	11.00	Voiced				
2860	there's a knife for the big one	[ðɛɹzənaʲfəˠðə‘bɪgwʌn]	[dɪzə‘najˌfɔ.ə‘bɪg‘wɐ̃n]					3.00	Voiced
2951	these guys	[‘ðizgaʲz]	[‘dijˌgajs]	9.00	Voiced				
2971	?? just wanna go see a monster	[...dʒʊsˌwɑnəgoʷˌsijə‘mɑnˌstəˠ]	[‘dæwɐ̃nˌd͡ʒʊswɐ̃.əgowsijə‘mɐ̃θtʰɑ]	8.00	Voiced				
2976	don't find the horses	[ˌdonʔfaʲnðə‘hɔɹsəs]	[‘dõwˌfɐ̃jndə‘hɔ.əsɛz]	3.00	Voiced				
2997	that's a	[‘ðætsə]	[‘dæsə]	6.00	Voiced				
3000	that, I'm gonna blow	[‘ðætaʲmgənə‘bloʷ]	[‘dæʔajŋgɐ̃ˌbwow]	10.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
3016	the wind's coming in	[ðəˈwɪndskʰʌmɪˌŋɪn]	[dəˈwĩnkʰɤ̃mĩŋˌĩn]					3.00	Voiced
3023	that and that	[ðætˀˌnðætˀ]	[ˈdæʔləˌðætʰ]	11.00	Voiced				
3051	that a apple	[ˌðærnˌˈæpɬ]	[ˈdæʔæpʰuw]	3.00	Voiced				
3061	that red	[ðætˀˈɹɛd]	[ˈdæʔɹɛd]	6.00	Voiced				
3065	this blue	[ðɪsˈbluː]	[ˈdɪθˌbluw]	8.00	Voiced				
3070	they really like each other	[ðeʲˌɹɪliˈlaʲkiˌtʃʌðɚ]	[dejɹəlijˈlajkˀdəˌt͡ʃʌðə]					5.00	Voiced
3071	do it	[]	[ˈduwɪtʰ]	10.00	Voiced				
3072	these guys gotta	[ˈðizgaʲzgɑɾə]	[dɪˈgajˌgɑɾə]					5.00	Voiced
3076	this are kissing each other	[ˌðɪsɚˈkʰɪsɪŋiˌtʃʌðɚ]	[ˈdɪzəɹˌkʰɪsĩnˈt͡ʃʌða]	8.00	Voiced				
3077	they're kissing each other	[ðɛɹˈkʰɪsɪŋiˌtʃʌðɚ]	[dɛˈkʰɪsĩnəˌt͡ʃʌd͡ʒa]					4.00	Voiced
3080	this	[ðɪs]	[ˈdɪθ]	5.00	Voiced				
3081	this guy's still laughing	[ˈðɪsˈgajzstʰɪɬˈˈlæfɪŋ]	[ˈdɪgajˌθɪɬlæfĩj]	10.00	Voiced				
3097	duck	[dʌkˀ]	[ˈdʌkˀ]	2.00	Voiced				
3114	there's the spoon	[ˈðɛɹzðəˈspʰuwn]	[dəθdəˈpʰuːwn]					4.00	Voiced
3191	daddy gonna go that house	[ˌdædigənəgoˌðætˀhaʷs]	[ˈdæɾijgowĩgowˌðædˈhaws]	8.00	Voiced				
3225	Daddy	[ˈdædi]	[ˈdæɾij]	7.00	Voiced				
3263	this a big	[ˈðɪsəˌbɪg]	[ˈdɪsəˌbij]	9.00	Voiced				
3329	this is red	[ˈðɪsɪzˌɹɛd]	[ˈdɪsəˌwɛd]	7.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
3340	he just ate some	[hidʒʌsteˈitsəm]	[ˈdɪsʔejtˀˌθɐ̃m]	11.00	Voiced				
3350	dogs	[dɑgz]	[ˈdɑg]	6.00	Voiced				
3356	dogs can't	[ˈdɑgskænt]	[ˈdʌkskʰæ̃ʔ]	10.00	Voiced				
3412	ducks	[ˈdʌks]	[ˈdʌkˀ]	13.00	Voiced				
3413	this is orange	[ˌðɪsɪˈzɔɹɪnd͡ʒ]	[ˈdɪθɪˌðɔ.ɪ̃nd͡ʒ]	11.00	Voiced				
3415	this is yellow	[ˌðɪsɪzˈjɛlow]	[dɪsəˈjɛlə]					4.00	Voiced
3418	this white	[ðɪsˈwajt]	[ˈdɪsˌwajtʰ]	12.00	Voiced				
3426	there's a horse	[ˌðɛɹsəˈhɔɹs]	[ˌdɛɹzəˈhɔ.ə]			7.00	Voiced		
3431	do that	[duwˈðæt]	[duwˈðætʰ]					3.00	Voiced
3435	this blue	[ðɪsˈbluw]	[ˌdɪsˈbwuw]			5.00	Voiced		
3437	there it is	[ˈðɛɹɪtɪz]	[ˈdɛɹɪɾɪz]	13.00	Voiced				
3482	do you wanna back?	[duwjuwˌwɑnəˈbæk]	[djuwɐ̃nɪˈbækʰ]					5.00	Voiced
3571	there	[ˈðɛɹ]	[ˈdɛ]	4.00	Voiced				
3582	there it is	[ˈðɛɹɪtɪz]	[ˈdɛɹəɪð]	7.00	Voiced				
3653	don't wear your other one	[downtwɛɹjɔɹˈʔʌðəɹˌwʌn]	[ˈdõwʔwɛjəˈʔɛðʌˌwɐ̃n]	10.00	Voiced				
3679	don't wear hat	[ˌdowntwɛɹˈhæt]	[ˌdõwʔwɛˈhæːtˀ]			7.00	Voiced		
3706	That's his mom?	[ˌðætshɪzˈmɑm]	[ˈdæθhɪˌmɐ̃m]	7.00	Voiced				
3715	little piggy	[ˌlɪtəɬˈpɪgij]	[dɪɬˈpʰɪgij]					3.00	Voiced
3759	dog	[ˈdɑg]	[ˈdɑg]	7.00	Voiced				
3767	the dirt fell down	[dəˈdɜɹtfɛɬˌdawn]	[dəˈdøʔˌfɛɬdɐ̃wn]					3.00	Voiced
3860	this thing like this	[ðɪsˌθɪŋlajkˈðɪs]	[ˈdɪsˌθĩŋl̃ĩŋˈðɪθ]	8.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
			Voiceless		0		0		1
			Borderline		1		0		1
			Voiced		184		32		42

Appendix B - VOT and Initial Voicing Labels
Word-initial [k]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0001	cup	[]	[ˈkʰʌʔ]	90.00	Voiceless				
0030	Keesha	[ˈkʰiʲʃə]	[ˈkʰijʃɪ]	94.00	Voiceless				
0046	a book...cup	[ʌˈbʊkˀ...kʰʌpˀ]	[əˈbʊkˀ...kʰɪˈkʰʌpˀ]	122.00	Voiceless				
0047	apple	[ˈæpˌ̪ɬ]	[ˈkʰuw]	102.00	Voiceless				
0058	car	[kʰaɹ]	[ˈkʰʌw]	104.00	Voiceless				
0059	colour	[ˈkʰʊləˑ]	[ˈkʰʌwjæʔ]	105.00	Voiceless				
0060	colour	[ˈkʰʌləˑ]	[ˈkʰʌlə]	133.00	Voiceless				
0073	cat	[kʰætˀ]	[ˈkʰæʔ]	51.00	Voiceless				
0079	keys	[kʰiʲz]	[ˈkʰij]	141.00	Voiceless				
0081	keys	[kʰiʲz]	[ˈkʰij]	138.00	Voiceless				
0083	keys	[kʰiʲz]	[ˈkʰijʔ]	168.00	Voiceless				
0108	cat	[kʰætˀ]	[ˈkʰæ]	65.00	Voiceless				
0114	Keesha	[ˈkʰiʲʃɑ]	[ˈkʰijʃɪ]	120.00	Voiceless				
0127	keys	[kʰiʲz]	[əˈkʰɪʔ]	153.00	Voiceless				
0136	dada cookie	[dædæˈkʰʊki]	[gʌʔˈdʌdʌˈkʰɪhʊɪ]	59.00	Voiceless				
0162	cat	[kʰætˀ]	[ˈkʰæʔ]	49.00	Voiceless				
0163	cat	[kʰætˀ]	[əˈkʰɛ]	54.00	Voiceless				
0168	bear(?)	[bɛɹ]	[ˌkʰowˈbɑː]			60.00	Voiceless		
0178	cookie	[ˈkʰʊki]	[ˈkʰɪˈkʰɪ]	73.00	Voiceless				
0183	colour	[ˈkʰʊɬəˑ]	[ɲ̃ŋˈkʰʌlʊ]	85.00	Voiceless				
0204	lion king	[ˈlaʲn̪ˌkʰɪŋ]	[ˈzɛwˌkʰɛ]			45.00	Voiceless		
0209	lion king	[ˈlaʲn̪ˌkʰɪŋ]	[ˈlajˌkʰɛ̃]			54.00	Voiceless		
0260	shoe	[ʃuʷ]	[kʰəˈʒuw]	82.00	Voiceless				
0304	...key, key	[...kʰiʲkʰi]	[.....ˈkʰijˌkʰij]	94.00	Voiceless	192.00	Voiceless		
0321	lion king	[ˈlaʲn̪ˌkʰɪŋ]	[ˈlʊˌkʰæ]			35.00	Voiceless		
0323	lion king	[ˈlaʲn̪ˌkʰɪŋ]	[ˈlijˌkʰæ̃]			24.00	Borderline		
0324	lion king	[ˈlaʲn̪ˌkʰɪŋ]	[ˈlɛˌkʰæ]			33.00	Voiceless		
0327	cat	[kʰætˀ]	[ˈkʰæʔ]	53.00	Voiceless				
0330	lion king	[ˈlaʲn̪ˌkʰɪŋ]	[ˈlʊˌkʰɛʔ]			67.00	Voiceless		

Appendix B - VOT and Initial Voicing Labels
Word-initial [k]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0332	heart	[haɹtˀ]	[ow‘kʰɑ]	83.00	Voiceless				
0334	lion king	[‘laʲn̩ˌkʰɪŋ]	[‘lʊˌkʰɛʔ]			49.00	Voiceless		
0351	keys	[kʰiʲz]	[‘kʰij]	47.00	Voiceless				
0363	towel	[‘tʰawɬ]	[‘kʰɤ̃məwɪ]	107.00	Voiceless				
0421	lion king	[‘laʲn̩ˌkʰɪŋ]	[ə‘lawkʰɛ]					90.00	Voiceless
0422	lion king	[‘laʲn̩ˌkʰɪŋ]	[ə‘lajkʰɛ]					72.00	Voiceless
0423	lion king	[‘laʲn̩ˌkʰɪŋ]	[‘lajˌkʰæ]			39.00	Voiceless		
0424	uh, car	[ʌʔkʰaɹ]	[ɤ̃ʔʌʔej‘kʰɑː]	77.00	Voiceless				
0425	car	[kʰaɹ]	[‘kʰɑː]	111.00	Voiceless				
0426	car	[kʰaɹ]	[uw‘kʰɑ]	103.00	Voiceless				
0427	oh, car	[oʷkʰaɹ]	[ow‘kʰɑ]	55.00	Voiceless				
0428	lion king	[‘laʲn̩‘kʰɪŋ]	[‘lɛkʰɛ]					44.00	Voiceless
0430	lion king	[‘laʲn̩ˌkʰiŋ]	[‘lajkʰɛ]					61.00	Voiceless
0432	car	[kʰaɹ]	[‘kʰʌː]	53.00	Voiceless				
0433	lion king	[‘laʲn̩ˌkʰɪŋ]	[‘lajkʰɛ]					77.00	Voiceless
0462	uh, cow	[ʌkʰaʷ]	[õʔɤ̃m‘kʰaw]	12.00	Voiced				
0469	a big cow	[əbɪgkʰaʷ]	[ʌ.æ.ɛː‘bijˌkʰɑw]			64.00	Voiceless		
0474	uh, cow	[ʌkʰaʷ]	[ɤ̃ʔə‘kʰɑːw]	58.00	Voiceless				
0476	cat	[‘kʰætˀ]	[‘kʰɑtʰ]	59.00	Voiceless				
0478	cow	[kʰaʷ]	[‘kʰɑːw]	78.00	Voiceless				
0481	uh, tractor(?)	[ʌ‘tɹæktəˠ]	[ə̃n.nʊ.ə‘kʰijm]	40.00	Voiceless				
0490	cookie	[‘kʰʊki]	[‘kʰɪ‘kʰij]	91.00	Voiceless				
0496	cat tail	[‘kʰætˀˌtʰeʲɬ]	[‘kʰæʔˌtʰijʌ]	66.00	Voiceless				
0499	uh, key	[ʌ‘kʰi]	[‘ɤ̃ʔəˌkʰij]	53.00	Voiceless				
0500	candle	[‘kʰændˌɬ]	[‘kʰæːdaː]	82.00	Voiceless				
0501	cookie	[‘kʰʊki]	[‘kʰɪkʰij]	76.00	Voiceless				
0504	cookie	[‘kʰʊki]	[‘kʰijˌkʰij]	49.00	Voiceless				
0526	car	[kʰaɹ]	[‘kʰɑː]	118.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [k]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0533	...Cathy ... paper	[ˈkʰæθi...ˈpʰeˌpɚ]	[...ˈkʰæʃej...ˈpʰɑpʰɑ]	31.00	Voiceless				
0534	Cathy	[ˈkʰæθi]	[...əˈkʰæθa]	67.00	Voiceless				
0551	keys	[kʰiˌz]	[hãˈkij]	106.00	Voiceless				
0558	cat	[kʰætˀ]	[ˈkʰætˀ]	94.00	Voiceless				
0561	cat	[kʰætˀ]	[ˈkʰætʰ]	54.00	Voiceless				
0630	make castle	[meˌkˀˈkʰæsˌ]	[ʊwɑ̃ˌmejkʰʔɑ̃ˈkʰæʃuw]	85.00	Voiceless				
0635	cow	[kʰaʷ]	[ˈkʰɑw]	136.00	Voiceless				
0639	cat...tail	[kʰæt...ˈtʰeˌɬ]	[ˈkʰæʔkʰə̹ʔəˌtʰejə]	45.00	Voiceless				
0677	cow	[kʰaʷ]	[ˈkʰɑw]	123.00	Voiceless				
0678	tractor	[ˈtɹæktɚ]	[ˈkʰæt͡ʃˌɬɑ]	67.00	Voiceless				
0680	cat	[kʰætˀ]	[ˈkʰæ]	44.00	Voiceless				
0706	carrot	[ˈkʰɛɹɪət]	[ˈkʰɛɹɪʔ]	53.00	Voiceless				
0712	a castle	[əˈkʰæsˌ]	[ʊˈkʰæʃjuw]	30.00	Voiceless				
0729	cake	[kʰeˌkˀ]	[ˈkʰejkʰ]	63.00	Voiceless				
0734	kip, cup	[kʰɪpkʰʌpˀ]	[ˈkʰɪpʰˌkʰʌpʰ]	87.00	Voiceless	55.00	Voiceless		
0737	...cookie	[...ˈkʰʊki]	[...ˈkʰijkʰij]	96.00	Voiceless				
0746	cat	[kʰætˀ]	[ˈkʰæ]	73.00	Voiceless				
0767	moo-cow	[ˈmuʷkʰaʷ]	[nəˈmuwˌkʰʌw]			72.00	Voiceless		
0769	cow	[kʰaʷ]	[ˈkʰɑw]	142.00	Voiceless				
0790	a cow	[əˈkʰaʷ]	[əˈkʰɑːwə]	119.00	Voiceless				
0792	cat	[kʰætˀ]	[ˈkʰætʰ]	81.00	Voiceless				
0805	squeeze	[skwiz]	[ˈkʰeːjv]	138.00	Voiceless				
0822	Cathy	[ˈkʰæθi]	[uwˈkʰæˌsij]	48.00	Voiceless				
0837	clock	[kʰlɑk]	[ˈkʰɑkʰ]	106.00	Voiceless				
0874	cake	[kʰeˌkˀ]	[ˈkʰejkʰ]	122.00	Voiceless				
0876	cup	[kʰʌpˀ]	[ˈkʰʌˌpʰʌ]	65.00	Voiceless				
0902	cook	[kʊkˀ]	[ˈkʰʊkʰ]	91.00	Voiceless				
0903	that's a cow	[ðætsəkʰaʷ]	[tʰɑ̃tʰəʔʌˈkʰɑwa]	76.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [k]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0905	cat	[kʰæt̚]	[ˈkʰætʰ]	91.00	Voiceless				
0926	clock	[kʰlɑk]	[ˈkʰɑkʰ]	69.00	Voiceless				
0934	crocodile	[ˈkʰɹɑkʰəˌdaʲəl]	[ˈkʰɑkʰəˌdajvə]	61.00	Voiceless				
0937	cat	[kʰæt̚]	[ˈkʰætʰa˜duwijɛn]	58.00	Voiceless				
0949	that's a carrot	[ðætsəˈkʰɛɹət]	[ˌdæsɨˈkʰɛɹæ]	94.00	Voiceless				
0969	kite	[kʰaˌɪt̚]	[ˈkʰajtʰ]	86.00	Voiceless				
0990	candle	[ˈkʰændɬ]	[ˈkʰæ̃ˌnõw]	23.00	Borderline				
0991	eating cookie	[iɾɪŋkʰʊki]	[ʔajʔəˈejtʰɾ̃ɪʔəˈkʰijkʰij]	23.00	Borderline				
0993	cookie	[kʰʌki]	[əˈkʰɪˌkʰijs]	87.00	Voiceless				
1021	going ... car	[gowɪŋ...kʰaɹ]	[ˌgowijnawʔəpʰo̰ʔʌʔəˈkʰɑ]	95.00	Voiceless				
1025	going in the car	[gowɪŋɪnðəkʰaɹ]	[əˈgowɑ̃nɪ̃ŋnʊʔɑ̃ː...ˈkʰɑː]	84.00	Voiceless				
1035	I like cookies	[aʲlaʲk̚ˈkʰʌkiz]	[ˌlalajˈkʰɪʔkʰijs]	32.00	Voiceless				
1048	cutting knife	[ˈkʰʌɾɪŋnaʲf]	[ˈkʰʌtʰəˈnajfwɪf]	77.00	Voiceless				
1073	oh cat, hi cat	[owkʰæt̚haʲkʰæt̚]	[õˈkʰætʰɑ̃ˈhajˌkʰæʔtʰ]	34.00	Voiceless	32.00	Voiceless		
1074	cat	[kʰæt̚]	[ˈkʰʌtʰ]	45.00	Voiceless				
1077	...cat	[kʰæt̚]	[ˌdæzəˈkʰætʰ]	36.00	Voiceless				
1078	call phone	[kʰɑɬfown]	[əˌkʰɑɬˈɸownə]			89.00	Voiceless		
1085	cat	[kʰæt̚]	[ˈkʰæt̚]	46.00	Voiceless				
1086	couch	[kʰawtʃ]	[mˌˈpʰɑ̃ntʃ]	24.00	Borderline				
1091	colour, colouring	[ˌkʰʌləˑˈkʰʌləˑɹɪŋ]	[ˈkʰʌlɑʔɑ̃ʔəˈkʰʌlʌɪ̃ˌnɛ̃]	51.00	Voiceless				
1091	colour, colouring	[ˌkʰʌləˑˈkʰʌləˑɹɪŋ]	[ˈkʰʌlɑʔɑ̃ʔəˈkʰʌlʌɪ̃ˌnɛ̃]	67.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [k]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1098	...a cat, a boy	[ə‘kʰærə‘boʲ]	[...ə‘kʰætʰəʔɐ̃‘bɔjʌ]	60.00	Voiceless				
1111	...man cooking	[mænkʰʌkɪŋ]	[...ˌmæ̃nɐ̃‘kʰʊkʰɪŋə]	56.00	Voiceless				
1124	carrot	[‘kʰɛɹət]	[‘kʰɛˌvæ]	46.00	Voiceless				
1133	cracker,cheese, ice cream	[‘kʰɹɑkəɹ‘ʧiːz‘aʲskɹiːm]	[dætʰa‘kʰɔkʰɐ̃ˌdædən‘t͡ʃijʔʌˌɪkʰij]	38.00	Voiceless				
1137	spoon cook	[‘spʰuʷn‘kʰʊk]	[ə‘pʰuwɛ̃n‘kʰʊkə]	35.00	Voiceless				
1141	clock	[kʰlɑk]	[‘kʰɑkʰ]	68.00	Voiceless				
1167	cat	[kʰæt˺]	[‘kʰætʰ]	105.00	Voiceless				
1179	clothes	[kʰloʷðz]	[‘kʰʌ.əd]	90.00	Voiceless				
1186	cats	[kʰæts]	[‘kʰæt˺]	44.00	Voiceless				
1206	cat too	[kʰæt˺tʰuʷ]	[əˌkʰæ‘tʰuw]			31.00	Voiceless		
1207	cat hair	[kʰæt˺hɛɹ]	[‘kʰæt˺ʔɐ̃‘haw]	50.00	Voiceless				
1220	Cathy, a horse	[kʰæθijəhɔɹs]	[əˌkʰæʃijʔɐ̃ʔə‘hɔjs]			47.00	Voiceless		
1227	comb mama	[kʰoʷmmɑmə]	[ˌkʰʌj‘majˌhɔ]			61.00	Voiceless		
1236	corn	[kʰɔɹn]	[‘kʰɔ̃n]	66.00	Voiceless				
1253	cat	[kʰæt˺]	[‘kʰætʰ]	90.00	Voiceless				
1264	piggy come	[‘pʰɪgitʰuʷ]	[ˌpʰɪgij‘kʰɐ̃mna]	88.00	Voiceless				
1265	carrots	[‘kʰɛɹəts]	[‘kʰɛɹæʔ]	51.00	Voiceless				
1277	cat	[kʰæt˺]	[‘kʰæt˺]	118.00	Voiceless				
1281	Cathy	ɕʔ.,ɣ[□ð;ɻʁɻɸ]ɢβɳχʒ ʒ	[ə‘kʰæʧij]	97.00	Voiceless				
1307	knife	[naʲf]	[kʰə‘najf]					93.00	Voiceless
1325	no want that kind	[nowɑntðætkʰaʲnd]	[nowɑ‘dæʔkʰajn]	65.00	Voiceless				
1340	and corn pie	[ənkʰɔɹnpʰiʲ]	[ænəˌkʰɔ̃m‘pʰaj]			99.00	Voiceless		
1341	my cooking	[maʲkʰʌⁿkɪŋ]	[ə‘majkʰʊˌkʰɛ̃n]					63.00	Voiceless

Appendix B - VOT and Initial Voicing Labels
Word-initial [k]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1346	...cook a duck	[ˌkʰʊkəˈdʌk]	[ˌkʰʊkʰəˈdækʰ]			59.00	Voiceless		
1347	cook a chicken	[kʰʊkətʃɪkn̩]	[əˈkʰʊkʰəˌt͡ʃɪkʰĩn]	59.00	Voiceless				
1397	tractor	[ˈtɹæktəˑ]	[ˈkʰɑt͡ʃɚm]	104.00	Voiceless				
1408	carrots	[ˈkʰɛɹəts]	[ˈkʰɛɹɛts]	111.00	Voiceless				
1444	kids like toast	[kʰɪdslaʲktʰoʷstˀ]	[ˈkʰɪdəˈlajkˀˌtʰows]	41.00	Voiceless				
1445	kids like toast	[kʰɪdzlaʲktʰoʷstˀ]	[kʰɪdˈlajkˀˌtʰows]					36.00	Voiceless
1446	corn	[kʰɔɹn]	[ˈkʰɑwĩŋ]	87.00	Voiceless				
1457	Cathy	[ˈkʰæθi]	[ˈkʰæt͡ʃij]	83.00	Voiceless				
1461	give it mom, to Cathy	[gɪvɪtmɑmtʰuʷkʰæθi]	[ɾ̃gɛvɪ.əˈmɑ̃ʔəˈkʰæs.tʰijə]	70.00	Voiceless				
1494	heart	[haɹtˀ]	[ˈkʰɔ.ɛ]	83.00	Voiceless				
1511	...somebody coming sit down	[sʌmbʌdikʰʌmɪŋsɪʔdaʷn]	[ˈmɑ̃mijʔɛʔæ̃ndəˌsɾ̃mbʌ.ijˈkʰɾ̃mijnæ̃nʃijˈdawn]	50.00	Voiceless				
1512	mama is cooking	[mɑmɑɪzkʰʌkɪŋ]	[ˌmɑ̃məʔĩnˈkʰʊkʰĩjnə]	55.00	Voiceless				
1526	carrots	[ˈkʰɛɹəts]	[əˈkʰɛvɛtʰ]	57.00	Voiceless				
1566	can't find cow	[ˌkʰænʔfaʲndˈkʰaʷ]	[ˌkæ̃.fãjˈhaw]			58.00	Voiceless		
1586	Cathy ... too	[kʰæθi...tʰuʷ]	[ˌkʰæʔij...ˈtʰuw]			53.00	Voiceless		
1592	country	[ˈkʰʌntɹi]	[ˈkʰɾ̃nt͡ʃij]	74.00	Voiceless				
1604	that's a cow	[ðætsəkʰaʷ]	[ˈðætəˌkʰaw]			49.00	Voiceless		
1616	can't find my spoon	[ˈkʰæntˀfajndˀmajˈspʰuwn]	[ˌkʰɛ̃ˈfwajmajsmuw]			42.00	Voiceless		
1691	cats	[kʰæts]	[ˈkʰætʰ]	76.00	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-initial [k]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1811	cat go	[kʰæt˺goʷ]	[ˈkʰæˌdow]	53.00	Voiceless				
1839	cut its, cut its	[ˈkʰʌɾɪtskʰʌɾɪts]	[ˈkʰɛɾætsˈkʰɛɾæt˺]	66.00	Voiceless				
1902	came back	[kʰeʲmbæk˺]	[ˈkʰejmˌbæːkʰ]	53.00	Voiceless				
1904	come	[kʰʌm]	[ˈkʰɐ̃m]	88.00	Voiceless				
2317	cappucino	[ˌkʰæpəˈtʃinoʷ]	[ˌkʰæpʰəˈkʰijnow]			30.00	Voiceless		
2342	cut	[kʰʌt˺]	[ˈkʰʌtʰ]	68.00	Voiceless				
2586	something else	[sʌmpθɪŋˈɛɬs]	[ˌkʰɐ̃mhəˈnɛɬs]			31.00	Voiceless		
2889	O.K., they	[ʊʷkeʲðeʲ]	[kʰejˈðej]					36.00	Voiceless
3038	cup of tea	[kʰʌpəfˈtʰi]	[ˈkʰʌpʰˌtʰij]	88.00	Voiceless				
3092	Cathy, can you lift this up?	[ˌkʰæθikənjuʷˈlɪfðɪsˌʌp˺]	[ˈkʰæθijkʰɐ̃nlɪfdɪˌzʌpʰ]	27.00	Voiceless				
3168	curb fall	[kʰəˑbˈfɑɬ]	[kʰʊɾəbˈfɑɬ]					67.00	Voiceless
3444	I can't cut it	[ajˌkæntˈkʌtɪt]	[kæ̃ʔˈkʰʌɾɪtʰ]					25.00	Voiceless
3495	to call us	[tuwˈkɑɬʌs]	[ˈkʰɑwʌs]	52.00	Voiceless				
3530	coffee	[ˈkɑfij]	[ˈkʰɑfij]	66.00	Voiceless				
3587	cats	[ˈkæts]	[ˈkʰætʰ]	49.00	Voiceless				
3597	cats	[ˈkæts]	[ˈkʰæts]	75.00	Voiceless				
3663	ok, lets keep this there	[owkejˌlɛtskijpˈðɪsðɛɹ]	[kʰejlɛsˈkʰijpdʌθˌðɛ]					48.00	Voiceless
3819	Kathy met P.J.?	[ˌkæθijmɛtˈpijd͡ʒej]	[ˈkʰæθijmɛ.əˌpʰij˺ˈd͡ʒij]	51.00	Voiceless				
3828	to drink	[tuwˈdɹɪŋk]	[kʰɛ̃ˈdwĩŋkʰ]					28.00	Voiceless
			Voiceless		127		25		13

