Utilizing Audiovisual Stimuli in the Classroom to Facilitate Pronunciation of French Stop Consonants

by Caleb J. Pecue, Bachelor of Arts

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Advisory Committee:

Kristine Hildebrandt, Chair

Seran Aktuna

Larry LaFond

Graduate School
Southern Illinois University Edwardsville
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CHAPTER I

INTRODUCTION

How one acquires a second language has been the topic of discussion for the past century. From vocabulary-acquisition to grammar-acquisition, to acquisition of conversation, many researchers have explored the intricacies of learning a second language. Many of these studies couple production and perception experiments together; however, in this thesis, I only study the production aspect. The perception element of this study should be studied in future experiments. In addition, if production comes after perception, it is unlikely that students perceive French stop consonants as different from English stop consonants.

Many researchers who study SLA recognize that production and perception can proceed at different rates, and in different ways. This study focuses on production; particularly how second language learners of French (English L1) produce voiceless stop consonants in word-initial position.

French stops are unlike English stops in the way they are aspirated. While French voiceless stops /p, t, k/ are realized as unaspirated or unreleased [p̚, t̚, k̚], English voiceless stops are realized as aspirated [p^h, t^h, k^h], specifically, in word-initial position. However, this is not something that can be easily taught given that aspiration is a sub-phonemic and not easily distinguishable.

Because audiovisual stimuli exposure has been shown to be beneficial to, specifically, vocabulary-acquisition, and somewhat mixed reviews to grammar-acquisition, this study expands the idea to target-like production-acquisition of stop consonants. This study takes a longitudinal look at the production of stop consonants in English learners of French and the benefits, if any, to utilizing audiovisual stimuli in the classroom as a facilitator to acquiring

target-like production. Being that this is an expansion on the audiovisual stimuli exposure studies, much of the literature on the specific topic is indirectly related.

Chapter Two of this thesis reviews three types of literature: a) audiovisual stimuli exposure in L2 classrooms, b) voice-onset time for both English and French, and c) second language teaching of pronunciation (CALL). It includes an introduction to voice onset time (VOT), a discussion on place of articulation (POA) as well as the experiments conducted on the benefits to audiovisual stimuli for various types of acquisition: vocabulary and grammar.

Chapters Three through Six focus on the study and the results. Chapter Three presents the methodology and steps took to obtain the data. Chapter Four present the results for the native speakers recorded: French and monolingual English speakers to form a basis of comparison. Chapters Five and Six present the results for the learners. Chapter Five examines first all of the learners as an undistinguished group, then it looks at the two groups, control and experimental, independently, finally it compares the two independent groups to one another. Chapter Six examines the two groups across their proficiency levels: first, at the macro level, looking at the learners as a whole, then at the micro level, looking at the experimental group in depth. Finally, subjects whose productions support the hypothesis are compared with those whose productions do not support the hypothesis.

Chapter Seven concludes this paper by summarizing the findings with a discussion on further studies and the limiting factors of this study.

CHAPTER II

LITERATURE REVIEW

Section 2.1: Introduction

The goal of this thesis is to analyze whether or not L2 target-like production is facilitated by the exposure to audiovisual stimuli, specifically, whether or not learners are able to more accurately produce French-like stop VOT's through time and with exposure to particular instructional stimuli. Throughout this study, prominent questions were asked and examined:

1. Which group shows more progression towards French-like VOT in production across sessions, beginner-levels or intermediate-levels?
2. Is there a noticeable difference between VOT in words produced in isolation versus in carrier phrases?
3. Do we see a continuous, linear progression in French-like VOT through time, or does the change plateau in this progression between Sessions 1 and 4?
4. What are the phonetic differences between stops in L1 French and English?

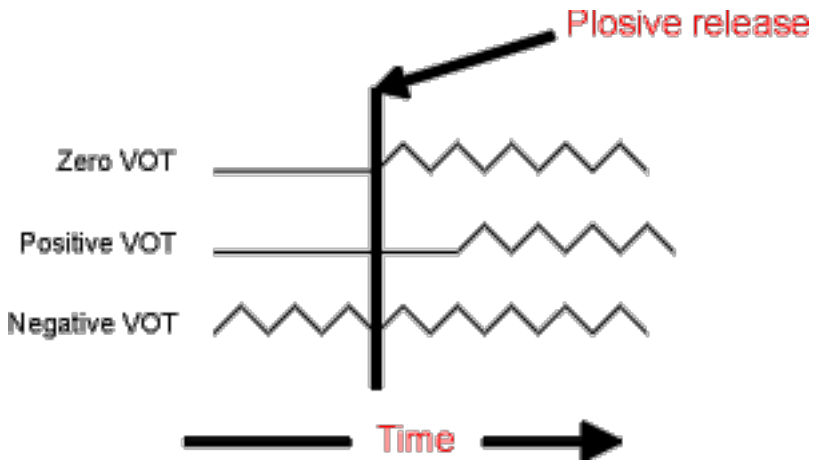
In this chapter, I will present selected review of second language acquisition (SLA) literature through exposure to audiovisual stimuli and on voiceless stop consonant VOT duration differences between English and French. In addition, I will present research on Computer Assisted Language Learning (CALL), which has connections to this study.

Section 2.2: Voiceless Stop Consonants, English and French VOT

One way in which stop consonants may be described is in terms of their voicing and their aspiration. Whalen et al. (2007) define aspiration phonetically as a function of Voice Onset Time (VOT), namely, "the time between the onset of laryngeal vibration and the

release of a stop" (p. 341). From an impressionistic perspective, aspirated voiceless stops are produced with an extra "puff" of air upon the release of the stop closure, while unaspirated voiceless stops lack this extra "puff." VOT is considered positive when the stops are released prior to voice onset and negative when the voicing onset precedes the release. Refer to Figure 2.1 for a descriptive drawing of VOT. The wavy line indicates the voicing, whereas the flat part of the line prior to it (in the case of Zero VOT and Positive VOT) is the period before the voicing, also known as voicing lag. Zero VOT is an example of French VOT, when the plosive is released, the voicing occurs directly after, resulting in not duration of lag or aspiration. English VOT is more associated with Positive VOT, where the plosive is released and aspiration occurs followed by a lag, then voicing. Negative VOT occurs when the vowel voicing occurs before the release of the plosive.

Figure 2.1: Voice Onset Time Depiction



(What is Voice Onset Time?. Retrieved April 20, 2015 from http://www.phon.ucl.ac.uk/home/johnm/siphtra/plostut2/plostut2-2.htm)

French and English stops show an effect of place of articulation, with velars showing longer VOT than bilabials or alveolars, (Lisker and Abramson, 1967). This is also noted by

Ian Maddieson (1997) to be universal in languages that all three places of articulation in their sound inventory, regardless of whether aspiration is phonemic or sub-phonemic (part of allophonic alternations):

> In contrast to this language-specific pattern, the fact that the duration of the aspiration is on average longer with the velar plosive than the bilabial is usually attributed to factors that are inherent in the use of this place contrast (621).

Nearey and Rochet (1994; p.4) detailed the average VOTs for English speakers for the three places of articulation: bilabial, alveolar, and velar. They found that the preceding vowel could affect the duration of voiceless stop consonant's VOT. However, /k/-initial stop consonants were averagely higher than /p/- or /t/-initial, which supports the claim made by Lisker and Abramson (1967) and supports Ian Maddieson's (1997) universal claim. Nearey and Rochet reported the following values as the averages of each POA for English speakers: /p/-initial, 67.4ms, /t/-initial, 73.5ms, and /k/-initial, 79.0ms. For French speakers, the average VOT was as follows: /p/-initial, 31.5ms, /t/-initial, 35.0ms, /k/-initial, 46.3ms.

Unlike English, French voiceless stops are not aspirated. In general, when the time after the initial burst of a stop and before laryngeal vibration is less than 20ms, then it is considered "short-lag," while those longer than 25ms are called "long-lag." In French /p, t, k/ are realized with short voicing lag (Lisker & Abramson, 1964; Caramazza and Yeni-Komshian, 1974). The difference to here is aspiration is the puff of air that occurs when producing a voiceless stop consonant and the lag is the time it takes for the voicing of the vowel to occur. The shorter the lag, the quieter the burst of air will be.

In addition Lisker and Abramson (1964, 1967) have shown that in citation speech, VOT differentiates stops of different phonological voicing classes in initial prestressed position in English and in 10 other languages. Abdelli-Beruh (2004) quotes Lisker and

Abramson (1964) in saying that French and English differ greatly in the manner in which they instantiate the phonological voicing distinction of /p, t, k/. English initial prestressed /p, t, k/ are produced with long voicing lag and are phonetically realized as [p^h, t^h, k^h]. Again, this makes English stop production different from French.

In the Caramazza et al.'s production experiment (1973), VOT between English and French speakers was analyzed. The study contained three groups (Canadian French-speaking monolinguals, Canadian English-speaking monolinguals, and Canadian bilinguals). With the voiceless stops, the monolingual French speakers produced short-lag (<20ms) VOTs, whereas the English monolinguals produced long-lag (>25ms) VOTs. Table 2.1 shows the averages of the different groups across the POAs.

(adapted from Caramazza et al., 1973).

Table 2.1: Average VOT (in ms) of Voiceless Stops between French and English

	Monolingual French	Bilingual French	Bilingual English	Monolingual English
/p/	18	20	39	63
/t/	23	28	48	70
/k/	32	35	67	90

Table 2.1 shows that the bilingual group produced voiceless stops unlike either monolingual group. Recall, Nearey & Rochet's study's averages of /p/-initial, 67.4ms, /t/-initial, 73.5ms, and /k/-initial, 79.0ms for monolingual English speakers. This shows that bilinguals may have an in-between pronunciation, which is neither fully English-like nor fully French-like. This could imply that learning a language at a younger age as a bilingual

may have greater advantages for pronunciation. I will briefly discuss this, the Critical Period Hypothesis, in a future section.

Laeufer (1992, 1996) suggested that the differences between French and English are the realization of /p, t, k/ could be contributed to the fact that English is a stress-based language and French is not. Delattre (1951) stated, "in French, the voicing contrast is carried more by the characteristics of the consonant and, in particular, by the presence/absence of pulsing during the closure" (p. 417). In addition, French stops are fully released, accompanied by audible bursts in utterance-final position (Delattre, 1951; Kohler, 1979); however, English final stops are often partially devoiced (Flege & Brown, 1982) and unreleased (Rositzke, 1943).

The differences in the pronunciation of voiceless stop consonants between French and English may be considered important because when a learner fails to produce the French-like version, their pronunciation becomes marked. A marked pronunciation could be a result of the transfer of L1 sounds into the L2, or even an interlanguage sound (Selinker, 1972). At any rate, it is what contributes to one's foreign accent, which builds one's identity in language learning contexts. At the strong end of the Critical Period Hypothesis spectrum, Lenneberg (1967) states that it would be virtually impossible for adults to acquire native like pronunciation in a foreign language. The Critical Period refers to the ages of around 6-7 years old. This is important to note because if the strong version of the Critical Period Hypothesis were true, then we would not expect to see any student acquiring native-like production in the following study.

In some instances, a foreign accent can be harmful; Derwing (2003) conducted a study on what ESL students say about their accents. Her study took place in Edmonton, Alberta, Canada, which is primarily monolingual. The participants were 100 adult ESL

immigrants who were of varying minorities. This study showed that nearly one-third of the participants stated that they felt they were discriminated against because of their accent. In other cases, this can be even more harmful. Gass (2013) cites the New International Version of The Holy Bible, wherein Chapter 12 of Judges the story of Ephraimites and the Gileadites was told. In this story, in order to detect who was a fleeing Ephraimite and who was not, the Gileadites set up a linguistic test for the Ephraimites, who tradition says could not pronounce the sound /ʃ/ *'sh'*. So, the Gileadites would ask the fleeing men to say the word '*Sibboleth'* and if they could not say it correctly they would be seize them and kill them at the fords of Jordan. It's purported that forty-two thousand Ephraimites were killed at that time (p. 100). This may be an extreme example, however, stereotyping unfortunately can occur still. This can to lead to the learner feeling upset, which could lead to the learner ultimately giving up.

This aforementioned set of literature illustrates the main differences between French and English voiceless stop consonants, and also provides some additional phonetic details about VOT itself in languages where it is distinct. In the next section, I will explore the approaches to second language teaching in addition to studies on multimedia exposure for facilitating L2 acquisition.

Section 2.3: Second Language Teaching Approaches

The field of Second Language Acquisition (SLA) has many different methodologies and positions concerning how and when language learning takes place as well as different methodologies for measuring acquisition. Krashen (1981), for instance, states that acquisition only takes place when input is comprehensible to the learner, as an unconscious process. Pavakanun and d'Ydewalle (1992) infer this to mean that if adults are to acquire a second language in the same way that children do, incidental exposure to another language will lead

them to gradually acquire the language. Vanachter, De Bruycker, and d'Ydewalle (2002) examined whether or not participants who watched a foreign spoken movie would obtain new lexicon by the exposure to the film. They tested their hypothesis by using a sentence recognition test, where sentences to be recognized were directly cut from the soundtrack of the movie. In addition, they mixed in words and sentences that were from other parts of the movie, which the participants did not watch. To see whether or not subtitles had an effect some of the movies where shown with the subtitles and some were shown without them. Their study showed that children seemed to ignore the foreign subtitling when the FL soundtrack was used, Dutch in that case. In d'Ydewalle and Van de Poel (2002), they studied German movies; the adults were shown to perform better on the sentence recognition test than children.

Lonergan (1984) noted that visual media are highly motivating for students and also contextualize language development by exposure to authentic and meaningful models of language use. Although, this study is more of a testament to perception learning, the relation to production can be linked because if one perceives a feature, they may be more likely to produce said feature. In addition, Wood (1996) suggested that it's the narrative element of film that makes them so compelling and that film can provide cross-cultural values and linguistic diversity in an otherwise monolingual situation. Wood suggested that students would often persevere through the difficult language in order to see what happens next.

Chapple and Curtis (2000) looked at film as a means of content under the Content-Based Instruction (CBI). In their study they looked at 31 Cantonese, third-year students, who were taking a General Education course taught in English at the Chinese University of Hong Kong, a bi-lingual university. The course ran for a 13-week semester, twice per week. The first session each week was 45 minutes and the second was 90 minutes. The teaching

pedagogy was highly communicative in approach, with the majority of the class time spent in small-group/whole-group discussion of films and the issues that came from or are explored in them.

Eight films were utilized, seven of which were picked by the teacher and one of which was nominated by the students. The films that were chosen varied in cultural elements and interest, as well as artistic appeal and intellectual challenge. The films came from English-speaking countries as well as those from Europe, Hong Kong, China, and Asian countries. Therefore, not all the films were in English, however, if at all available, the subtitles would be put in English. The class would view the films independently, in a learning center, each week outside of the class, before the discussion.

An English language teacher taught the course, however, the course did not have any specific language goals, as the language was very limitedly taught. The research goals were:

1. Do the students believe their English language skills develop?
2. What are their perceptions of the course and of their own academic development?
3. What other skills and knowledge do they feel they acquire?

In order to answer these questions, the researchers asked to have the students rate how far they thought their English language skills had improved throughout the course, by the following six criteria (425):

1. Confidence in expressing themselves in English
2. Ability to express their ideas when speaking English
3. Ability to express their ideas when writing English
4. English listening skills
5. Knowledge and use of English vocabulary
6. English presentation skills.

No explicit instruction was given, except for minor and incidental corrections to pronunciation. Chapple and Curtis found that afterwards their students' responses indicated that their English language skills had increased in all areas, particularly in speaking and listening skills. The researchers also state the limitations to a questionnaire-type study.

Brinton and Gaskill (1978) studied the effect of listening to TV and radio news on improving EFL students' listening comprehension in an ESL/EFL context, comparing independent experiences of an EFL instructor in Germany and an ESL instructor in the United States. The videotaped broadcasts consisted of BBC's "News of the Week," which is a weekly in-depth broadcast.

The students were then given a two-page handout that consisted of the vocabulary gloss and the comprehension questions. Each word was defined and put into a sentence which related to the context. After the comprehension questions, they were presented with a 12-15 minute edited version of the broadcast. The students were then allowed to recheck their answers and make any additional marks that they had left blank initially. The teacher would then ask individuals for the answers, during which time peer correction was encouraged. The comprehension questions consisted of true/false questions as well as multiple choices. In addition, they wrote a small essay, which was turned into the teacher and handed back the next week with corrections. Brinton and Gaskill note that initially the students felt quite overwhelmed but they persevered and reacted favorably to the technique. "No doubt, the technique provided a welcome relief from the rigidity of the grammar-translation method normally employed in the teaching of English at the school" (407).

In the ESL context, radio broadcasts were used. Three different ESL classes at UCLA Extension were analyzed. Two of the classes had five hours of instruction per day as part of an intensive program (one class was "low-intermediate" and one was "advanced"). In those

classes, the radio broadcasts were used three days a week for thirty to forty-five minutes at a time. The third class was an intermediate class, which met for two and half hours twice a week. The radio broadcasts were used for about thirty minutes over a ten-week period. The broadcasts covered short news segments.

For all classes, a short new report of about one minute in length, which included four or five brief news items, was taped and then transcribed. Because of the initial listening difficulty, the transcript seemed necessary. However, there were omissions in part of the transcript as to challenge the students. The lower intermediate class answered five simple short-answer or true/false questions. Once the transcripts were distributed the broadcast was played three times. Then, they were given time to check over their responses and spelling with a student sitting next to them. The instructor then wrote the answers on the board for the students to check from. The responses were neither collected nor graded. Then, a discussion followed.

As the sessions progressed the transcripts would omit more-and-more words. Although the study had no test to determine the value of using news broadcasts in the classrooms, the following observations were made: First, students were enthusiastic about the broadcasts, and rated them highly in the course evaluation. Second, students asked how they could find the stations on their own radios. Third, students listened to radio and television broadcasts more frequently and understood more than they had prior to the class. Fourth, students would report on further developments of which they had heard or read at home.

At their conclusion, Brinton and Gaskill note that one of the greatest advantages of using news broadcasts in the classroom was vocabulary acquisition. As cited in Blatchford (1973), vocabulary is recycled in the consistent use of the newspaper in the ESL classroom; Brinton and Gaskill note the same thing happening in the broadcasts. “The recycling of

vocabulary takes the pressure off both the student and the instructor in that not everything has to be mastered or taught the first time" (411). Brinton and Gaskill note that it is important to not grade the students on listening performance because, for some, the task is so overwhelming initially that adding grades might prove to be totally demoralizing (412).

Brinton and Gaskill (1978, p. 412) conclude by noting that new broadcasts best fulfill student needs for the following reasons:

1. They are timely and relevant.
2. The recycling of vocabulary is more consistent, particularly in news items which reappear over a period of several week.
3. News items provide the student with a more useful core vocabulary, which enables the student to more readily participate in the type of conversations he is likely to encounter in a social situation.
4. The cultural asides which are a by-product of using news broadcasts provide the student with a broader knowledge of the target culture.