Appendix B - VOT and Initial Voicing Labels
Word-initial [k]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
			Borderline		3		1		0
			Voiced		1		0		0

Appendix B - VOT and Initial Voicing Labels
Word-initial [g]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
0022	cup	[kʰʊp˺]	[ˈgʌʔ]	15.00	Borderline				
0051	car	[kʰaɹ]	[ˈgɑʔ]	10.00	Voiced				
0136	dada cookie	[dædæˈkʰʊki]	[gʌʔˈdʌdʌˈkʰɪhʊɪ]					5.00	Voiced
0146	gorilla	[gəˈɹɪɬə]	[owgəˈwɛ.ə]					1.00	Voiced
0331	cat(?)	[kʰæt˺]	[ˈga]	8.00	Voiced				
0382	two, three, go	[ˌtʰuʷˌθɹiˈgoʷ]	[ˌtʃuːwˌfwaːjˈgow]	8.00	Voiced				
0384	two, three, go	[ˌtʰuʷˌθɹiˈgoʷ]	[ˌtʰuːwˌfwajˈgoːw]	2.00	Voiced				
0391	two, go	[ˌtʰuʷˌgoʷ]	[ˈtʃ́uːwˈgoːw]	10.00	Voiced				
0403	two, three, go	[ˌtʰuʷˌθɹiˈgoʷ]	[ˌtʰuːwˌhwaːjˈgoːw]	5.00	Voiced				
0404	two, three, go	[ˌtʰuʷˌθɹiˈgoʷ]	[ˌtʰuːwˌfwaːjˈgoːw]	19.00	Borderline				
0408	two, three, go	[ˌtʰuʷˌθɹiˈgoʷ]	[ˌtʰuːwˌlaːjˈgoːw]	8.00	Voiced				
0589	glass(?)	[glæs]	[majˈgæː]	8.00	Voiced				
0704	garden(?)	[ˈgaɹdn̩]	[əˈgɑˌdʌ]					10.00	Voiced
0816	mm, green	[mːˈgɹiːn]	[ɐ̃ːˈgẽjn]	3.00	Voiced				
0823	uh, Grandma	[ʌˈgɹæ̃mɑ]	[ɐ̃ˈgæ̃m.mɑ]	4.00	Voiced				
0829	green	[gɹiːn]	[ʊˈgiˌjnə]	8.00	Voiced				
0959	glasses	[ˈglæsəz]	[ˈgæʃə]	13.00	Voiced				
1016	green one	[ˈgɹiːnwən]	[ˈgɪ.uw.ˌwɐ̃n]	17.00	Borderline				
1021	going ... car	[goʷɪŋ...kʰaɹ]	[ˌgowijnawʔəpʰo̞ʔʌʔəˈkʰɑ]			5.00	Voiced		
1025	going in the car	[goʷɪŋɪnðəkʰaɹ]	[əˈgowɐ̃nɪ̃ŋnʊʔɐ̃ːˈkʰɑː]	2.00	Voiced				
1057	man all gone	[mænɑɬgɑn]	[ˌmæ̃nəˈʔɑgɐ̃n]	6.00	Voiced				
1081	getting something	[ˌgɛɾɪŋˈsʌmpθɪŋ]	[ɐ̃ˌgɛdəʔɐ̃ˈs̪ɐ̃ma]	11.00	Voiced				
1139	good eating	[gʊˈdiɾiŋ]	[ə̯ˌgʊdɛˈʔijtʃ́ɪnɛ]			3.00	Voiced		

Appendix B - VOT and Initial Voicing Labels
Word-initial [g]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
1225	guitar	[gɪˈtʰaɹ]	[gɛˈtʰɑ]					7.00	Voiced
1413	glasses	[ˈglæsəz]	[əˈgæt͡ʃɑ]	9.00	Voiced				
1449	good soup	[gʊdsuʷpˀ]	[ˌgʊdˈt͡suwpˀ]			3.00	Voiced		
1458	give to mom	[gɪvtəmɑm]	[ˈgɪvəˌmɑ̃mij]	2.00	Voiced				
1461	give it mom, to Cathy	[gɪvɪtmɑmtʰuʷkʰæθi]	[ɾ̃ɡɛvɪ.əˈmɑ̃ʔəˈkʰæs.tʰiˌjə]	8.00	Voiced				
1462	give it Cathy	[gɪvɪtkʰæθi]	[ˈgɪvɪˈkʰætʰij]	5.00	Voiced				
1507	that guy ... purple	[ðætˀgaʲ...pʰəˑpɬ]	[dæˈgajʔɛtˀʔõnˌpʰɜɹpʊ]	15.00	Borderline				
1533	get bean	[gɛtˀˈbiʲn]	[ˌgɛtˈbijn]			3.00	Voiced		
1535	where did bean go	[wɛɹdɪdbiʲngoʷ]	[əwəˈbɛŋˌgow]			8.00	Voiced		
1671	green	[gɹiːn]	[ˈgiːjn]	12.00	Voiced				
1765	gone	[gɑn]	[ˈgɑ̃n]	14.00	Voiced				
1772	going	[gowɪŋ]	[ˈgowɪ̃jnə]	14.00	Voiced				
1889	go to kitchen	[goʷtuʷkʰɪtʃn̩]	[gowtʰɘ̆ˈkʰɪt͡ʃɛ̃n]					5.00	Voiced
1956	getting the hot	[ˌgɛɾɪŋðəˈhɑtˀ]	[ˈgɛ.ɪ̃nðəˌhɑtˀ]	7.00	Voiced				
1958	getting more	[gɛɾɪŋˈmɔɹ]	[gɪðɪˈmɔː]					14.00	Voiced
2126	keys	[kʰiʲz]	[ˈgijð]	13.00	Voiced				
2157	got blue?	[gɑtˈbluː]	[gaˈbwuw]					5.00	Voiced
2279	get	[gɛtˀ]	[ˈgɪtʰ]	19.00	Borderline				
2370	get that out	[ˌgɛʔðæˈɾaʷtˀ]	[ˈgɛˈðæˌʔawtʰ]	19.00	Borderline				
2371	get that out	[gɛʔðæɾɑaʷtˀ]	[gɪtˀˈðæɾawtˀ]					6.00	Voiced
2373	get those	[gɛʔˌðoʷz]	[gɛtˀˈðowz]					6.00	Voiced
2504	gum	[gʌm]	[ˈgʌ̃m]	19.00	Borderline				
2541	get it off	[ˈgɛɾɪɾɑf]	[ˈgɛɾɪɾɑf]	13.00	Voiced				
2573	going in the water	[ˌgowɪŋɪnðəˈwɑɾəˑ]	[ˌgowɪ̃ŋɪ̃nəˈwɑdɑ]			4.00	Voiced		

Appendix B - VOT and Initial Voicing Labels
Word-initial [g]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
2708	he's got sharp nails	[hizgɑʔˌʃaɹp‘neʲɬz]	[‘gɑt̚‘θɑp̚ˌnejʌɬs]	14.00	Voiced				
2821	they ran away	[ˌðeʲɹænə‘weʲ]	[gɛ.əˌwɑ̃nə‘wej]					6.00	Voiced
2878	got a boo-boo	[gɑɾə‘buʷbuʷ]	[ˌgɑ‘buwbuw]			3.00	Voiced		
2913	going, wanna eat	[gowɪŋwɑnəʔit̚]	[‘gowĩnsijˌwɑ̃.ə‘ʔijt̚]	15.00	Borderline				
2924	going to that	[gowɪŋtəðæt̚]	[‘gowĩnˌtʰuw‘ðæt̚]	14.00	Voiced				
2984	get the keys, I'm coming in	[gɛʔðə‘kʰizaʲmkʰʌmɪŋˌɪn]	[‘gɪðətʰəkʰijzajmˌkʰɑ̃mĩ.‘ĩn]	16.00	Borderline				
3034	that all done?	[ðæɾɑɬ‘dʌn]	[‘gaʔɑɬˌdɑ̃n]	16.00	Borderline				
3073	go home	[goʷ‘hoʷm]	[gʌ‘hõwm]					5.00	Voiced
3202	going to see the fishies	[gowɪŋtəsiðə‘fɪʃiz]	[gowĩnˌsijə‘fɪʃijs]					4.00	Voiced
3436	get it	[‘gɛtɪt]	[‘gɪɾɛʔ]	18.00	Borderline				
3464	going to get the pump	[gowɪŋtuwˌgɛtðə‘pʌmp]	[gowĩŋ‘gɪt̚dʌˌpʰʌp̚]					7.00	Voiced
3639	go	[‘gow]	[‘gɔ]	23.00	Borderline				
3643	go	[‘gow]	[‘gow]	11.00	Voiced				
3655	go on there	[ˌgowɑn‘ðɛɹ]	[gowˌɑ̃‘nɛ.a]					8.00	Voiced
3712	guy	[‘gaj]	[‘gʌʔaj]	15.00	Borderline				
3808	go on here again	[gowɑn‘hɪɹəˌgɛn]	[gowɑ̃n‘hija‘gɛ̃n]					6.00	Voiced
			Voiceless		0		0		0
			Borderline		13		0		0

Appendix B - VOT and Initial Voicing Labels
Word-initial [g]

Record #	Orthography	Target	Realization	WI-1S	Label	WI-2S	Label	WI-U	Label
			Voiced		28		7		15

Appendix B - VOT and Initial Voicing Labels
Word-medial [p]

Record #	Orthpgraphy	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
0005	papa	[ˈpʰɑpə]	[ˈpʰʌpˌpʰɑʔ]			55.00	Voiceless		
0049	apple	[ˈæpˌ]	[ˌʌˈpʰɑ]	85.00	Voiceless				
0050	apple	[ˈæpˌ]	[ˈpʰɑ]	36.00	Voiceless				
0067	apple	[ˈæpˌ]	[ˈpʰʊʔʌ]	102.00	Voiceless				
0119	apple	[ˈæpˌ]	[hʊˈpʰʌ]	34.00	Voiceless				
0472	apple	[ˈæpˌ]	[ˈæˌpʰɑː]			21.00	Borderline		
0553	purple	[ˈpʰəˑpˌ]	[ˈpʰʌˌpʊ]			43.00	Voiceless		
0563	apple	[ˈæpˌ]	[ˈʔæˌpʰɑ]			33.00	Voiceless		
0647	airplane	[ˈɛɹpleʲn]	[ɛˈpʰẽjn]	55.00	Voiceless				
0649	apple	[ˈæpˌ]	[ˈʔæˌpʰa]			41.00	Voiceless		
0650	apple	[ˈæpˌ]	[ˈʔæˌpʰuwə]			76.00	Voiceless		
0711	airplane	[ˈɛɹpleʲn]	[ʊˈpʰɛ̃n]	25.00	Voiceless				
0761	uh, apple	[ʌʔˈæpˌ]	[ɛ̃ˈʔæˌpʰuw]			62.00	Voiceless		
0804	oh, purple...	[oʷˈpʰəˑpˌ...]	[owˈpʰɜpʰʊˌwʌ̃n]					60.00	Voiceless
0840	hippo	[ˈhɪpoʷ]	[ˈhʌpʰowæ]					33.00	Voiceless
0847	apple	[ˈæpˌ]	[ˈʔæˌpʰuw]			61.00	Voiceless		
0861	newspaper	[ˈnuʷzˌpʰeʲpəˑ]	[ˈowpʰɑpʰɑ]			59.00	Voiceless	17.00	Borderline
0867	elephant ... bicycle	[ɛɬəfənt...ˈbaʲsɪkɬˌ]	[æ̃nəˈɛɬfɛ̃...ˈpʰʌtʰæ]	25.00	Voiceless				
0868	aligator on bicycle	[ˌæɬigeʲɹəˑɑnˈbaʲdsɪkɬ]	[mˌˈægɛləʔʌ̃ʔõnˌpʰʌtʰɑ]	31.00	Voiceless				
0945	apple	[ˈæpˌ]	[ˈʔæpʰʊ]					31.00	Voiceless
0947	apple	[ˈæpˌ]	[ˈʔæpʰʊ]					50.00	Voiceless
0967	blue and red and purple too	[ˈbluːənˈɹɛdənˈpəɹpəltuː]	[ˌwuwɑ̃nəˈwɛdʔɑ̃nˈpʰɜpʰʌˌtʰuwə]					75.00	Voiceless
0974	airplane	[ˈɛɹpleʲn]	[ʔʌ̃mˈpʰẽjn]	52.00	Voiceless				
0979	paper	[ˈpʰeʲpəˑ]	[ˈpʰejˌpʰʊ]			62.00	Voiceless		
1002	airplane	[ˈɛɹpleʲn]	[ˈʔɛˌpʰẽjn]			32.00	Voiceless		
1058	...apple	[ˈæpˌ]	[....ˈʔæpʰow]					35.00	Voiceless
1093	that's a purple	[ðætsəˈpʰəˑpˌ]	[ˌʔætʰaˈpʰɜˌpʰʊ]			27.00	Voiceless		

Appendix B - VOT and Initial Voicing Labels
Word-medial [p]

Record #	Orthpgraphy	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
1097	that's a blue and a purple	[ˌðætsəˈbluːændəˈpəɹpəl]	[əˈdæt^{h}ʌˌbuwɜ̃nəˈbɔ p^{h}ʌ]					46.00	Voiceless
1107	diaper	[ˈdaʲpəˑ]	[ˈt^{h}ɛpɛʔ]					24.00	Borderline
1154	apple	[ˈæpˌɬ]	[ˈʔæp^{h}ow]					69.00	Voiceless
1181	airplane	[ˈɛɹpleʲn]	[ˈʔɛ̃ˌp^{h}ẽjləˌ]			63.00	Voiceless		
1202	purple	[ˈp^{h}əˑpɬ]	[mˌˈp^{h}ʌp^{h}ɔ]					59.00	Voiceless
1204	slippers	[ˈslɪpˀp^{h}əˑz]	[ˈt͡ʃɪp^{h}ɛ]					52.00	Voiceless
1217	rabbit	[ˈɹæbɪtˀ]	[əˈwæˌp^{h}ʌt^{h}]			92	Voiceless		
1238	apple	[ˈæpˌɬ]	[ˈʌp^{h}ɔ]					63.00	Voiceless
1263	apple	[ˈæpˌɬ]	[ˈʔæp^{h}ow]					115.00	Voiceless
1271	apples	[ˈæpˌɬz]	[ˈʔæp^{h}ɔjs]					54.00	Voiceless
1480	airplane	[ˈɛɹpɬeʲn]	[ˈʔɛˌp^{h}ẽj]			77.00	Voiceless		
1483	airplane	[ˈɛɹpleʲn]	[ˈhɜˌp^{h}ẽj]			69.00	Voiceless		
1658	that's yucky	[ðætsˈjʌki]	[ˈðæˌdjʌp^{h}ij]					29	Voiceless
1668	airplane	[ˈɛɹpleʲn]	[ˈɛp^{h}ẽjn]					17.00	Borderline
1723	I want the puppets	[aʲwɑntðəp^{h}ʌpəts]	[wɑ̃ndəˈp^{h}ʌp^{h}ʌjts]					50.00	Voiceless
1726	we'll eat something	[wiʲɬˈitsʌmpθɪŋ]	[wəˈʔijtˀsɤ̃mp^{h}ijnə]					63.00	Voiceless
1793	watch my jumping	[wɑtʃmaʲˈdʒʌmpɪŋ]	[wɑʃˈmajˌd͡ʒɤ̃mp^{h}ijnə]					55.00	Voiceless
1796	want the puppet	[wɑntðəˈp^{h}ʌpɪt]	[ʔɤ̃dəˈp^{h}ʌp^{h}ɛt^{h}]					84.00	Voiceless
1840	I want go, something a cookie	[aʲwɑntgoʷsʌmpθɪŋəkʰʌki]	[ˌʔɤ̃mgowɜ̃ˌd͡ʒɤ̃mp^{h}ɪ̃nejˈk^{h}ʌk^{h}ij]					25.00	Voiceless
1979	this guy happy	[ðɪsgaʲˈhæpi]	[dɪsgʌˈhæp^{h}ij]					68.00	Voiceless
1980	happy	[ˈhæpi]	[ˈʔæp^{h}ij]					70.00	Voiceless
2039	sweeping	[ˈswiʲp^{h}ɪŋ]	[fwɪˈp^{h}ijdə]	62.00	Voiceless				
2051	apple	[ˈæpˌɬ]	[ˈʔæp^{h}ʌɬ]					56.00	Voiceless
2059	apple	[ˈæpˌɬ]	[ˈʔæp^{h}ɔɬ]					32.00	Voiceless

Appendix B - VOT and Initial Voicing Labels
Word-medial [p]

Record #	Orthpgraphy	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
2065	and a pear and a apple	[ændə‘pʰɛɹændə‘næpɬ]	[ænəˌpʰæʔæ̃ndə‘ʔæpʰʌɬ]					99.00	Voiceless
2110	all sleepy	[aɬ‘sliʲpʰiʲ]	[ˌʔɑɬ‘ɬijpʰijnə]					64.00	Voiceless
2207	and a caterpillar	[ænə‘kʰærəˠˌpʰɪləˠ]	[ʔæ̃ːnə‘kʰæləˌpʰɪlʌ]			27.00	Voiceless		
2208	and a hippopotamus	[ænəˌhɪpoʷ‘pʰɑɾəmʌs]	[‘æ̃ːnhɪpʰow‘pʰɑ.ʌ]			41.00	Voiceless	29.00	Voiceless
2262	purple	[‘pʰəˠpɬ]	[‘pʰʌpʰɔ]					25.00	Voiceless
2316	something spicy	[‘sʌmθɪŋ‘spʰʌʲsiʲ]	[ˌsʌ̃mpʰ͡ɪŋ‘pʰajsij]					40.00	Voiceless
2317	cappucino	[ˌkʰæpə‘tʃinoʷ]	[ˌkʰæpʰə‘kʰijnow]					27.00	Voiceless
2398	apples	[‘æpɬz]	[‘ʔæpʰʌɬ]					39.00	Voiceless
2455	a lot of people	[əˌlæɾə‘pʰipɬ]	[lɑɾə‘pʰijpʰʌɬ]					52.00	Voiceless
2471	You open the door and see here	[juʷoʷpn̩ðədɔɹənsihiɹ]	[juw‘ʔowpʰ͡ɪ̃ndəˌdɔ.əsijhija]					33.00	Voiceless
2494	is this one happy?	[ɪzðɪswʌnhæpi]	[ɪ‘ðɪswʌ̃ŋˌhæpʰij]					28.00	Voiceless
			Voiceless		10		17		33
			Borderline		0		1		3
			Voiced		0		0		0

Appendix B - VOT and Initial Voicing Labels
Word-medial [b]

Record #	Orthography	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
0023	Peter	[ˈpʰiˌjɾɚ]	[ˈbʌˌbʊ.ɛʔ]			38.00	Voiceless		
0027	Booboo	[ˈbuʷbuʷ]	[ˌbʊˈbʊː]	4.00	Voiced				
0043	Babar	[ˈbæbaɹ]	[ˈbæbʌʔ]					8.00	Voiced
0080	Peter	[ˈpʰiˌjɾɚ]	[ˈbʊbʊ]					2.00	Voiced
0115	baby	[ˈbeʲbi]	[bijʔˈbejˌbij]			4.00	Voiced		
0116	baby	[ˈbeʲbi]	[ˈbejbɪ]					2.00	Voiced
0118	baby	[ˈbeʲbi]	[ˈbejbɪ]					6.00	Voiced
0120	baby	[ˈbeʲbi]	[ˈbɛbij]					3.00	Voiced
0155	Peter, Hanna	[pʰiɾɚhænə]	[ʌˌbʊbəˈhæ̃nɛ]					4.00	Voiced
0283	rabbit	[ɹæbaʲ]	[ˈbʊˌbuwˈɹætˀ]			4.00	Voiced		
0300	garbage truck	[ˈgɑɹbədʒˌtʃɹʌk]	[ˈbejt͡ʃʌ]	7.00	Voiced				
0303	oh, garbage truck	[oʷˈgɑɹbədʒˌtʃɹʌk]	[ˌoːwbejˈʃæ]					5.00	Voiced
0467	garbage truck	[ˈgɑɹbədʒˌtʃɹʌk]	[bæˈt͡ʃɛkʰ]					4.00	Voiced
0700	teddybear	[ˈtʰɛdibɛɹ]	[ˈtʰejˌbʌʔ]			3.00	Voiced		
0794	wheelbarrow	[wiʲɬbɛɹoʷ]	[owˈwejbɛbɑ]			9.00	Voiced		
0873	teddybear(?)	[ˈtʰɛdibɛɹ]	[əˈtʰɛˌbɑː]			17.00	Borderline		
0961	hippo	[ˈhɪpoʷ]	[ajmˈpʱ̃ĩmˌbow]			8.00	Voiced		
0962	that's a hippo	[ðætsəhɪpoʷ]	[dæsaˈbʱ̃ĩmˌbow]			9.00	Voiced		
1012	hippo like it	[hɪpoʷlaʲkɪtˀ]	[ʔʱ̃ĩmˈpʰʱ̃ĩmˌbowˈlaj kʰɪtʰ]			3.00	Voiced		
1020	hippo	[ˈhɪpoʷ]	[ˈbʱ̃ĩmˌboːw]			4.00	Voiced		
1028	hippo drive	[ˈhɪpoʷˌʤɹaʲv]	[ʱ̃ĩʔəˈpʰʱ̃ẽmbowʱ̃ĩˌdəʁ ajf]					5.00	Voiced
1029	hippo drive	[ˈhɪpʰoʷˌʤɹaʲv]	[mˌˈpʰʱ̃ẽmˈbowʱ̃ẽˌd͡ʒaj]	8.00	Voiced				
1042	hippo ... towel ... toys	[ˈhɪpoʷ...ˈtʰæwɬ...tʰoʲz]	[əˈθĩmbow...ˈtʰʌwa ...ˈtʰɔjs]					4	Voiced
1103	little baby	[lɪɾɬbeʲbi]	[ˌlejˈbijbij]					12	Voiced
1106	baby	[ˈbeʲbi]	[ˈbejbij]					5	Voiced

Appendix B - VOT and Initial Voicing Labels
Word-medial [b]

Record #	Orthography	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
1129	apple	[ˈæpˌɬ]	[ˈʔæthæbæʔ]					8.00	Voiced
1146	that's a baby and thats' a lady...	[ðætsəˈbeʲbijənðæts əˌleʲdi...]	[ˌðæsɑˈbejbijʔəthæs əˈlejdijˈkhɹɪkhɪth]					7	Voiced
1283	two rabbits	[thuwˈɹæbɪts]	[thuwʔˈwæbɛt̚]					7	Voiced
1424	elbow	[ˈɛɬbow]	[ˈʔæbow]					3	Voiced
1436	wheelbarrow	[ˈwiʲɬbɛɹow]	[ˈwijbʌ.ow]					5	Voiced
1478	a rabbit	[əˈɹæbɪt̚]	[ədˈɹæbɛth]					7	Voiced
1511	...somebody coming sit down	[sʌmbʌdikhʌmɪŋsɪʔ dawn]	[ˈmɑ̃mijʔɛʔæ̃ndəˌsɑ̃ mbʌ.ijˈkhɑ̃mijnæ̃nʃi jˈdawn]			11.00	Voiced		
1513	...mama cooking, somebody eat to	[mɑmɑkhʌkɪŋsʌmb ʌdijithuw]	[ˈmɑ̃mijthejʔɛ̃nʌːˌm ɑ̃mijˈthɛkhɪt̚ʌʒɑ̃mb ʌ.ijʔɑ̃ʔijˈthuw]			8.00	Voiced		
1669	purple	[ˈphəˑpˌɬ]	[ˈphʊbʌ]					33.00	Voiceless
1688	rabbits	[ˈɹæbɪts]	[ˈɹæbɪts]					7	Voiced
1856	another rabbit	[ənʌðəˑɹæbɪt̚]	[ˈnʌvˌɹæbɪth]					3	Voiced
1893	rabbits	[ˈɹæbɪts]	[ˈwæbɛth]					5	Voiced
2000	rabbits	[ˈɹæbɪt̚]	[ˈwæbɛts]					3	Voiced
2004	and that rabbit	[ənðætˈɹæbɪt̚]	[uwʔəˈðæˌwæbɪθʌ]					4	Voiced
2017	all the rabbits	[ɑɬðəˈɹæbɪts]	[ʔɑɬˈwæbɛt]					3	Voiced
2048	the baby	[ðəˈbeʲbi]	[dɪˈbejbij]					8	Voiced
2101	zebra	[ˈzibrə]	[ˈzijba]					6	Voiced
2142	a rabbit	[əɹæbɪt̚]	[əˈɹæbɪt̚]					7	Voiced
2195	a rabbit	[əˈɹæbɪt̚]	[əˈwæbɪth]					3	Voiced
2199	a zebra	[əˈzibɹə]	[əˈʒijbəʔɑ̃n]					6	Voiced
2246	rabbits	[ˈɹæbɪts]	[ˈwæbɪts]					4	Voiced
2280	everybody in	[ˈɛvɹibʌdiˌjin]	[ʔʌˈbajĩn]	7.00	Voiced				

Appendix B - VOT and Initial Voicing Labels
Word-medial [b]

Record #	Orthography	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
2281	and the rabbit	[ændəˈɹæbɪt˺]	[ʔɛ̃nðə˛wæˈbɛtʰ]	3	Voiced				
2332	a rabbit	[əˈɹæbɪt˺]	[əˈwæbɪʔ]					4	Voiced
2368	apple	[ˈæp̚ɬ]	[ˈʔæp˺bow]					3	Voiced
2402	a cheapy	[əˈtʃipi]	[ʔəˈtʃijbij]	5.00	Voiced				
2403	strawberries	[ˈstʰɹabəɹiz]	[ˈtʰwɑːbejz]					6	Voiced
2436	you my baby	[juʷmaʲbeʲbi]	[juw˛majʔˈbejbij]					7	Voiced
2450	other baby	[ˈʌðəˠ˛beʲbi]	[ˈʔʌðə˛bejbij]					7	Voiced
2483	baby cat	[beʲbikʰæt˺]	[ˈbejbij˛pʰætʰ]					7	Voiced
			Voiceless		0		1		1
			Boderline		0		1		0
			Voiced		6		10		36

Appendix B - VOT and Initial Voicing Labels
Word-medial [t]

Record #	Orthography	Target	Realization	W-1S	Label	WM-2S	Label	WM-U	Label
0188	turtle	[ˈtʰəˠɾ̩]	[ˈtʰʒːtʰɛ̃]					67.00	Voiceless
0273	turtle	[ˈtʰəˠɾ̩]	[ˈtʰɜˌtʰuw]			61.00	Voiceless		
0446	potato head	[pəˈtʰeʲɾoʷhɛd]	[ˈtʰejˌhɑɹʔ]	56.00	Voiceless				
0461	turtle	[ˈtʰəˠɾ̩]	[ˈtʰʊtʰʌ]					22.00	Borderline
0512	bicycle	[ˈbaʲsɪˌkɬ]	[ˈpʰowˌtʰʌ]			16.00	Borderline		
0513	bicycle	[ˈbaʲsikˌɬ]	[ˌbɛʔjəˈpʰʊtʰʌ]					19.00	Borderline
0690	painting	[ˈpʰeʲntɪŋ]	[ˈpʰejˌtʰij]			36.00	Voiceless		
0696	guitar	[gɪˈtʰaɹ]	[əˈtʰæ]	107	Voiceless				
0728	bicycle	[ˈbaʲsɪkɬ]	[ˌbʷawsˈtʰʌtʰʌ]			30.00	Voiceless	30.00	Voiceless
0867	elephant ... bicycle	[ɛɬəfənt...ˈbaʲsɪkˌɬ]	[ǽnəˈɛɬfɛ̃...ˈpʰʌtʰæ]					33.00	Voiceless
0868	aligator on bicycle	[ˌæɬigeʲɾəˠɑnˈbaʲdsɪkɬ]	[mˌˈægɛlə?ɑ̃?õnˌpʰʌtʰɑ]					117.00	Voiceless
0890	eating.....	[ˈiɾɪŋ.....]	[ˈʔejtʰɪ̃...]					54.00	Voiceless
0936	guitar	[gɪˈtaɹ]	[ɑ̃ŋˈtʰɛ.a]	38.00	Voiceless				
1196	whiskers	[wɪskəˠz]	[ʔɪkˀˈtʰɛ]	55	Voiceless				
1225	guitar	[gɪˈtʰaɹ]	[gɛˈtʰɑ]	50	Voiceless				
1239	mm, potato	[mmpəˈtʰeʲɾoʷ]	[mˌˈtʰejdow]	75	Voiceless				
1245	guitar	[giˈtʰaɹ]	[ˈtʰɑː]	40	Voiceless				
1292	turtle	[tʰəˠɾ̩]	[ˈtʰʊˌtʰow]			45	Voiceless		
1345	potato	[pəˈtʰeʲdoʷ]	[ˈtʰejdow]	76	Voiceless				
1383	turtle	[ˈthəˠɾ̩]	[ˈtʰʊˌtʰʌ]			41	Voiceless		
1433	a guitar, guitar	[əgətʰaɹgətʰaɹ]	[ðægəˈtʰɑːˌgɛˈdɑ]	109	Voiceless				
1450	potato	[pəˈtʰeʲdoʷ]	[ənʊˈtʰeːjdoːw]	94	Voiceless				
1460	potato	[pətʰeʲdoʷ]	[ˈtʰejdow]	65	Voiceless				
1462	give it Cathy	[gɪvɪtkʰæθi]	[ˈgɪvɪˈkʰætʰij]					60.00	Voiceless
1548	turtle	[ˈtʰəˠɾ̩]	[ˌʌˈtʰɔtʰɪ]					95.00	Voiceless
1642	cutting	[ˈkʰʌɾɪŋ]	[ˈkʰʌtʰijn]					48.00	Voiceless
1775	dancing	[ˈdænsɪŋ]	[ˈdæntʰɪ̃ŋ]					80.00	Voiceless
1961	eating the	[ˈiɾɪŋðə]	[ˈʔijtʰɪ̃ŋnɛ]					13.00	Voiced
2166	potato	[ˈpətʰeʲɾoʷ]	[ˈtʰejdow]	81	Voiceless				

Appendix B - VOT and Initial Voicing Labels
Word-medial [t]

Record #	Orthography	Target	Realization	W-1S	Label	WM-2S	Label	WM-U	Label
2407	painting	[pʰeʲntʰɪŋ]	[ˈpʰẽjntʰ̪jn]					29.00	Voiceless
			Voiceless		12		5		10
			Borderline		0		1		2
			Voiced		0		0		1

Appendix B - VOT and Initial Voicing Labels
Word-medial [d]

Record #	Orthography	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
0004	dada	[ˈdædæ]	[ˈdɛdæʔ]					5.00	Voiced
0019	dada	[ˈdædæ]	[ʌˈdædɛ]					2.00	Voiced
0020	dada	[ˈdædæ]	[ʌˈdædæ]					2.00	Voiced
0024	dada	[ˈdædæ]	[ˈdæˌdæ]			5.00	Voiced		
0025	dada	[ˈdædæ]	[ˈdæˌdɛ]			2.00	Voiced		
0045	Babar's dada	[ˌbəbaɹzˈdædæ]	[ˈboʷˌdædæ]					4.00	Voiced
0069	dada	[ˈdædæ]	[ˈdæˌdæ]			4.00	Voiced		
0070	dada	[ˈdædæ]	[ˈdæˌdʌ]			2.00	Voiced		
0084	dada	[ˈdædæ]	[ˈdɛdæ]					2.00	Voiced
0113	dada	[ˈdædæ]	[ˈdæˌdɛ]			3.00	Voiced		
0136	dada cookie	[dædæˈkʰʊki]	[gʌʔˈdʌdʌˈkʰɪhʊɪ]					3.00	Voiced
0156	dada	[dædæ]	[ˈdɛdæ]					11.00	Voiced
0500	candle	[ˈkʰændl̩]	[ˈkʰæːdaː]					5.00	Voiced
0523	um, uh, dada	[ʌmʌˈdædæ]	[mˌʔõnˈdædæ]					4.00	Voiced
0541	dada	[ˈdædæ]	[ˌdɛˈda]	6.00	Voiced				
0666	dada	[ˈdædæ]	[ˈdædæ]					3.00	Voiced
0669	dada	[dædæ]	[ˈdædæ]					5.00	Voiced
0693	I want blanket	[ˈaʲwɑnt̚ˌblæŋkɪt]	[ʌjwãˈbædij]					7.00	Voiced
0695	want blanket	[wɑnt̚ˈblæŋkɪt]	[ãʔˈbædiːj]					9.00	Voiced
0707	potato(?)	[pəˈtʰeʲɾoʷ]	[tʰʊˈdij]	6.00	Voiced				
0900	window	[wɪndoʷ]	[ˈwĩnˌdowən]			8.00	Voiced		
0934	crocodile	[ˈkʰɹɑkʰəˌdaʲəl]	[ˈkʰɑkʰəˌdajvə]			10.00	Voiced		
0956	water	[ˈwɑɾɚ]	[ˈwʌdʊ]					4.00	Voiced
1062	...that's a daddy one	[ðætsədædiwʌn]	[...dædəˈdædijˌwãn]					7	Voiced
1136	putting that	[ˌpʰʊɾɪŋˈðæt̚]	[mˌpʰɪtʰẽnˈdæd]					14	Voiced
1147	dada	[ˈdædæ]	[ãmˈdæda]					7	Voiced
1270	birdies	[ˈbɚdiz]	[ˈbʌdejz]					4	Voiced
1345	potato	[pəˈtʰeʲdoʷ]	[ˈtʰejdow]					4	Voiced

Appendix B - VOT and Initial Voicing Labels
Word-medial [d]

Record #	Orthography	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
1357	...they're eating their food	[ðɛˌɹirɪŋðɛɹˈfuʷd]	[ðɪʔijdĩŋðɪˈfuwdə]					6	Voiced
1395	birdies	[ˈbəˑdiz]	[ˈbʊˌdij]			4	Voiced		
1433	a guitar, guitar	[əgətʰaɹgətʰaɹ]	[ðægəˈtʰɑːˌgɛˈdɑ]	3	Voiced				
1450	potato	[pəˈtʰeʲdoʷ]	[ənʊˈtʰeːjdoːw]					3	Voiced
1460	potato	[pətʰeʲdoʷ]	[ˈtʰejdow]					4	Voiced
1647	windy	[ˈwɪndi]	[əwĩnˈdij]	4	Voiced				
1771	daddy	[ˈdædi]	[ˈdædij]					3	Voiced
1795	other house	[ʌðəˑhaʷs]	[ʔʌdʌˈhaws]					5	Voiced
1796	want the puppet	[wɑntðəˈpʰʌpɪt]	[ʔɐ̃dəˈpʰʌpʰɛtʰ]					2	Voiced
1844	a turtle	[əˈtʰəˑɾɬ]	[əˈtʰɔdɑɬ]					3	Voiced
1846	another turtle	[ənʌðəˑtʰəˑɾɬ]	[ɐ̃ntʰɔʔəˈnaˌtʰɔdow]					3	Voiced
1946	making a quesadilla	[ˌmeʲkɪnəˌkʰeʲsɪˈdijɑ]	[ˈwejkʰĩnəˌkʰijsəˈdija]	6	Voiced				
1958	getting more	[gɛɾɪŋˈmɔɹ]	[gɪðĩˈmɔː]					7	Voiced
1963	here a quesadilla	[hiɹəˌkʰeʲsɪˈdijɑ]	[ˈhijɑːˌkʰijsəˈdija]	10	Voiced				
2005	eating	[ˈirɪŋ]	[ˈʔijdijnə]					3	Voiced
2010	water	[ˈwɑɾəˑ]	[ˈwɑdɑː]					4	Voiced
2014	cleaning water	[ˈkʰliːnɪŋˌwɑɾəɹ]	[ˌɬijəˈwɑda]					6	Voiced
2046	rattle	[ˈɹæɾɬ]	[ˈwædɔɬ]					8	Voiced
2063	radish	[ˈɹædɪʃ]	[ˈwædow]					14	Voiced
2111	candle	[ˈkʰændɬ]	[ˈkʰɐ̃ndijðə]					7	Voiced
2166	potato	[ˈpətʰeʲɾoʷ]	[ˈtʰejdow]					4	Voiced
2198	turtle	[ˈtʰəˑɾɬ]	[ˈtʰɔdʌɬ]					3	Voiced
2200	beetle	[ˈbiɾɬ]	[ˈbijdʌɬ]					3	Voiced
2205	and a panda	[ænəˈpʰændə]	[ʔɐ̃nəˈpʰɐ̃ndɑ]					6	Voiced
2254	they're not eating	[ˌðɛɹnɑʔˈirɪŋ]	[ˈðijnɑʔˌijdĩŋ]					9	Voiced

Appendix B - VOT and Initial Voicing Labels
Word-medial [d]

Record #	Orthography	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
2290	the turtle needs help	[ðətʰəˑɾɬnidshɛɬpˀ]	[dɪˈtʰɔdənijˌhɛɬpˀ]					6	Voiced
2328	turtle	[ˈtʰəˑɾɬ]	[ˈtʰʌɬduwd]					5	Voiced
2383	they're eating	[ðɛˈɹiɾɪŋ]	[dɛˈʔijd̪ɪŋ]					5	Voiced
2478	that's a nice bottle	[ˌðætsənaʲsbɑɾɬ]	[dæsənajəˈbɑdʌɬ]					5	Voiced
			Voiceless		0		0		0
			Borderline		0		0		0
			Voiced		6		8		43

Appendix B - VOT and Initial Voicing Labels
Word-medial [k]

Record #	Orthography	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
0047	apple	[ˈæpɨ]	[ˈkʰuw]	102	Voiceless				
0158	cookie	[ˈkʰʊki]	[huwəˈtʰejkʰɪʔ]					76.00	Voiceless
0159	oh, cookie	[oʷkʰʊki]	[ˈowəˌtʰejkʰɛ]					81.00	Voiceless
0177	cookie	[ˈkʰʊki]	[hɪmojˈtʰejkʰɪʔ]					135.00	Voiceless
0178	cookie	[ˈkʰʊki]	[ˈkʰɪˈkʰɪ]	65.00	Voiceless				
0279	monkey	[ˈmʌŋki]	[hejˈkʰij]	74.00	Voiceless				
0414	uh, monkey	[ʌˈmʌŋki]	[ˈʊʔˌmɐ̃ŋkʰej]					26.00	Voiceless
0448	okay	[oʷkeʲ]	[ʌˌkʰej]			88.00	Voiceless		
0470	peacock	[ˈpʰikɑkˀ]	[ˈpʰijˌkʰɑ]			76.00	Voiceless		
0471	peacock	[ˈpʰikɑkˀ]	[pʰijˈkʰɑː]	72.00	Voiceless				
0473	uh, peacock	[ʌˈpʰikɑkˀ]	[ɐ̃ʔɐ̃ʔɐ̃ʔəˌpʰijˈkʰɑ]	98.00	Voiceless				
0483	monkey	[ˈmʌŋki]	[ˈmækʰij]					68.00	Voiceless
0490	cookie	[ˈkʰʊki]	[ˈkʰɪˈkʰij]	87.00	Voiceless				
0493	monkey	[ˈmʌŋki]	[ˈmækʰiːj]					72.00	Voiceless
0501	cookie	[ˈkʰʊki]	[ˈkʰɪkʰij]					91.00	Voiceless
0502	monkey	[ˈmʌŋki]	[ˈmɛˌkʰij]			43.00	Voiceless		
0504	cookie	[ˈkʰʊki]	[ˈkʰijˌkʰij]			53.00	Voiceless		
0737	...cookie	[...ˈkʰʊki]	[...ˈkʰijkʰij]					94.00	Voiceless
0785	cookie	[ˈkʰʊki]	[ˈkʰejkʰij]					55.00	Voiceless
0810	okay	[oʷkʰeʲ]	[owˈkʰɛʔɛ]	67.00	Voiceless				
0819	okay	[oʷkʰeʲ]	[ˈʔʌˌkʰej]			43.00	Voiceless		
0821	okay	[oʷkʰeʲ]	[ʌˈkʰɸj]	55.00	Voiceless				
0934	crocodile	[ˈkʰɹɑkʰəˌdaʲəl]	[ˈkʰɑkʰəˌdajvə]					40.00	Voiceless
0970	monkey	[ˈmʌŋki]	[ˈmaʲʔˌkʰiːj]			111.00	Voiceless		
0976	vacuum	[ˈvækjuʷm]	[ˈbækʰɪ̃nɐ̃]					120.00	Voiceless
0978	...monkey and hippo	[ˌmʌŋkihənˈhɪpoʷ]	[...əˈmɛkʰijʔɐ̃nˈpʰɐ̃mˌbow]					81.00	Voiceless
0987	...crocodile	[ˈkʰɹɑkʰəˌdaʲəl]	[ˈhajkʰɛdə]					64.00	Voiceless
0991	eating cookie	[iɾɪŋkʰʊki]	[ʔajʔɜ̃ˈejtʰɪ̃ʔəˈkʰijkʰij]					55.00	Voiceless
0993	cookie	[kʰʌki]	[əˈkʰɪˌkʰijs]			106.00	Voiceless		

Appendix B - VOT and Initial Voicing Labels
Word-medial [k]

Record #	Orthography	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
1026	drive, monkey drive	[ˈd͡ʒɹaʲvˈmʌŋkiːˌd͡ʒɹaʲv]	[ə̃ˈd͡ʒajfˌmʌkʰijʔʊˈdɹajf]					36	Voiceless
1027	monkey drive	[ˈmʌŋkiːˌd͡ʒɹaʲv]	[ˈmɛkʰijˌd͡ʒaj]					43	Voiceless
1035	I like cookies	[aʲlaʲk˥ˈkʰʌkiz]	[ˌlalajˈkʰɪʔkʰijs]					117	Voiceless
1043	monkey	[ˈmʌŋki]	[ˈmajˌkʰij]			150	Voiceless		
1047	okay	[ˈoʷkeʲ]	[ʔowˈkʰej]	31	Voiceless				
1111	...man cooking	[mænkʰʌkɪŋ]	[...ˌmæ̃nʌ̃ˈkʰʊkʰɪŋə]					56	Voiceless
1133	cracker,cheese, ice cream	[ˈkʰɹɑkəɹˈt͡ʃiːzˈaʲskɹiːm]	[dætʰaˈkʰɔkʰʌ̃ˌdædənˈt͡ʃijʔʌˌɪkʰij]					40	Voiceless
1189	peacock	[ˈpʰiˌkʰɑk˥]	[ˈpʰejˌkʰɑkʰ]			96	Voiceless		
1257	my working on a tie-dye	[maʲwɚ˞kɪŋɑnəˈtʰaʲdaʲ]	[ˌmãjwɜkʰ̃ijnɑ̃nə̆ˈtʰajdaj]					101	Voiceless
1266	...my working ...	[maʲwɚ˞kɪŋ...]	[...ˈmajwʊkʰ̃ɪnə]					59	Voiceless
1269	my working ...	[maʲwɚ˞kɪŋ...]	[majˈwʊkʰ̃ɪŋ]					83	Voiceless
1272	chicken	[ˈtʃɪkn̩]	[ˈt͡ʃɪʔkʰijn]					81	Voiceless
1329	I want ... a popsicle	[aʲwɑnt˥...əˈpʰɑpsɪkɬ̩]	[ʌwãʔawɑ̃tʰɛdədtʰə̥ʔɛðəʔɛnˈpʰɑˌkʰʌ]			80	Voiceless		
1331	want popsicle on my plate	[wɑnt˥ˈpʰɑpsɪkəlɑnmaʲˌpʰleʲt]	[ʌ̃ˌpʰɑkʰəʔɪ̃majˈpʰajtʰ]					42	Voiceless
1348	cook a chicken	[kʰʊkətʃɪkn̩]	[ʌ̃ˈkʰʊkʰəˈt͡ʃɪkʰ̃ɪn]					10	Voiced
1349	cook a chicken	[ˌkʰʊkəˈtʃɪkn̩]	[əˌkʰʊkʰəˈt͡ʃɪkʰ̃ɪnəˈwʌ̃n]					16	Borderline
1434	peacock	[ˈpʰiˌkʰɑk˥]	[ˈpʰijˌkʰɑkʰ]			105	Voiceless		
1512	mama is cooking	[mɑmɑɪzkʰʌkɪŋ]	[ˌmɑ̃məʔɪ̃nˈkʰʊkʰ̃ijnə]					97	Voiceless
1513	...mama cooking, somebody eat to	[mɑmɑkʰʌkɪŋsʌmbʌdijitʰuʷ]	[ˈmɑ̃mijtʰejʔɛ̃nʌːˌmɑ̃mijˈtʰɛkʰɪt˥ʌʒʌ̃mbʌ.ijʔʌ̃ʔijˈtʰuw]					27	Voiceless
1537	I wanna... Bean in blanket	[ˈaʲwɑnə...ˌbiːnɪnˈblæŋkɪt]	[ʌˈwɑ̃nəbɪ̃ŋdɪbwɛ̃ŋkʰɪtʰʔɛ̃nɪ̃ˌbɛ̃ŋkʰɛ̃nt˥]					84	Voiceless
1538	blanket	[blæŋkɪt]	[ˈbwejkʰɪn]					69	Voiceless

Appendix B - VOT and Initial Voicing Labels
Word-medial [k]

Record #	Orthography	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
1546	walking ... Bean	[wɑɬkɪŋ...biʲn]	[ˈwɑkʰijnɑ̃ʔɑːˌbijn]					48	Voiceless
1625	o.k.	[oʷkaʲ]	[owˈkʰej]	37	Voiceless				
1643	haircut	[hɛrkʰʌt˺]	[ˈhɛkʰætʰ]					76	Voiceless
1657	yucky	[ˈjʌki]	[ˈlɛkʰij]					61	Voiceless
1678	they're waking up	[ðɛɹˌweʲkɪŋˈʌp˺]	[ʔœwejkʰijnˈʔʌpʰ]					69	Voiceless
1684	racoons	[ɹæˈkʰuʷnz]	[wæˈkʰuwns]	109	Voiceless				
1730	o.k. I get a pillow	[oʷkeʲaʲgɛɾəˈpʰɪɬoʷ]	[ʌkʰejˈʔajgɛɾəˌpʰɛluw]			74	Voiceless		
1834	okay	[oʷkʰeʲ]	[ˈʌˌkʰej]			65	Voiceless		
1840	I want go, something a cookie	[aʲwɑntgoʷsʌmpθɪŋəkʰʌki]	[ˌʔɑ̃mgowə̃ˌd͡ʒɑ̃mpʰɪ̃nejˈkʰʌkʰij]					104	Voiceless
1841	I want chocolate	[aʲwɑnˈtʃɑk˺lət˺]	[ʌˌwɑ̃nˈt͡ʃɑkʰɑtʰ]					17	Borderline
1849	a ducky	[əˈduk˺]	[əˈdʌkʰij]					57	Voiceless
1857	a ducky	[əˈdʌki]	[əˈdʌkʰij]					79	Voiceless
1883	wash the cookie	[ˌwɑʃðəˈkʰʊki]	[wɑʃðəˈkʰʊkʰij]					74	Voiceless
1912	monkey	[ˈmʌŋki]	[dəˈmɑ̃kʰij]					64	Voiceless
1936	...cookie	[ˈkʰʊki]	[...ˈʔæ̃nəˈkʰʊkʰij]					88	Voiceless
1946	making a quesadilla	[ˌmeʲkɪnəˌkʰeʲsɪˈdijɑ]	[ˈwejkʰɪ̃nəˌkʰijsəˈdija]					44	Voiceless
2020	racoons	[ɹæˈkʰuʷns]	[wæˈkʰuwnzə]	74	Voiceless				
2167	pickles	[ˈpʰɪkɬ̩z]	[ˈpʰɪkʰɔɬs]					62	Voiceless
2218	he's eating chicken	[hiziɾɪŋˈtʃɪkn̩]	[hijˌʔijɾɪ̃ŋˈʃɪkɪ̃n]					43	Voiceless
2232	Ichobod	[ˈɪkəbɑd]	[ɪgəˈbɑːd]					5	Voiced
2268	and the duckies	[ˌænðəˈdʌkiʲz]	[ʔɛ̃nəˈdʌkʰijs]					35	Voiceless
2295	pickles	[ˈpʰɪkɬz]	[ˈpʰɪkʰəɬs]					32	Voiceless