Van Lommel et al. (2006) furthered the concept of audiovisual stimuli exposure's facilitation to not only foreign-vocabulary acquisition but also to foreign-grammar acquisition. Van Lommel et al. state that to master a foreign language, grammar must be acquired beyond just the vocabulary (p. 244). Since previous studies had failed to detect foreign-grammar acquisition, Van Lommel et al. conducted an experiment whereby participants took part in one of the nine following audiovisual exposure conditions: 1) FL soundtrack, subtitled in the FL, 2) FL soundtrack, subtitled in the NL, 3) FL soundtrack, not subtitled, 4) NL soundtrack, subtitled in FL, 5) NL soundtrack, subtitled in NL, 6) NL soundtrack, not subtitled, 7) no Soundtrack, subtitled in FL, 8) no Soundtrack, subtitled in NL, and 9) No Soundtrack, not subtitled.

In the first experiment, Van Lommel et al. investigated whether grammar rules of a foreign language are acquired through watching a subtitled movie. They used reversed subtitling where the soundtrack was in the native language and the subtitles were in the foreign language. The foreign language was Esperanto because it is known for simplicity and small number of rules/irregularities.

Sixty-two (34 females and 28 males) Dutch-speaking sixth-graders from a primary school and forty-seven (32 females and 15 males) Dutch-speaking sixth-graders from a secondary school volunteered. *De Premiejager*, a Dutch spoken twenty-five minute cartoon, was subtitled in Esperanto. This film presented some of the grammar rules. The test consisted of 40 multiple-choice items, eight per grammar rule.

Van Lommel et al. found that the older students performed better than the younger students and presenting the rules beforehand enhanced the performance of the secondary school children considerably more than the primary school children. The experiment showed that the participants performed a lot better on the rules that were presented in the movie than the rules that were not presented in the movie; therefore, a significant interaction between items and the movie appeared.

In the second experiment, Esperanto was used as the soundtrack of the film and the native language was used in the subtitles. 94 sixth-graders from primary schools and 84 sixth-graders from secondary schools participated. The film was called *En Somera Vilao*. They found that no rule acquisition through the movie only and a strong effect of advance rule presentation, particularly among the older children.

Van Lommel et al. concluded by stating that watching the movie did not lead to an incidental acquisition of the rules, and in both experiments the performance improved

considerably when the rules were presented in advance. The older children were shown to be better at performance.

In 2012, Bahrani and Tam studied exposure to audiovisual programs as sources of authentic language input and second language acquisition in informal settings. 182 language learners, aged 20-24, majoring in Teaching English as a Second Language (TESL), participated in the study. The low-level learners were shown to have watched more cartoons, whereas, the intermediate-level learners were shown to have watched more films, and the upper-intermediate-level learners were shown to have watched more news programs. Therefore this study showed that the film helped all students advance their proficiency, however, different types of programs were utilized by different proficiencies. The upper-intermediate level improved their proficiency the most by watching news programs.

Therefore, in each of the studies, vocabulary was shown to benefit from exposure to audiovisual stimuli with varying degrees of acquisition depending on the type of input—whether it was subtitled in the native language or the foreign language and whether the soundtrack was in the native language or the foreign language.

Some believe grammar to be too complex to be able to be acquired from a rather short movie in a short period of time. Pienemann (1989, 1998a, 1998b, 1998c) stated that grammatical complexity could prevent rules from being learned through a simple presentation of the language in the form of a video or film. In addition, Harding & Riley (1986), stated that motivation and continued attention, such that one is processing input into intake, are necessary, even in real-life situations, for the acquisition of a foreign grammar to be successful. Berry (1991) noted that acquiring less salient rules could require exercise, meaning several exposures to the less salient rule, instead of mere observation. Therefore, a

sequence of several movies, over a long period of time, could be the trigger to foreign-grammar acquisition and foreign-vocabulary acquisition.

As noted in the aforementioned studies, both vocabulary-acquisition and grammar-acquisition have been facilitated by the exposure of multimedia, whether it was film, radio, or tv. This thesis looks at a third area of acquisition: pronunciation. The following section details literatures that are not identical to my thesis but shed light onto the acquisition of target-like pronunciation aided by multimedia, namely through Computer Assisted Language Learning (CALL).

Section 2.4: Second Language Teaching of Pronunciation

How can accurate L2 pronunciation be acquired? If it can be facilitated by the exposure to multimedia and audiovisual stimuli, what types are noticeably the best? Graza (1994) points to L2 music videos as an authentic source of input to foreign language phonology. Like poetry, the rhyming of the music, in forms of minimal pairs, can provide exposure to similar but different phonological sounds. In addition, since music videos are in a video format, one has the advantage of adding captioning for added in put. Graza mentions that one of the exploitation techniques for pronunciation is coloziation, where certain items on the screen appear in different colors. This technique was created by the PBS series "ColorSounds" in the 1980s. Certain sounds (e.g., /ð/, word-final /r/, /ə/, etc.) or grammatical items (e.g., nouns, adjectives, plurals, etc.) were colorized in the on-screen lyrics throughout. Students were then encouraged to sing along and note the colorized words/sounds.

In addition, Computer-Assisted Language Learning (CALL) has been used as a bridge between theoretical SLA and pedagogy. Levy (1997) describes CALL as "the search for and study of applications of the computer in language teaching and learning" (p. 1).

CALL utilizes many different information and communication technology applications. Bourdon (1999) notes that computer interactions enhance communication skills and strengthen language through computer support group interactions. Additionally, Torat (2000) described CALL as the use of computer technologies that promote educational learning. These technologies could include, but were not limited to: word processing, presentation packages, guided drill and practice, tutor, simulation, problem solving, games, multimedia CD-ROMs, and internet applications such as e-mail, chat and the World Wide Web (WWW) for language learning purposes.

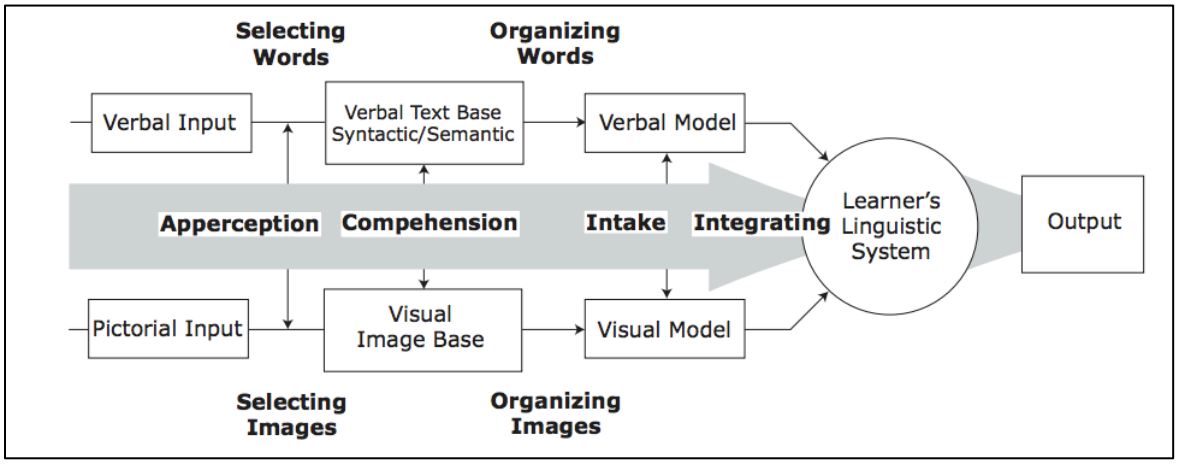
Chapelle (1998) details the seven hypotheses relevant for developing multimedia CALL: 1) The linguistic characteristics of target language input need to be made salient; 2) Learners should receive help in comprehending semantic and syntactic aspects of linguistic input; 3) Learners need to have opportunities to produce target language output; 4) Learners need to notice errors in their own output; 5) Learners need to correct their linguistic output; 6) Learners need to engage in target language interaction whose structure can be modified for negotiation of meaning; and, 7) Learners should engage in L2 tasks designed to maximize opportunities for good interaction (p. 23-24).

More specifically, Plass and Jones (2005) detailed an integrated model of SLA and Multimedia, shown in Figure 2.2 (Plass & Jones, 2005, p. 471). This, like my study, incorporates the technological aspect of CALL with the framework of how one takes input and creates output in a second language.

Plass and Jones' model shows input as both verbal and pictorial, both of which are comprehensible. If the resulting input is comprehended, it is then moved to intake, wherein it can be integrated in the learner's linguistic system. Finally, this feature will become output.

This builds on Krashen (1981) who believed that input must be comprehensible for language to be acquired.

Figure 2.2: Integrated Model of SLA with Multimedia



Kawai and Hirose (2000) studied teaching the pronunciation of Japanese double-mora phonemes using speech recognition technology. According to Taniguchi (1991), typical TJSL (Teaching Japanese as a second language) classrooms spent less than 10 total hours focused on pronunciation. Kawai and Hirose developed a study to examine how adults can efficiently learn to pronounce non-native languages using a CALL system that has features that extend to pronunciation problems found in many languages. They chose the double-mora in Japanese as the pronunciation unit to focus on. The CALL system was developed to teach the pronunciation of the Japanese double-mora phonemes to non-native speakers. Kawai and Hirose define a mora as, "a subsyllabic rhythmic unit that is phonemic in Japanese." (133). In addition, single-mora vowels form short syllables and double-mora vowels form long syllables. In Japanese, these vowels are spectrally almost identical but their phone durations differ significantly. They note that these phoneme sets are collectively called *tokushuhaku*, which literally means special mora. For the study, they call short phones as *short*

tokushuhaku and long phones as *long tokushuhaku*. Hibiya (1996) noted that since most languages do not have a phonemic distinction based on duration, non-natives make mistakes in both short and long *tokushuhaku*.

The CALL system presents the two phonemes in minimal pairs (e.g., *kado* vs *kaado*) and the learners are asked to read them as they appear on the screen. Next, the learner's speech is force-aligned by the speech recognizer and the tokushuhaku phone durations are measured. This is then compared to the perception experiments conducted on native speakers. Feedback to the learner consists of (a) an intelligibility score that shows the likelihood of native speakers understanding the learner's pronunciation, (b) instructions on how to correct the pronunciation, and optionally (c) the tokushuhaku duration in milliseconds. The student would repeat the process until the pronunciation is native-like or the student plateaus in which case the program decides if further testing is required (i.e., if the pronunciation is deemed understandable, then the program may say that is essentially good enough).

Kawai and Hirose found that, even though some scores occasionally fluctuate (possibly because the subjects were exploring various pronunciation strategies), as a whole, the pronunciation scores generally did improve with each practice turn, eventually reaching high levels. For all subjects, they successfully completed the training of each word pair after at most 20 turns. The gain was better for the long phoneme than the short phoneme; however, both increased considerably.

Al-Qudah (2012) researched a similar topic on Jordanian students learning English as foreign language. The sample included 149 third-year students (73 males and 76 females) from Al Zaytoonah University. An experimental group was exposed to the computer-assisted training program, while a control group used printed materials focused on English

pronunciation. The study lasted for 8 weeks. A pre-test was given to insure that the students were equivalent in proficiency. At the end a post-test was given to see whether the computer-assisted training program had any influence on the experimental group.

The program was able to illustrate a concept through attractive animation, sound, and demonstration. This also allowed the students to progress at their own pace and to work individually or to do a problem solving in a group. The programs provided immediate feedback, letting students know whether their answers were correct or not. If the student's response was incorrect, the program showed the students how to answer the question correctly.

Al-Qudah ran a two-way ANOVA to come to the conclusion that the two groups were in fact significantly different from another at the post-test. In addition, the research looked at gender as a factor, which showed no significance. This study, in addition to the previous study, shows that the CALL systems have facilitated the acquisition of L2 target-like pronunciation.

Why a CALL system? Pennington and Steven (1992) state that computer can do *some* of the work of a teacher in providing assistance when the teacher is not immediately present. Levy (1997) states that well-designed CALL software is readily available to teachers. Felix (1998) suggested that computers allow the incorporation of video, sound, and text simultaneously; this allows the learner to interact with both the program and other leaners. In addition, Felix (1998) notes that a computer allows for flexibility and pacing of individual learning—students can choose which activities that suit their learning style.

However, Hartoyo (2006) note that CALL is not at all beneficial because it cannot be easily taken on the train, home, used in the middle of the night, unlike textbooks. In addition, Gips et al. (2004) and Lai (2006) note that CALL could increase educational costs since

computers would be required for students to purchase. This would be a problem for low-budget schools and low-income families.

Although CALL is not specifically used in my study, in the traditional sense, I did incorporate technology through the usage of audiovisual stimuli. Much like Plass and Jones (2005), the students were able to watch the film and read the subtitles simultaneously while listening to the foreign input.

Finally, Zwicky (1972) notes the differences between casual, fast, and careful speech. The data results may be skewed if words in isolation are only taken into consideration. Given that careful speech can occur when the word isolated, therefore, the speech is more articulated, which can contribute to longer VOT values. For words in carrier phrases, fast/normal speech is more likely to occur, contributing to *normal* or shorter VOT values.

Section 2.5: Summary

In this chapter, I have presented literature on various topics in SLA. First, I reported the findings on VOT and the differences between English and French as well as in general about place of articulation. Second, I focused on studies that were related to second language acquisition, namely vocabulary-acquisition and grammar-acquisition, through the use of media (i.e, film, tv, radio). Finally, I focused on Computer Assisted Language Learning (CALL) and how these systems have facilitated the acquisition of target-like pronunciation. In the following thesis, I will pull from these sources and utilize the different areas to make up the foundation of my study. Thus, the following chapters will focus on role of audiovisual stimuli on L2 target-like pronunciation-acquisition.

CHAPTER III

METHODOLOGY

Section 3.1: Introduction

The main aim of the study is to find whether or not exposure to audiovisual stimuli facilitate in the acquisition of native-like production in one's second language (L2), in this case French, where the L1 is English. The specific L2 production aspect, focused on in this study, is aspiration or voice onset time (V.O.T.) at three comparable places of articulation for stop consonants: bilabial, alveolar, and velar. As stated in the literature review, there are VOT differences between French and English for voiceless stop consonants. For English, the stop consonants are aspirated in word-initial position, followed by a vowel, and for French they are unaspirated. The hypothesis is that for English learners of French, if aspiration occurs, it will be longer than a French speaker's VOT.

To test whether or not audiovisual stimuli can facilitate the acquisition of target-like production of V.O.T., the following study was devised. First, a questionnaire was given. This question established the general demographics of the group, as well as gave a summary of each student's experience outside the classroom learning French. In addition, it asked information about the parent's L1 as well as their reasoning behind taking the course.

Then, over the span of four weeks, one day per week, a portion of French language learning students watched a film and produced several French words and phrases (tokens); other students, simply produced the words and phrases without the exposure to any film. In addition, two groups were needed to establish the native's VOT, one for French and one for English. The following questions were raised:

1. Which group shows more progression towards French-like VOT in production across sessions, beginner-levels or intermediate-levels?
2. Is there a noticeable difference between VOT in words produced in isolation versus in carrier phrases?
3. Do we see a continuous, linear progression in French-like VOT through time, or does the change plateau in this progression between Sessions 1 and 4?
4. What are the phonetic differences between stops in L1 French and English?

Section 3.2: The Film

The film *Les Choristes* (2004), was chosen as the audiovisual stimuli, because of its ease of understandability and its generic appeal—it is a film that the majority of French learners easily gravitate toward. Another reason was that the story is simple in nature and is generally interesting to students. In addition, there is plenty of dialogue, and there is a transcript for this film, which made it possible for me to retrieve and organize the words and phrases for the experiment. The total length of the film is 97 minutes, which is roughly twenty minutes per session, if the end credits are not considered.

Section 3.3: Participants

The study was designed for two main groups of students, one control group and one experimental group. The students were recruited from either the beginner French course (FR101) or the intermediate course (FR201), both taught at SIUE. The same professor taught both classes and arrangements were made with the professor to have access to the students. At the end of each week for four weeks, the students were asked to produce the French tokens that contained bilabial-initial, alveolar-initial, and velar-initial sounds, as detailed in

Table 3.1. To emphasize the specific variables I examined they are boldfaced. These tokens were split into two contexts: words in isolation and words within carrier phrases. This was done because of the tendency to carefully aritulate the words when they are isolated. If the tokens were only in isolation, the data results would be skewed because one would not account for the differentiation between careful speech, for words in isolation, and normal speech, for words in carrier phrases.

Table 3.1: French Tokens

Words in Isolation		**Words in Carrier Phrases**
1. **P**etit	21. **P**ied	1. Je suis **p**etit.
2. **Q**ui	22. **T**u	2. **Q**ui est à la **p**orte?
3. **P**u	23. **P**ierre	3. **T**oute son histoire et la notre aussi.
4. **Q**ue	24. **Q**uoi	4. **P**ourquoi est la **p**orte ouverte?
5. **P**as	25. **P**uni	5. Donnez-moi ce **q**ue vous écrivez.
6. **K**ilomètre	26. **T**ant	6. Il a **t**enu **p**endant son séjour.
7. **P**ère	27. **P**ar	7. Où est Pierre?
8. **P**eut-être	28. **P**our	8. La **p**onctualité est nécessaire **p**our être un bon étudiant.
9. **P**ion	29. **Q**uarante	9. T'es **t**out seul?
10. **T**oute	30. **T**our	10. **T**u vas aller ou **q**uoi?
11. **P**onctualité	31. **P**otager	11. Je ne **p**eux **p**as au **p**ied.
12. **P**eux	32. **T**enu	12. Un **k**ilomètre de plus.
13. **C**ahier	33. **P**iège	13. **T**enez ça.
14. **P**ourquoi		14. J'ai **q**uinze ans.
15. **T**emps		15. Peut-être, mon **p**ère a **p**u sortir **p**endant la nuit.
16. **P**endant		16. Mon **p**ère a **q**uarante ans.
17. **Q**uand même		17. Chacun d'entre vous fera six heures de **c**achot à **t**our...
18. **T**enez		18. **T**u aime le film **q**uand même?
19. **P**orte		19. J'ajoute **q**ue **t**ant **q**ue le **c**oupable ne sera **p**as **c**onnu...
20. **Q**uinze		20. Mon **c**ahier est sur la tableau.

While the goal was to have both a control and experimental group comprised of both males and females, this was not in reality possible, due to the voluntary nature of the study.

The control group consisted of three learners of French, all females, of which two were enrolled in FR101 and one who was enrolled in FR201. Henceforth, they will be referred to as F4, F5, and F8, respectively. The control group was recruited on a volunteer basis from their respective courses. These three females preferred to be part of the control group, as they did not have the time required for the experimental group. As part of the study, all participants were asked to keep an *exposure journal*, in which they were asked to write down any French they used outside of their course/coursework; however, the participants neither encountered French outside their class, nor went to any events where French was spoken. Therefore, the only exposure that they had to French was directly from their course. The control group was asked to meet once a week after their bi-weekly course to complete a production test.

As aforementioned, all participants were females because of the voluntary recruitment of this study. F4 was enrolled in FR101 and was 19 at the time of the study. Her native language is English, which was also both her parents' L1. She noted in the questionnaire that she was born in Chicago, IL, had never been outside the U.S.A., and that she had never studied French prior to her course at SIUE. In addition, she was African-American. F5 was enrolled in FR101 and was 19 at the time of the study. Her native language is English, which was also her parents' L1. She noted in the questionnaire that she was born in Wentzville, MO, had never been outside the U.S.A., and that she had never studied French prior to her course at SIUE. F8, was enrolled in FR201 and was 20 at the time of the study. Her native language is English, which was also both of her parents' L1. She noted in the questionnaire that she was born in Edwardsville, IL, had never been outside the U.S.A., and that she had only taken a few courses of French in High School prior to her courses at SIUE. A recapitulation of the demographic data is presented in Table 3.2 below.

As can be seen from the table above, all three participants in the control group specified that their reason behind taking the French course was because it was to fulfill a requirement for their major.

The experimental group consisted of five students, all females, of which two were enrolled in the beginner French course and three were enrolled in the intermediate course. Henceforth, they will be referred to as F3, F6, F1, F2, and F7, respectively. As was the control group, they were asked to keep an *exposure journal*; likewise, these students did not have exposure to any additional French, outside their normal bi-weekly course. The students were asked to produce the tokens after they had watched approximately ten to twenty minutes of the film (the exact times varied slightly given the best stopping point between scenes). The students watched the film in a quiet office, under my supervision, where they were not distracted.

Table 3.2: Control Group Demographics

uic	***age***	***sex***	***level***	***L1***	***PL1***	***reasons***
F4	19	F	1	English	English	Requirement
F5	19	F	1	English	English	Requirement
F8	22	F	2	English	English	Requirement

As aforementioned, all participants were females because of the voluntary recruitment of this study. F3 was enrolled in FR101 and was 19 at the time of the study. Her native language is English, which was also both her parents' L1. She noted in the questionnaire that she was born in Granite Cite, IL, had never been outside the U.S.A., and that she had never studied French prior to her course at SIUE. F6 was enrolled in FR101 and

was 19 at the time of the study. Her native language is English; however, her parents' L1 is Tagalog ("Filipino"). She noted in the questionnaire that she was born in Oceanside, CA, had never been outside the U.S.A., and that she had studied French in high school prior to her course at SIUE.

Table 3.3: Experimental Group Demographics

uic	***age***	***sex***	***level***	***L1***	***PL1***	***reasons***
F3	19	F	1	English	English	Self
F6	19	F	1	English	Tagalog	Requirement
F1	25+	F	2	English	English	Requirement
F2	21	F	2	English	English	Requirement
F7	20	F	2	English	English	Requirement

F1, was enrolled in FR201 and was older than 25 at the time of the study. Her native language is English, which was also both of her parents' L1. She noted in the questionnaire that she was born in St. Louis, MO, that she had studied abroad in Germany, and that she had only taken a few courses of French in High School prior to her courses at SIUE. She noted that she can use German as an L2, as well, but has forgotten most of it. F2 was enrolled in FR201 and was 21 at the time of the study. Her native language is English, which was also both of her parents' L1. She noted in the questionnaire that she was born in Centralia, IL, that she had never been outside the U.S.A, and that she had never studied of French prior to her courses at SIUE. F7 was enrolled in FR201 and was 20 at the time of the study. Her native language is English, which was also both of her parents' L1. She noted in the questionnaire that she was born in Peoria, IL, that she had never been outside the U.S.A, and that she had

studied French in high school prior to her course at SIUE. A recapitulation of the demographic data is presented in Table 3.3 above.

As can be seen from the table above, all participants in the experimental group specified that their reason behind taking the French course was because it was to fulfill a requirement for their major, except for F3 who stated it was to satiate her own language learning appetite.

Table 3.4: English Tokens

Words in Isolation	Words in Carrier Phrases
1. **P**etty	1. I'm never late; therefore, I'm **p**unctual.
2. **P**our	2. We went swimming at the **p**ool.
3. **P**iece	3. Could you **p**our me a drink?
4. **P**oop	4. You are very **p**etty.
5. **P**ot	5. Goldilocks ate all the **p**orridge.
6. **P**ear	6. **C**an I have a **p**iece of that pie?
7. **P**art	7. You **k**eep it, I **k**ept it long enough
8. **P**ond	8.He needs to **p**oop.
9. **P**ort	9. I **c**ook with a **p**ot.
10. **P**ea	10. The **p**ear **t**astes good.
11. **P**ierre	11. I **p**unted the ball.
12. **P**orridge	12. I dislike **p**eas very much.
13. **P**oor	13. Don't you think **c**ats are **c**ute?
14. **P**ee	14. The **p**ort is clear.
15. **P**unctual	15. I need to **p**ee.
16. **P**ool	16. **P**ierre is a friend of mine.
17. **P**unt	17. I want to **p**unish you myself.
18. **P**unish	18. He's a **p**art of my life.
19. **C**ute	19. I'm so very **p**oor.
20. **C**arrot	20. Franklin flew the **k**ite that had a **k**ey attached.
21. **C**arpet	21. I ate the **c**arrot.
22. **K**eep	22. To **t**oot your horn is to honk.
23. **K**ept	23. Don't **t**empt me or you'll be sorry.
24. **C**at	24. Eight plus two is **t**en.
25. **K**ey	25. Don't **t**aunt me.
26. **K**ite	26. I took a tour of Italy when I was a **t**een.

The main difference between the control group and the experimental group was the exposure to the stimuli; all other variables were kept to a minimum or noted to be analyzed in a further section (as is the case for the differences of levels). It is important to note that several students noted that they had taken courses in French in High School; however, given that they were in the beginner-level and intermediate-level courses, I assumed that they are on an even level of proficiency, respectively.

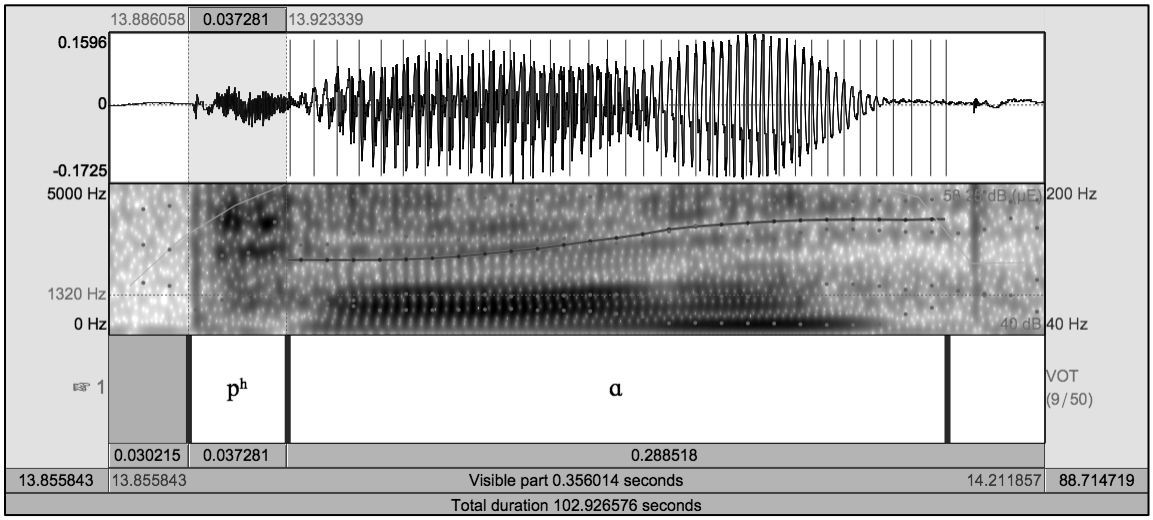
In order to get a fuller comparative understanding of V.O.T. in both native English and in native French, words with similar stop initials were also recorded from native speakers who were not language learners in these two French courses. The native group was comprised of one native French speaker and two monolingual English speakers. The native French speaker produced the same exact tokens as the control and experimental groups. She met one time and her results were recorded and stored in a folder. The two monolingual speakers met once and they produced a list of words and phrases slightly different than that of the French learners, for the simple fact that neither of them knew French. However, the words were limited to words that were polysemous across the two languages—i.e. French *porte* /pɔʀt/ 'door' and English *port* /pɔːt/, as detailed in table 3.4. To emphasize the specific variables I examined they are boldfaced.

Section 3.4: Data Analysis

To record the data, I utilized a Marantz professional solid-state recorder (PMD660) with a Shure microphone headset attached to record the tokens produced by all the participants. The data were recorded onto a 2GB solid-state flash card and then transmitted for backup to my iMac as well as to a password secure Google drive. To analyze the data, I

utilized the freeware program PRAAT (http://www.praat.org, or http://www.fon.hum.uva.nl/praat/). “Praat (the Dutch word for "talk" or "speak") is a free scientific computer software package for the analysis of speech in phonetics. It was designed, and continues to be developed, by Paul Boersma and David Weenink of the University of Amsterdam. It can run on a wide range of operating systems, including various versions of Unix, Linux, Mac and Microsoft Windows (95, 98, NT4, ME, 2000, XP, Vista, 7, 8). The program also supports speech synthesis, including articulatory synthesis.”

Figure 3.1: Aspiration Boundaries



I imported the audio files and created boundaries around the VOT, then using a script, automatically exported the duration of the aspiration, as shown in Figure 3.1 with the French word *pas* /pʰɑ/ ‘not’. The aspiration is noted in ipa by the superscript ‘h’. The boundaries around /pʰ/ notes the duration of the aspiration. A few ways to find where the VOT starts and ends was by first looking at the spectrogram (the shaded area in the middle). There is a visible dark grey bar that appears on the left—this is the start of the aspiration. In the spectrogram there is a line with dots—this is the pitch line. As the voiceless stops are

voiceless, there is no pitch in the area where the aspiration occurs. Therefore, for this speaker, the word /pʰɑ/ is aspirated; however, not heavily at 37ms, noted underneath the text.

The value is automatically pulled by the script and imported into an excel document for further analysis. Each word and phrase, the boundaries were manually placed. The value was in exported in seconds, the duration of the aspiration. A t-test was used to answer whether or not the averages were distinct across the groups. A two-sample test is a statistical examination of two averages. It examines whether the two samples, in my case, the different sessions, are different. At a very basic level, a t-test compares the variance between the two samples with the variance within the two samples. The t-test results in a p-value, *p* standing for probability that the pattern of data in the sample could be produced by random data. If p=.05, there is a 5% change there is no real difference and if p=.01, that means there is only a 1% change that there is no real difference. To be considered significantly different, the p-value must be below .05 (http://vassarstats.net/). In addition, smaller groups help reduce the randomness, i.e. bigger samples can help but with diminishing returns (de Winter, 2013).

CHAPTER IV

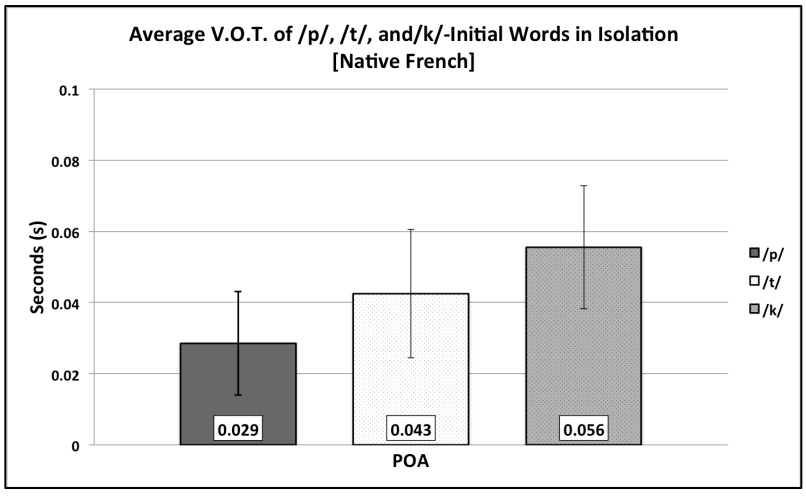
NATIVE GROUP ANALYSIS

Section 4.1: Introduction

In this chapter, I will describe the L1 speakers' of French and English production of voiceless stop consonants for both Native French and English. To analyze the data from the learner groups, it is important to have a solid foundation to which one can compare the data. The learner groups, both the control and experimental, will be analyzed in a later section. In section 4.2, I will compare the data of the native speaker groups, both the native French group and monolingual English group.

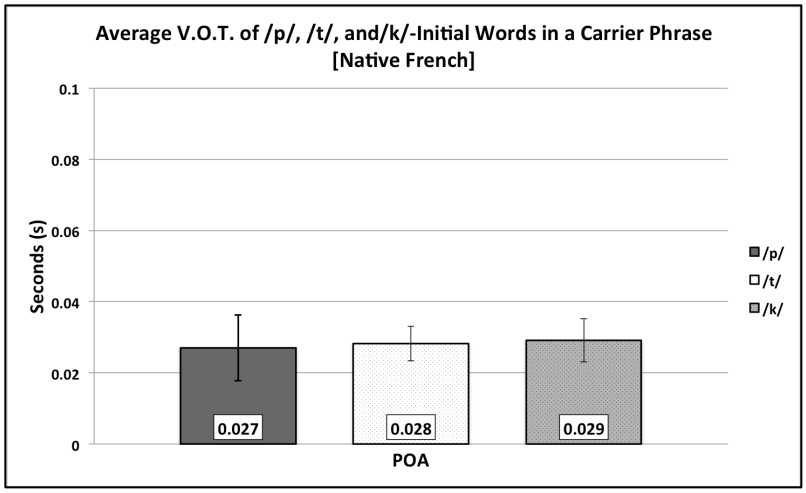
The Native French group met for one session and produced the words in isolation and within carrier phrases. The group consisted of only one native female because of the lack of availability of any native speakers in the area. The average VOT for NF is 29ms for voiceless bilabial stops (/p/), 43ms for voiceless alveolar stops (/t/), and 56ms for voiceless velar stops (/k/), as shown in Figure 4.1.

Figure 4.1: Average NF VOT Isolation



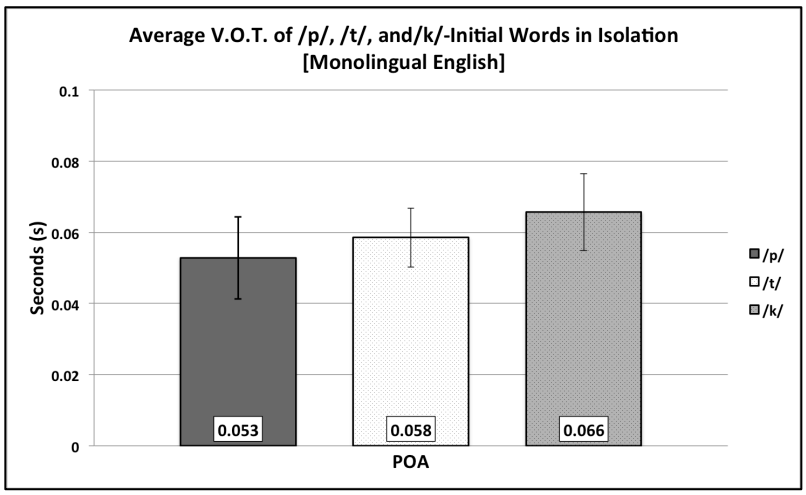
The voiceless velar stops were on average almost twice the length of the voiceless bilabial stops. The error bars on each bar represent the standard deviation, or the quantification of the amount of variation of the data sets. What this means is how far from the average the speaker deviated—i.e., in Figure 4.1, NF produces /p/ at the average of 29ms, however sometimes it was shorter at under 20ms and sometimes it was longer at over 40ms. The larger the error bar the more deviation there is and the less significant the variable. The error bar of /p/ crosses the error bars of /t/ and /k/ which means that it is unlikely that these numbers are significantly different from one another. In a later section, I will use what is called a T-test to input the values to test the actual deviation. If we have shorter bars that do not overlap, it is likely that the variables are significantly different and thus the T-test will report a p-value of less than .05. If the value is bigger than .05 then the variable is not significant to the second variable tested. Figure 4.1 will be considered the target-like production for VOT in isolation for the learner groups.

Figure 4.2: Average NF VOT Carrier Phrases



As can be seen in Figure 4.2, the average VOT for the word within carrier phrases has drastically dropped for both the alveolar and velar places of articulation. The average VOT for voiceless bilabial stops is 27ms, 28ms for voiceless alveolar stops, and 29ms for voiceless velar stops. In addition the error bars are shorter, therefore, the standard deviation for the POAs has decreased. This drop can be contributed to the careful speech associated to saying a word in isolation and the casual/fast speech associated to saying a word embedded in a sentence. Zwicky (1972) notes the differences between casual, fast, and careful speech. In casual speech, an English speaker may say [rʌnin] for [rʌniŋ], thus altering the sound (607). Figure 4.2 will be considered the target-like production for VOT in carrier phrases for the learner groups.

Figure 4.3: Average ME1 VOT Isolation



The Monolingual English group met for one session and produced the words in isolation and within carrier phrases. The average VOT for ME1 is 53ms for voiceless bilabial stops (/p/), 58ms for voiceless alveolar stops (/t/), and 66ms for voiceless velar stops (/k/), as shown in Figure 4.3. The average VOT for ME2 is 55ms for voiceless bilabial stops (/p/),

68ms for voiceless alveolar stops (/t/), and 72ms for voiceless velar stops (/k/), as shown in Figure 4.4.

However, within carrier phrases, the length of VOT is not as noticeable for either English speaker. Instead, both speakers remained above 50ms for every place of articulation and, specifically, ME1's VOT decreased slightly across all POAs, noted by Δ for the difference between the carrier phrase values versus the insolation values, (Δ/p/=-6ms; Δ/t/=-8ms; Δ/k/=-6ms), shown in Figure 4.5; whereas, ME2's VOT increased across all POAs (Δ/p/=+6ms; Δ/t/=+4ms; Δ/k/=+6ms), shown in Figure 4.6. A possible explanation could be that ME2 was monitoring her language output more closely than that of ME1.