Appendix B - VOT and Initial Voicing Labels
Word-medial [k]

Record #	Orthography	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
2299	chicken	[ˈtʃɪkn̩]	[ˈt͡ʃɪkʰɛ̃n]					59	Voiceless
2304	I'm just making his	[aʲmdʒʌsmeʲkɪŋhɪz]	[ɐ̃mˈdɪsmejkʰ̃ɪnəz]					39	Voiceless
2317	cappucino	[ˌkʰæpəˈtʃinoʷ]	[ˌkʰæpʰəˈkʰijnow]	71	Voiceless				
2395	this marker's not working	[ðɪsˌmaɹkɚznɑʔˈwɚkɪŋ]	[dɪsˈmɑkʰənɑʔˌwʌkʰ̃ijn]					39	Voiceless
2395	this marker's not working	[ðɪsˌmaɹkɚznɑʔˈwɚkɪŋ]	[dɪsˈmɑkʰənɑʔˌwʌkʰ̃ijn]					48	Voiceless
2427	peacock	[ˈpʰikɑk˺]	[ˈpʰijkʰɑ]					23	Borderline
2441	the wacky witches	[ðəˌwækiˈwɪtʃɪz]	[ðəˌwækʰijˈwɪt͡ʃɛz]					69	Voiceless
2481	bacon	[ˈbeʲkn̩]	[ˈbejˌkʰ̃ɪn]					13	Voiced
2487	a pickle	[əˈpʰɪkɫ̩]	[əˈpʰɪkʰow]					40	Voiceless
2492	I want the wacky witches	[aʲˌwɑnt˺ðəˌwækiˈwɪtʃɪz]	[ʌwɑ̃nðəˌwɑkʰijˈwɪt͡ʃəz]					73	Voiceless
			Voiceless		13		13		50
			Borderline		0		0		3
			Voiced		0		0		3

Appendix B - VOT and Initial Voicing Labels
Word-medial [g]

Record #	Orthography	Target	Realization	WM-1S	Label	WM-2S	Label	WM-U	Label
0386	again	[əˈgɛn]	[ˈægɛʔ]					12.00	Voiced
0388	again	[əˈgɛn]	[æˈgɛʔ]	7.00	Voiced				
0396	again	[əˈgɛn]	[ˈʌjgæʔ]					9.00	Voiced
0399	again	[əˈgɛn]	[ʌjˈgæʔ]	8.00	Voiced				
0400	again	[əˈgɛn]	[ɛˈgæʔ]	8.00	Voiced				
0405	again	[əˈgɛn]	[ɛˈgæʔ]	6.00	Voiced				
0717	monkey	[ˈmʌŋki]	[ˈmejk.gij]			41.00	Voiceless		
0906	that's a piggy	[ðætsəˈpʰɪgi]	[ˈtʰætʰaˌpʰɪgij]					6.00	Voiced
0915	daddy duck	[dædidʌkˀ]	[dæθajnõmˈdʌgej]					10.00	Voiced
1006	doggie	[dɑgi]	[ˈbɪkʰˌdɑgij]					6	Voiced
1131	mango	[ˈmæŋgoʷ]	[ˈmẽgow]					15	Borderline
1219	piggy too	[ˈpʰɪgitʰuʷ]	[əˈpʰɪgijˌtʰuw]					7	Voiced
1250	piggy	[ˈpʰɪgi]	[ˈpʰɪgijˌ]					4	Voiced
1264	piggy come	[ˈpʰɪgitʰuʷ]	[ˌpʰɪgijˈkʰɤ̃mna]					10	Voiced
1300	piggy	[ˈpʰɪgi]	[ˈpʰɪgij]					6	Voiced
1301	piggy	[ˈpʰɪˌgi]	[ˈpʰɪgiːj]					5	Voiced
1389	doggie, mom read that	[dɑgimɑmɹɛdðæt]	[ˌdɑgijəˈmɑ̃ɹijˌdæ]					3	Voiced
1406	piggy, two piggy	[pʰɪgitʰuʷpʰɪgi]	[ˈpʰɪgijtʰuwˌpʰijgij]					5	Voiced
1406	piggy, two piggy	[pʰɪgitʰuʷpʰɪgi]	[ˈpʰɪgijtʰuwˌpʰijgij]					6	Voiced
1448	doggies	[ˈdɑgiz]	[ˈdɑgija]					7	Voiced
1528	wagon	[ˈwægn̩]	[ˈwægĩn]					8	Voiced
1701	yogurt	[ˈjoʷgəˑtˀ]	[ˈjʌgɛtʰ]					4	Voiced
1823	I'll get doggy	[aɟɬgɛtˀdɑgi]	[aˈgɛtˀˌdɑgij]					7	Voiced
2094	doggie	[ˈdɑgi]	[ˈdɑgij]					4	Voiced
2421	a wagon	[əˈwægn̩]	[əˈwejgẽn]					4	Voiced
2424	kangaroo	[ˌkʰæŋgəˈɹuʷ]	[ˈkʰwẽŋgəuw]					8	Voiced
			Voiceless		0		1		0
			Borderline		0		0		1
			Voiced		4		0		20

Appendix B - VOT and Revised Voicing Labels
Word-initial [p]

Record #	Orthography	Target	Realization	WI-U	Label
0471	peacock	[ˈpʰikɑkˀ]	[pʰijˈkʰɑː]	24.00	Voiceless
1064	I wanna turn page	[aʲwɑnətʰɚnpʰeʲdʒ]	[ɐ̃ˈmɑ̃nˌtʰuːwpʰejd]	21.00	Voiceless
1637	put it on my hair	[ˌpʰʌɾɪɾɑnmaʲˈhɛɹ]	[pʰʊdəʔɐ̃ˈmaˌhaw]	30.00	Voiceless
3221	put some more	[pʰʊtˀsəˈmɔɹ]	[pʰəsɐ̃ˈbɔ.a]	15.00	Borderline
			Voiceless		3
			Borderline		1
			Voiced		0

Appendix B - VOT and Revised Voicing Labels
Word-initial [b]

Record #	Orthography	Target	Realization	WI-U	Label
0082	Peter	[ˈpʰiˌɹɚ˞]	[bəˈwɛʔ]	4.00	Voiced
0115	baby	[ˈbeˌbi]	[bijʔˈbejˌbij]	3.00	Voiced
0225	bean	[biˌn]	[bejˈvij]	3.00	Voiced
0303	oh, garbage truck	[oʷˈgɑɹbədʒˌtʃɹʌk]	[ˌoːwbejˈʃæ]	2.00	Voiced
0335	oh, teddy bear	[oʷˈtʰɛdibɛɹ]	[owəˈdɛːwɛ]	5.00	Voiced
0467	garbage truck	[ˈgɑɹbədʒˌtʃɹʌk]	[bæˈtʃɛkʰ]	2.00	Voiced
0468	uh, dada	[ʌˈdædæ]	[bʊˈdæɾæ]	4.00	Voiced
0748	big tail	[bɪgtʰeˌɬ]	[bɪˈtʰejʌ]	3.00	Voiced
0904	big tail	[bɪgtʰeˌɬ]	[bɪˈtʰejəɬ]	3.00	Voiced
0916	big tail	[bɪgtʰeˌɬ]	[bɪʔˈtʰejʌː]	4.00	Voiced
0917	that's a big slide	[ˈðætsəˈbɪgˈslaˌd]	[ˈdætʰəbɪˌɬajtʰ]	2.00	Voiced
1060	big tail	[bɪgtʰeˌɬ]	[bɪˈtʰejow]	5.00	Voiced
1152	...big tail	[bɪgtʰeˌɬ]	[bijˈtʰejow]	3.00	Voiced
1195	big tail too	[bɪgtʰeˌɬtʰuʷ]	[əbɪˌtʰejəˈtʰuw]	5.00	Voiced
1222	big eyes	[bɪgaˌz]	[bijˈʔaj]	5.00	Voiced
1223	big toes	[bɪgtʰoʷz]	[bɪʔˈtʰows]	4.00	Voiced
1537	I wanna... Bean in blanket	[ˈaˌwɑnə...ˌbiːnɪnˈblæŋkɪt]	[ʌˈwɑ̃nəbĩŋdɪbwɛ̃ŋkʰɪtʰʔɛ̃nĩˌbɛ̃ŋkʰɛ̃ntˀ]	3.00	Voiced
1877	be careful	[biˈkʰɛɹfˌɬ]	[bɪˈkʰɛfʌɬ]	4.00	Voiced
2074	clock	[kʰlɑk]	[buwˈhɑ]	3.00	Voiced
2156	blue	[bluː]	[bəˈjʊ]	3.00	Voiced
2460	B,what B for?	[biwʌʔbifɔɹ]	[bijˌʔɐ̃ˈbijfɔ.a]	2.00	Voiced
2692	black	[blæk]	[bəˈwækʰ]	4.00	Voiced
2752	for these	[fɚ˞ˈðiz]	[bʌˈdij]	2.00	Voiced
			Voiceless		0

Appendix B - VOT and Revised Voicing Labels
Word-initial [b]

Record #	Orthography	Target	Realization	WI-U	Label
			Borderline		0
			Voiced		23

Appendix B - VOT and Revised Voicing Labels
Word-initial [t]

Record #	Orthography	Target	Realization	WI-U	Label
0106	cat	[kʰæt̚]	[tʰəˈkʰæt̚]	41.00	Voiceless
0903	that's a cow	[ðætsəkʰaʷ]	[tʰɐ̃tʰəʔʌˈkʰɑwa]	19.00	Borderline
1405	no my take knife	[noʷmaʲtʰeʲknaʲf]	[nowˈmajətʰɛkʰˌnejf]	21.00	Voiceless
1638	I have a big knot	[aʲhævəbɪgnɑt̚]	[tʰaˈbɪʔˌnɑtʰ]	48.00	Voiceless
1704	telephone	[ˈtʰɛɬəfoʷn]	[tʰɛləˈfɛwn]	15.00	Borderline
1898	too high	[tʰuʷˈhaʲ]	[tʰuwˈhaj]	43.00	Voiceless
2366	two books	[ˈtʰuʷbʊks]	[tʰuwˈbʊks]	63.00	Voiceless
2749	to the train	[tʰuðəˈtʃɹeʲn]	[tʰuwðəˈtwejn]	63.00	Voiceless
3361	two cookies	[ˈtuwˌkʊkijz]	[tʰuwˈkʰʊkʰijs]	56.00	Voiceless
3558	turn it	[ˈtɜɹnɪt]	[ˈtʰɜnij]		
			Voiceless		7
			Borderline		2
			Voiced		0

Appendix B - VOT and Revised Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-U	Label
0090	dada	[ˈdædæ]	[dʌˈdæ]	2.00	Voiced
0132	dada	[dædæ]	[dæˈdæ]	2.00	Voiced
0538	dada	[ˈdædæ]	[dɛˈdæ]	5.00	Voiced
0636	mama	[mɑmə]	[dæt̚ˈmɑ̃mã]	7.00	Voiced
0910	that horsie	[ðætˈhɔɹsi]	[dæʔˈhɔs̥ij]	5.00	Voiced
0915	daddy duck	[dædidʌk̚]	[dæθajnʊ̃mˈdʌgej]	6.00	Voiced
0937	cat	[kʰæt̚]	[ˈkʰætʰãˈduwijɛn]	2.00	Voiced
0962	that's a hippo	[ðætsəhɪpoʷ]	[dæsaˈbɑ̃mˌbow]	8.00	Voiced
1062	...that's a daddy one	[ðætsədædiwʌn]	[...dædəˈdædijˌwɑ̃n]	3.00	Voiced
1063	that's a tiny one	[ðætsətʰaʲniwʌn]	[dætʰəˈtʰajnijˌwɑ̃n]	16.00	Borderline
1084	that's a man	[ðætsəmæn]	[dætʰamˌmæ̃n]	41.00	Voiceless
1664	that guy driving a	[ˈðæt̚gaʲˌd̠ʒɹaʲvɪŋə]	[dæˈgajˌdwajvijnʌʔ]	6.00	Voiced
1666	that drives	[ðæt̚ˈd̠ʒɹaʲvz]	[dæˈdwajv]	7.00	Voiced
1925	eating corn	[iɾɪŋkʰɔɹn]	[dijðəˈklɔwən]	3.00	Voiced
1937	the white one	[ðəˈwaʲtwʌn]	[dəˈwajfˌwɑ̃n]	5.00	Voiced
2029	the little one is swimming	[ðəˈlɪɾɫwʌnɪzˈswɪmɪŋ]	[dəˈlɪɫwɑ̃nˌswɪ̃mɪ̃ŋ]	5.00	Voiced
2083	down there	[daʷnˈðɛɹ]	[dawˈnɛː]	5.00	Voiced
2085	don't move	[doʷnt̚muʷv]	[dõwt̚ˈmjuwv]	6.00	Voiced
2273	the horse don't swim	[ðəˈhɔɹsdoʷnt̚ˈswɪm]	[dəˈhɔləˌfwɪ̃m]	5.00	Voiced
2290	the turtle needs help	[ðətʰɚɾɫnidshɛɫp̚]	[dɪˈtʰɔdənijzˌhɛɫp̚]	7.00	Voiced
2340	the cat got a tail	[ðəkʰæt̚gɑɾətʰeʲɫ]	[dəˈkʰægɑðəˌtʰejəɫ]	3.00	Voiced
2391	the little duck	[ðəlɪɾɫdʌk]	[dəˌlɪ.əˈdʌkʰ]	6.00	Voiced

Appendix B - VOT and Revised Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-U	Label
2451	the other baby	[ðəˈjʌðəˌbeʲbi]	[dəˈʔʌðəˌbejbij]	6.00	Voiced
2457	D for Dada	[difəˑdædæ]	[dijfaˈdæɾɑ]	5.00	Voiced
2574	them animals	[ðɛmˈmɑnəmɬz]	[dɛ̃mˈʔæ̃nəwʌɬs]	5.00	Voiced
2640	don't like it	[doʷnʔˈlaʲkɪtˀ]	[dõwʔˈlajgɛtˀ]	7.00	Voiced
2644	the bowl	[ðəˈboʷɬ]	[dəˈbowʌɬ]	4.00	Voiced
2722	there's keys	[ðɛɹsˈkʰiz]	[dɪsˈkʰij]	5.00	Voiced
2738	they're running away	[ðɛɹʌnɪŋəˈweʲ]	[dɛwɐ̃n̈jəˈwej]	6.00	Voiced
2739	there's his hat	[ðɛɹzhɪzˈhætˀ]	[dɛshɪzˈhæːʔ]	3.00	Voiced
2787	she got mad on this page?	[ʃɪgɑtˀˌmadɑnˈðɪspeʲdʒ]	[dʊnɑtˀˈmædɑ̃nˌðɪθˈpʰejt͡ʃ]	3.00	Voiced
2833	they got soup	[ðeʲgɑʔˈsuʷpˀ]	[dejgɑtˀˈsuwpʰ]	3.00	Voiced
2844	they like pickles	[ðeʲlaʲkˈpʰɪkɬz]	[dɛˌlajkˀˈpʰɪkʰəɬ]	5.00	Voiced
2860	there's a knife for the big one	[ðɛɹzənaʲfəˑðəˈbɪgwʌn]	[dɪzəˈnajˌfɔ.əˈbɪgˈwɐ̃n]	3.00	Voiced
3016	the wind's coming in	[ðəˈwɪndskʰʌmɪˌŋɪn]	[dəˈwĩnkʰɐ̃mĩŋˌĩn]	3.00	Voiced
3070	they really like each other	[ðeʲˌɹɪliˈlaʲkiˌtʃʌðəˑ]	[dejɹəlijˈlajkˀdəˌt͡ʃʌðə]	5.00	Voiced
3072	these guys gotta	[ˈðizgaʲzgɑɾə]	[dɪˈgajˌgɑɾə]	5.00	Voiced
3077	they're kissing each other	[ðɛɹˈkʰɪsɪŋiˌtʃʌðəˑ]	[dɛˈkʰɪsĩnəˌt͡ʃʌd͡ʒa]	4.00	Voiced

Appendix B - VOT and Revised Voicing Labels
Word-initial [d]

Record #	Orthography	Target	Realization	WI-U	Label
3114	there's the spoon	[ˈðɛɹzðəˈsphuwn]	[dəθdəˈphuːwn]	4.00	Voiced
3415	this is yellow	[ˌðɪsɪzˈjɛlow]	[dɪsəˈjɛlə]	4.00	Voiced
3431	do that	[duwˈðæt]	[duwˈðæth]	3.00	Voiced
3482	do you wanna back?	[duwjuwˌwɑnəˈbæk]	[djuwə̃nɪˈbækh]	5.00	Voiced
3715	little piggy	[ˌlɪtəɬˈpɪgij]	[dɪɬˈphɪgij]	3.00	Voiced
3767	the dirt fell down	[ðəˈdɜɹtfɛɬˌdawn]	[dəˈdøʔˌfɛɬdə̃wn]	3.00	Voiced
			Voiceless		1
			Borderline		1
			Voiced		42

Appendix B - VOT and Revised Voicing Labels
Word-initial [k]

Record #	Orthography	Target	Realization	WI-U	Label
0421	lion king	[ˈlaʲn̩ˌkʰɪŋ]	[əˈlawkʰɛ]	90.00	Voiceless
0422	lion king	[ˈlaʲn̩ˌkʰɪŋ]	[əˈlajkʰɛ]	72.00	Voiceless
0428	lion king	[ˈlaʲn̩ˈkʰɪŋ]	[ˈlɛkʰɛ]	44.00	Voiceless
0430	lion king	[ˈlaʲn̩ˌkʰiŋ]	[ˈlajkʰɛ]	61.00	Voiceless
0433	lion king	[ˈlaʲn̩ˌkʰɪŋ]	[ˈlajkʰɛ]	77.00	Voiceless
1307	knife	[naʲf]	[kʰəˈnajf]	93.00	Voiceless
1341	my cooking	[maʲkʰʌⁿkɪŋ]	[əˈmajkʰʊˌkʰɛ̃n]	63.00	Voiceless
1445	kids like toast	[kʰɪdzlaʲktʰoʷstˀ]	[kʰɪdˈlajkˀˌtʰows]	36.00	Voiceless
2889	O.K., they	[ᵒʷkeʲðeʲ]	[kʰejˈðej]	36.00	Voiceless
3168	curb fall	[kʰəˑbˈfɑɬ]	[kʰʊɾəbˈfɑɬ]	67.00	Voiceless
3444	I can't cut it	[ajˌkæntˈkʌtɪt]	[kæ̃ʔˈkʰʌɾɪtʰ]	25.00	Voiceless
3663	ok, lets keep this there	[owkejˌlɛtskijpˈðɪsðɛɹ]	[kʰejlɛsˈkʰijpdʌθˌðɛ]	48.00	Voiceless
3828	to drink	[tuwˈdɹɪŋk]	[kʰɛ̃ˈdwĩŋkʰ]	28.00	Voiceless
			Voiceless		13
			Borderline		0
			Voiced		0

Appendix B - VOT and Revised Voicing Labels
Word-initial [g]

Record #	Orthography	Target	Realization	WI-U	Label
0136	dada cookie	[dædæˈkʰʊki]	[gʌʔˈdʌdʌˈkʰɪhʊɪ]	5.00	Voiced
0146	gorilla	[gəˈɹɪɬə]	[owgəˈwɛ.ə]	1.00	Voiced
0704	garden(?)	[ˈgaɹdn̩]	[əˈgɑ˛dʌ]	10.00	Borderline
1225	guitar	[gɪˈtʰaɹ]	[gɛˈtʰɑ]	7.00	Voiced
1889	go to kitchen	[goʷtuʷkʰɪtʃn̩]	[gowtʰɤ̆ˈkʰɪt͡ʃɛ̃n]	5.00	Voiced
1958	getting more	[gɛɾɪŋˈmɔɹ]	[gɪðɪˈmɔː]	14.00	Borderline
2157	got blue?	[gɑtˈbluː]	[gaˈbwuw]	5.00	Voiced
2371	get that out	[gɛʔðæɾɑaʷt˺]	[gɪt˺ˈðæɾawt˺]	6.00	Voiced
2373	get those	[gɛʔ˛ðoʷz]	[gɛt˺ˈðowz]	6.00	Voiced
2821	they ran away	[˛ðeʲɹænəˈweʲ]	[gɛ.ə˛wʌ̃nəˈwej]	6.00	Voiced
3073	go home	[goʷˈhoʷm]	[gʌˈhõwm]	5.00	Voiced
3202	going to see the fishies	[gowɪŋtəsiðəˈfɪʃiz]	[gowĩn˛sijəˈfɪʃijs]	4.00	Voiced
3464	going to get the pump	[gowɪŋtuw˛gɛtðəˈpʌmp]	[gowĩŋˈgɪt˺dʌ˛pʰʌp˺]	7.00	Voiced
3655	go on there	[˛gowɑnˈðɛɹ]	[gow˛ʌ̃ˈnɛ.a]	8.00	Voiced
3808	go on here again	[gowɑnˈhɪɹə˛gɛn]	[gowɑ̃nˈhijaˈgɛ̃n]	6.00	Voiced
			Voiceless		0
			Borderline		2
			Voiced		13

Appendix B - VOT and Revised Voicing Labels
Word-medial [p]

Record #	Orthography	Target	Realization	WM-U	Label
0804	oh, purple...	[oʷˈpʰəˌpɬ...]	[owˈpʰɜpʰʊˌwɐ̃n]	60.00	Voiceless
0840	hippo	[ˈhɪpoʷ]	[ˈhʌpʰowæ]	33.00	Voiceless
0861	newspaper	[ˈnuʷzˌpʰeʲpəˌ]	[ˈowpʰɑpʰɑ]	17.00	Borderline
0945	apple	[ˈæpɬ]	[ˈʔæpʰʊ]	31.00	Voiceless
0947	apple	[ˈæpɬ]	[ˈʔæpʰʊ]	50.00	Voiceless
0967	blue and red and purple too	[ˈbluːənˈɹɛdənˈpəɹpəltuː]	[ˌwuwɐ̃nəˈwɛdʔɐ̃nˈpʰɜpʰʌˌtʰuwə]	75.00	Voiceless
1058	...apple	[ˈæpɬ]	[....ˈʔæpʰow]	35.00	Voiceless
1097	that's a blue and a purple	[ˌðætsəˈbluːændəˈpəɹpəl]	[əˈdætʰʌˌbuwɐ̃nəˈbɔpʰʌ]	46.00	Voiceless
1107	diaper	[ˈdaʲpəˌ]	[ˈtʰɛpɛʔ]	24.00	Voiceless
1154	apple	[ˈæpɬ]	[ˈʔæpʰow]	69.00	Voiceless
1202	purple	[ˈpʰəˌpɬ]	[mˌpʰʌpʰɔ]	59.00	Voiceless
1204	slippers	[ˈslɪpˈpʰəˌz]	[ˈtʃ͡ɪpʰɛ]	52.00	Voiceless
1238	apple	[ˈæpɬ]	[ˈʌpʰɔ]	63.00	Voiceless
1263	apple	[ˈæpɬ]	[ˈʔæpʰow]	115.00	Voiceless
1271	apples	[ˈæpɬz]	[ˈʔæpʰɔjs]	54.00	Voiceless
1658	that's yucky	[ðætsˈjʌki]	[ˈðæˌdjʌpʰij]	29	Voiceless
1668	airplane	[ˈɛɹpleʲn]	[ˈɛpʰɛ̃jn]	17.00	Borderline
1723	I want the puppets	[aʲwɑntðəpʰʌpəts]	[wɐ̃ndəˈpʰʌpʰʌjts]	50.00	Voiceless
1726	we'll eat something	[wiɬˈitsʌmpθɪŋ]	[wəˈʔijtˈsɐ̃mpʰijnə]	63.00	Voiceless
1793	watch my jumping	[wɑtʃmaʲˈdʒʌmpɪŋ]	[wɑʃˈmajˌdʒ͡ɐ̃mpʰijnə]	55.00	Voiceless
1796	want the puppet	[wɑntðəˈpʰʌpɪt]	[ʔɐ̃dəˈpʰʌpʰɛtʰ]	84.00	Voiceless
1840	I want go, something a cookie	[aʲwɑntgoʷsʌmpθɪŋəkʰʌkiˌ]	[ˌʔɐ̃mgowɐ̃ˌdʒ͡ɐ̃mpʰn̄ɪnejˈkʰʌkʰij]	25.00	Voiceless
1979	this guy happy	[ðɪsgaʲˈhæpi]	[dɪsgʌˈhæpʰij]	68.00	Voiceless
1980	happy	[ˈhæpi]	[ˈʔæpʰij]	70.00	Voiceless
2051	apple	[ˈæpɬ]	[ˈʔæpʰʌɬ]	56.00	Voiceless
2059	apple	[ˈæpɬ]	[ˈʔæpʰɔɬ]	32.00	Voiceless
2065	and a pear and a apple	[ændəˈpʰɛɹændəˈnæpɬ]	[ɐ̃nəˌpʰæʔɐ̃ndəˈʔæpʰʌɬ]	99.00	Voiceless
2110	all sleepy	[aɬˈsliʲpʰiʲ]	[ˌʔɑɬˈɬijpʰijnə]	64.00	Voiceless

Appendix B - VOT and Revised Voicing Labels
Word-medial [p]