Figure 4.4: Average ME2 VOT Isolation

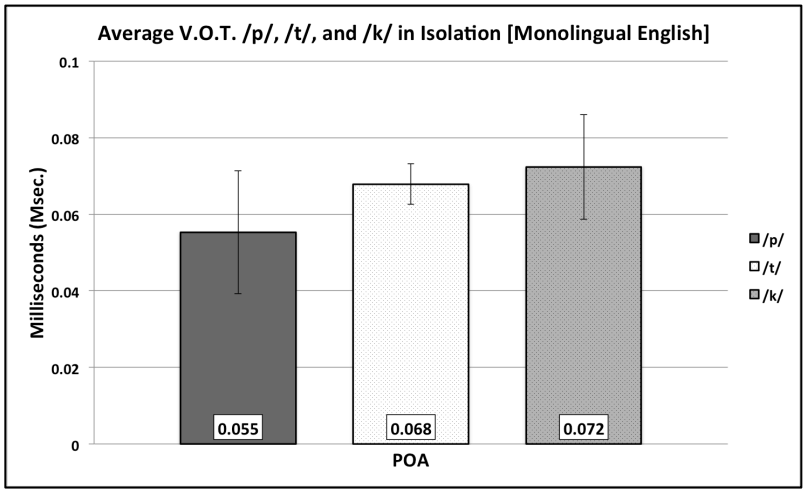


Figure 4.5: Average ME1 VOT Carrier Phrase

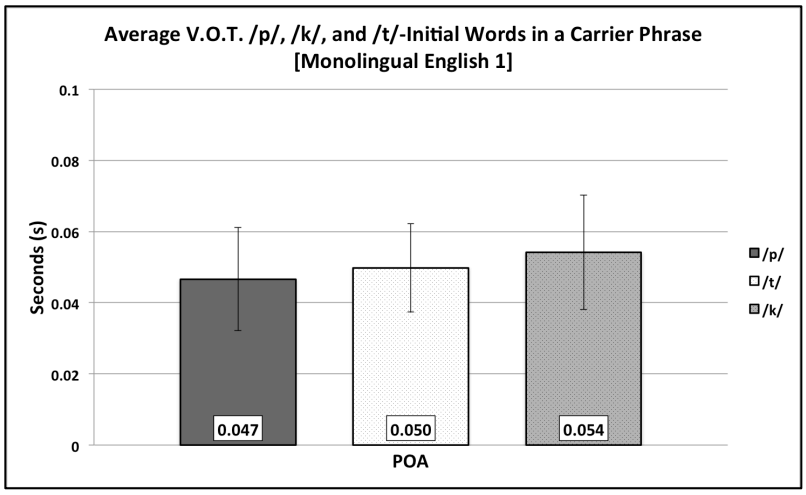
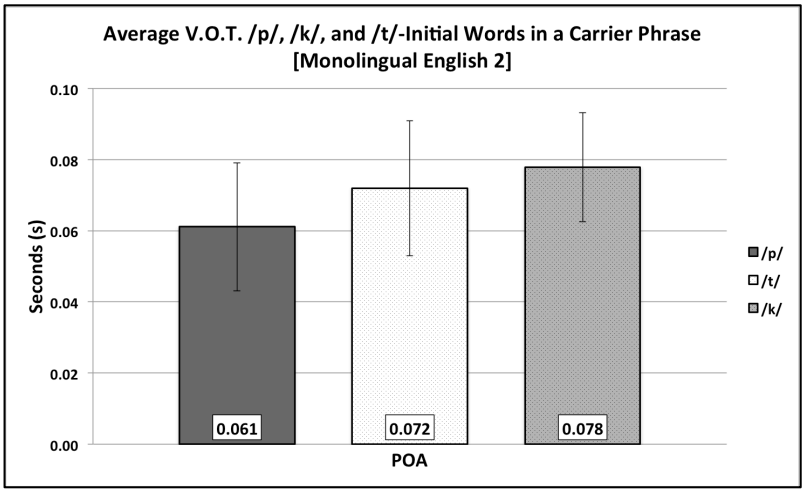


Figure 4.6: Average ME2 VOT Carrier Phrase



Section 4.2: T-test Statistics

In this section, I will describe the results of the following T-tests conducted on the native speaker groups, in order to clearly define whether or not stop consonants are significantly different between native French speakers and monolingual English speakers, or whether there is no notable difference. First, in section 4.2.1, I will analyze the words in

isolation, starting with /p/-initial French and /p/-initial English. Then I will compare the alveolar and velar places of articulation. In Section 4.2.2, I will repeat the same process except it will be for the words in carrier phrases. Recall that I will utilize the T-test calculation utility on the VassarStats website (http://www.vassarstats.net), which will give me the resulting p-value for each place of articulation.

Section 4.2.1: NF vs. ME in Isolation T-test Results

In isolation, the degree of significance varies from place of articulation. Bilabial-initial stops show great difference between NF and ME. The summarization in Figure 4.7 shows the one-tailed p-value as "<.0001" which is lower than .05, indicating that /p/-initial words in isolation between native French speakers and monolingual English speakers are produced significantly differently.

Table 4.1: Average VOT (in ms) for NF vs. ME in Isolation

POA	NF Avg.	ME Avg.	P-value
/p/	29ms	53ms	<.0001
/t/	42ms	65ms	0.001869
/k/	56ms	68ms	0.0246915

In addition, both alveolar-initial and velar-initial places of articulation show p-values of less than .05, indicating that both /t/-initial and /k/-initial words in isolation between native French speakers and monolingual English speakers are produced significantly differently.

To summarize this section, we can say that all three places of articulation between monolingual English speakers and native French speakers will be distinctly significant in terms of V.O.T. In other words, English aspiration is unlike French aspiration entirely, in

isolation. In the next section I will check to see if V.O.T. in carrier phrases are distinctly different between the native French speaker and the monolingual English speakers.

Section 4.2.2: NF vs. ME in Carrier Phrases T-test Results

In carrier phrases, the degree of significance can vary between places of articulation. English speakers are said to aspirate quite differently than French speakers, but to what degree of significance? In this section, I will test the different places of articulation between the monolingual English speakers and the native French speaker. I will use a T-test to statistically analyze the data.

In /p/-initial words within carrier phrases, the native French speaker's average V.O.T. was 27ms whereas the monolingual English speaker's average V.O.T. was 54ms (47ms and 61ms, respectively). This means that the English speaker's duration of aspiration nearly doubled that of the French speaker. This is supported by the T-test value of less than .05—<.0001 in this case—which means that /p/-initial words within carrier phrases spoken by the monolingual English speakers are distinct from those spoken by the native French speaker. In Figures 4.1.2, 4.1.5, and 4.1.6, the charts show no overlap if they were overlaid—i.e., the Native French speaker's error bars would not intersect either of the monolingual English speakers' error bars or averages. In Figure 4.8, the T-tests are shown.

Table 4.2: Average VOT (in ms) for NF vs. ME in Carrier Phrases

POA	NF Avg.	ME Avg.	P-value
/p/	27ms	54ms	<.0001
/t/	28ms	55ms	.000131
/k/	29ms	66ms	<.0001

In addition, /t/-initial words within carrier phrases, the native French speaker's average V.O.T. was 28ms, whereas the monolingual English speaker's average V.O.T. was 61ms (50ms and 72ms, respectively). This means that the English speaker's duration of aspiration doubled that of the French speaker. This is supported by the T-test value of less than .05—.000131 in this case—which means that /t/-initial words within carrier phrases spoken by the monolingual English speakers are distinct from those spoken by the native French speaker.

Finally, /k/-initial words within carrier phrases, the native French speaker's average V.O.T. was 29ms, whereas the monolingual English speaker's average V.O.T. was 66ms (54ms and 78ms, respectively). This means that the English speaker's duration is approximately twice the duration than that of the French speaker. This is supported by the T-test value of less than .05—<.0001 in this case—which means that /k/-initial words within carrier phrases spoken by the monolingual English speakers are distinct from those spoken by the native French speaker.

To summarize this section, we can say that all three places of articulation between monolingual English speakers and native French speakers will be distinctly significant in terms of V.O.T. In other words, English aspiration is unlike French aspiration entirely, in carrier phrases. For this study, the aspiration is found to be significantly different between monolingual English speakers and the native French speaker regardless of the context (in isolation or within carrier phrases). It is fair to say that monolingual English speakers aspirate stop consonants more than French speakers (almost double in all POAs), regardless of POA or context.

CHAPTER V

RESULTS I: AN OVERVIEW OF THE EXPERIMENTAL AND CONTROL GROUPS

Section 5.1: Introduction

Recall that the focus of this study is to see whether or not L2 native-like production, such as V.O.T., as in this study, can be acquired by the exposure to L2 audiovisual stimuli. This study looks closely at French stop consonants produced by English natives who are learning French at university. In particular, the stop consonants are at the three most comparable places of articulation between the two languages: bilabial, alveolar, and velar. They share the POA and the voicing, but differ in terms of laryngeal contrasts/aspiration.

In this chapter, I will give an overview of all the learners, including the control group and the experimental group, as one group and also individually. First, in Section 5.2, I will provide an overview of the average V.O.T.s of all the learner groups, control and experimental groups, combined. This will allow for a general overview of how the groups preformed as one. Recall that all learners were recorded in four sessions across a four-week period (Session 1, Session 2, Session 3, and Session 4). I will look at how the averages changed from Session 1 to Session 4, across the places of articulation, and note any significant or interesting changes through time.

Then, in Sections 5.3 and 5.4, I will take a closer look at the control and experimental groups separately, reporting how the groups' averages changed in isolation and in carrier phrases across each session. This will allow me to observe whether the video stimuli correlate with any changes, in particular to see whether or not the groups produced significantly different stop aspiration at Session 4 as compared with Session 1, respectively.

In Section 5.5, I will provide the results of the T-tests on the control group against the experimental group to further prove whether or not the data observed is statistically different. I will then make observations as to whether or not the type of input seemed to have an effect on the resulting data. The aim to this chapter is answer the question of whether or not input can affect one's production of L2 pronunciation, specifically via exposure to L2 audiovisual stimuli. If the experimental group's averages are significantly different from the commencement of the study to the final Session, then one can argue that there is pedagogical value to audiovisual stimuli exposure in the classroom setting; however, to what degree would remain debatable. In addition, if the experimental group's averages are significantly different from averages of the control group, at Session 4 in particular, then one can argue that audiovisual stimuli within L2 classes is extremely important as it would seem to have a influence on facilitation of L2 phonological production. This would be a strong claim that would need further testing.

Section 5.2: Learner Findings – All Groups Combined

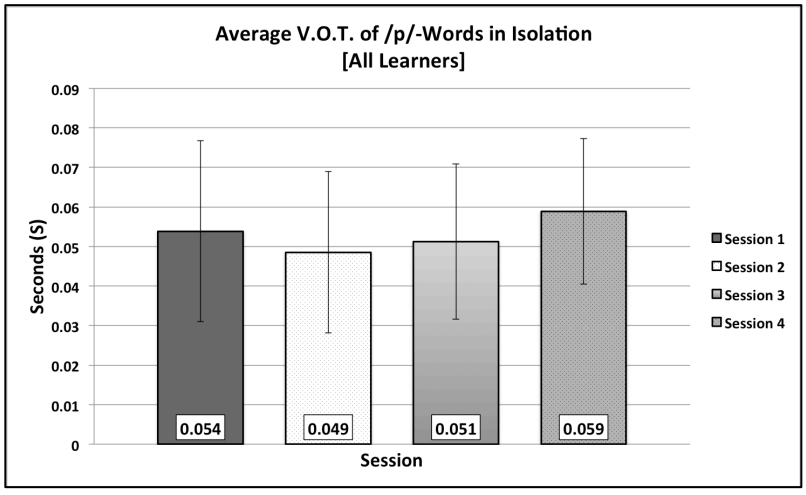
I will broadly present the data of all the learners a whole. First, I will present the learners' average for voiceless stop consonants in isolation, including bilabial-initial, alveolar-initial, and velar-initial places of articulation. Then, I will present the learners' average for voiceless stop consonants within carrier phrases, including all three POAs.

Recall from Chapter 3, the control group consisted of three learners (two in FR101 and one in FR202) and the experimental group consisted of five learners (two in FR101 and three in FR201). It is important to keep this in mind while observing the data as a whole because the averages are made up of two different exposures (non-exposure and exposure) to the audiovisual stimuli as well as two different proficiency levels (FR101 and FR201). I also

note again that these groups are not equal in size. In Chapter 6, I will take the students' proficiency levels into consideration in a closer analysis to see whether or not one's level of proficiency has an influence on L2 pronunciation and production, whether it is resistance to change or facilitation to change.

For each figure I will note the degree of change across each session as follows: for instances where VOT change is not greater than +/- 5 milliseconds in any direction, "small or negligible change in VOT" is noted; for instances where VOT change is between 6-10 milliseconds in any direction, "moderate change in VOT" is noted, and for those where change is greater than 10 milliseconds in any direction, "greater change in VOT" is noted.

Figure 5.1:Average V.O.T. /p/-Initial Words in Isolation of All Learners



In Figure 5.1, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 54 milliseconds. At Session 2 and Session 3, negligible change is observed and at Session 4, moderate change is observed.

In addition, it appears that bilabial-initial stop consonant words in isolation are not significantly distinct from Session 1 to Session 4. The resulting change from Session 1 to

Session 4 is 5 milliseconds, which is negligible. However, that is without statistical analysis, this can be deceiving. In Table 5.1, a T-test was preformed on each session analyzed against the other sessions.

Table 5.1:T-test of p-Initial Words in Isolation of All Learners

Sessions	P-value
S1→S2	0.0299865
S1→S3	0.2240035
S2→S3	0.152028
S2→S4	<.0001
S3→S4	0.0017615
S1→S4	0.0299865

What is notable from this table most of all is not the difference across individual sessions, but the difference from Session 1 to Session 4, S1→S4, because this says that there was a significant difference from the production of /p/-initial stop consonants at the very beginning of this study compared to the very end of this study. In other words, the learners as a whole changed their production of p-initial stops consonants; however, if one looks at Figure 5.1 the change was in positive direction and thus the final averages of the learners was further away from 0, becoming more aspirated and less like the French production of aspirated stop consonants. Next, I will look at /p/-initial words in carrier phrases as produced by the learners.

In Figure 5.2, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 53 milliseconds. At Session 2 and Session 3, small/negligible change is observed and at Session 4, moderate change is observed. In addition, the same pattern seems to emerge between Session 1 to Session 4 (from the start of the study to the end). The difference in

duration is 5 milliseconds, for a moderate change. In Table 5.2, a T-test was preformed on each Session to test for significance.

Figure 5.2: Average V.O.T. /p/-Initial Words in Carrier Phrases of All Learners

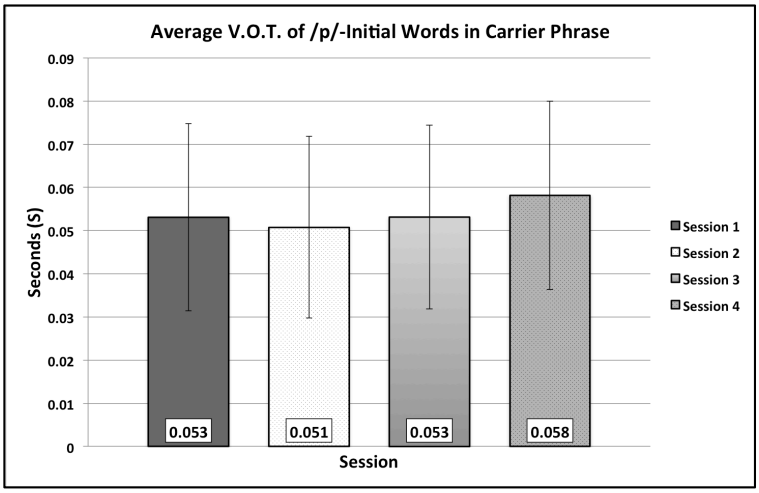


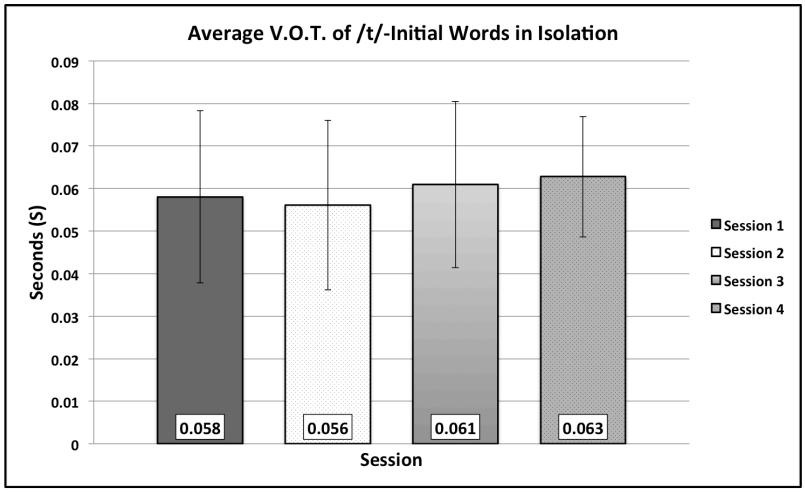
Table 5.2:T-test of P-initial Words in Carrier Phrases of All Learners

Sessions	P-value
S1→S2	0.184461
S1→S3	0.5
S2→S3	0.181817
S2→S4	0.003195
S3→S4	0.032023
S1→S4	0.03274

Again, Session 1 and Session 4 differed significantly in terms of /p/-initial V.O.T.; however, as seen in Figure 5.2, the average of Session 4 is larger than that of Session 1, therefore, the V.O.T. is larger and so reflects more an English style of stop aspiration. Moreover, the learners as a whole seem to have produced significantly different values at Session 1 and Session 4 but as a whole, it seems to be further from 0, or the normal V.O.T. for French speakers.

Turning now to alveolar POA, /t/-initial words. In isolation, shown in Figure 5.3, the same trend seems to appear: a downward slope toward zero from Session 1 to Session 2 and then rising to the highest point at Session 4. Therefore, I hypothesize that the same sort of significance will appear.

Figure 5.3: Average V.O.T. /t/-Initial Words in Isolation of All Learners



In Figure 5.3, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 58 milliseconds. At Sessions 2, 3, and 4 negligible change is observed. In addition, the difference of V.O.T. from Session 1 to Session 4 is 7 milliseconds, for a moderate change. A T-test is preformed in Table 5.3.

In Table 5.3, the T-tests show that almost no session is significantly different from one another, with exception to Sessions 2 and 4 where some significance is shown. However, the significance between Session 2 and Session 4 is in the positive direction, further away from 0, and thus the production of /t/-initial stop consonants seems to be less French-like at Session 4 than at Session 2. In addition, Session 1 to Session 4 showed no significance and

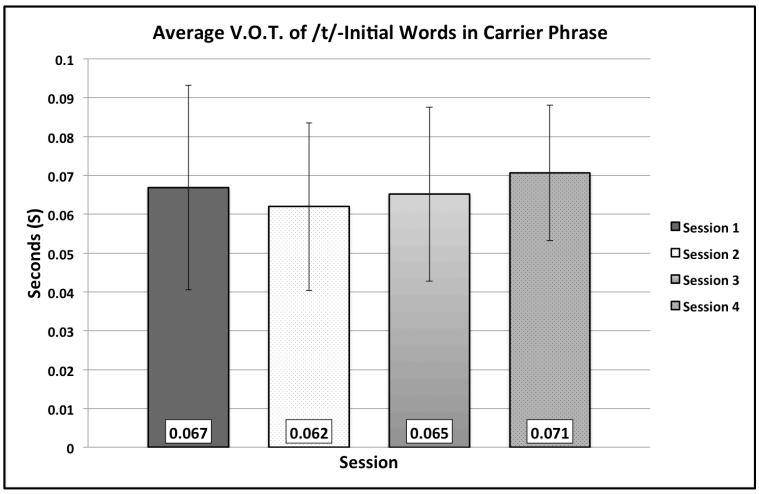
therefore it can be said that that the learners did not change their /t/-initial production significantly as a whole for words in isolation.