Record #	Orthography	Target	Realization	WM-U	Label
2208	and a hippopotamus	[ænə˛hɪpoʷˈpʰɑɾəmʌs]	[ˈæ̃ːnhɪpʰowˈpʰɑ.ʌ]	29.00	Voiceless
2262	purple	[ˈpʰəˑpɬ]	[ˈpʰʌpʰɔ]	25.00	Voiceless
2316	something spicy	[ˈsʌmθɪŋˈspʰʌʲsiʲ]	[˛sʌ̃mpʱɪŋˈpʰajsij]	40.00	Voiceless
2317	cappucino	[˛kʰæpəˈtʃinoʷ]	[˛kʰæpʰəˈkʰijnow]	27.00	Voiceless
2398	apples	[ˈæp˛ɬz]	[ˈʔæpʰʌɬ]	39.00	Voiceless
2455	a lot of people	[ə˛læɾəˈpʰip˛ɬ]	[lɑɾəˈpʰijpʰʌɬ]	52.00	Voiceless
2471	You open the door and see here	[juʷoʷpn̥ðədɔɹənsihiɹ]	[juwˈʔowpʱɪ̃ndə˛dɔ.əsijhija]	33.00	Voiceless
2494	is this one happy?	[ɪzðɪswʌnhæpi]	[ɪˈðɪswʌ̃ŋ˛hæ̃pʰij]	28.00	Voiceless
			Voiceless		34
			Borderline		2
			Voiced		0

Appendix B - VOT and Revised Voicing Labels
Word-medial [b]

Record #	Orthography	Target	Realization	WM-U	Label
0043	Babar	[ˈbæbaɹ]	[ˈbæbʌʔ]	8.00	Voiced
0080	Peter	[ˈpʰiʲɾəˠ]	[ˈbʊbʊ]	2.00	Voiced
0116	baby	[ˈbeʲbi]	[ˈbejbɪ]	2.00	Voiced
0118	baby	[ˈbeʲbi]	[ˈbejbɪ]	6.00	Voiced
0120	baby	[ˈbeʲbi]	[ˈbɛbij]	3.00	Voiced
0155	Peter, Hanna	[pʰiɾəˠhænə]	[ʌˌbʊbəˈhæ̃nɛ]	4.00	Voiced
0303	oh, garbage truck	[oʷˈgɑɹbəʤtʃɹʌk]	[ˌoːwbejˈʃæ]	5.00	Voiced
0467	garbage truck	[ˈgɑɹbəʤtʃɹʌk]	[bæˈt͡ʃɛkʰ]	4.00	Voiced
1028	hippo drive	[ˈhɪpoʷˌʤɹaʲv]	[ɐ̃ʔəˈpʰõmbowɪ̃ˌdəʁajf]	5.00	Voiced
1042	hippo ... towel ... toys	[ˈhɪpoʷ...ˈtʰæwɬ...tʰoʲz]	[əˈθĩmbow...ˈtʰʌwa...ˈtʰɔjs]	4	Voiced
1103	little baby	[lɪɾɬbeʲbi]	[ˌlejˈbijbij]	12	Borderline
1106	baby	[ˈbeʲbi]	[ˈbejbij]	5	Voiced
1129	apple	[ˈæpɬ]	[ˈʔætʰæbæʔ]	8.00	Voiced
1146	that's a baby and thats' a lady...	[ðætsəˈbeʲbijənðætsəˌleʲdi...]	[ˌðæsɑˈbejbijʔətʰæsəˈlejdijˈkʰɹɪkʰɪtʰ]	7	Voiced
1283	two rabbits	[tʰuʷˈɹæbɪts]	[tʰuwʔˈwæbɛtˀ]	7	Voiced
1424	elbow	[ˈɛɬboʷ]	[ˈʔæbow]	3	Voiced
1436	wheelbarrow	[ˈwiʲɬbɛɹoʷ]	[ˈwɪjbʌ.ow]	5	Voiced
1478	a rabbit	[əˈɹæbɪtˀ]	[ədˈɹæbɛtʰ]	7	Voiced
1669	purple	[ˈpʰəˠpɬ]	[ˈpʰʊbʌ]	33.00	Voiceless
1688	rabbits	[ˈɹæbɪts]	[ˈɹæbɪts]	7	Voiced
1856	another rabbit	[ənʌðəˠɹæbɪtˀ]	[ˈnʌvˌɹæbɪtʰ]	3	Voiced
1893	rabbits	[ˈɹæbɪts]	[ˈwæbɛtʰ]	5	Voiced
2000	rabbits	[ˈɹæbɪtˀ]	[ˈwæbɛts]	3	Voiced
2004	and that rabbit	[ənðætˈɹæbɪtˀ]	[uwʔɜ̃ˈðæˌwæbɪθʌ]	4	Voiced
2017	all the rabbits	[ɑɬðəˈɹæbɪts]	[ʔɑɬˈwæbɛt]	3	Voiced

Appendix B - VOT and Revised Voicing Labels
Word-medial [b]

Record #	Orthography	Target	Realization	WM-U	Label
2048	the baby	[ðəˈbeʲbi]	[dɪˈbejbij]	8	Voiced
2101	zebra	[ˈzibrə]	[ˈzijba]	6	Voiced
2142	a rabbit	[əɹæbɪt˺]	[əˈɹæbɪt˺]	7	Voiced
2195	a rabbit	[əˈɹæbɪt˺]	[əˈwæbɪtʰ]	3	Voiced
2199	a zebra	[əˈzibɹə]	[əˈʒijbəʔɑ̃n]	6	Voiced
2246	rabbits	[ˈɹæbɪts]	[ˈwæbɪts]	4	Voiced
2332	a rabbit	[əˈɹæbɪt˺]	[əˈwæbɪʔ]	4	Voiced
2368	apple	[ˈæpl̩]	[ˈʔæp˺bow]	3	Voiced
2403	strawberries	[ˈstʰɹabəɹiz]	[ˈtʰwɑːbejz]	6	Voiced
2436	you my baby	[juʷmaʲbeʲbi]	[juwˌmajʔˈbejbij]	7	Voiced
2450	other baby	[ˈʌðəˌbeʲbi]	[ˈʔʌðəˌbejbij]	7	Voiced
2483	baby cat	[beʲbikʰæt˺]	[ˈbejbijˌpʰætʰ]	7	Voiced
			Voiceless		1
			Boderline		1
			Voiced		35

Appendix B - VOT and Revised Voicing Labels
Word-medial [t]

Record #	Orthography	Target	Realization	WM-U	Label
0188	turtle	[ˈtʰɚɾɬ̩]	[ˈtʰɜ̰ːtʰɛ̃]	67.00	Voiceless
0461	turtle	[ˈtʰɚɾɬ̩]	[ˈtʰʊtʰʌ]	22.00	Voiceless
0513	bicycle	[ˈbaʲsikɬ̩]	[ˌbɛʔjəˈpʰʊtʰʌ]	19.00	Borderline
0728	bicycle	[ˈbaʲsɪkɬ]	[ˌbʷawsˈtʰʌtʰʌ]	30.00	Voiceless
0867	elephant ... bicycle	[ɛɬəfənt...ˈbaʲsɪkɬ̩]	[æ̃nəˈɛɬfɛ̃...ˈpʰʌtʰæ]	33.00	Voiceless
0868	aligator on bicycle	[ˌæɬigeʲɾɚɑnˈbaʲdsɪkɬ]	[m̩ˈægɛləʔʌ̃ʔʊ̃n̩pʰʌtʰɑ]	117.00	Voiceless
0890	eating.....	[ˈiɾɪŋ.....]	[ˈʔejtʰĩ...]	54.00	Voiceless
1462	give it Cathy	[gɪvɪtkʰæθi]	[ˈgɪvɪˈkʰætʰij]	60.00	Voiceless
1548	turtle	[ˈtʰɚɾɬ̩]	[ˌʌˈtʰɔtʰɪ]	95.00	Voiceless
1642	cutting	[ˈkʰʌɾɪŋ]	[ˈkʰʌtʰijn]	48.00	Voiceless
1775	dancing	[ˈdænsɪŋ]	[ˈdæ̃ntʰĩŋ]	80.00	Voiceless
1961	eating the	[ˈiɾɪŋðə]	[ˈʔijtʰĩŋnɛ]	13.00	Borderline
2407	painting	[pʰeʲntʰɪŋ]	[ˈpʰẽjntʰĩjn]	29.00	Voiceless
			Voiceless		11
			Borderline		2
			Voiced		0

Appendix B - VOT and Revised Voicing Labels
Word-medial [d]

Record #	Orthography	Target	Realization	WM-U	Label
0004	dada	[ˈdædæ]	[ˈdɛdæʔ]	5.00	Voiced
0019	dada	[ˈdædæ]	[ʌˈdædɛ]	2.00	Voiced
0020	dada	[ˈdædæ]	[ʌˈdædæ]	2.00	Voiced
0045	Babar's dada	[ˌbəbaɹzˈdædæ]	[ˈbowˌdædæ]	4.00	Voiced
0084	dada	[ˈdædæ]	[ˈdɛdæ]	2.00	Voiced
0136	dada cookie	[dædæˈkʰʊki]	[gʌʔˈdʌdʌˈkʰɪhʊɪ]	3.00	Voiced
0156	dada	[dædæ]	[ˈdɛdæ]	11.00	Borderline
0500	candle	[ˈkʰændɬ]	[ˈkʰæːdaː]	5.00	Voiced
0523	um, uh, dada	[ʌmʌˈdædæ]	[mˌʔõnˈdædæ]	4.00	Voiced
0666	dada	[ˈdædæ]	[ˈdædæ]	3.00	Voiced
0669	dada	[dædæ]	[ˈdædæ]	5.00	Voiced
0693	I want blanket	[ˈaʲwɑntˀˌblæŋkɪt]	[ʌjwãˈbædij]	7.00	Voiced
0695	want blanket	[wɑntˀˈblæŋkɪt]	[ãʔˈbædiːj]	9.00	Voiced
0956	water	[ˈwɑɾəˠ]	[ˈwʌdʊ]	4.00	Voiced
1062	...that's a daddy one	[ðætsədædiwʌn]	[...dædəˈdædijˌwãn]	7	Voiced
1136	putting that	[ˌpʰʊɾɪŋˈðætˀ]	[mˌpʰɪtʰẽnˈdæd]	14	Borderline
1147	dada	[ˈdædæ]	[ãmˈdæda]	7	Voiced
1270	birdies	[ˈbəˠdiz]	[ˈbʌdejz]	4	Voiced
1345	potato	[pəˈtʰeʲdoʷ]	[ˈtʰejdow]	4	Voiced
1357	...they're eating their food	[ðɛˌɹiɾɪŋðɛɹˈfuʷd]	[ðɪʔijðɪŋðɪˈfuwdə]	6	Voiced
1450	potato	[pəˈtʰeʲdoʷ]	[ənʊˈtʰeːjdoːw]	3	Voiced
1460	potato	[pətʰeʲdoʷ]	[ˈtʰejdow]	4	Voiced
1771	daddy	[ˈdædi]	[ˈdædij]	3	Voiced
1795	other house	[ʌðəˠhaʷs]	[ʔʌdʌˈhaws]	5	Voiced
1796	want the puppet	[wɑntðəˈpʰʌpɪt]	[ʔãdəˈpʰʌpʰɛtʰ]	2	Voiced
1844	a turtle	[əˈtʰəˠɾɬ]	[əˈtʰɔdɑɬ]	3	Voiced
1846	another turtle	[ənʌðəˠtʰəˠɾɬ]	[ẽntʰɔʔəˈnaˌtʰɔdow]	3	Voiced
1958	getting more	[gɛɾɪŋˈmɔɹ]	[gɪɾĩˈmɔː]	7	Voiced
2005	eating	[ˈiɾɪŋ]	[ˈʔijdijnə]	3	Voiced
2010	water	[ˈwɑɾəˠ]	[ˈwɑdɑː]	4	Voiced
2014	cleaning water	[ˈkʰliːnɪŋˌwɑɾəɹ]	[ˌɬijəˈwɑda]	6	Voiced

Appendix B - VOT and Revised Voicing Labels
Word-medial [d]

Record #	Orthography	Target	Realization	WM-U	Label
2046	rattle	[ˈɹæɾɬ]	[ˈwædɔɬ]	8	Voiced
2063	radish	[ˈɹædɪʃ]	[ˈwædow]	14	Borderline
2111	candle	[ˈkʰændɬ]	[ˈkʰændijðə]	7	Voiced
2166	potato	[ˈpətʰeɪ̯ɾoʷ]	[ˈtʰejdow]	4	Voiced
2198	turtle	[ˈtʰɚɾɬ]	[ˈtʰɔdʌɬ]	3	Voiced
2200	beetle	[ˈbiɾɬ]	[ˈbijdʌɬ]	3	Voiced
2205	and a panda	[ænəˈpʰændə]	[ʔæ̃nəˈpʰæ̃ndɑ]	6	Voiced
2254	they're not eating	[ˌðɛɹnɑʔˈiɾɪŋ]	[ˈðijnɑʔˌijðĩŋ]	9	Voiced
2290	the turtle needs help	[ðətʰɚɾɬnidshɛɬpˀ]	[dɪˈtʰɔdənijzˌhɛɬpˀ]	6	Voiced
2328	turtle	[ˈtʰɚɾɬ]	[ˈtʰʌɬduwd]	5	Voiced
2383	they're eating	[ðɛˈɹiɾɪŋ]	[dɛˈʔijðĩŋ]	5	Voiced
2478	that's a nice bottle	[ˌðætsənaɪ̯sbɑɾɬ]	[dæsənajəˈbɑdʌɬ]	5	Voiced
			Voiceless		0
			Borderline		3
			Voiced		40

Appendix B - VOT and Revised Voicing Labels
Word-medial [k]

Record #	Orthography	Target	Realization	WM-U	Label
0158	cookie	[ˈkʰʊki]	[huwəˈtʰejkʰɪʔ]	76.00	Voiceless
0159	oh, cookie	[oʷkʰʊki]	[ˈowəˌtʰejkʰɛ]	81.00	Voiceless
0177	cookie	[ˈkʰʊki]	[hɪmojˈtʰejkʰɪʔ]	135.00	Voiceless
0414	uh, monkey	[ʌˈmʌŋki]	[ˈʊʔˌmʌ̃ŋkʰej]	26.00	Voiceless
0483	monkey	[ˈmʌŋki]	[ˈmækʰij]	68.00	Voiceless
0493	monkey	[ˈmʌŋki]	[ˈmækʰiːj]	72.00	Voiceless
0501	cookie	[ˈkʰʊki]	[ˈkʰɪkʰij]	91.00	Voiceless
0737	...cookie	[...ˈkʰʊki]	[...ˈkʰijkʰij]	94.00	Voiceless
0785	cookie	[ˈkʰʊki]	[ˈkʰejkʰij]	55.00	Voiceless
0934	crocodile	[ˈkʰɹɑkʰəˌdaʲəl]	[ˈkʰɑkʰəˌdajvə]	40.00	Voiceless
0976	vacuum	[ˈvækjuʷm]	[ˈbækʰɪ̃nʌ̃]	120.00	Voiceless
0978	...monkey and hippo	[ˌmʌŋkihənˈhɪpoʷ]	[...əˈmɛkʰijʔʌ̃nˈpʰʌ̃mˌbow]	81.00	Voiceless
0987	...crocodile	[ˈkʰɹɑkʰəˌdaʲəl]	[ˈhajkʰɛdə]	64.00	Voiceless
0991	eating cookie	[iɾɪŋkʰʊki]	[ʔajʔə̃ˈejtʰɪ̃ʔəˈkʰijkʰij]	55.00	Voiceless
1026	drive, monkey drive	[ˈd͜ʒɹaʲvˈmʌŋkiːˌd͜ʒɹaʲv]	[ə̃ˈd͡ʒajfˌmʌkʰijʔʊˈdɹajf]	36	Voiceless
1027	monkey drive	[ˈmʌŋkiːˌd͜ʒɹaʲv]	[ˈmɛkʰijˌd͡ʒaj]	43	Voiceless
1035	I like cookies	[aʲlaʲk˺ˈkʰʌkiz]	[ˌlalajˈkʰɪʔkʰijs]	117	Voiceless
1111	...man cooking	[mænkʰʌkɪŋ]	[...ˌmæ̃nʌ̃ˈkʰʊkʰɪŋə]	56	Voiceless
1133	cracker,cheese, ice cream	[ˈkʰɹɑkəɹˈt͜ʃiːzˈaʲskɹiːm]	[dætʰaˈkʰɔkʰʌ̃ˌdædənˈt͡ʃijʔʌˌɪkʰij]	40	Voiceless
1257	my working on a tie-dye	[maʲwɚkɪŋɑnəˈtʰaʲdaʲ]	[ˌmãjwɜkʰɪ̃jnɑ̃nə̆ˈtʰajdaj]	101	Voiceless
1266	...my working ...	[maʲwɚkɪŋ...]	[...ˈmajwʊkʰɪ̃nə]	59	Voiceless
1269	my working ...	[maʲwɚkɪŋ...]	[majˈwʊkʰɪ̃ŋ]	83	Voiceless
1272	chicken	[ˈtʃɪkn̩]	[ˈt͡ʃɪʔkʰijn]	81	Voiceless
1331	want popsicle on my plate	[wɑnt˺ˈpʰɑpsɪkəlɑnmaʲˌpʰleʲt]	[ʌ̃ˌpʰɑkʰəʔɪ̃majˈpʰajtʰ]	42	Voiceless
1348	cook a chicken	[kʰʊkətʃɪkn̩]	[ʌ̃ˈkʰʊkʰəˈt͡ʃɪkʰɪ̃n]	10	Borderline
1349	cook a chicken	[ˌkʰʊkəˈtʃɪkn̩]	[əˌkʰʊkʰəˈt͡ʃɪkʰɪ̃nəˈwʌ̃n]	16	Borderline
1512	mama is cooking	[mɑmɑɪzkʰʌkɪŋ]	[ˌmɑ̃məʔɪ̃nˈkʰʊkʰɪ̃jnə]	97	Voiceless
1513	...mama cooking, somebody eat to	[mɑmɑkʰʌkɪŋsʌmbʌdijitʰuʷ]	[ˈmɑ̃mijtʰejʔɛ̃nʌːˌmɑ̃mijˈtʰɛkʰɪt˺ʌʒʌ̃mbʌ.ijʔʌ̃ʔijˈtʰuw]	27	Voiceless
1537	I wanna... Bean in blanket	[ˈaʲwɑnə...ˌbiːnɪnˈblæŋkɪt]	[ʌˈwɑ̃nəbɪ̃ŋdɪbwɛ̃ŋkʰɪtʰʔɛ̃nɪ̃ˌbɛ̃ŋkʰɛ̃nt˺]	84	Voiceless

Appendix B - VOT and Revised Voicing Labels
Word-medial [k]

Record #	Orthography	Target	Realization	WM-U	Label
1538	blanket	[blæŋkɪt]	[ˈbwejkʰɪn]	69	Voiceless
1546	walking ... Bean	[wɑɬkɪŋ...biʲn]	[ˈwɑkʰijnɑ̃ʔɑːˌbijn]	48	Voiceless
1643	haircut	[hɛrkʰʌtˀ]	[ˈhɛkʰætʰ]	76	Voiceless
1657	yucky	[ˈjʌki]	[ˈlɛkʰij]	61	Voiceless
1678	they're waking up	[ðɛɹˌweʲkɪŋˈʌpˀ]	[ʔœwejkʰijnˈʔʌpʰ]	69	Voiceless
1840	I want go, something a cookie	[aʲwɑntgoʷsʌmpθɪŋəkʰʌki]	[ˌʔɐ̃mgowə̃ˌdʒ̆ɐ̃mpʰⁿɪnejˈkʰʌkʰij]	104	Voiceless
1841	I want chocolate	[aʲwɑnˈtʃɑkˀlətˀ]	[ʌˌwɐ̃nˈt́ʃɑkʰɑtʰ]	17	Borderline
1849	a ducky	[əˈdukˀ]	[əˈdʌkʰij]	57	Voiceless
1857	a ducky	[əˈdʌki]	[əˈdʌkʰij]	79	Voiceless
1883	wash the cookie	[ˌwɑʃðəˈkʰʊki]	[wɑʃðəˈkʰʊkʰij]	74	Voiceless
1912	monkey	[ˈmʌŋki]	[dəˈmɐ̃kʰij]	64	Voiceless
1936	...cookie	[ˈkʰʊki]	[...ˈʔæ̃nəˈkʰʊkʰij]	88	Voiceless
1946	making a quesadilla	[ˌmeʲkɪnəˌkʰeʲsɪˈdijɑ]	[ˈwejkʰⁿĩnəˌkʰijsəˈdija]	44	Voiceless
2167	pickles	[ˈpʰɪkɬz]	[ˈpʰɪkʰɔɬs]	62	Voiceless
2218	he's eating chicken	[hizɪrɪŋˈtʃɪkn̩]	[hijˌʔijɾĩŋˈʃɪkĩn]	43	Voiceless
2232	Ichobod	[ˈɪkəbɑd]	[ɪgəˈbɑːd]	5	Voiced
2268	and the duckies	[ˌændəˈdʌkiʲz]	[ʔɛ̃nəˈdʌkʰijs]	35	Voiceless
2295	pickles	[ˈpʰɪkɬz]	[ˈpʰɪkʰəɬs]	32	Voiceless
2299	chicken	[ˈtʃɪkn̩]	[ˈt́ʃɪkʰɛ̃n]	59	Voiceless
2304	I'm just making his	[aʲmdʒʌsmeʲkɪŋhɪz]	[ʃə̃mˈdɪsmejkʰⁿĩnəz]	39	Voiceless
2395	this marker's not working	[ðɪsˌmaɹkəˠznɑʔˈwəˠkɪŋ]	[dɪsˈmɑkʰənɑʔˌwʌkʰⁿijn]	39	Voiceless
2395	this marker's not working	[ðɪsˌmaɹkəˠznɑʔˈwəˠkɪŋ]	[dɪsˈmɑkʰənɑʔˌwʌkʰⁿijn]	48	Voiceless
2427	peacock	[ˈpʰikɑkˀ]	[ˈpʰijkʰɑ]	23	Voiceless
2441	the wacky witches	[ðəˌwækiˈwɪtʃɪz]	[ðəˌwækʰijˈwɪt́ʃɛz]	69	Voiceless
2481	bacon	[ˈbeʲkn̩]	[ˈbejˌkʰⁿĩn]	13	Borderline
2487	a pickle	[əˈpʰɪkɬ]	[əˈpʰɪkʰow]	40	Voiceless
2492	I want the wacky witches	[aʲˌwɑntˀðəˌwækiˈwɪtʃɪz]	[ʌwɑ̃nðəˌwɑkʰijˈwɪt́ʃəz]	73	Voiceless

Appendix B - VOT and Revised Voicing Labels
Word-medial [k]

Record #	Orthography	Target	Realization	WM-U	Label
			Voiceless		51
			Borderline		4
			Voiced		1

Appendix B - Revised Voicing Labels
Word-medial [g]

Record #	Orthography	Target	Realization	WM-U	Label
0386	again	[əˈgɛn]	[ˈægɛʔ]	12.00	Borderline
0915	daddy duck	[dædidʌkˀ]	[dæθajnõmˈdʌgej]	10.00	Borderline
1131	mango	[ˈmæŋgoʷ]	[ˈmẽgow]	15	Borderline
1264	piggy come	[ˈpʰɪgitʰuʷ]	[ˌpʰɪgijˈkʰɤ̃mna]	10	Borderline
0396	again	[əˈgɛn]	[ˈʌjgæʔ]	9.00	Voiced
0906	that's a piggy	[ðætsəˈpʰɪgi]	[ˈtʰætʰaˌpʰɪgij]	6.00	Voiced
1006	doggie	[dɑgi]	[ˈbɪkʰˌdɑgij]	6	Voiced
1219	piggy too	[ˈpʰɪgitʰuʷ]	[əˈpʰɪgijˌtʰuw]	7	Voiced
1250	piggy	[ˈpʰɪgi]	[ˈpʰɪgijˌ]	4	Voiced
1300	piggy	[ˈpʰɪgi]	[ˈpʰɪgij]	6	Voiced
1301	piggy	[ˈpʰɪˌgi]	[ˈpʰɪgiːj]	5	Voiced
1389	doggie, mom read that	[dɑgimɑmɹɛdðæt]	[ˌdɑgijəˈmɑ̃ɹijˌdæ]	3	Voiced
1406	piggy, two piggy	[pʰɪgitʰuʷpʰɪgi]	[ˈpʰɪgijtʰuwˌpʰijgij]	5	Voiced
1406	piggy, two piggy	[pʰɪgitʰuʷpʰɪgi]	[ˈpʰɪgijtʰuwˌpʰijgij]	6	Voiced
1448	doggies	[ˈdɑgiz]	[ˈdɑgija]	7	Voiced
1528	wagon	[ˈwægn̩]	[ˈwægɰ̃n]	8	Voiced
1701	yogurt	[ˈjoʷgəˑtˀ]	[ˈjʌgɛtʰ]	4	Voiced
1823	I'll get doggy	[aɟɬgɛtˀdɑgi]	[aˈgɛtˀˌdɑgij]	7	Voiced
2094	doggie	[ˈdɑgi]	[ˈdɑgij]	4	Voiced
2421	a wagon	[əˈwægn̩]	[əˈwejgɛ̃n]	4	Voiced
2424	kangaroo	[ˌkʰæŋgəˈɹuʷ]	[ˈkʰwɛ̃ŋgəuw]	8	Voiced
			Voiceless		0
			Borderline		4
			Voiced		17

Appendix C - Onset Clusters
Obstruent+Lateral

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;04.18	blue	ˈbluw	ˈbuw	WI-1						1		
1;05.00	blue	ˈbluw	əˈbwuːw	WI-1				1				
1;05.29	plate	ˈplejt	hʊˈwɛː	WI-1								1
1;05.29	blue	ˈbluw	ˈbuw	WI-1						1		
1;05.29	dragonfly	ˈdɹægənˌflaj	ˈɛ̃gmijtʰə	WM-2								1
1;05.29	butterfly	ˈbʌɾəɹˌflaj	ˈfwɑ	WM-2				1				
1;05.29	dragonfly	ˈdɹægənˌflaj	ˈɛmɪhĩ	WM-2								1
1;05.29	airplane	ˈɛɹplejn	ˈɛ̃fʊ	WM-2								1
1;06.10	blue	ˈbluw	ˈbuw	WI-1						1		
1;06.10	plate	ˈplejt	ˈpʰæː	WI-1						1		
1;06.10	plate	ˈplejt	ʌ̃ˈpʰæː	WI-1						1		
1;06.10	airplane	ˈɛɹplejn	ˈɛ̃ʔˌhɛ̃n	WM-2								1
1;06.10	flower	ˈflɑwəɹ	õˌfõ	WI-1						1		
1;06.10	blue	ˈbluw	ˈbluw	WI-1	1							
1;06.10	bluebird	ˈbluwˌbəɹd	ˈbluwˌajs	WI-1	1							
1;06.10	blue	ˈbluw	ˈbwuːw	WI-1				1				
1;06.10	blue	ˈbluw	əˈbuwə	WI-1						1		
1;06.10	blue	ˈbluw	ˈbuw	WI-1						1		
1;06.10	blue	ˈbluw	ˈbuw	WI-1						1		
1;06.23	blue	ˈbluw	ˈbʊ	WI-1						1		
1;06.23	blue	ˈbluw	ˈbuw	WI-1						1		
1;07.27	uh, blue	ʔʌˈbluw	ʌgˈvuw	WI-1						1		
1;08.06	blue	ˈbluw	ˈbuːw	WI-1						1		
1;08.06	blue	ˈbluw	ˈbwuw	WI-1				1				
1;08.06	glass(?)	ˈglæs	majˈgæː	WI-1						1		
1;08.06	glass(?)	ˈglæs	mˌˈgæ	WI-1						1		

Appendix C - Onset Clusters
Obstruent+Lateral

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;08.06	plate	ˈplejt	ˈpwejtʰ	WI-1				1				
1;08.06	butterfly	ˈbʌtəɹˌflaj	ˈbɛfɛj	WM-2						1		
1;08.06	climbing trunk	ˌklajmɪŋˈtɹʌŋk	ˈkʰajŋənˈt͡ʃʌk˞	WI-1						1		
1;08.06	blue	ˈbluw	ˈbuw	WI-1						1		
1;08.11	airplane	ˈɛɹplejn	ɛˈpʰẽjn	WM-2						1		
1;08.11	airplane	ˈɛɹplejn	ɪnəˈʔæˌfẽːjn	WM-2						1		
1;08.11	plate	ˈplejt	ˈpʰej	WI-1						1		
1;08.11	blue	ˈbluw	m̩ˈbuw	WI-1						1		
1;08.11	blanket	ˈblæŋkət	ˈuwɹɛˌdɪ	WI-1								1
1;08.11	I want blanket	ˌajwantˈblæŋkət	ʌjwãˈbædij	WI-1						1		
1;08.11	want blanket	wantˈblæŋkət	ãʔˈbædiːj	WI-1						1		
1;08.11	flower(?)	ˈflawəɹ	ˈhwɑdʊ	WI-1		1						
1;08.11	airplane	ˈɛɹplejn	ʊˈpʰɛ̃n	WM-2						1		
1;08.11	I want blanket	ʔajˌwantˈblaŋkət	ˈowbʌˌd͡ʒij	WI-1						1		
1;08.22	mm, blue	m̩ˈbluw	m̩ˈbuw	WI-1						1		
1;08.22	blue	ˈbluw	ˈbuw	WI-1						1		
1;08.22	blue	ˈbluw	ˈbuw	WI-1						1		
1;08.22	blue	ˈbluw	m̩ˈbluw	WI-1	1							
1;08.22	clock	ˈklɑk	ˈkʰɑkʰ	WI-1						1		
1;08.22	um, block	ʔʌmˈblɑk	ˌʌ̃ːmˈbwɑkʰ	WI-1				1				
1;08.22	airplane	ˈɛɹˌplejn	ˈʔɛ̃ˌfẽj	WM-2						1		
1;08.22	blue	ˈbluw	ˈbluːw	WI-1	1							
1;08.22	blue	ˈbluw	ˈbuw	WI-1						1		

Appendix C - Onset Clusters
Obstruent+Lateral

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;09.11	blue	ˈbluw	ˈbuwə	WI-1						1		
1;09.11	blocks	ˈblɑks	ˈbwɑkʰ	WI-1				1				
1;09.11	clock	ˈklɑk	ˈkʰɑkʰ	WI-1						1		
1;09.11	...flowers	ˈflɑwəɹz	ˈpʰwʊlʌ	WI-1		1						
1;09.11	glasses	ˈglæsəz	ˈgæʃə	WI-1						1		
1;09.11	blue and red and purple too	bluwənɹɛdənˈpɜɹpəɬˌtuw	ˌwuwɑ̃nəˈwɛdʔɑ̃nˈpʰɜpʰʌˌtʰuwə	WI-1					1			
1;09.11	airplane	ˈɛɹˌplejn	ʔʌ̃mˈpʰẽjn	WM-2						1		
1;09.11	...blue one	ˈbluwwʌn	ˈbuwwʌ̃nə	WI-1						1		
1;09.11	airplane	ˈɛɹˌplejn	ˈʔɛˌpʰẽjn	WM-2						1		
1;09.11	a blue one	əˈbluwwʌn	ʌ̃nˈbuwʌ̃n	WI-1						1		
1;09.11	blue one	ˈbluwwʌn	ˈbuwʌ̃n	WI-1						1		
1;09.11	blue one	ˈbluwwʌn	ˈbuwʌ̃nə	WI-1						1		
1;09.11	that's a blue and a purple	ðætsəˌbluwɛndəˈpɜɹpəɬ	əˈdætʰʌˌbuwə̃nəˈbɔpʰʌ	WI-1						1		
1;09.11	clock	ˈklɑk	ˈkʰɑkʰ	WI-1						1		
1;09.11	I want blow	ˌajwantˈblow	ʌ̃ˈwɑ̃ːbow	WI-1						1		
1;09.11	that's a blue one	ˌðætsəˈbluwwʌn	ˌdætʰəˈbuwʌ̃n	WI-1						1		
1;09.26	black	ˈblæk	ˈbækʰ	WI-1						1		
1;09.26	clothes	ˈklowðz	ˈkʰʌəd	WI-1						1		
1;09.26	airplane	ˈɛɹˌplejn	ˈʔɛ̃ˌpʰẽjlə	WM-2						1		
1;09.26	butterflies	ˈbʌtəɹˌflajz	ˈbɛˌfaj	WM-2						1		
1;09.26	airplane	ˈɛɹˌplejn	ˈʔɛˌpʰẽjn	WM-2						1		

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
				70	4	2	0	7	1	50	0	6
					6%	3%	0%	10%	1%	71%	0%	9%
				CC	19%							
1;10.10	black	ˈblæk	mˌˈbwækʰ	WI-1				1				
1;10.10	plate	ˈplejt	ˈpʰejt˥	WI-1						1		
1;10.10	airplane	ˈɛɹˌplejn	ˈɛpʰwẽjn	WM-2				1				
1;10.10	...black one	ˈblækwʌn	ˈblækʰwʌ̃n	WI-1	1							
1;10.10	want popsicle on my plate	wantˈpɑpsəkʌɬɑnmajˌplejt	ʌ̃ˌpʰɑkʰəʔĩmajˈpʰajtʰ	WI-1						1		
1;10.10	...b, blue one	bəˈbluwˌwʌn	bəˈbwuwwʌ̃n	WI-1				1				
1;10.10	plate	ˈplejt	mˌˈpwejtʰ	WI-1				1				
1;10.10	...climbing a ladder	ˌklajmɪŋəˈlæɾəɹ	ˈkʰajmijməˈlædɔ	WI-1						1		
1;10.10	clothes	ˈklowz	ˈkʰwowwəz	WI-1				1				
1;10.10	glasses	ˈglæsəz	əˈgæt͡ʃɑ	WI-1						1		
1;10.10	blue one, want blue one mom	ˌbluwwʌnˌwantˈbluwwʌnˌmɑm	buwˈwẽnəʔãˈbuwwʌ̃nˌmɑ̃m	WI-1						1		
1;10.10	blue one, want blue one mom	ˌbluwwʌnˌwantˈbluwwʌnˌmɑm	buwˈwẽnəʔãˈbuwwʌ̃nˌmɑ̃m	WI-1						1		
1;10.10	butterfly	ˈbʌtəɹˌflaj	əˈbwɛɹˌfaj	WM-2						1		
1;10.24	plate	ˈplejt	ʌ̃mˈpʰwejt	WI-1				1				
1;10.24	want plate	wantˈplejt	awəˈpʰwej	WI-1				1				

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;10.24	airplane	ˈɛɹˌplejn	ˈʔɛˌpʰẽj	WM-2						1		
1;10.24	airplane	ˈɛɹˌplejn	ˈhɜˌpʰẽj	WM-2						1		
1;10.24	that guy ... blue	ˈðætgajˌbluw	dəˈðætˀˈgajʔə̃ʔəˈblu w	WI-1	1							
1;10.24	uh, blow	ʔʌˈblow	ʌ̃ˈfuw	WI-1								1
1;10.24	blow	ˈblow	ʌ̃mˈbəoːw	WI-1						1		
1;10.24	bean in my blanket(?)	ˌbijnɪnmajˈblæŋkət	ˈbejŋgowˌwʌːʔəˌbɹẽ ŋkʰε̃n	WI-1				1				
1;10.24	I wanna... Bean in blanket	ajwɑnəˈbijnɪnˌblæŋ kət	ʌˈwɑ̃nəbĩŋdɪbwɛ̃ŋkʰɪtʰʔɛ̃nĩˌbɛ̃ŋkʰε̃ntˀ	WI-1						1		
1;10.24	blanket	ˈblæŋkət	ˈbwejkʰɪn	WI-1				1				
1;11.08	I wanna play that	ajˌwɑnəˈplejˌðæt	ˊajwɑ̃ˌpʰwejˈdæː	WI-1				1				
1;11.08	blue one	ˈbluwˌwʌn	ˈbwuwɛ̃n	WI-1				1				
1;11.08	airplane	ˈɛɹˌplejn	ˈɛpʰẽjn	WM-2						1		
1;11.08	blue	ˈbluw	ˈbuw	WI-1						1		
1;11.08	flowers	ˈflɑwəɹz	ˈawʌs	WI-1							1	
				28	2	0	0	11	0	13	1	1
					7%	0%	0%	39%	0%	46%	4%	4%
				CC	46%							
1;11.27	get the plates	ˌgɛtðəˈplejts	ˈʔʊdəˌpʰwejts	WI-1				1				
1;11.27	my plate	majˈplejt	ˈmajˌplajtʰ	WI-1	1							
1;11.27	plate	ˈplejt	ˈpʰwejtʰ	WI-1				1				

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;11.27	playing beads	ˌplejɪŋˈbijdz	pwejĩŋˈbijdzə	WI-1				1				
1;11.27	blue	ˈbluw	ˈbwuw	WI-1				1				
1;11.27	I want chocolate	ˌajwantˈt͡ʃɑklət	ʌˌwɐ̃nˈt͡ʃɑkʰɑtʰ	WM-U						1		
2;00.04	clean	ˈklijn	ɐ̃mˈkʰɥijn	WI-1				1				
2;00.04	cleaning water	ˈklijnɪŋˌwɑtəɹ	ˌɬijəˈwɑda	WI-1								1
2;00.04	airplanes	ˈɛɹˌplejnz	ˈʔɛˌpʰɥẽjn	WM-2				1				
2;00.04	in big glasses	ɪnˌbɪgˈglæsəz	ʔĩnbɪgˈglæʒɛð	WI-1	1							
2;00.04	clock	ˈklɑk	bɯwˈhɑ	WI-1						1		
2;02.03	plate	ˈplejt	ˈpwej	WI-1				1				
2;02.03	blue	ˈbluw	ˈbwuw	WI-1				1				
2;02.03	airplane	ˈɛɹˌplejn	ˈʔɛpwẽjn	WM-2				1				
2;02.03	another plate	əˈnʌðəɹˌplejt	ˈnʌðˌpʰlejtʰ	WI-1	1							
2;02.03	you got blue?	juwˌgɑtˈbluw	jəˈgɑˌbuw	WI-1						1		
2;02.03	blue	ˈbluw	bəˈjʊ	WI-1								1
2;02.03	got blue?	gɑtˈbluw	gaˈbwuw	WI-1				1				
2;02.03	butterfly	ˈbʌtəɹˌflaj	ˈbʌˌfwaj	WM-2				1				
2;02.03	a blue one	əˈbluwwʌn	ʌˈbowˌwɐ̃n	WI-1						1		
2;02.03	the airplane	ðəˈɛɹˌplejn	ðəˈʔɛɹpwẽjn	WM-2				1				
2;02.03	and blue	ɛndˈbluw	ɐ̃nˈbluw	WI-1	1							

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;02.03	and black mom	ɛndˈblækˌmɑm	æ̃nˈblækʰˌmɑ̃m	WI-1	1							
2;02.03	airplane	ˈɛɹˌplejn	ˈʔɛpʰwejn	WM-2				1				
2;02.03	this my place	ðɪsˈmajˌplejs	ðɪsˌmajˈpwejs	WI-1				1				
2;02.22	a plate	əˈplejt	ʔəˈpʰwejtʰ	WI-1				1				
2;02.22	black	ˈblæk	ˈbwækʰ	WI-1				1				
2;02.22	airplane	ˈɛɹˌplejn	ˈʔɛˌpʰlejn	WM-2	1							
2;02.22	glasses	ˈglæsəz	ˈkʰwæθɪz	WI-1		1						
2;02.22	slide	ˈslajd	ˈlaːjtʰ	WI-1					1			
2;02.22	airplane	ˈɛɹˌplejn	ˈʔɛpwẽjn	WM-2				1				
2;02.22	butterfly	ˈbʌtəɹˌflaj	ˈbwɛfaj	WM-2						1		
2;02.22	butterfly	ˈbʌtəɹˌflaj	ˈbwɛfaj	WM-2						1		
2;02.22	this Mowgli's gum	ðɪsˈmowglijzˌgʌm	ˈdɪsmowgijˌgɐ̃m	WM-U						1		
2;03.03	you play with this?	juwˌplejwɪθˈðɪs	juwpʰə̆lawˈdɪ	WI-1								1
2;03.03	claws	ˈklɑz	ˈwɑəs	WI-1								1
2;03.03	blue	ˈbluw	ˈbwuw	WI-1				1				
2;03.03	black ball	ˈblækˈbɑɬ	ˈblækʰˌbɑɬ	WI-1	1							
2;03.03	airplane	ˈɛɹˌplejn	ˈʔæpʰwĩn	WM-2				1				
2;03.03	blowing away	ˌblowɪŋəˈwej	bwowĩnəˈwej	WI-1				1				
2;03.03	something on a plate	ˌsʌmθɪŋɑnˈplejt	ˌsɐ̃mpʰ̃ĩŋɑ̃nəˈpʰwejt ˥	WI-1				1				

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;03.03	there's my glasses	ˌðɛɹzmajˈglæsəz	ðɛzmajˈgwæsəz	WI-1				1				
2;03.03	how about the blanket slide?	hawəbawtðəˈblæŋkətˌslajd	hawbawtdəˈblɛ̃ŋgɪt ˈˌslajd	WI-1	1							
2;03.03	put the blanket slide	pʊtðəˈblæŋkətˌslajd	ˈpʰʊðəˈblɛ̃ŋkʰɪtˈˌt͡saj	WI-1	1							
2;03.03	I don't wanna play with Kathy's toys	ʔajdowntˌwɑnəplej wɪθˈkæθijzˌtojz	ʔajõwˈwɑ̃əpʰwejˈkʰ æðijˌtʰɔj	WI-1				1				
2;03.03	claws	ˈklɑz	ˈkʰlɔəz	WI-1	1							
2;03.03	bleed	ˈblijd	ˈbwijd	WI-1				1				
2;03.17	it's a airplane	ˌɪtsəˈɛɹˌplejn	ɛ̃dəˈʔɛˌpwɛ̃jn	WM-2				1				
2;03.17	black	ˈblæk	bəˈwækʰ	WI-1								1
2;03.17	plate	ˈplejt	ˈpwejtʰ	WI-1				1				
2;03.17	blue	ˈbluw	ˈbwuw	WI-1				1				
2;03.17	he's tickling	hijzˈtɪklɪŋ	hijsˈtʰɪkl̃ɪŋ	WM-U	1							
2;03.17	look, it's flying away	ˌlʊkʔɪtsˈflajɪŋəˌwej	ˈlʌkʰʔɪtfʌnəˈwej	WI-1						1		
2;03.17	plane	ˈplejn	ˈwɛ̃jn	WI-1					1			
2;03.17	airplane	ˈɛɹˌplejn	ˈʔɛpwɛ̃jn	WM-2				1				
2;03.17	the flashing one	ðəˈflæʃɪŋwɔn	dəˈpʰlæʃijˌwʌ̃n	WI-1			1					

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;03.17	we want the plate	wijˈwantðəˌplejt	wijˈwãndəˌpʰlejtˀ	WI-1	1							
2;03.27	plate	ˈplejt	ˈplej	WI-1	1							
2;03.27	plate	ˈplejt	ˈpʰwejtˀ	WI-1				1				
2;03.27	they wanna play with the ij	ðejwɑnəˈplejwɪθˌm	dejˈwãdɛˌwãpʰwej wɪtˀˈðɅm	WI-1				1				
2;03.27	wanna play with the horse	wɑnəˌplejwɪθðəˈhɔ ɹs	ˈdõwãʔpwejˌwɪθðəˈ hɔəθɛ	WI-1				1				
2;03.27	you wanna play with us	juwwɑnəˈplejwɪˌθʌ s	ˈjuwãəˌplijwɪˈθʌθ	WI-1	1							
2;03.27	that, I'm gonna blow	ðætˌʔajmgownəˈbl ow	ˈdæʔajŋgɅ̃ˌbwow	WI-1				1				
2;03.27	green and blue	ˌgɹijnɛndˈbluw	ˈgwijnæ̃ˈbwuw	WI-1				1				
2;03.27	this blue	ðɪsˈbluw	ˈdɪθˌbluw	WI-1	1							
2;03.27	what's that blue thing?	watsðætˈbluwˌθɪŋ	Ʌðæˈbwuwˌθĩŋ	WI-1				1				
2;04.29	got claws on	gɑtˈklɑzɑn	gɑtˀˈwɑzɑ̃nɪtʰ	WI-1				1	1			
2;04.29	blue	ˈbluw	ˈbwuwə	WI-1				1				
2;04.29	or black	ɔɹˈblæk	ɔˈbwækʰ	WI-1				1				
2;05.12	I play green thing	ajˌplejˈgɹijnθɪŋ	ɑʔˈfmejˌkwijpˀθĩŋs	WI-1		1						
2;05.12	claws	ˈklɑz	ˈpʰwɑːz	WI-1		1						
2;05.12	I'm just playing	ajmˌd͡ʒʌstˈplejɪŋ	Ʌ̃ʔɅ̃mˈd͡ʒɪsˌpʰlẽjŋ	WI-1	1							

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;05.12	we played Mrs. McGregor	ˌwijplejdmɪsmɪkˈgɹɛgəɹ	wəˌpwejˈmɪsəzməˈgweja	WI-1				1				
2;05.12	climbing in the	ˈklajmɪŋɪnðə	ˈklajmĩɪŋĩnðʊ	WI-1	1							
2;05.12	purple and blue	ˌpɜɹpəɬendˈbluw	ˌpʰɔpʰəæ̃nˈwuw	WI-1					1			
2;05.12	I'll have a chocolate one	ajɬhævəˈt͡ʃɑklətˌwʌn	ˈɑɬhævəˈt͡ʃɑklɛtˀˌwʌ̃n	WM-U	1							
2;05.12	a chocolate one	əˈt͡ʃɑklətˌwʌn	əˈt͡ʃɑklɛtˀwʌ̃n	WM-U	1							
2;05.12	wanna have some chocolate one?	wɑnəhævsʌmˈt͡ʃɑklətˌwʌn	uwˌhæsʌ̃mˈt͡ʃɑklɪtˀwʌ̃n	WM-U	1							
2;05.12	blue	ˈbluw	ˈbwuw	WI-1				1				
2;05.12	I like the chocolate	ajˌlajkðəˈt͡ʃɑklət	əlajkˀðəˈt͡ʃɑklɛtˀ	WM-U	1							
2;05.12	chocolate	ˈt͡ʃɑklət	ˈtʰɑgɑˌlɛʔ	WM-U								1
2;05.12	blue	ˈbluw	ˈbwuw	WI-1				1				
2;05.12	cause he got sharp claws	kʌzhijgɑtˌʃɑɹpˈklɑz	kʰʌzhijˈgɑtˀθʌˌpwɑz	WI-1		1						
2;05.25	no, its a plate	ˌnowʔɪtsəˈplejt	nʌtsəˈpwejtʰ	WI-1				1				
2;05.25	and black	ɛndˈblæk	æ̃nˈbwæː	WI-1				1				

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;05.25	blue	ˈbluw	ˈbwuw	WI-1				1				
2;05.25	this blue	ðɪsˈbluw	ˌdɪsˈbwuw	WI-1				1				
2;05.25	it's a airplane	ɪtsəˈʔɛɹˌplejn	səˈʔɛɹpʰwẽjn	WM-2				1				
2;05.25	it's flying	ɪtsˈflajɪŋ	ˈɪsθəˌfwajĩŋ	WI-1				1				
2;05.25	I got blueberry bagel	ajgatˌbluwbɛɹijˈbej gəɬ	ajgaˌbwuwbɛɹijˈbej gəɬ	WI-1				1				
2;05.25	he played drums	hijˌplejdˈdɹʌmz	wijˌpʰwejˈdɹɐ̃ms	WI-1				1				
2;05.25	it's blowing	ɪtsˈblowɪŋ	əˈblowĩŋ	WI-1	1							
2;05.25	blowed	ˈblowd	ˈbwow	WI-1				1				
2;05.25	What doing her clothes?	watˌduwɪŋhɜɹˈklowz	wʌduwəhʌˈkʰwoːwð	WI-1				1				
2;05.25	blowing the wind	ˌblowɪŋðəˈwɪnd	ˈpʰowĩŋəˈwẽnd	WI-1						1		
2;06.02	Let's play with car	lɛtsˈplejwɪθˌkɑɹ	ʊtˀˈðɛɪðʔəθˌkʰɑ	WI-1								1
2;06.02	blue	ˈbluw	ˈbwuw	WI-1				1				
2;06.02	Blue right here	ˌbluwɹajtˈhɪɹ	ˈbwuwwajˈkʰija	WI-1				1				
2;06.02	flowers	ˈflɑwəɹz	ˈfawʌz	WI-1						1		
2;06.02	the trees blowing in it	ðəˌtɹijzˈblowɪŋɪnɪt	dəˈtɹijˈbwowijñĩnɪ	WI-1				1				
2;06.02	It's blowing away	ɪtsˈblowɪŋəˌwej	ɪˈblowijəˌd͡ʒʌˈwejɛ	WI-1	1							

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;06.02	blocks	ˈblɑks	ˈblɑks	WI-1	1							
2;06.02	airplane	ˈɛɹplejn	ˈɛˌpwẽjn	WM-2				1				
2;06.02	I wanna see your glasses	ajwɑnəˌsijɔɹˈglæsəz	ʔsijəˈgwæθəð	WI-1				1				
2;06.02	Yeah, I wanna see your glasses	jæʔajwɑnəˌsijɔɹˈglæsəz	ˈjæ̃nθijəˌgwʌ	WI-1				1				
2;06.02	black	ˈblæk	ˈbwækʰ	WI-1				1				
2;06.02	That's a ladder can climb up	ðætsəˌlædəɹkænˈklajmʌp	ˈðæθəˈbaəˌkʰæˈkʰwajˈmʌpʰ	WI-1				1				
				108	24	4	1	58	4	10	0	7
					22%	4%	1%	54%	4%	9%	0%	6%
				CC	81%							