Table 5.3: T-test of t-initial Words in Isolation of All Learners

Sessions	P-value
S1→S2	0.378635
S1→S3	0.201555
S2→S3	0.1165775
S2→S4	0.0376435
S3→S4	0.3091615
S1→S4	0.1037165

For /t/-initial words in carrier phrases, Figure 5.4 shows the averages of V.O.T. at four different sessions.

Figure 5.4: Average V.O.T. /t/-Initial Words in Carrier Phrases of All Learners



In Figure 5.4, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 67 milliseconds. At Session 2 and Session 3, negligible change is observed and at

Session 4, moderate change is observed. In addition, the difference of V.O.T. from Session 1 to Session 4 is 4 milliseconds for a negligible change. A T-test is preformed in Table 5.4.

As noted for /t/-initial words in isolation, the only sessions that are significant from one another are Sessions 2 and 4 and that the difference at S4 is higher than at S2, thus the change is further from 0, or French-like production. In addition, Session 1 and Session 4 were not significantly different and thus their production did not change all that much between sessions. Therefore, the learners as a whole do not show a significant change in /t/-initial POA for stop consonants.

Table 5.4: T-test of t-initial Words in Carrier Phrases of All Learners

Sessions	P-value
S1→S2	0.378635
S1→S3	0.201555
S2→S3	0.1165775
S2→S4	0.0376435
S3→S4	0.3091615
S1→S4	0.1037165

Turning now to velar POA, /k/-initial words. In isolation, shown in Figure 5.5, the same trend seems to appear: a downward slope toward zero from Session 1 to Session 2 and then rising to the highest point at Session 4. However, at Session 3, unlike the previous examples, the V.O.T. decreases slightly instead of increasing.

In Figure 5.5, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 71 milliseconds. At Session 2 and Session 3, negligible change is observed and at Session 4, moderate change is observed. In addition, the difference of V.O.T. from Session 1 to Session 4 is 4 milliseconds for a negligible change. In addition, the difference of V.O.T.

from Session 1 to Session 4 is 5 milliseconds or negligible change. A T-test is preformed to test the significance in Table 5.5.

Figure 5.5: Average V.O.T. /k/-Initial Words in Isolation of All Learners

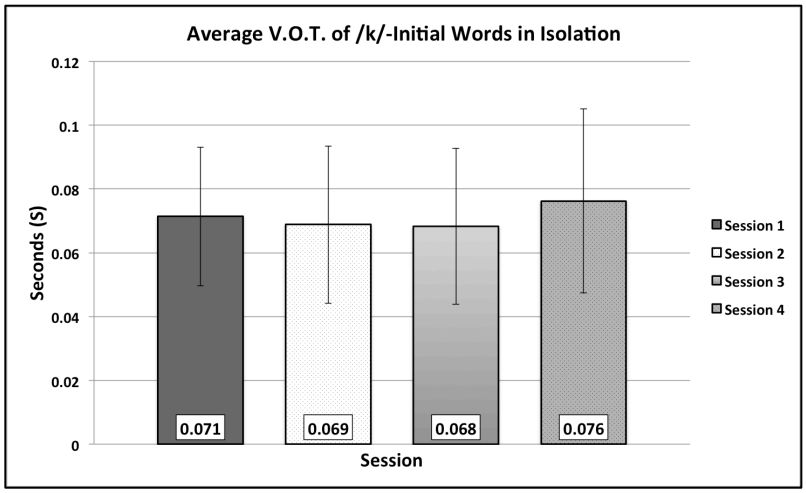


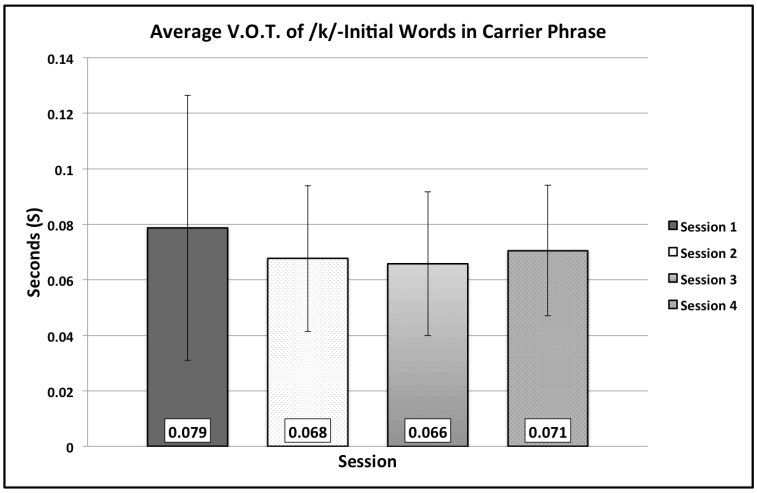
Table 5.5: T-test of k-initial Words in Isolation of All Learners

Sessions	P-value
S1→S2	0.2649225
S1→S3	0.218427
S2→S3	0.4444425
S2→S4	0.0668695
S3→S4	0.051834
S1→S4	0.150233

For velar-initial words in isolation, no VOT values across sessions were significantly different from any others. Session 3 and Session 4 are marginally significant, however, it is so close that change in VOT cannot be inferred to mean that there is significance. This means that the learners, as whole produced roughly the same V.O.T. for /k/-initial words in isolation throughout the entire experiment.

For /k/-initial words in carrier phrases, Figure 5.6 shows the averages of V.O.T. at the four different sessions.

Figure 5.6: Average V.O.T. /k/-Initial Words in Carrier Phrases of All Learners



In Figure 5.6, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 79 milliseconds. At Session 2 great change is observed and at Session 3, negligible change is observed. At Session 4, negligible change is observed. In addition, the difference of V.O.T. from Session 1 to Session 4 is 4 milliseconds for a negligible change. Also, the difference of V.O.T. from Session 1 to Session 4 is 8 milliseconds, a moderate change. A T-test is preformed to test the significance in Table 5.6.

In carrier phrases, for /k/-initial words, VOT is shown to be significant for the learners at Session 1 and Session 2, as well as at Session 2 and Session 3; however, at any other session there is no significance. For this study, Session 1 and Session 4 for is the most interesting, with the resulting p-value of less than .05 and thus, velar-initial words in carrier phrases for the learners as a whole are not significantly different. Thus, their VOT values remained as a whole the same throughout the experiment.

Table 5.6: T-test of k-initial Words in Carrier Phrases of All Learners

Sessions	P-value
S1→S2	0.01985
S1→S3	0.0079775
S2→S3	0.2983415
S2→S4	0.2134795
S3→S4	0.0905755
S1→S4	0.0689285

In summary, at Sessions 1 (start of the study) and Session 4 (end of the study), the only significantly differences were with /p/-initial words in isolation and in carrier phrases. For both isolation and carrier phrases, /p/-initial stop consonant VOT were produced significantly different from S1 to S4; however, the S4 was longer in duration than S1 and therefore the learners seemed to deviate from French-like production, i.e., further from 0. The other two places of articulation, alveolar and velar, showed no significance from S1 to S4. This gives a general inclination that audiovisual stimuli has not played a huge part in the facilitation of this specific aspect the L2 pronunciation (i.e., English-like aspiration did not significantly change to become more French-like). One could hypothesize that if audiovisual stimuli did contribute, then the averages even at the general level would have decreased at S4. However, this was not observed at the macro-level.

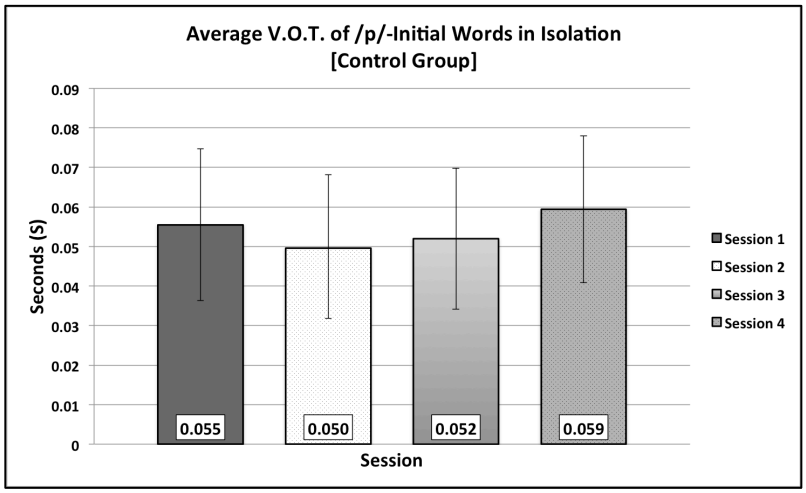
But, the experimental group could have had significant differences that were washed away because of the variation of the control group. In addition, the small group sizes could contribute the potential loss of individual variation when the speakers are lumped together. Thus, in the next two sections, I will zoom in closer to the micro-level to see if individually the control group and experimental group showed significant change from S1 to S4.

Section 5.3: Findings – Control Group

Recall from the previous section that at the macro level, looking at both the control group and experimental group as one, no clear indication of significance emerged. In this section, I will focus on the control group and look at their variation within to see if the change in V.O.T. is significantly different from Session 1 to Session 4. I will follow the same process as before: I will present the data for each place of articulation first in isolation, and then in carrier phrases, along with presentation of T-test results for statistical analysis to support what the visual portrait shows in the charts.

For bilabial-initial POA, the control group's average V.O.T. is shown in Figure 5.7.

Figure 5.7: Average V.O.T. /p/-Initial Words in Isolation of Control Group



The "u"-shaped progression is evident for the control group for /p/-initial words in isolation, as shown in Figure 5.7. This is already interesting because, recall to Figure 5.1, of the "u"-shaped progression.

In Figure 5.7, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 55 milliseconds. At Session 2 and Session 3, negligible change is observed and at

Session 4, moderate change is observed. In addition, the difference of V.O.T. from Session 1 to Session 4 is 4 milliseconds, negligible change. A T-test is preformed to test the significance in Table 5.7.

Table 5.7: T-test of p-initial Words in Isolation of Control Group

Sessions	P-value
S1→S2	0.066048
S1→S3	0.1852885
S2→S3	0.367329
S2→S4	0.0056155
S3→S4	0.040057
S1→S4	0.160026

As shown in Table 5.7, the T-test showed no significance between S1 and S4 V.O.T.s and thus the control group's production of /p/-initial words in isolation is static or in other words remained roughly the same throughout the study. However, some significance is shown between S2 and S4 as well as S3 and S4 but the result of S4 is further from 0 or the average V.O.T. of a native French person.

In carrier phrases, /p/-initial words are shown in Figure 5.8.

As shown in Figure 5.8, the averages for V.O.T. for the control group have stabilized, or so it seems, and thus I predict that the T-tests will show little significance. In Figure 5.8, the average V.O.T. for learners in the control group is shown.

At Session 1, the average V.O.T. was 53 milliseconds. At Session 2, Session 3, and Session 4, negligible change is observed. In addition, the difference of V.O.T. from Session 1 to Session 4 is 3 milliseconds, a negligible change. A T-test is preformed to test the significance in Table 5.8.

Figure 5.8: Average V.O.T. /p/-Initial Words in Carrier Phrases of Control Group

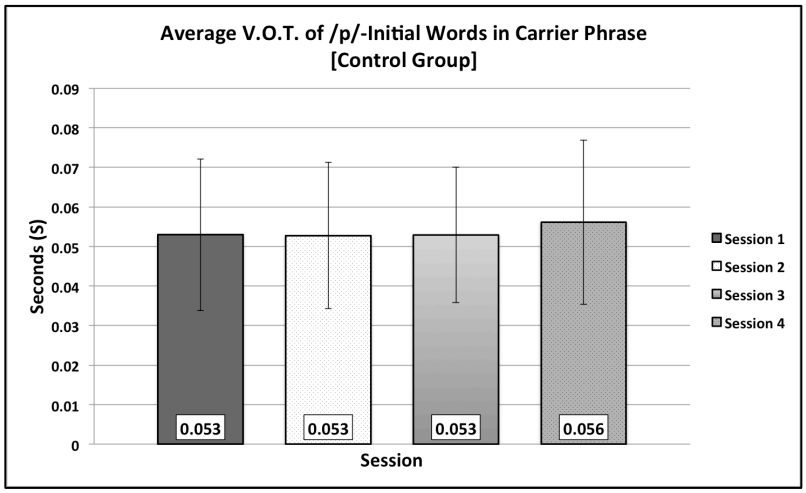


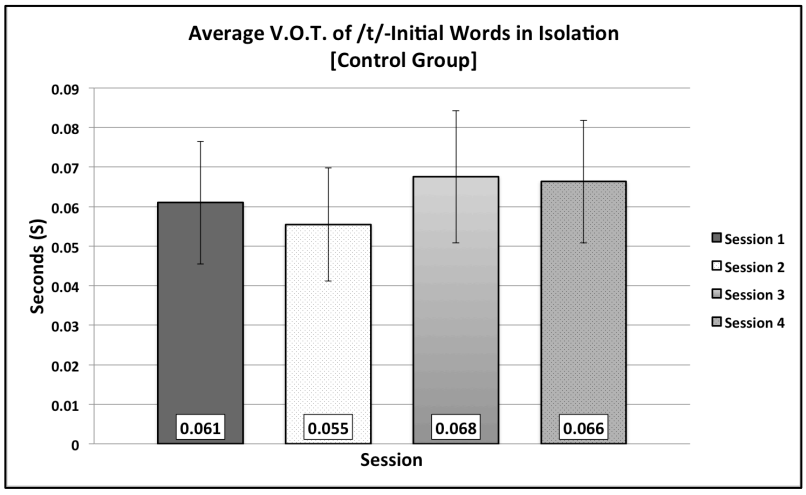
Table 5.8: T-test of p-initial Words in Carrier Phrases of Control Group

Sessions	P-value
S1→S2	0.4761375
S1→S3	0.4920415
S2→S3	0.4840865
S2→S4	0.193192
S3→S4	0.198678
S1→S4	0.2156985

As predicted, there is no significant difference between Sessions 1 through 4 and thus V.O.T. remained static for /p/-initial words in carrier phrases for the control group. This is interesting because it suggests that individually, there may have been some change in the production of bilabial-initial words in isolation; however, in carrier phrases this distinction is diminished and thus no significance appears.

Turning to alveolar place of articulation, /t/-initial words. In isolation, shown in Figure 5.9, the "u"-shaped progression has disappeared. This is unique to the previous examples.

Figure 5.9: Average V.O.T. /t/-Initial Words in Isolation of Control Group



In Figure 5.9, the average V.O.T. for /t/-initial words in isolation for learners in the control group is shown. At Session 1, the average V.O.T. was 61 milliseconds. At Session 2 moderate change is observed and at Session 3, great change is observed. At Session 4, negligible change is observed. In addition, the difference of V.O.T. from Session 1 to Session 4 is 4 milliseconds for a negligible change. In addition, the difference of V.O.T. from Session 1 to Session 4 is 5 milliseconds, a moderate change. A T-test is preformed to test the significance in Table 5.9.

Table 5.9: T-test of t-initial Words in Isolation of Control Group

Sessions	P-value
S1→S2	0.13953
S1→S3	0.11543
S2→S3	0.013239
S2→S4	0.018138
S3→S4	0.409735
S1→S4	0.1528395

For the control group, the only sessions that show any significance were S2 and S3 as well as S2 and S4, as detailed in Table 5.9. Sessions 1 and 4 are not significantly different and thus their production did not change significantly from the start of the study to the end of the study.

In Figure 5.10, /t/-initial words for the control group are analyzed in carrier phrases.

As shown in Figure 5.10, the averages for V.O.T. for the control group have more-or-less stabilized, with exception to S2, and thus I predict that the T-tests will show little significance other than for Session 2. In Figure 5.10, the average V.O.T. for learners in the control group is shown. At Session 1, the average V.O.T. was 67 milliseconds. At Session 2 and at Session 3 moderate change is observed. At Session 4, negligible change is observed. In addition, the difference of V.O.T. from Session 1 to Session 4 is 3 milliseconds, a negligible change. A T-test is performed to test the significance in Table 5.10.

Figure 5.10: Average V.O.T. /t/-Initial Words in Carrier Phrases of Control Group

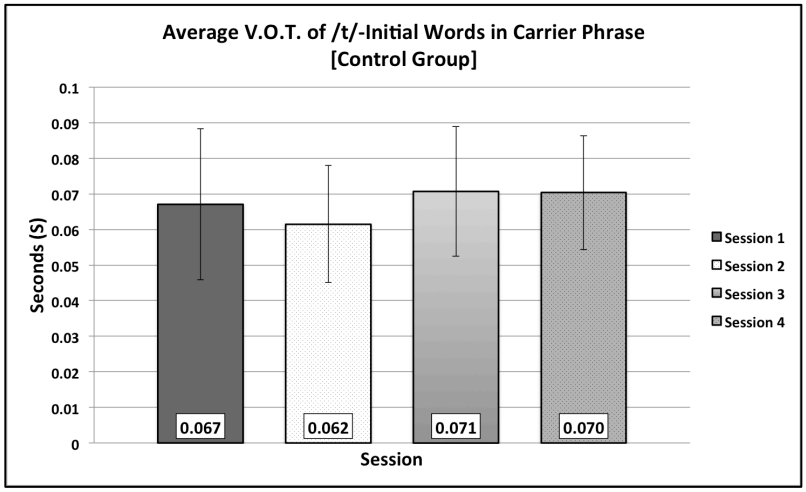


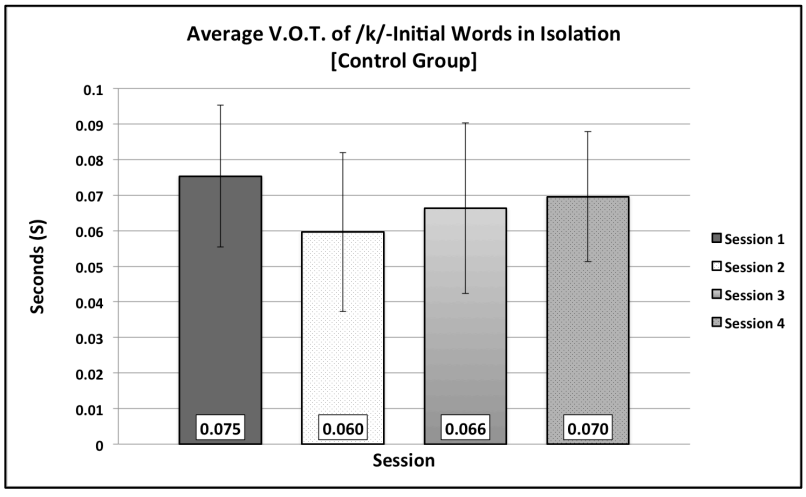
Table 5.10: T-test of t-initial Words in Carrier Phrases of Control Group

Sessions	P-value
S1→S2	0.142563
S1→S3	0.252911
S2→S3	0.028906
S2→S4	0.025368
S3→S4	0.472231
S1→S4	0.2624915

As was the results from the /t/-initial carrier phrase words, the only significant change in VOT values through time was at S2 with S3 and S4. Session 1 and Session 4 showed no significant changes in VOT values, therefore, the control group for /t/-initial words in carrier phrases, little change is observed and thus the production for the most part remained unchanged from the debut of the study to the end of the study.