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Obstruent+Rhotic

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;04.18	Gabriella	ˈgæbɹijˌɛɬa	ˈʃɛzɬæ	WM-U								1
1;04.18	Gabriella	ˈgæbɹijˌɛɬa	ˈhɛðæ	WM-U								1
1;05.29	truck	ˈtɹʌk	ˈt͡ʃʌə	WI-1						1		
1;05.29	truck	ˈtɹʌk	ɪˈt͡ʃʊʔə	WI-1						1		
1;05.29	throw(?)	ˈθɹow	ˈd͡ʒow	WI-1						1		
1;05.29	dragonfly	ˈdɹægənˌflaj	ˈɛ̃gmijtʰə	WI-1								1
1;05.29	dragonfly	ˈdɹægənˌflaj	ˈɛmɪhĩ	WI-1								1
1;06.10	brown(?)	ˈbɹawn	əˈbɑkˀ	WI-1						1		
1;06.10	oh, truck	owˈtɹʌk	ˈoːwuːwˌt͡ʃʌkˀ	WI-1						1		
1;06.10	oh, truck	owˈtɹʌk	ˌowʔˈt͡ʃʌʔ	WI-1						1		
1;06.10	garbage truck	ˈgaɹbəd͡ʒˌtɹʌk	ˈbejt͡ʃʌ	WI-1						1		
1;06.10	garbage truck	ˈgaɹbəd͡ʒˌtɹʌk	ˈbɛʃ̃ɛ̃	WI-1						1		
1;06.10	oh, garbage truck	owˈgaɹbəd͡ʒˌtɹʌk	ˌoːwbejˈʃæ	WI-1						1		
1;06.10	tree	ˈtɹij	ˈt͡ʃij	WI-1						1		
1;06.10	tree	ˈtɹij	ˈʃijə	WI-1						1		
1;06.23	truck(?)	ˈtɹʌk	ˈt͡ʃʊʔ	WI-1						1		
1;06.23	tree	ˈtɹij	ˈsjij	WI-1		1						
1;07.27	truck	ˈtɹʌk	ˈt͡ʃʌkʰ	WI-1						1		
1;07.27	garbage truck	ˈgaɹbəd͡ʒˌtɹʌk	bæˈt͡ʃɛkʰ	WI-1						1		
1;07.27	uh, tractor(?)	ʔʌˈtɹæktəɹ	ə̃nnʊəˈkʰijm	WI-1								1
1;07.27	uh, gran	ʔʌˈgɹæn	ʌ̃ˈʔõnɑ	WI-1								1
1;08.06	tractor	ˈtɹæktəɹ	əˈt͡ʃɛtˠt͡ʃʌ̃ː	WI-1						1		
1;08.06	truck	ˈtɹʌk	ˈt͡ʃʌkʰ	WI-1						1		
1;08.06	tree	ˈtɹij	ənəˈʃijʔˌtʰɪð	WI-1								1
1;08.06	tree	ˈtɹij	ˈkʰij	WI-1						1		

Appendix C - Onset Clusters
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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;08.06	giving tree	ˈgɪvɪŋˌtɹij	ˈgijvˌtʰiːj	WI-1						1		
1;08.06	giving tree	ˈgɪvɪŋˌtɹij	ɐ̃ˈbijˈd͡ʒiːj	WI-1						1		
1;08.06	climbing trunk	ˌklajmɪŋˈtɹʌŋk	ˈkʰajŋənˈt͡ʃʌkˀ	WI-1						1		
1;08.11	throw away	ˌθɹowəˈwej	ˌuwʃowˈveːj	WI-1						1		
1;08.11	tractor	ˈtɹæktəɹ	ˈkʰæt͡ʃɬɑ	WI-1						1		
1;08.11	truck	ˈtɹʌk	ˈʃɑʔ	WI-1								1
1;08.11	treehouse	ˈtɹij ˌhaws	ˈtʰijˌhʌw	WI-1						1		
1;08.22	um, brown	ʔʌmˈbɹawn	ɐ̃mˈbawn	WI-1						1		
1;08.22	mm, green	mˌˈgɹijn	ɐ̃ːˈgẽjn	WI-1						1		
1;08.22	brush(?)	ˈbɹʌʃ	ˈbʌt͡ʃ	WI-1						1		
1;08.22	uh, Grandma	ʔʌˈgɹændma	ɐ̃ˈgæ̃mmɑ	WI-1						1		
1;08.22	green	ˈgɹijn	ʊˈgijŋə	WI-1						1		
1;08.22	truck	ˈtɹʌk	ˈt͡ʃɹʌkʰ	WI-1	1							
1;08.22	throw away	ˌθɹowəˈwej	ˈvwowəˌvej	WI-1		1						
1;08.22	...up tree	ʔʌpˈtɹij	ʌpʰəˈt͡ʃij	WI-1						1		
1;09.11	fridge	ˈfɹɪd͡ʒ	ˈpʰɪ̃mpʰ	WI-1								1
1;09.11	crocodile	ˈkɹɑkədajəɬ	ˈkʰɑkʰəˌdajvə	WI-1						1		
1;09.11	grass	ˈgɹæs	ˌnˈdæs	WI-1						1		
1;09.11	boat ... drive	ˈbowtˌdɹajv	ˈbowtʰəʔɐ̃wɑ̃nədəˈdɹajv	WI-1	1							
1;09.11	crocodile	ˈkɹakədajəɬ	ˈhækʰadə	WI-1						1		
1;09.11	...crocodile	ˈkɹakədajəɬ	ˈhajkʰɛdə	WI-1						1		
1;09.11	...drink	ˈdɹɪŋk	əˈmajˌd͡ʒɪ̃ŋkʰə̃	WI-1						1		
1;09.11	oh, green one	ʔowˈgɹijnwʌn	oːwˈgijnˌwɐ̃n	WI-1						1		
1;09.11	green one	ˈgɹijnwʌn	ˈgɪuwˌwɐ̃n	WI-1						1		

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;09.11	drive, monkey drive	dɹajvˈmʌŋkijˌdɹajv	ə̃ˈd͡ʒajfˌmʌkʰijʔʊˈdɹajf	WI-1						1		
1;09.11	drive, monkey drive	dɹajvˈmʌŋkijˌdɹajv	ə̃ˈd͡ʒajfˌmʌkʰijʔʊˈdɹajf	WI-1	1							
1;09.11	monkey drive	ˈmʌŋkijˌdɹajv	ˈmɛkʰijˌd͡ʒaj	WI-1						1		
1;09.11	hippo drive	ˈhɪpowˌdɹajv	ɐ̃ʔəˈpʰɛ̃mbowĩˌdəʁajf	WI-1								1
1;09.11	hippo drive	ˈhɪpowˌdɹajv	mˌˈpʰɛ̃mˈbowə̃ˌd͡ʒaj	WI-1						1		
1;09.11	drive	ˈdɹajv	ˈdwajvtʰə	WI-1				1				
1;09.11	I'm crying	ajmˈkɹajɪŋ	ɐ̃ːŋˌmãjwowˈkʰwajn	WI-1				1				
1;09.11	I'm crying in bed	ajmˈkɹajɪŋɪnˌbɛd	ɛ̃nɐ̃ˌmajuwˈkʰwãjnɑ̃ˈbɛtʰ	WI-1				1				
1;09.11	green	ˈgɹijn	ˈgĩjn	WI-1						1		
1;09.11	mushroom	ˈmʌʃɹuwm	ˈhɐ̃ˌsuːw	WM-U						1		
1;09.11	cracker,cheese, ice cream	ˌkɹækəɹˌt͡ʃijzˈʔajskɹijm	dætʰaˈkʰɔkʰɐ̃ˌdædənˈt͡ʃijʔʌˌɪkʰij	WI-1						1		
1;09.11	cracker,cheese, ice cream	ˌkɹækəɹˌt͡ʃijzˈʔajskɹijm	dætʰaˈkʰɔkʰɐ̃ˌdædənˈt͡ʃijʔʌˌɪkʰij	WI-1						1		
1'09.26	truck	ˈtɹʌk	ˈt͡ʃʌkʰ	WI-1						1		
1'09.26	riding ... truck	ˌɹajdɪŋˈtɹʌk	owˈɹajdəʔʌdʔowəˈt͡ʃʌkʰ	WI-1						1		
1'09.26	brush	ˈbɹʌʃ	ɐ̃ˈbas	WI-1						1		
1'09.26	brushing	ˈbɹʌʃɪŋ	ɐ̃ˈdɛsĩŋə	WI-1						1		
1'09.26	brushing	ˈbɹʌʃɪŋ	ˈdɹɛsijnʌ	WI-1			1					

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1'09.26	...up a tree	ˌʌpəˈtɹij	ˈʔʌpʰəˌt͡ʃij	WI-1						1		
1'09.26	truck	ˈtɹʌk	ˈt͡ʃʌkʰ	WI-1						1		
				68	3	2	1	3	0	49	0	10
					4%	3%	1%	4%	0%	72%	0%	15%
				CC	13%							
1;10.10	one two three four five	ˌwʌntuwˌθɹijfɔɹˈfajv	ˌɛ̃ntʰuwˌfwijfɔˈfaj	WI-1		1						
1;10.10	two brush	ˈtuwˌbɹʌʃ	ˈtʰuwbwɛːˌʃtʰ	WI-1				1				
1;10.10	no want broken	ˌnowwantˈbɹowkən	ˈnowəəwɐ̃ˈbwowkʰɛ̃n	WI-1				1				
1;10.10	grapes	ˈgɹejps	ˈgwɛəpʰ	WI-1				1				
1;10.10	trucks	ˈtɹʌks	ˈt͡ʃʌ	WI-1						1		
1;10.10	tractor	ˈtɹæktəɹ	ˈkʰɑt͡ʃɐ̃m	WI-1						1		
1;10.10	...driving a truck	ˌdɹajvɪŋəˈtɹʌk	ˌhajmijɛ̃tʰəˈɹʌkʰ	WI-1						1		
1;10.10	...driving a truck	ˌdɹajvɪŋəˈtɹʌk	ˌhajmijɛ̃tʰəˈɹʌkʰ	WI-1								1
1;10.10	grapes	ˈgɹejps	ˈɛgstʰ	WI-1							1	
1;10.10	mushrooms	ˈmʌʃɹuwm	ˈmʌˌʃow	WM-U						1		
1;10.24	want the truck	ˌwantðəˈtɹʌk	ʌˈwɑ̃ntˀʔɪˈt͡ʃʌkʰ	WI-1						1		
1;10.24	one two three five	ˌwʌntuwθɹijˈfajv	dəˈwʌ̃nˌtʰuwfwijfjætʰ	WI-1		1						
1;11.08	one, two, three	ˌwʌntuwˈθɹij	ˈwɐ̃nˈtʰuwˈfwij	WI-1		1						
1;11.08	I take off all the bruise	ajˌtejkafɑɬðəˈbɹuwz	əˌtʰejkʰɑfɑlɜ̃ˈbwuwd	WI-1				1				

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;11.08	take ... bruise off	tejkˈbɹuwzaf	ˈtʰɛkʰəmbʊˈʔɑʔəbʌ bwuwzɑf	WI-1				1				
1;11.08	country	ˈkʌntɹij	ˈkʰɐ̃nt͡ʃij	WM-U						1		
1;11.08	oh, country	ʔowˈkʌntɹij	ˈowˌkʰɛ̃nt͡ʃij	WM-U						1		
1;11.08	one, two, three	ˌwʌntuwˈθɹij	ˈwɐ̃nˈtʰuwˈfwij	WI-1				1				
1;11.08	to have a brush too	tuwhævəˈbɹʌʃˌtuw	hənaːwbəʃˈhuw	WI-1						1		
1;11.08	that guy driving a	ðætˈgajˌdɹajvɪŋə	dæˈgajˌdwajvijnʌʔ	WI-1				1				
1;11.08	that drives	ðætˈdɹajvz	dæˈdwajv	WI-1				1				
1;11.08	green	ˈgɹijn	ˈgiːjn	WI-1						1		
1;11.08	tractors	ˈtɹæktəɹz	ˈt͡ʃʌʃɛʔ	WI-1						1		
1;11.08	frogs	ˈfɹɑgz	ˈfwɑ	WI-1				1				
1;11.27	bread	ˈbɹɛd	ˈbwɛd	WI-1				1				
1;11.27	that's the ground	ˌðætsðəˈgɹawnd	ˈdæzəˌgawn	WI-1						1		
1;11.27	in the front	ɪnðəˈfɹʌnt	ɐ̃nəˈfwɐ̃ntʰ	WI-1				1				
1;11.27	truck	ˈtɹʌk	ˈt͡ʃɥʌkˀ	WI-1						1		
				28	0	3	0	11	0	12	1	1
					0%	11%	0%	39%	0%	43%	4%	4%
				CC	50%							
2;00.04	ice cream	ˈajsˌkɹijm	ʔijkʰijjɔədˀʔaˈbɛlij	WI-1						1		
2;00.04	and a bread	ɛndəˈbɹɛd	ˌãndəˈbwɛd	WI-1				1				
2;00.04	more dresses	ˌmɔɹˈdɹɛsəz	məˈdɹɛsɪz	WI-1	1							

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;00.04	we need more dresses	wijˌnijdməɹˈdɹɛsəz	wijnijmɔˈdɹɛsɛð	WI-1	1							
2;00.04	bring it	ˈbɹɪŋɪt	ˈbwĩŋɪtʰ	WI-1				1				
2;00.04	dresses	ˈdɹɛsəz	ˈdwɛʃɛð	WI-1				1				
2;00.04	all of dresses	ɑɬʌvˈdɹɛsəz	ˈɑːɬˈdɹɛsɛðə	WI-1	1							
2;00.04	three	ˈθɹij	ˈfwij	WI-1		1						
2;00.04	frogs	ˈfɹɑgz	ˈfwɑg	WI-1				1				
2;00.04	trucks	ˈtɹʌks	ˈt͡ʃʌkˀ	WI-1						1		
2;00.04	frogs	ˈfrɑgz	ˈwɑɪzə	WI-1					1			
2;00.04	frogs	ˈfɹɑgz	ˈpwɑgə	WI-1		1						
2;00.04	laundry	ˈlɑndɹij	ˈwãnd͡ʒij	WM-U						1		
2;00.04	mushroom	ˈmʌʃɹuwm	ˈmʌt͡ʃuw	WM-U								1
2;00.04	cracker	ˈkɹækəɹ	ˈkwækwa	WI-1		1						
2;00.04	bring in that book	bɹɪŋɪnˌðætˈbʊk	ˈwĩŋĩnæʔˈbʊkʰ	WI-1					1			
2;00.04	tree	ˈtɹij	ˈtwijə	WI-1				1				
2;00.04	crying	ˈkɹajɪŋ	ˈχwajjãŋ	WI-1		1						
2;00.04	driver	ˈdɹajvəɹ	ˈdɥajf	WI-1				1				
2;00.04	zebra	ˈzijbɹa	ˈzijba	WM-U						1		
2;02.03	one, two, three and four	ˌwʌntuwˌθɹijɛndˈfɔɹ	ˈwʌ̃ntuwfwijəfɔə	WI-1		1						
2;02.03	brown one	ˈbɹawnˌwʌn	ˈbɹãwwʌ̃n	WI-1	1							
2;02.03	french fries	ˈfɹɛnt͡ʃˌfɹajz	ˈfɛ̃ntˀˌfaj	WI-1						1		
2;02.03	french fries	ˈfɹɛnt͡ʃˌfɹajz	ˈfɛ̃ntˀˌfaj	WI-1						1		
2;02.03	Gran's	ˈgɹænz	ˈgwæ̃ns	WI-1				1				
2;02.03	a zebra	əˈzijbɹa	əˈʒijbəʔɑ̃n	WM-U						1		

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;02.03	a frog	əˈfɹɑg	əˈfwɑg	WI-1				1				
2;02.03	trucks	ˈtɹʌks	ˈtʰə̆ɹʌks	WI-1								1
2;02.03	a green one	əˈgɹijnwʌn	əˈgwijnwə̃n	WI-1				1				
2;02.03	some frogs	sʌmˈfɹɑgz	sə̃mˈfwɑːs	WI-1				1				
2;02.03	Andrew	ˈændɹuw	ˈʔændɥuw	WM-U				1				
2;02.03	this ground	ˈðɪsˌgɹawnd	dɪsˈgwə̃wnd	WI-1				1				
2;02.03	this is the ground	ˌðɪsɪzðəˈgɹawnd	ˌdɪzəˈgwawn̩t̚	WI-1				1				
2;02.03	everybody in	ˈɛvɹijbɑdijʔɪn	ʔʌˈbajĩn	WM-U								1
2;02.03	he drips his	hijˈdɹɪpshɪz	ˌhijˈdrɪptʰɪð	WI-1	1							
2;02.03	I like the french fries	ajlajkˈfɹɛn͡tʃˌfɹajz	əlajkˤðəˈfɹɛ̃nˌfwaj	WI-1	1							
2;02.03	I like the french fries	ajlajkˈfɹɛn͡tʃˌfɹajz	əlajkˤðəˈfɹɛ̃nˌfwaj	WI-1				1				
2;02.03	don't drip it	downtˈdɹɪpɪt	ˈdownˌdɹɛpʰɪtʰ	WI-1	1							
2;02.22	brown	ˈbɹawn	ˈbwawn	WI-1				1				
2;02.22	grapes	ˈgɹejps	ˈgwejpˤ	WI-1				1				
2;02.22	train	ˈtɹejn	ˈpwejn	WI-1		1						
2;02.22	G for Gran	ˌd͡ʒijfɔɹˈgɹæn	ʔijfɔˈgwæ̃ːn	WI-1				1				
2;02.22	green	ˈgɹijn	ˈgwijn	WI-1				1				
2;02.22	she's a tree	ˌʃijzəˈtɹij	ʃijʔˈtʰwij	WI-1				1				
2;02.22	brown	ˈbɹawn	ˈbwawn	WI-1				1				
2;02.22	brown	ˈbɹawn	ˈbwawn	WI-1				1				
2;03.03	One, two, three, four, five	ˌwʌntuwˌθɹijfɔɹˈfajv	ˈwə̃nˈtʰuwˌfwijˈfɔəˈfajv	WI-1		1						
2;03.03	green	ˈgɹijn	ˈgwijn	WI-1				1				

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;03.03	they're all getting dry	ˌðɛɹɑɬgɛtɪŋˈdɹaj	ðɛˌʔɑ̃gɛɾ̃ɪŋˈdɹaj	WI-1	1							
2;03.03	they're dry	ðɛɹˈdɹaj	ðəˈdwaj	WI-1				1				
2;03.03	one, two, three	ˌwʌntuwˈθɹij	ˈwɐ̃nˈtʰuwˈfwij	WI-1		1						
2;03.03	a zebra and a peacock	əˌzijbɹəʔɛndəˈpijk ɑk	əˌzijbɹəæ̃nəˈpʰijkʰ ɑkʰ	WM-U	1							
2;03.03	a lot of fruit	əˌlɑtʌvˈfɹuwt	əlɑˈfwuwtʰ	WI-1				1				
2;03.03	right down the tree house	ˌɹajtdawnðəˈtɹijha ws	ˈwajt˺dawnəˈpʰijˌhaws	WI-1			1			1		
2;03.03	trucks	ˈtɹʌks	ˈbʌkʰ	WI-1			1			1		
2;03.03	my favorite bear	majˈfejvɹɪtˌbɛɹ	majˈfejvɪt˺ˌbɛa	WM-U						1		
2;03.17	he eats grass	hijˌʔijtsˈgɹæs	hijˈgwæ	WI-1				1				
2;03.17	he's licking the grass	hijsˈlɪkɪŋðəˌgɹæs	hijˈlɪkɐ̃ŋðijˌgɹæ	WI-1	1							
2;03.17	he's eating grass	hijzˌʔijtɪŋˈgɹæs	hijzˌijɾɪŋˈgwæs	WI-1				1				
2;03.17	to the train	tuwðəˈtɹejn	tʰuwðəˈtwejn	WI-1				1				
2;03.17	they're trucks	ðɛɹˈtɹʌks	ðəˈtwʌkʰ	WI-1				1				
2;03.17	library	ˈlajbɹɛɹij	ˈlajbwɛwij	WM-2				1				
2;03.17	frogs	ˈfɹɑgz	ˈwɑ	WI-1					1			
2;03.17	they got ice cream	ˌðejgɑtˈajsˌkɹijm	ˈðejgɑt˺ˈʔajswiːjm	WI-1					1			
2;03.17	One, two, three, four	wʌntuwθɹijˈfɔɹ	ˈwɐ̃ntʰuwfwijˌfɔa	WI-1		1						
2;03.17	wanna break it?	ˌwɑnəˈbɹejkɪt	ɐ̃mˈbɹejkʰɪt˺	WI-1	1							

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Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;03.17	I wanna break it	ˌajwɑnəˈbɹejkɪt	ʔajwɑ̃ˈbɹejkʰɪtʰ	WI-1	1							
2;03.17	brown	ˈbɹawn	ˈbwawn	WI-1				1				
2;03.17	it's pretty hot	ɪtsˌpɹɪtijˈhɑt	ɪsˈpʰɪtʰijˌhɑ	WI-1						1		
2;03.17	he can eat it with his trunk	hijkæˌnijtɪtwɪθhɪzˈtɹʌŋk	hijgɪˈnijəʔijɾɪʔɪθhɪzˈtʰwɑ̃ŋkʰ	WI-1				1				
2;03.17	grass	ˈgɹæs	ˈgwæ	WI-1				1				
2;03.27	not eating your dress	nɑtˌʔijtɪŋjɔɹˈdɹɛs	nɑʔijĩŋjʌˈdɹɛə	WI-1	1							
2;03.27	yeah, he want see a friendly one	ˌjæhijˌwantsijəˈfɹɛndlijwʌn	ˈjæhijwɑ̃nʔəˈsijəˈfɹɛ̃nwijˌwɑ̃n	WI-1	1							
2;03.27	he wanna go see a friendly monster	hijˌwɑnəgowsijəˌfɹɛndlijˈmɑnstəɹ	nowˈhijwɑ̃nəgʌˈsijəfɹɛ̃nlijˌmɑ̃nstʰa	WI-1	1							
2;03.27	under the bridge	ˌʌndəɹðəˈbɹɪd͡ʒ	zʌ̃ndʌðəˈbwɛd͡ʒ	WI-1				1				
2;03.27	he friendly one	hijˈfɹɛndlijˌwʌn	hɪðəˈfwɛ̃nwijˌwɑ̃n	WI-1				1				
2;03.27	everything out	ˈɛvɹijθɪŋˌawt	ˈʌ̃wijˌθɛ̃jŋˈʔawtʰ	WM-U					1			
2;03.27	brought the hat	ˌbɹɑtðəˈhæt	ˌbɑtdaˈhæt˧	WI-1						1		
2;03.27	there's turtle on your dress	ðɛɹsˈtɜɹtəɬɑnjɔɹˌdɹɛs	ðɪsˈtʰɔləʔɑ̃njɪˈdwɛs	WI-1				1				
2;03.27	they like frogs	ðejˌlajkˈfɹɑgz	ʌlajk˧ˈfwagz	WI-1				1				
2;03.27	they like frogs	ðejˌlajkˈfɹɑgz	ðɛlajk˧ˈvwɑgz	WI-1		1						
2;03.27	ya they're eating frogs	jæðɛɹˌʔijtɪŋˈfɹɑgz	jæðɛˈʔijðĩŋəˈwɑgs	WI-1					1			

Appendix C - Onset Clusters
Obstruent+Rhotic

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;03.27	I could try and take them out	ajkʊdˌtɹajɛndtejkðɛˈmawt	ʔajkʰəˈfɹajə̃nˌtʰejkˤðə̃ˈmawtˤ	WI-1			1					
2;03.27	look at the froggy	ˌlʊkætðəˈfɹɑgij	ʊghɪdˈfwɑgij	WI-1				1				
2;03.27	green and blue	ˌgɹijnɛndˈbluw	ˈgwijnæˈbwuw	WI-1				1				
2;03.27	green and blue	ˌgɹijnɛndˈbluw	ˈgwijnæˈbwuw	WI-1				1				
2;03.27	green	ˈgɹijn	ˈgwijn	WI-1				1				
2;03.27	it's my favorite guy	ɪtsmajˈfejvɹɪtˌgaj	ɪθmajˈfejvɹɪtˤˌgaj	WM-U	1							
2;03.27	he's very friendly	hijzˈvɛɹijˌfɹɛndlij	hɪvɛɹijˈfɛ̃nwij	WI-1						1		
2;04.29	inside his crib	ɪnˌsajdhɪzˈkɹɪb	ĩsajdˤˈkwɪb	WI-1				1				
2;04.29	you know how to break this?	juwnowˌhawtuwˈbɹejkðɪs	juwnəˈhawəˌbwejtˤdɪθ	WI-1				1				
2;04.29	I just saw some on the ground	ajd͡ʒʌstˌsɑsʌmɑnðəˈgɹawnd	ajˈd͡ʒʊsɑθʌ̃mɑ̃nəˌgwɑ̃wn	WI-1				1				
2;04.29	brown	ˈbɹawn	ˈbawn	WI-1						1		
2;04.29	the farm with Adrian	ðəˌfaɹmwɪˈθejdɹijən	wɪt͡ʃʷwejˌwĩˈʔejd͡ʒijwʌ̃n	WM-U						1		
2;05.12	he's trying get off of the	hijzˈtɹajɪŋgɛˑtɑfʌvðə	ɪsˈtɹɑ̃jnəgɛˈʔɑfədɪʔ	WI-1	1							
2;05.12	I play green thing	ajˌplejˈgɹijnθɪŋ	ɑʔˈfmejˌkwijpˤθĩŋs	WI-1		1						
2;05.12	green	ˈgɹijn	ˈgwijn	WI-1				1				
2;05.12	cream	ˈkɹijm	ˈkwijm	WI-1				1				

Appendix C - Onset Clusters
Obstruent+Rhotic

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;05.12	It's pretty creamy	its,pɹɪtijˈkɹijmij	ˈɪzpʰɪtʰijˌkwiːjm	WI-1						1		
2;05.12	It's pretty creamy	its,pɹɪtijˈkɹijmij	ˈɪzpʰɪtʰijˌkwiːjm	WI-1				1				
2;05.12	we played Mrs. McGregor	ˌwijplejdmɪsmɪkˈgɹɛgəɹ	wəˌpwejˈmɪsəzməˈgweja	WI-1				1				
2;05.12	everything	ˈɛvɹijθɪŋ	ˈɛvɹijθĩj	WM-U	1							
2;05.12	green	ˈgɹijn	ˈgwijn	WI-1				1				
2;05.12	I like them brown	ajˌlajkðɛmˈbɹawn	ˈajpʰɪtˤðʌ̃mˈbwãwn	WI-1				1				
2;05.12	brown	ˈbɹawn	ˈbwawn	WI-1				1				
2;05.12	brown	ˈbɹawn	ˈbãwn	WI-1						1		
2;05.25	green	ˈgɹijn	ˈgwijn	WI-1				1				
2;05.25	and brown	ɛndˈbɹawn	æ̃nˈbwawn	WI-1				1				
2;05.25	brown	ˈbɹawn	ˈbwawn	WI-1				1				
2;05.25	eyebrows	ˈajbɹawz	ˈajˌbwaw	WM-U				1				
2;05.25	this favourite...	ðɪsˈfejvɹət	ˈðɪsfwejvɹɪʔˌmajf	WM-U	1							
2;05.25	this favourite	ðɪsˈfejvɹət	ˌðɪsˈfwejvwɛtʰ	WM-U				1				
2;05.25	this my favourite colour	ðɪsmajˈfejvɹətˌkʌləɹ	ˈðɪsmajfwejwɪtˤˌkʰʌla	WM-U				1	1			
2;05.25	grey	ˈgɹej	ˈgwej	WI-1				1				
2;05.25	we saw some trucks	wijˌsɑsʌmˈtɹʌks	wijˈsɑsʌ̃mˌtwʌks	WI-1				1				
2;05.25	he played drums	hijˌplejdˈdɹʌmz	wijˌpʰwejˈdɹʌ̃ms	WI-1	1							
2;05.25	I want Gran	ˌajwantˈgɹæn	ʌwʌ̃ˈgwæ̃n	WI-1				1				

Appendix C - Onset Clusters
Obstruent+Rhotic

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;05.25	on the ground	ˌɑnðəˈgɹawnd	ɐ̃ndəˈgɹæ̃ːwn	WI-1	1							
2;05.25	a broom	əˈbɹuwm	əˈbwũwm	WI-1				1				
2;05.25	What's a frisbee mom?	watsəˈfɪɪzbijˌmɑm	ˈfwɪðbijˌmɑ̃m	WI-1				1				
2;05.25	a tractor	əˈtɹæktəɹ	əˈtɹækˀda	WI-1	1							
2;05.25	you hear the truck?	juwˌhɪɹðəˈtɹʌk	juwhɪɹəˈtɹʌkʰ	WI-1	1							
2;05.25	one, two, three	ˌwʌntuwˈθɹij	ˈwɐ̃nˌtʰuwˈfwij	WI-1		1						
2;05.25	a tractor	əˈtɹæktəɹ	əˈtɹækˀtʰa	WI-1	1							
2;05.25	trucks	ˈtɹʌks	ˈtɹʌks	WI-1	1							
2;06.02	uh oh where did that come from	ˌʔʌʔowwɛɹdɪdˌðæt kʌmˈfɹʌm	ʔʌʔʌwˌwɪðætˈkʰɐ̃ mˈfɐ̃m	WI-1						1		
2;06.02	the trees blowing in it	ðəˌtɹijzˈblowɪŋɪnɪt	dəˈtɹijˈbwowijnĩnɪ	WI-1	1							
2;06.02	broom	ˈbɹuwm	ˈbwuwm	WI-1				1				
2;06.02	umbrella	ʌmˈbɹɛlə	ˈɐ̃mˌbwɛla	WM-1				1				
2;06.02	one two three four five six seven eight nine	wʌntuwθɹijfɔɹfajv sɪksɛvənejtnajn	ˈwɐ̃ntʰuwˈfijfɔfajsɪ kˌsɛvĩejtˀˈnãjn	WI-1			1			1		
2;06.02	I wanna try it	ajˌwɑnəˈtɹajɪt	ɑ̃ndəˈtɹaj	WI-1	1							
2;06.02	Yeah, I wanna try it	ˌjæʔajˌwɑnəˈtɹajɪt	jæəˈtɹaj	WI-1	1							
2;06.02	A christmas tree	əˈkɹɪsmɪsˌtɹij	əˈkʰwɪsəˌwɪsˈtʰwiːj	WI-1				1				

Appendix C - Onset Clusters
Obstruent+Rhotic

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;06.02	A christmas tree	əˈkɹɪsmɪsˌtɹij	əˈkʰwɪsəˌwɪsˈtʰwiːj	WI-1				1				
2;06.02	a present	əˈpɹɛzɪnt	əˌpʰwɛˈðɛ̃n	WI-1				1				
2;06.02	Where did that come from?	wɛɹdɪdˈðætkʌmˌfɹʌm	ɜdɪˈdəʔˈkʰʌ̃mˌfɹʌ̃m	WI-1	1							
2;06.02	I'm trying to	ajmˈtɹajɪŋˌtuw	ʌ̃ˈtɹãjətʰuw	WI-1	1							
2;06.02	this is a trunk	ˌðɪsɪzəˈtɹʌŋk	dɪθɪðəˈtwʌ̃ŋkʰ	WI-1				1				
2;06.02	try to balance on it	tɹajtuwˈbalənˌsɑnɪt	ˈtɹajɾəˈbãwnsɑ̃nɪtˀ	WI-1	1							
2;06.02	there's no drink	ˌðɛɹznowˈdɹɪŋk	dɪðˈnowˌdɹ̃ĩŋkʰ	WI-1	1							
2;06.02	to drink	tuwˈdɹɪŋk	kʰɛ̃ˈdwĩŋkʰ	WI-1				1				
2;06.02	I lose my grip	ajˌluwzmajˈgɹɪp	əˈluwzmajˌgwɪpʰ	WI-1				1				
				146	32	12	4	69	7	19	0	3
					22%	8%	3%	47%	5%	13%	0%	2%
					CC	80%						
						117						

Appendix C - Onset Clusters
Obstruent+Glide

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C2Mod	C1Del	C2Del	CCDel	Oth
1;08.22	vacuum	ˈvækjuwm	ˈvækjuwˈkʰuwkʰuwˈvækʰjuwˌnɐ̃	WM-U	1						
1;09.11	vacuum	ˈvækjuwm	ˈbækʰ̚ĩnɐ̃	WM-U					1		
1;09.11	cucumber	ˈkjuwkʌmbəɹ	ˈkʰɐ̃mabɑː	WI-1							1
1;11.27	I want the penguin	ajˌwantðəˈpɛŋgwɪn	ʌwɑ̃nðəˈpʰɛ̃ŋˌwɐ̃n	WM-U				1			
2;00.04	so cute	sowˈkjuwt	səʔsʊˈkʰjɨowtʰ	WI-1	1						
2;02.03	penguin	ˈpɛŋgwɪn	ˈpʰɛ̃ŋwĩn	WM-U				1			
2;02.22	penguins	ˈpɛŋgwɪnz	ˈpʰɛ̃ŋwĩns	WM-U				1			
2;03.03	penguin	ˈpɛŋgwɪn	ˈpʰɛ̃ŋwĩn	WM-U				1			
2;06.02	no this one is a square	nowˌðɪswʌmɪsəˈskwɛɹ	mɑ̃mˈdɪθwɐ̃nɪðəˌkwɛ	WI-1	1						

Appendix C - Onset Clusters
s+Obstruent

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;04.18	uh, Steve	ʌˈstijv	ʌəˈt͡ʃiːj	WI-1								1
1;05.29	stroller	ˈstɹowləɹ	ˈhɜtʰʌ	WI-1								1
1;05.29	stroller	ˈstɹowləɹ	əˈd͡ʒɛphõ	WI-1								1
1;05.29	spoon	ˈspuwn	ˈpʰũːw	WI-1					1			
1;05.29	spoon	ˈspuwn	ˈpʰuw	WI-1					1			
1;05.29	spoon	ˈspuwn	ˈpʰuw	WI-1					1			
1;05.29	spoon	ˈspuwn	ˈpʰow	WI-1					1			
1;08.11	squeeze	ˈskwijz	ˈçiːj	WI-1					1			
1;08.11	squeeze	ˈskwijz	ˈnɪ	WI-1					1			
1;08.22	squeeze	ˈskwijz	ˈkʰeːjv	WI-1					1			
1;09.11	spoon	ˈspuwn	ˈpʰõw	WI-1					1			
1;09.11	...tiny stairs	tajnijˈstɛɹz	ˈtʰãjˈtʰɛjə	WI-1					1			
1;09.11	tiny stairs	tajnijˈstɛɹz	˜ˈtʰãjˈtʰɛ	WI-1					1			
1;09.11	tiny stairs	tajnijˈstɛɹz	ˈtʰajnˌtʰɛ	WI-1					1			
1;09.11	spoon cook	spuwnˈkʊk	əˈpʰuwẽnˈkʰʊkə	WI-1					1			
1;10.10	spoon	ˈspuwn	ˈpʰũw	WI-1					1			
1;10.10	spicy	ˈspajsij	ˈpʰajsij	WI-1					1			
1;10.10	stand up	ˌstænˈdʌp	uwˈtʰæmʌpʰ	WI-1					1			
1;10.10	there's a spoon	ˌðɛɹzəˈspuwn	ˈbɛzɛˌpʰuwŋ	WI-1					1			
1;10.10	...steaming	ˈstijmɪŋ	ˈtʰijˈmijnə	WI-1					1			
1;10.10	spoon	ˈspuwn	ˈpʰũwə	WI-1					1			
1;10.24	and spoon and knife	ɛndˌspuwnɛndˈnajf	ɤ̃ˈpʰuwnʔəʔɤ̃ʔˈnajf	WI-1					1			

Appendix C - Onset Clusters
s+Obstruent

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;11.08	can't find my spoon	kantˌfajndmajˈspuwn	ˌkʰɛ̃ˈfwajmajsmuw	WI-1				1				
1;11.27	have you seen my spoon	hævˈjuwsijnmajˌspuwn	ʔɤ̃ʔfəmajˈpʰuwnə	WI-1					1			
2;00.04	spoons	ˈspuwnz	ˈpʰuwuwnə	WI-1					1			
2;00.04	all the ice cream spilled	ɑɬðəˈʔajskɹijmˌspɪɬd	ˈʔɑːɬʔijtʰijmˈpʰɪɬdə	WI-1					1			
2;02.03	a spoon	əˈspuwn	əˈpʰuwn	WI-1					1			
2;02.03	in my stroller	ɪnmajˈstɹowləɹ	˜ĩnˌmajˈt͡ʃɹʌlɑ	WI-1								1
2;02.03	something spicy	ˌsʌmθɪŋˈspajsij	ˌsɤ̃mpʰ˜ĩŋˈpʰajsij	WI-1					1			
2;02.03	this your spoon	ðɪsˈjɔɹˌspuwn	ˈdɪʃjuwˈpʰuwn	WI-1					1			
2;02.22	a spoon	əˈspuwn	ʔʌˈpʰuwn	WI-1					1			
2;02.22	a spoon	əˈspuwn	˜ʔʌˈpʰjuwn	WI-1					1			
2;02.22	strawberries	ˈstɹaˌbɛɹijz	ˈtʰwɑːbejz	WI-1					1			
2;03.03	a stem	əˈstɛm	əˈtʰɛ̃m	WI-1					1			
2;03.03	a spoon	əˈspuwn	ʔəˈpʰɨuwn	WI-1					1			
2;03.03	oops, I stubbed my toe	ˌuwpsʔajˌstʌbdmajˈtow	ˈʔuwpsəˈstʰʌb˞majˈtʰaw	WI-1	1							
2;03.17	spoon	ˈspuwn	ˈpʰuw	WI-1					1			
2;03.17	they're standing his hat	ðɛɹˌstændɪŋhɪzˈhæt	ðɪˈðæ̃wijhɪzˌhæ	WI-1								1

Appendix C - Onset Clusters
s+Obstruent

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;03.17	splash	ˈsplæʃ	ˈpwæʃ	WI-1					1			
2;03.17	that spoon	ðætˈspuwn	ˈdætˀˌpʰuwn	WI-1					1			
2;03.27	I'm squeezing it	ajmˈskwijzɪŋɪt	ˌʌ̃ŋˈkwijvĩɲɪtˀ	WI-1					1			
2;04.29	and a spoon	ɛndəˈspuwn	ˈʔæ̃nəˌpʰũw	WI-1					1			
2;04.29	there's the spoon	ˌðɛɹzðəˈspuwn	dəθdəˈpʰuːwn	WI-1					1			
2;05.12	ice cream store	ˌajskɹijmˈstɔɹ	ˈajkʰˌθɔwa	WI-1								1
2;05.12	the going at the ice cream store	ðəˌgowɪŋætðəˈajskɹijmˌstɔɹ	nɑʔɛtˀdəˈʔajkˀˈkwĩjmˌtʰɔə	WI-1					1			
2;05.12	he goin' at the ice cream store	hijˌgowənætðəˈajskɹijmˌstɔɹ	hɪgowĩnætˀðəˈʔajskwijmˌtʰɔwa	WI-1					1			
2;05.12	they're standing up	ðɛɹˌstændɪŋˈʌp	ðɔˈtʰæ̃nĩnʌpˀ	WI-1					1			
2;05.12	I dont like strawberries	ajdowntˈlajkˌstɹɑbɛɹijz	aowˈlajkˀˌtwɑwɛwij	WI-1					1			
2;05.12	there's some sprinkles over here	ðɛɹzsʌmˈspɹɪŋkəɬzowvəɹˌhɪɹ	ðɛɹsʌ̃mˌpwĩnkʌɬowəˈhijajtʰ	WI-1					1			
2;05.12	mom, I have some sprinkles?	ˌmɑmʔajhævsʌmˈspɹɪŋkəɬz	mʌ̃mˈʔajhæsʌ̃mˌpwĩnkʰəɬs	WI-1					1			

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s+Obstruent

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;05.12	mom, I have some sprinkles?	ˌmɑmʔajhævsʌmˈspɹɪŋkəɬz	ˈmɑ̃majhæsʌ̃mˌpwĩŋkʰəɬs	WI-1					1			
2;05.12	I want some sprinkles	ajˌwantsʌmˈspɹɪŋkəɬz	ɑˈwɑ̃ʔθʌ̃mˌpʰwĩŋkʰəɬs	WI-1					1			
2;05.12	some sprinkles	ˌsʌmˈspɹɪŋkəɬz	ˌsʌ̃mˈpʰ˜ĩŋkʰəɬs	WI-1					1			
2;05.12	dogs like have sprinkles?	dɑgzˌlajkhævˈspɹɪŋkləz	ˈdɑgðˌlajk˞hævˈpwĩŋkʰəɬs	WI-1					1			
2;05.12	no, dogs can't eat sprinkles	nowˌdɑgskæntˈʔijtˌspɹɪŋkləz	ˈnowdɑgsˌkʰæ̃nʔijt˞pw˜ĩnkʰəɬs	WI-1					1			
2;05.25	on street	ɑnˈstɹijt	ɑ̃nˈtɹij	WI-1					1			
2;05.25	wanna go to circus school?	wɑnəgowtuwˈsɜɹkəˌskuwɬ	wʌ̃nˈgowtʰuwðˈsɪɹkʰɛðˌkʰʊɬ	WI-1					1			
2;05.25	What's a stage?	ˌwatsəˈstejd͡ʒ	ʌtʰəˈtʰejd͡ʒ	WI-1					1			
2;05.25	it spilled	ɪtˈspɪɬd	ɪt˞ˈpʰɪɬ	WI-1					1			
2;06.02	say stop	sejˈstɑp	ˈθejˈtʰɑp˞	WI-1					1			
2;06.02	say stop	sejˈstɑp	ˈθejsˌtʰɑpʰ	WI-1					1			
2;06.02	stop	ˈstɑp	ˈtʰɑ	WI-1					1			
2;06.02	stop	ˈstɑp	ˈdɑ	WI-1					1			
2;06.02	stop	ˈstɑp	ˈtʰɑpʰ	WI-1					1			
2;06.02	stop	ˈstɑp	ˈtʰɑp˞	WI-1					1			
2;06.02	it's a square	ɪtsəˈskwɛɹ	ʔɪsəˈkwæ	WI-1					1			

Appendix C - Onset Clusters
s+Obstruent

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;06.02	no this one is a square	now,ðɪswʌmɪsəˈskwɛɹ	mɑ̃mˈdɪθwɑ̃nɪðə,kwɛ	WI-1					1			
				67	1	0	0	1	59	0	0	6
					1%	0%	0%	2%	88%	0%	0%	9%
				CC	3%							

Appendix C - Onset Clusters
s+Lateral

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
1;08.11	slide	ˈslajd	ˈθlajˌwɪɬ	WI-1			1					
1;08.11	slide	ˈslajd	ˈsl̥aj	WI-1	1							
1;08.22	a slide	əˈslajd	əˈslajtʰ	WI-1	1							
1;08.22	a slide	əˈslajd	ɛˈslaːj	WI-1	1							
1;08.22	a slide... wee, down	əˈslajdwijˌdawn	əˈslajdãdəˈwiːjˈdɑwn	WI-1	1							
1;09.11	that's a big slide	ðætsəˈbɪgˌslajd	ˈdætʰəbɪˌɬajtʰ	WI-1								1
2;00.04	all sleepy	ɑɬˈslijpij	ˌʔɑɬˈɬijpʰijnə	WI-1								1
2;02.22	slide	ˈslajd	ˈlaːjtʰ	WI-1					1			
2;03.03	I'll swing on that slide	ajɬˌswɪŋɑnðætˈslajd	ʔejˈswĩŋẽnˈðæt˞ˌslaj	WI-1	1							
2;03.03	I go on slide	ˌʔajgowɑnˈslajd	ʔejˌgowənˈslajd	WI-1	1							
2;03.03	how about the blanket slide?	hawəbawtðəˈblæŋkət ˌslajd	hawbawtdəˈblẽŋgɪt˞ˌ slajd	WI-1	1							
2;03.03	put the blanket slide	pʊtðəˈblæŋkətˌslajd	ˈpʰʊðəˈblẽŋkʰɪt˞ˌt͡saj	WI-1								1
2;03.03	I really wanna slide	ʔajˌɪɪlijwɑnəˈslajd	ʔʌˈwɪlijˈwãnəˌslajd	WI-1	1							
2;03.17	going to sleep	ˌgowɪŋtuwˈslijp	gowĩnˈzejpʰ	WI-1						1		
2;03.17	I got a slipper on	ajgɑtəˈslɪpəɹɑn	aˌgɑt˞ˈslɪpʰɑ̃n	WI-1	1							
2;03.27	he just wanna go sleep	hijd͡ʒʌstˌwɑnəgowˈslijp	jæˈhijdɪswãəgəˌslijp˞	WI-1	1							
2;03.27	they gotta go sleep	ðejˌgɑtəgowˈslijp	ðejˈgɑəˌgowslijp˞	WI-1	1							

Appendix C - Onset Clusters
s+Lateral

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C1Mod	C2Mod	C1Del	C2Del	CCDel	Oth
2;03.27	I wanna go sleep	ajˌwɑnəgowˈslijp	ʌˈwɑ̃gowˌslijpˀ	WI-1	1							
2;03.27	wanna go sleep right now	ˌwɑnəgowˌslijpɹajtˈnaw	wɑ̃nəgowslijpˀˌwajtˀˈnaw	WI-1	1							
2;03.27	no I want to go to sleep	nowajˌwantuwˌgowtuwˈslijp	ˈnowʌ̃ngəɾəˌslijpʰ	WI-1	1							
2;03.27	I just wanna go sleep	ajd͡ʒʌstˌwɑnəgowˈslijp	ˈʔajd͡ʒʌswʌ̃əgowˌslijp	WI-1	1							
2;06.02	a slide	əˈslajd	əˈfwajd	WI-1		1						
				22	15	1	1	0	1	1	0	3
					68%	5%	5%	0%	5%	5%	0%	14%
				CC	77%							

Appendix C - Onset Clusters
s+Nasal

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C2Mod	C1Del	C2Del	CCDel	Oth
1;08.22	snow	ˈsnow	ˈnow	WI-1				1			
1;09.11	snail	ˈsnejɬ	ˈmij	WI-1				1			
				2	0	0	0	2	0	0	0
					0%	0%	0%	100%	0%	0%	0%
				CC	0%						
2;00.04	smoke	ˈsmowk	ˈθmowkʰ	WI-1		1					
2;02.03	I don't want a smaller one	ajdowntˈwantəˌsmɑləɹˌwʌn	ɤ̃owˈwɑ̃ʔɛsmajɤ̃ˌwɤ̃n	WI-1	1						
2;03.03	you get the small one	juwgɛtðəˈsmɑɬˌwʌn	juwgɪdəˌsmɑɬˈwɤ̃n	WI-1	1						
2;03.03	the snow	ðəˈsnow	ðəˈsnowə	WI-1	1						
2;03.17	you have to see snowy one	juwˌhævtuwsijˈsnowij wʌn	juwˈhæftʰəsijˈhnowijˌ wɤ̃n	WI-1		1					
2;03.17	the snowy one	ðəˈsnowijwʌn	ʔɪˈsnowɤ̃ŋˌwɤ̃n	WI-1	1						
2;05.12	too small	ˌtuwˈsmɑɬ	ˈtʰuwsmɑɬ	WI-1	1						
2;05.25	a snake	əˈsnejk	əˈθnej	WI-1		1					
2;05.25	and a small boat	ɛndəˌsmaɬˈbowt	æ̃nəˈθmɑˌbowtʰ	WI-1		1					
				9	5	4	0	0	0	0	0
					56%	44%	0%	0%	0%	0%	0%
				CC	100%						

Appendix C - Onset Clusters
s+Glide

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C2Mod	C1Del	C2Del	CCDel	Oth
1;08.06	swing, swing	ˈswɪŋˌswɪŋ	ˈhwĩŋˈpwijn	WI-1		1					
1;08.06	swing, swing	ˈswɪŋˌswɪŋ	ˈhwĩŋˈpwijn	WI-1		1					
1;08.11	swing	ˈswɪŋ	ˈʍĩŋ	WI-1				1			
1;08.11	swing	ˈswɪŋ	əˈɸwĩŋ	WI-1		1					
1;08.22	swing	ˈswɪŋ	ˈpʰɛg	WI-1							1
1;08.22	swing	ˈswɪŋ	ˈɸwĩŋ	WI-1		1					
1;09.11	a swing	əˈswɪŋ	ʌˈɸwĩŋʌ	WI-1		1					
1;09.11	...mommy's on the swing too	ˈmɑmijzɑnðəswɪŋˌtuw	mɅ̃mijʌvəˌfwĩŋəˈtʰu wə	WI-1		1					
1;11.08	duck swim	ˈdʌkˌswɪm	nowˈdʌkˌswɛ̃m	WI-1	1						
1;11.08	duck swim back	ˌdʌkswɪmˈbæk	ˌdʌkswejˈbækˀ	WI-1	1						
1;11.27	swimming	ˈswɪmɪŋ	ˈwĩmijnə	WI-1				1			
2;00.04	swing around	ˌswɪŋəˈɹawnd	ˈwĩŋəˌwawn	WI-1				1			
2;00.04	swimming	ˈswɪmɪŋ	ˈɸwɪmijɛ̃	WI-1		1					
2;00.04	the little one is swimming	ðəˌlɪtəɬwʌnɪzˈswɪmɪŋ	dəˈlɪɬwɅ̃nˌswĩmĩŋ	WI-1	1						
2;00.04	sweeping	ˈswijpɪŋ	fwɪˈpʰijdə	WI-1		1					
2;02.03	the horse don't swim	ðəˌhɔɹsdowntˈswɪm	dəˈhɔləˌfwĩm	WI-1		1					
2;02.03	she can't swim	ˈʃijkæntˌswɪm	ˈʃijkʰɑ̃ˌfwĩm	WI-1		1					
2;02.03	she can swim	ˈʃijkænˌswɪm	əˈʃijkʰəˌfwĩm	WI-1		1					
2;03.03	I'll swing on that slide	ajɬˌswɪŋɑnðætˈslajd	ʔejˈswĩŋɛ̃nˈðætˀˌslaj	WI-1	1						
2;03.17	swimming pool	ˈswɪmɪŋˌpuwɬ	ˈwĩmĩŋˌpʰɨuwɬ	WI-1				1			
2;03.27	it's a swing	ɪtsəˈswɪŋ	ɪzəˈswĩŋ	WI-1	1						
2;04.29	swim	ˈswɪm	ˈwĩm	WI-1				1			

Appendix C - Onset Clusters
s+Glide

Age	Utterance	IPATarget	IPAActual	Position	TL	CCMod	C2Mod	C1Del	C2Del	CCDel	Oth
2;05.25	swimming swimming?	ˌswɪmɪŋˈswɪmɪŋ	ˌfwĩmĩnəˈfwĩmĩŋ	WI-1		1					
2;05.25	swimming swimming?	ˌswɪmɪŋˈswɪmɪŋ	ˌfwĩmĩnəˈfwĩmĩŋ	WI-1		1					
2;05.25	know how to swim	nowˌhawtuwˈswɪm	nowˈhawtʰuwˌfwĩm	WI-1		1					
2;05.25	I wanna go on the little swing	ajˌwɑnegowɑnðəˈlɪtəɬˌ swɪŋ	ajˈwɑ̃nəgowĩnðəlɪɾəɬˌ fwĩŋ	WI-1		1					
2;05.25	and Eric swing me	ɛnˌdeɹɪkˈswɪŋmij	ˈɛ̃nʔɛwkˈfwĩŋˌmij	WI-1		1					
2;05.25	a sweepy	əˈswijpij	əˈfwɪðbij	WI-1		1					
2;06.02	a swing	əˈswɪŋ	əˈfwĩŋ	WI-1		1					
2;06.02	just swim	ˌd͡ʒʌstˈswɪm	əˈd͡ʒɪfwĩːm	WI-1		1					
				30	5	19	0	5	0	0	1
					17%	63%	0%	17%	0%	0%	3%
				CC	80%						