Turning to velar place of articulation for learners in the control group, isolation is analyzed in Figure 5.11.

Figure 5.11: Average V.O.T. /k/-Initial Words in Isolation of Control Group



In Figure 5.11, the average V.O.T. for learners in the control group is shown. At Session 1, the average V.O.T. was 75 milliseconds. At Session 2 great change is observed and at Session 3, moderate change is observed. At Session 4, negligible change is observed. In addition, the difference of V.O.T. from Session 1 to Session 4 is 4 milliseconds for a negligible change. In addition, the difference of V.O.T. from Session 1 to Session 4 is 5 milliseconds, a negligible change. A T-test is preformed to test the significance in Table 5.11.

Table 5.11: T-test of k-initial Words in Isolation of Control Group

Sessions	P-value
S1→S2	0.006737
S1→S3	0.081175
S2→S3	0.161271
S2→S4	0.0488975
S3→S4	0.2993305
S1→S4	0.1496015

For /k/-initial words in isolation, S1 and S2 are significantly different, as well as S2 and S4. However, S1 and S4, are not significantly different; therefore, the difference between the start of the study and the end of the study is minimal. Thus, the control group's production of velar-initial stop consonants does not change from S1 to S4 too significantly.

As for /k/-initial words in carrier phrases, Figure 5.12 shows similar results. In Figure 5.12, the average V.O.T. for learners in the control group is shown. At Session 1, the average V.O.T. was 68 milliseconds. At Session 2, 3, and 4 negligible change is observed. In addition, the difference of V.O.T. from Session 1 to Session 4 is 4 milliseconds, a negligible change. It is important to note that this decrease in Session 4 is the first time observed. A T-test is preformed to test the significance in Table 5.12.

Figure 5.12: Average V.O.T. /k/-Initial Words in Carrier Phrases of Control Group

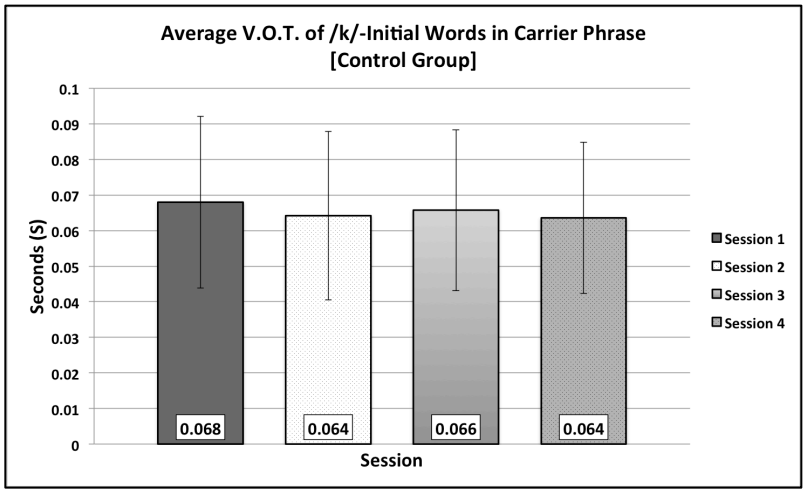


Table 5.12: T-test of k-initial Words in Carrier Phrases of Control Group

Sessions	P-value
S1→S2	0.2430325
S1→S3	0.337835
S2→S3	0.382498
S2→S4	0.4524
S3→S4	0.330593
S1→S4	0.196247

Regardless of the dip in S4, the difference is not significant as shown in Table 5.12. Moreover, for /k/-initial words in carrier phrases, the control group did not show any significance in any of the sessions.

In summary, the following table shows which session showed significance.

S1→S4 does not appear to show any significant change in VOT values across POAs; however, a change between S2→S4, is more prominent. For all POAs, differences between S2 and S4 show significance in VOT value differences and each show S4 having a longer V.O.T. than S2, except for velar-initial words in isolation, whereby S4 is shorter than S2.

Table 5.13: Recapitulation of Significance of the Control Group VOT

	Isolation	Carrier Phrase
Bilabial-Initial	S2→S4, S3→S4	Ø
Alveolar-Initial	S2→S3, S2→S4	S2→S3, S2→S4
Velar-Initial	S1→S2, S2→S4	Ø

What does this mean for the control group in a general way? First, it means that contrary to prediction, the carrier phrase does not seem to play an active role in shortened VOT through time. Also, contrary to prediction for the control group, VOT actually increases through time (across sessions) for some learners.

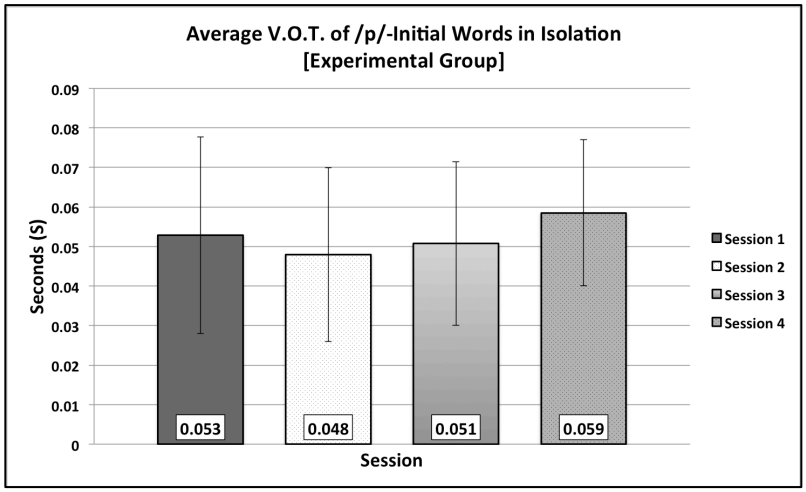
In the following section, I will zoom in to the micro-level on the experimental group. This section's results will answer the question whether or not audiovisual stimuli seems to make a difference to the L2 pronunciation over time.

Section 5.4: Findings – Experimental Group

In this section, I will focus on the experimental group and look at their variation within to see if the change they produced was significantly different from Session 1 to Session 4. I will follow the same process as before: I will present the data for each place of articulation in isolation and then in carrier phrases along with T-tests for statistical analysis to support what is shown in the charts. Ideally, we should see a steady decrease of V.O.T. at each session in which case that would support the claim that audiovisual stimuli facilitates the production of L2 target-like pronunciation. In the next Chapter, I will zoom in even further to look at individual patterns within the experimental group.

For bilabial-initial words in isolation, the experimental group's average V.O.T. is shown in Figure 5.13.

Figure 5.13: Average V.O.T. /p/-Initial Words in Isolation of Experimental Group



For /p/-initial words in isolation the experimental group produced V.O.T. values of 53 milliseconds at Session 1. At Session 2 and at Session 3 negligible change in VOT for /p/-initial words in isolation is observed. At Session 4, moderate change is observed. The difference from S1 to S4 in VOT was an increase of 6 milliseconds, a moderate change, which seems to counter the claim that L2 target-like pronunciation is facilitated by audiovisual stimuli. A T-test, shown in Table 5.14, establishes the significances of each session.

As shown in Table 5.14, the T-test showed no significance between S1 and S4 V.O.T.s and thus the experimental group's production of /p/-initial words in isolation is static or in other words remained roughly the same throughout the study. However, some significance is shown between S2 and S4 as well as S3 and S4 but the result of S4 is further from 0 or the average V.O.T. of a native French person.

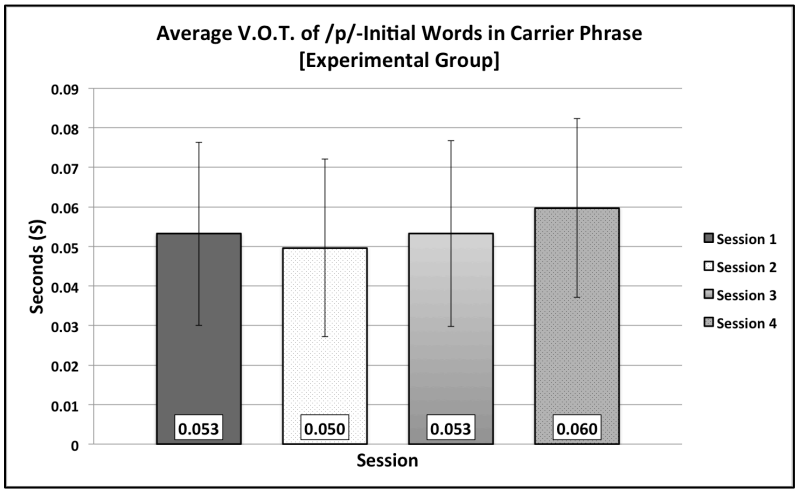
In carrier phrases, /p/-initial words are shown in Figure 5.14.

Table 5.14: T-test of p-initial Words in Isolation of Experimental Group

Sessions	P-value
S1→S2	0.101274
S1→S3	0.288163
S2→S3	0.2096205
S2→S4	0.001767
S3→S4	0.012408
S1→S4	0.0719615

For /p/-initial words in carrier phrases the experimental group produced V.O.T. values of 53 milliseconds at Session 1. At Session 2 and at Session 3 negligible change is observed. At Session 4, moderate change is observed. The difference from S1 to S4 was an increase of 7 milliseconds, a moderate change. A T-test, shown in Table 5.15, measures cross-group differences and within-group variation, which results in a p-value for significance.

Figure 5.14: Average V.O.T. /p/-Initial Words in Carrier Phrases of Experimental Group



As shown in Table 5.15, the T-test showed significance between S1 and S4 V.O.T.s and thus the experimental group's production of /p/-initial words in carrier phrases did change from the beginning of the study to the end of the study. However, this goes against the claim: audiovisual stimuli exposure will result in a lower V.O.T. and thus, the experimental group changed at the end of the study but this change does not correlate to native French-like production of stop consonants. Therefore, one could make the assumption that audiovisual stimuli exposure, for /p/-initial words, does not correspond to a decrease in V.O.T. duration.

Table 5.15: T-test of p-initial Words in Carrier Phrases of Experimental Group

Sessions	P-value
S1→S2	0.1522455
S1→S3	0.4920335
S2→S3	0.149917
S2→S4	0.1522455
S3→S4	0.149917
S1→S4	0.041948

Turning to alveolar place of articulation, /t/-initial words. In isolation, shown in Figure 5.15, the "u"-shaped progression has disappeared. This is unique to the previous examples.

For /t/-initial words in isolation the experimental group produced V.O.T. values of 56 milliseconds at Session 1. At Session 2 and at Session 3 negligible change is observed. At Session 4, negligible change is observed. The difference from S1 to S4 was an increase of 4 milliseconds, which is also a negligible change. A T-test is shown in Table 5.16.

Figure 5.15: Average V.O.T. /t/-Initial Words in Isolation of Experimental Group

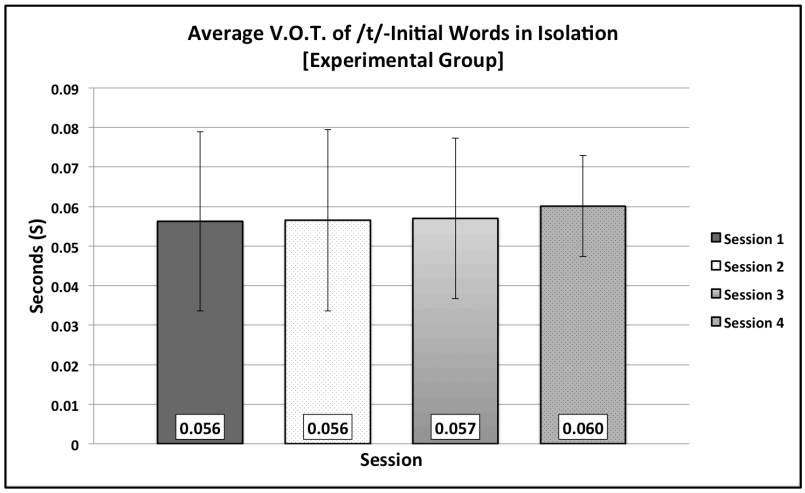


Table 5.16: T-test of t-initial Words in Isolation of Experimental Group

Sessions	P-value
S1→S2	0.3978845
S1→S3	0.448508
S2→S3	0.4642985
S2→S4	0.246631
S3→S4	0.2560835
S1→S4	0.231314

As shown in Table 5.16, there is no significant difference between any two sessions, which supports the negligible change as noted in Figure 5.15. Thus, for /t/-initial words in isolation the experimental group produced them the same from the beginning of the study to the end of the study. Figure 5.16 focuses on the alveolar-initial words in carrier phrases.

For /t/-initial words in carrier phrases, the experimental group produced V.O.T. values of 67 milliseconds at Session 1. At Session 2 and at Session 3 moderate change is observed. At Session 4, negligible change is observed. The difference from S1 to S4 was an

increase of 4 milliseconds, which is also a negligible change. A T-test, shown in Table 5.17, establishes the significances of each session.

Figure 5.16: Average V.O.T. /t/-Initial Words in Carrier Phrases of Experimental Group

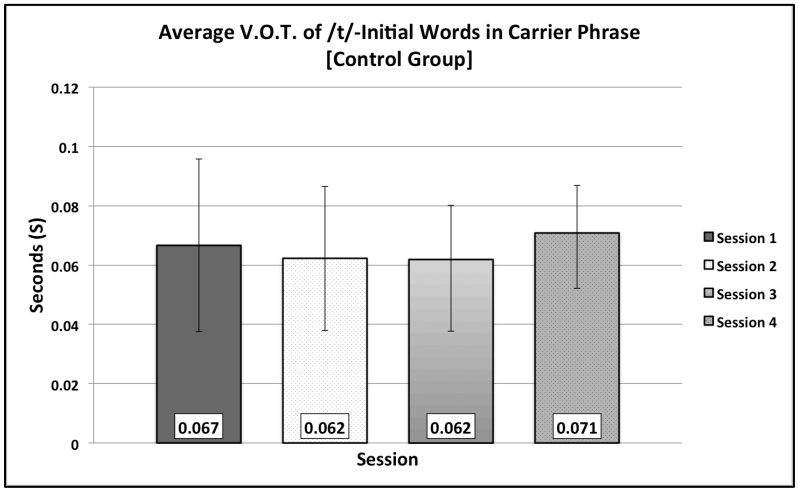


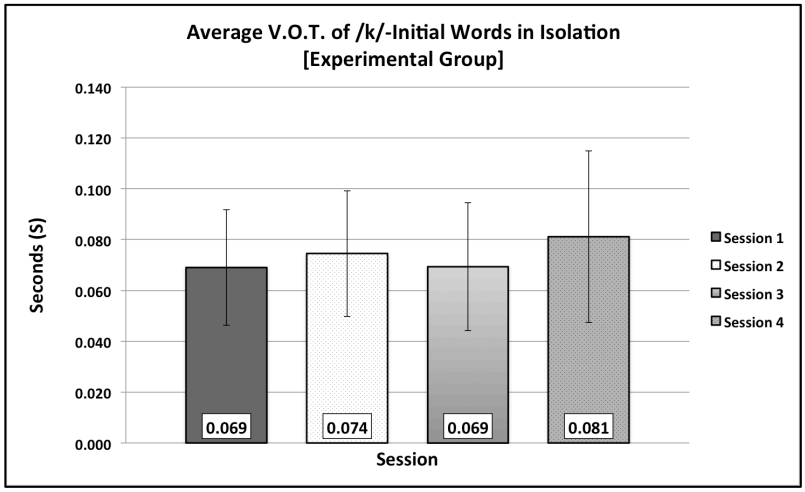
Table 5.17: T-test of t-initial Words in Carrier Phrases of Experimental Group

Sessions	P-value
S1→S2	0.2158255
S1→S3	0.198816
S2→S3	0.476146
S2→S4	0.0420005
S3→S4	0.0362735
S1→S4	0.2337745

As were the results from the /t/-initial carrier phrase words, the only significant session was S2 and S4 as well as S3 and S4. Session 1 and Session 4 was not significantly different, therefore, the experimental group for /t/-initial words in carrier phrases, little change is observed and thus the production for the most part remained unchanged from the debut of the study to the end of the study.

Turning to velar place of articulation for learners in the control group, isolation is analyzed in Figure 5.17.

Figure 5.17: Average V.O.T. /k/-Initial Words in Isolation of Experimental Group



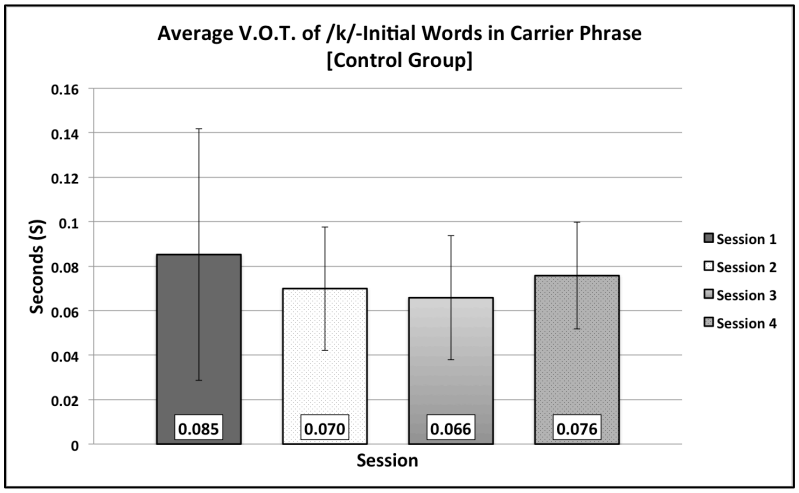
For /k/-initial words in isolation the experimental group produced V.O.T. values of 69 milliseconds at Session 1. At Session 2 and at Session 3 moderate change is observed. At Session 4, great change is observed. The difference from S1 to S4 was an increase of 6 milliseconds, which is also a moderate change. A T-test, shown in Table 5.18, establishes the significances of each session.

Table 5.18: T-test of k-initial Words in Isolation of Experimental Group

Sessions	P-value
S1→S2	0.1554615
S1→S3	0.4761545
S2→S3	0.182831
S2→S4	0.1702035
S3→S4	0.0467855
S1→S4	0.037294

As shown in Table 5.18, the only significantly different sessions were S3→S4 and S1→S4. Thus, for /k/-initial words in isolation the experimental group produced them the differently from the beginning of the study to the end of the study. Figure 5.18 focuses on the velar-initial words in carrier phrases.

Figure 5.18: Average V.O.T. /k/-Initial Words in Carrier Phrases of Experimental Group



For /k/-initial words in carrier phrases the experimental group produced V.O.T. values of 85 milliseconds at Session 1. At Session 2, great change is observed and at Session 3 moderate change is observed. At Session 4, great change is observed. The difference from S1 to S4 was a decrease of 9 milliseconds, which is also a moderate change. A T-test, shown in Table 5.19, establishes the significances of each session.

As shown in Table 5.19, /k/-initial words in carrier phrases were produced significantly different between the following sessions: Session 1 and Session 2, Session 1 and Session 3, and Session 3 and Session 4. In addition, the change from S1 to S4 was not significant; therefore, the experimental group produced roughly the same /k/-initial VOT

throughout the study. Even though there is notably a decrease in VOT at Session 4, it is not truly significant.

Table 5.19: T-test of k-initial Words in Carrier Phrases of Experimental Group

Sessions	P-value
S1→S2	0.0254985
S1→S3	0.0072185
S2→S3	0.20687
S2→S4	0.1124805
S3→S4	0.0218205
S1→S4	0.1325235

In summary, the following table shows which session showed significance.

Table 5.20: Recapitulation of Significance of the Experimental Group VOT

	Isolation	Carrier Phrase
Bilabial-Initial	S2→S4, S3→S4	S1→S4
Alveolar-Initial	Ø	S2→S4, S3→S4
Velar-Initial	S3→S4, S1→S4	S1→S2, S1→S3

S1→S4 does appear to be significant in two positions: bilabial-initial stop consonants within carrier phrases and velar-initial stop consonants in isolation; however, this change results in a more English-like pronunciation and less French-like pronunciation. Therefore, the experimental group did not change their production to be more French-like.

What does this mean for the experimental group in a general way? Much like with the control group, the experimental group's production of stop consonants increases through time

(across sessions) for some learners and in general becomes more aspirated than the initial S1 V.O.T. If S4 is significantly different from S1, it is always a higher V.O.T. value, therefore, less French-like. Contrary to the hypothesis, the experimental group's V.O.T. did not change from exposure to the audiovisual stimuli.

In the next Section, I will compare the control group to the experimental in terms of V.O.T. duration. I will examine control and experimental bilabial-initial data against the two groups. This will be done through additional T-tests.

Section 5.5: Control Group Vs. Experimental Group T-tests

In this section, I will analyze the two groups together to see whether or not the experimental group produced significantly different V.O.T.s than the control group. Recall that the previous two sections looked at the group independently. Table 5.21 analyzes the stop-initial consonants between the two groups, control and experimental, and across the sessions. In addition, there is an overall analysis where all the data is analyzed through a T-test for significance. If the two groups were distinct from another, specifically at Session 4, then the T-test will show a p-value of less than .05.

Table 5.21: Stop-Initial V.O.T. in Isolation; Comparing Control and Experimental Averages

	Bilabial-Initial		*Alveolar-Initial*		*Velar-Initial*	
	Control	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*
S1	55ms	53ms	61ms	56ms	75ms	69ms
S2	50ms	48ms	55ms	56ms	60ms	74ms
S3	52ms	51ms	68ms	57ms	66ms	69ms
S4	59ms	59ms	66ms	60ms	70ms	81ms
All	54ms	53ms	62ms	46ms	68ms	73ms

The only area of significance is shown to be /t/-initial words in isolation overall. This is interesting considering none of the individual sessions showed great significance among each other. Regardless, it is safe to say that for words in isolation, stop consonants, no matter the place of articulation, did not vary greatly. Therefore the two groups were rather similar in their productions of the stop consonants throughout the study, with little change.

Turning to stop consonants in carrier phrases, Table 5.22 analyses the significance between the two groups.

Table 5.22 shows marginal significance for /t/-initial stop consonants in carrier phrases between the experimental group and the control group. There is not a lot to say about this distinction and whether or not the audiovisual stimuli had anything to do with the change. For /k/-initial stop consonants, the degree of significance is more prevalent with S1, S3, and S4, as well as overall, all showing some degree of significance.

Table 5.22: Stop-Initial V.O.T. in Carrier Phrases; Comparing Control and Experimental Averages

	Bilabial-Initial		*Alveolar-Initial*		*Velar-Initial*	
	Control	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*
S1	53ms	53ms	67ms	67ms	68ms	85ms
S2	53ms	50ms	62ms	62ms	64ms	70ms
S3	53ms	53ms	61ms	62ms	66ms	66ms
S4	56ms	60ms	70ms	71ms	64ms	76ms
All	54ms	54ms	58ms	66ms	66ms	74ms

It is important to note that this degree of significance may not be attributed to the audiovisual stimuli. Take for instance the average V.O.T. for /k/-initial stop consonants in carrier phrases for both the experimental and control groups; the control group's average VOT duration was 64ms (refer back to Figure 5.12) and the experimental group's average

VOT duration was 76ms (refer back to Figure 5.18). Thus, the control group's production was more closely related to the French-like production than was the experimental group's production. Therefore, it would seem that the audiovisual stimuli did not directly influence the learners in the experimental group to produce more French-like stop consonants.

Section 5.6: Summary

In summary, in Chapter 5, the learner groups were analyzed—first, at the macro-level; I analyzed all learners independent of which group they took place in (Section 5.2); second, at the micro-level; I analyzed the two groups independently, the control group (Section 5.3) and the experimental group (Section 5.4); and third, I looked at the experimental group's production of stop consonants versus the control group's production (Section 5.5).

In Section 5.2, the following observations were made for both learner groups (control and experimental):

1. Bilabial-initial words in isolation and in carrier phrases showed significant change between Session 1 and Session 4.
2. Audiovisual stimuli seem to have not played a huge part in the facilitation of this specific aspect of the L2 pronunciation (i.e., English-like aspiration did not significantly change to become more French-like).

In Section 5.3, the following conclusions were drawn for the control group:

1. S1→S4 does not appear to be significant in any of the POAs.
2. Contrary to prediction, the carrier phrase does not seem to play an active role in shortened VOT through time.

3. Also, contrary to prediction for the control group, VOT actually increases through time (across sessions) for some learners.

In Section 5.4, the following conclusions were drawn for the experimental group:

1. S1→S4 does appear to be significant in two positions: bilabial-initial stop consonants within carrier phrases and velar-initial stop consonants in isolation; however, this change results in a more English-like pronunciation and less French-like pronunciation in terms of aspiration.
2. Much like with the control group, the experimental group's production of stop consonants increases through time (across sessions) for some learners and in general becomes more aspirated than the initial S1 V.O.T.
3. Contrary to the hypothesis, the experimental group's V.O.T. values did not change from exposure to the audiovisual stimuli.

In Section 5.5, the following conclusions were drawn for control group versus the experimental group:

1. It seems as though the experimental and control groups produced more-or-less the same duration of V.O.T. across all the sessions, therefore, they did not very greatly.
2. When significance was observed between the control group and experimental group, it was always the case that the experimental group's average V.O.T. duration was longer than the control groups, i.e., it seems as though the audiovisual stimuli did not facilitate the acquisition of French-like aspiration.

In Chapter 6, I will further analyze the data from the experimental group only.

CHAPTER VI

RESULTS II: A CLOSE-UP OF THE EXPERIMENTAL GROUP

Section 6.1: Introduction

Recall that the aim of this study is to test whether or not selected aspects of L2 pronunciation, namely French VOT, can be acquired through the exposure of learners to L2 audiovisual stimuli more so than can learners who have not been exposed to this audiovisual stimulus. As seen in the previous chapters, learners, when examined as an undifferentiated whole, do not seem to be influenced by the extra stimuli and for the most part their changes throughout the study, across the session, are negligible.

In this chapter, in Section 6.2, I examine more closely the control group and experimental group to see whether or not their proficiency level (i.e, FR101 or FR202) illustrates any differences in pronunciation of L2 (French) VOT of stops. In Section 6.3, I will zoom in still closer to consider individuals who showed characteristics of advancing French-like production of VOT. In addition, I will consider learners whose production goes against the predicted hypothesis, i.e., who show, across sessions, change that is moderate/great but in the opposite direction from the hypothesis.

The following questions can be addressed:

1. Which group shows more progression towards French-like VOT in production, across sessions, beginner-levels, or intermediate-levels?
2. Is there a noticeable difference between VOT in words produced in isolation versus in carrier phrases?
3. Do we see a continuous, decrease in VOT through time or does the change plateau in this progression between Sessions 1 and 4?

Section 6.2: Analysis of Data for All Learners (Control & Experimental)

During this study, two groups were analyzed, a control group and an experimental group, both of which were comprised of at least one beginner-level student (FR101) and at least one intermediate-level student (FR201).[1] In this Section, I examine both the experimental group and the control group together, separated only by their proficiency level. Then, in Section 6.3, I will look more closely at the experimental group's production of French VOT of stops, across the sessions and by level. This will provide both a macro (group) view and a micro (individual) view. In addition, in Section 6.4, I will zoom in closer to select individuals whose production was notable either because it supports the hypothesis (a linear progression to French-like VOT) or goes against the hypothesis.

For each place of articulation, I will present the data as follows: first, in isolation, I will present the results for the learners who were at the beginner-level; second, I will present the results for the learners who were at the intermediate-level; third, I will compare results between the two groups to see whether or not the sessions are distinct from one another between the proficiency levels. I will, then, repeat these steps for the words in carrier phrases. A recapitulative table will summarize the data at the end of the section.

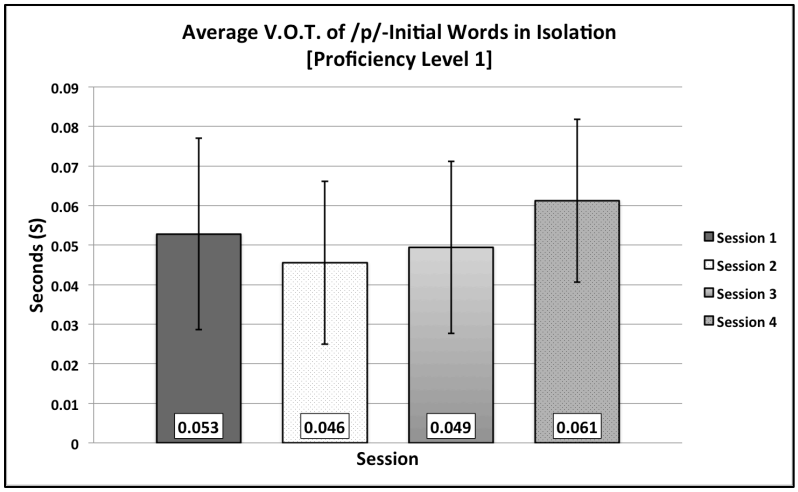
Section 6.2.1: Bilabial-Initial Stop Consonants

For bilabial-initial words in isolation, Figure 6.1 shows the average V.O.T. duration for learners who are at beginner-level proficiency (i.e., FR101). This is contrasted with Figure 6.2, which shows the average V.O.T. duration for learners who are at the

[1] Advanced learners were not analyzed to keep the variables the most consistent as no sections of FR301/401 were taught by the same professor.

intermediate-level proficiency (i.e., FR201). Recall that there are four learners from each proficiency level: F3/F4/F5/F6 in FR101 and F1/F2/F7/F8 in FR201.

Figure 6.1: Average V.O.T. /p/-Initial Words in Isolation of All Beginner-Level Learners



In Figure 6.1, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 53 milliseconds. At Session 2 great change is observed, and at Session 3, moderate change is observed. At Session 4, great change is observed. In addition, it appears that bilabial-initial stop consonant words in isolation are significantly distinct from Session 1 to Session 4. The resulting change from Session 1 to Session 4 is 8 milliseconds, which is a moderate change.

In Table 6.1, a T-test is run to statistically test whether any of the individual sessions are distinctly different from one another.

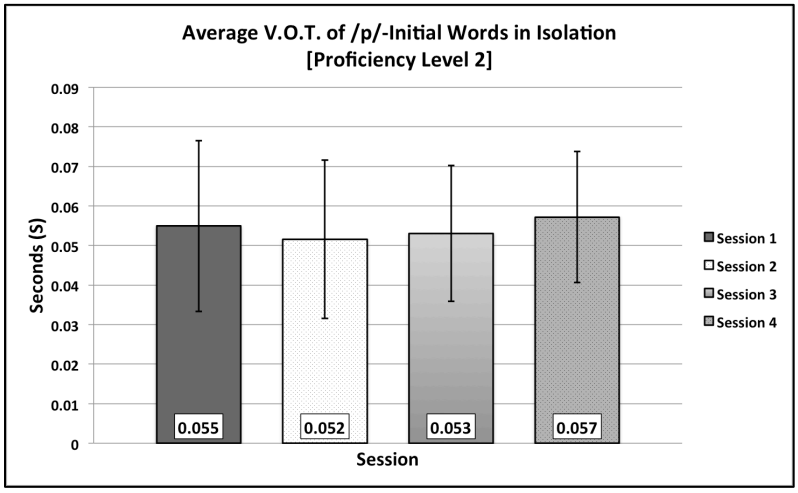
As shown in Table 6.1, Session 1 and Session 4 differed significantly, however, Session 4's average V.O.T. is *larger* than any other V.O.T., therefore concluding that the beginner-level learners' production of stop consonants became *less* French-like at the conclusion on the study as compared to at the beginning. At the intermediate-level, the same

increase can be seen for Session 4, in Figure 6.2. For each of the T-test charts, the shaded cell values represent a significant p-value of less than .05. This number indicates that the values were produced significantly different between the sessions.

Table 6.1:T-test of P-initial Words in Isolation of All Beginner-Level Learners

Sessions	P-value
S1→S2	0.039655
S1→S3	0.212659
S2→S3	0.1596785
S2→S4	<.0001
S3→S4	0.002965
S1→S4	0.031467

Figure 6.2: Average V.O.T. /p/-Initial Words in Isolation of All Intermediate-Level Learners



In Figure 6.2, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 55 milliseconds. At Session 2 and Session 3, negligible change is observed. At Session 4, negligible change is also observed. In addition, it appears that bilabial-initial stop consonant words in isolation are not significantly distinct from Session 1 to Session 4. The resulting change from Session 1 to Session 4 is 2 milliseconds, which is negligible.

In Table 6.2, a T-test is run to statistically test whether any of the individual sessions are distinctly different from one another.

Table 6.2: T-test of P-initial Words in Isolation of All Intermediate-Level Learners

Sessions	P-value
S1→S2	0.190324
S1→S3	0.298554
S2→S3	0.33399
S2→S4	0.478015
S3→S4	0.0898
S1→S4	0.258478

As shown in Table 6.2, Session 1 and Session 4 did not differ significantly. S4's average was larger than any of the other sessions, but only marginally compared to S2. This means that the intermediate-level for bilabial-initial stop consonants did not change their production throughout the study and stayed rather consistent. This could support my claim that the intermediate-level may be more resilient to changing their production.

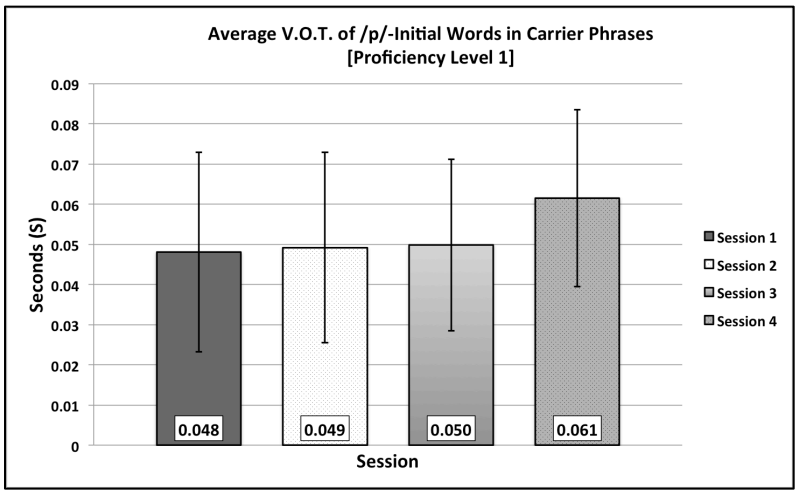
In Table 6.3, a T-test was used to compare the two levels to one another at each session to statistically see whether or not the data are significantly produced differently for the beginner- or intermediate-level learners.

Table 6.3: T-test of P-initial Words in Isolation of All Beginner-Level Learners Across Proficiency Levels

Sessions	P-value
S1 LVL1→S1 LVL 2	0.309003
S2 LVL1→S2 LVL 2	0.053951
S3 LVL1→S3 LVL 2	0.1596785
S4 LVL1→S4 LVL 2	0.1326595

As shown in Table 6.3, there is a marginal difference between the production of the beginner-level, LVL1, and the intermediate-level, LVL2; however, the average V.O.T. for the intermediate-level was 52 msec. and 46 msec. for the beginner-level. With these observations, it may be assumed that proficiency level is not a factor in the change of the production of /p/-initial words in isolation. Next, I will look at /p/-initial words in carrier phrases in Figure 6.3.

Figure 6.3: Average V.O.T. /p/-Initial Words in Carrier Phrases of All Beginner-Level Learners



In Figure 6.3, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 48 milliseconds. At Session 2 and Session 3, negligible change is observed. At Session 4, striking change is observed. In addition, it appears that bilabial-initial stop consonant words in carrier phrases are significantly distinct from Session 1 to Session 4. The resulting change from Session 1 to Session 4 is 13 milliseconds, which is a great change.

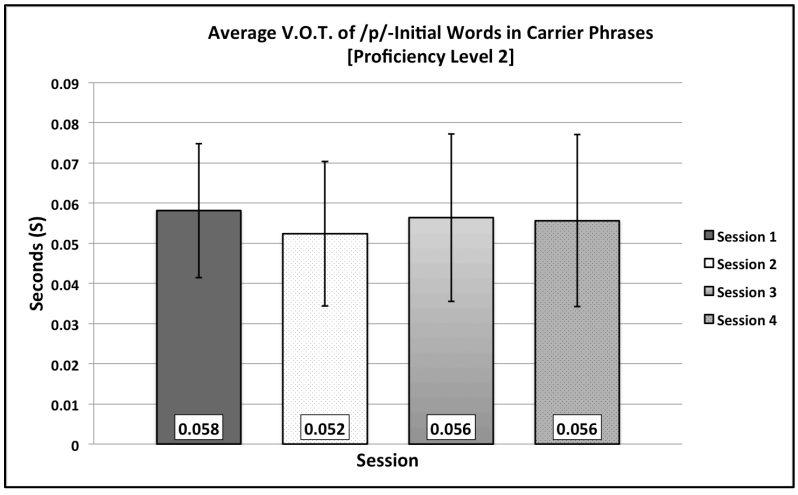
In Table 6.4, a T-test is run to test whether any of the individual sessions are different from one another.

Table 6.4: T-test of /p/-Initial Words in Carrier Phrases of All Beginner-Level Learners

Sessions	P-value
S1→S2	0.393788
S1→S3	0.330323
S2→S3	0.4326335
S2→S4	0.0023655
S3→S4	0.002229
S1→S4	0.0014155

As shown in Table 6.4, there is significance difference in the production of /p/-initial stop consonants when compared to S4; however, S4 is the largest of all the production, therefore, it is further from the target-like production. Therefore, it seems that through time the beginner-level learners produced progressively larger V.O.T.s that are further from French-like production. Next, I will observe the intermediate-level learners in Figure 6.4.

Figure 6.4: Average V.O.T. /p/-Initial Words in Carrier Phrases of All Intermediate-Level Learners



In Figure 6.4, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 58 milliseconds. At Session 2, moderate change is observed, and at Session 3, negligible change is observed. At Session 4, negligible change is observed. In addition, it appears that bilabial-initial stop consonant words in carrier phrases are not significantly distinct from Session 1 to Session 4. The resulting change from Session 1 to Session 4 is 2 milliseconds, which is negligible.

In Table 6.5, a T-test is run to statistically test whether any of the individual sessions are distinctly different from one another.

Table 6.5: T-test of /p/-Initial Words in Carrier Phrases of All Intermediate-Level Learners

Sessions	P-value
S1→S2	0.02724
S1→S3	0.2984945
S2→S3	0.1142045
S2→S4	0.166897
S3→S4	0.420892
S1→S4	0.227285

As noted for the /p/-initial words in isolation for all intermediate-level learners, the significance is limited. As shown in Table 6.5, the /p/-initial words in carrier phrases for all intermediate-level learners was only significantly different between S1 and S2. This trend of no significance for the intermediate-level may suggest that the intermediate-level is more resilient to change as compared to the beginner-level, as I had hypothesized.

In Table 6.6, a T-test is used to compare the two levels to one another at each session to statistically see whether or not the data are produced significantly differently for the beginner- or intermediate-level learners.

As shown in Table 6.6, there is significant difference between how intermediate- and beginner-level learners produced /p/-initial words in carrier phrases at Sessions 1 and 3. However, there is no notable change for Session 4; therefore, the production of /p/-initial words in carrier phrases are produced similarly for both the intermediate- and beginner-level learners. What is increasingly interesting is that for both significances, the intermediate-level learners' average VOT was greater than the beginner-level learners. This is interesting because it proposes that learning L2 production of French-like VOT may not decrease incrementally through time and may plateau at different points; in addition, non-native-like production of stop consonant VOT may reemerge, as discussed in the u-shaped development.

Table 6.6: T-test Comparison of /p/-Initial Words in Carrier Phrases Across Proficiency Levels

Sessions	P-value
S1 LVL1→S1 LVL 2	0.003295
S2 LVL1→S2 LVL 2	0.192928
S3 LVL1→S3 LVL 2	0.0362685
S4 LVL1→S4 LVL 2	0.074867

Proficiency level does seem to play some role in how the learners produce /p/-initial stop consonants in carrier phrases. Primarily I am observing whether S4 is significantly different between the two groups because in theory that is where they should have change the most, at the end. The tendency of the intermediate-level to remain more consistent in VOT duration across the fours session than the beginner-level tends to tell me that the significance patterns showing up are a result of the beginner-level's inconsistency of production, i.e. their average VOTs where more apt to change than the intermediate-level learners' averages.

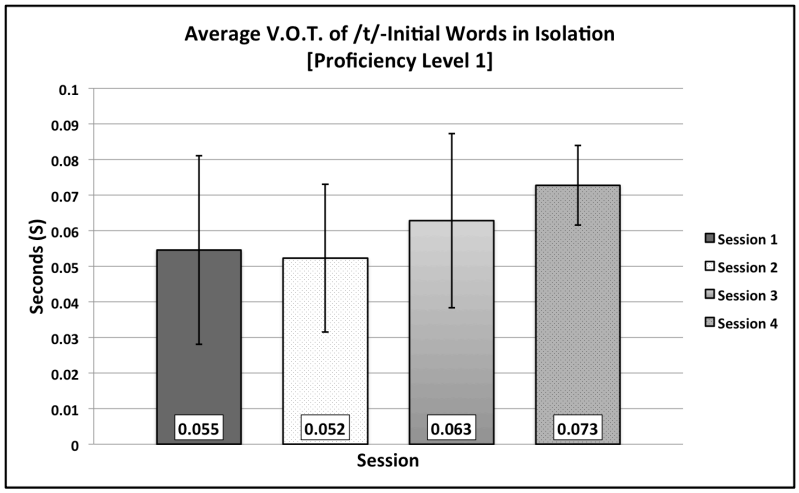
Overall, /p/-initial stop consonants are observed to be more consistently produced when produced by an intermediate-level speaker than a beginner-level speaker, no matter the

context of the word, whether it is in isolation or within a carrier phrase. This will be interesting to see whether this holds true for the other two places of articulation. Next, I will examine the alveolar place of articulation for words in carrier phrases and isolation across the two levels.

Section 6.2.2: Alveolar-Initial Stop Consonants

For alveolar-initial words in isolation, Figure 6.5 shows the average V.O.T. duration for learners who are at beginner-level proficiency (i.e., FR101). This is contrasted with Figure 6.6, which shows the average V.O.T. duration for learners who are at the intermediate-level proficiency (i.e., FR201). Recall that there are four learners from each proficiency level: F3/F4/F5/F6 in FR101 and F1/F2/F7/F8 in FR201.

Figure 6.5: Average V.O.T. /t/-Initial Words in Isolation of All Beginner-Level Learners



In Figure 6.5, the average V.O.T. for all learners is shown. At Session 1, the average V.O.T. was 55 milliseconds. At Session 2, negligible change is observed. At Session 3 and at Session 4, great change is shown. In addition, it appears that alveolar-initial stop consonant

words in isolation are significantly distinct from Session 1 to Session 4. The resulting change from Session 1 to Session 4 is 18 milliseconds, which is a great change.

In Table 6.7, a T-test is run to statistically test whether any of the individual sessions are distinctly different from one another.

Table 6.7: T-test of /t/-Initial Words in Isolation of All Beginner-Level Learners

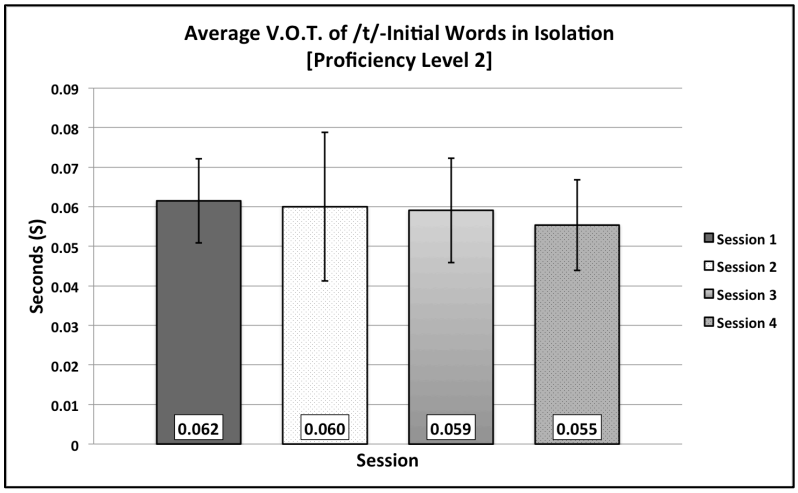
Sessions	P-value
S1→S2	0.371449
S1→S3	0.132167
S2→S3	0.05712
S2→S4	0.000249
S3→S4	0.059854
S1→S4	0.0046855

As shown in Table 6.7, the beginner-level learners produced significantly different VOTs for /t/-initial words in isolation between S2→S4 and S1→S4 as well as marginally different VOTs between S2→S3 and S3→S4. The duration of alveolar-initial stop consonant words in isolation or beginner-level learners was significantly different between Sessions 1 and 4; therefore, the learners' productions changed from the beginning of the study to the end of the study. However, this change was, as shown in Figure 6.4, an *increase* in the VOT; the alveolar-initial stop consonants became less French-like through time to Session 4. Therefore, it appears as though beginner-level learners' production of alveolar-initial stop consonants was not facilitated by the audiovisual stimuli—at least, not in the negative VOT duration of French-like production.

Next, I will look at intermediate-level learners in isolation, as shown in Figure 6.6.

In Figure 6.6, the average V.O.T. for all intermediate-level learners is shown. At Session 1, the average V.O.T. was 62 milliseconds. At Session 2 and Session 3, negligible change is observed. At Session 4, negligible change is observed. In addition, it appears that alveolar-initial stop consonant words in isolation are significantly distinct from Session 1 to Session 4. The resulting change from Session 1 to Session 4 is 7 milliseconds, which is a moderate change.

Figure 6.6: Average V.O.T. /t/-Initial Words in Isolation of All Intermediate-Level Learners



In Table 6.8, a T-test indicates whether any of the individual sessions are distinctly different from one another.

As shown in Table 6.8, the intermediate-level learners alone produced significantly different VOT values for alveolar-initial stop consonants in isolation between S1→S4. However, as shown in Figure 6.6, there was a gradual decrease in duration from S1 to S4; therefore, the VOT duration decreased from the beginning of the study to the end, where it became significantly different. This is important to note, because this would conform to the hypothesis that exposure to audiovisual stimuli would facilitate the acquisition of L2 target-like production—in this case, French VOT—but the intermediate-level learner group was

comprised of three in the experimental group and one in the control group. Further analysis in the next section will provide individual variations and therefore answer whether or not part of this group conforms to the hypothesis

Table 6.8: T-test of /t/-Initial Words in Isolation of All Intermediate-Level Learners

Sessions	P-value
S1→S2	0.363968
S1→S3	0.2437265
S2→S3	0.4250725
S2→S4	0.151888
S3→S4	0.1473395
S1→S4	0.0292625

In Table 6.9, a T-test indicates whether or not the data are significantly produced differently for the beginner- or intermediate-level learners.

Table 6.9: T-test Comparison of /t/-Initial Words in Isolation Across Proficiency Levels

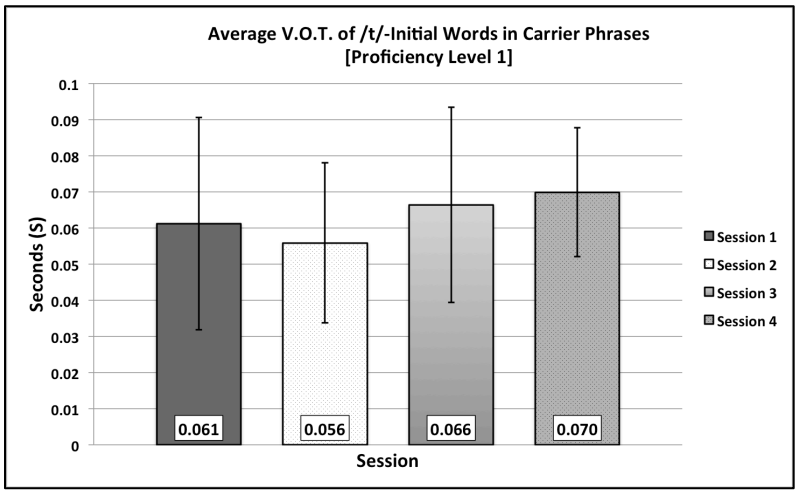
Sessions	P-value
S1 LVL1→S1 LVL 2	0.1181415
S2 LVL1→S2 LVL 2	0.090229
S3 LVL1→S3 LVL 2	0.2594625
S4 LVL1→S4 LVL 2	<.0001

As shown in Table 6.9, there is significant difference between how intermediate- and beginner-level learners produced /t/-initial words in isolation at Session 4. Therefore, the production of /t/-initial words in isolation are produced differently between the intermediate- and beginner-level learners; the beginner-level learners produced a much higher VOT duration (at 73ms) as compared to the intermediate-level learners (at 55ms).

Proficiency level does seem to play some role in how the learners produce /t/-initial stop consonants in isolation. Primarily, I am observing whether S4 is significantly different between the two groups because I predict that is where they should have changed the most, at the end. Still, the tendency of the intermediate-level to not deviate as much as the beginner-level tends to tell me that the significance patterns showing up are a result of the beginner-level's inconsistency of production, i.e. their average VOTs where more apt to change than the intermediate-level learners' averages. There may be other factors at work, too. I'll comment on these later.

Next, I will look at /t/-initial words in carrier phrases in Figure 6.7.

Figure 6.7: Average V.O.T. /t/-Initial Words in Carrier Phrases of All Beginner-Level Learners



In Figure 6.7, the average V.O.T. for all beginner-level learners is shown. At Session 1, the average V.O.T. was 61 milliseconds. At Session 2, moderate change is observed at and Session 3, great change is observed. At Session 4, negligible change is observed.

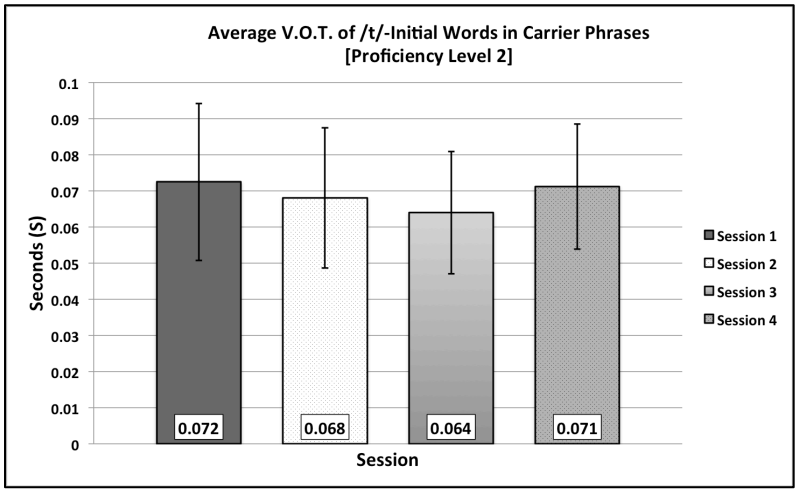
In Table 6.10, a T-test is run to statistically test whether any of the individual sessions are distinctly different from one another.

As shown in Table 6.10, VOT duration for /t/-initial stop consonants in carrier phrases is significantly different for beginner-level learners at Session 2 when compared with Sessions 3 and 4. Session 1 and Session 4 do not show significant difference despite the visual suggestion otherwise in the chart. This is due to a great deal of deviation of individual values making of the averages. Therefore, the beginner-level learners produced more-or-less the same /t/ VOT duration at the beginning of the study as compared with the end of the study. Figure 6.8 shows /t/-initial stop consonant words in carrier phrases produced by intermediate-level learners.

Table 6.10: T-test of /t/-Initial Words in Carrier Phrases of All Beginner-Level Learners

Sessions	P-value
S1→S2	0.193637
S1→S3	0.2219455
S2→S3	0.037294
S2→S4	0.0044805
S3→S4	0.278685
S1→S4	0.0894175

Figure 6.8: Average V.O.T. /t/-Initial Words in Carrier Phrases of All Intermediate-Level Learners



In Figure 6.8, the average V.O.T. for all intermediate-level learners is shown. At Session 1, the average V.O.T. was 72 milliseconds. At Session 2 and Session 3, negligible change is observed. At Session 4, moderate change is observed. The resulting change from Session 1 to Session 4 is 1 millisecond, which is negligible.

In Table 6.11, a T-test is run to statistically test whether any of the individual sessions are distinctly different from one another.

Table 6.11: T-test of /t/-Initial Words in Carrier Phrases of All Intermediate-Level Learners

Sessions	P-value
S1→S2	0.1829725
S1→S3	0.035004
S2→S3	0.175225
S2→S4	0.2400315
S3→S4	0.041388
S1→S4	0.386337

As shown in Table 6.11, VOT duration for /t/-initial stop consonants in carrier phrases is significantly different for intermediate-level learners at Session 3 when compared with Sessions 1 and 4. Session 1 and Session 4 do not show significant difference. Therefore, the intermediate-level learners produced more-or-less the same /t/ VOT duration at the beginning of the study as compared with the end of the study.

In Table 6.12, a T-test is used to compare the two levels to one another at each session to statistically see whether or not the data are significantly produced differently for the beginner- or intermediate-level learners.

As shown in Table 6.12, there is significant difference between how intermediate- and beginner-level learners produced /t/-initial words in carrier phrases at Sessions 1 and 2. Therefore, the production of /t/-initial words in carrier phrases are produced differently

between the intermediate- and beginner-level learners; the beginner-level learners produced a much lower VOT duration (at 61ms) as compared to the intermediate-level learners (at 72ms). However, no notable difference is observed for alveolar-initial stop consonant words in carrier phrases at Sessions 1 and 4; therefore, the proficiency level does not seem to be a consistent factor to the degree of significance and variance for alveolar-initial stop consonant words in carrier phrases.

Table 6.12: T-test Comparison of /t/-Initial Words in Carrier Phrases Across Proficiency Levels

Sessions	P-value
S1 LVL1→S1 LVL 2	0.035004
S2 LVL1→S2 LVL 2	0.0077735
S3 LVL1→S3 LVL 2	0.3270505
S4 LVL1→S4 LVL 2	0.394036

Overall, /t/-initial stop consonants are observed to be more consistently produced by an intermediate-level speaker than a beginner-level speaker, no matter the context of the word, whether it is in isolation or within a carrier phrase.

Section 6.2.3: Velar-Initial Stop Consonants

For velar-initial words in isolation, Figure 6.9 shows the average V.O.T. duration for learners who are at beginner-level proficiency (i.e., FR101). This is contrasted with Figure 6.10, which shows the average V.O.T. duration for learners who are at the intermediate-level proficiency (i.e., FR201). Recall that there are four learners from each proficiency level: F3/F4/F5/F6 in FR101 and F1/F2/F7/F8 in FR201.

In Figure 6.9, the average V.O.T. for all beginner-level learners is shown. At Session 1, the average V.O.T. was 67 milliseconds. At Sessions 2 and 3, negligible change is

observed. At Session 4, moderate change is shown. The resulting change from Session 1 to Session 4 is 7 milliseconds, which is a moderate change.

In Table 6.13, a T-test indicates whether any of the individual sessions are distinctly different from one another.

Figure 6.9: Average V.O.T. /k/-Initial Words in Isolation of All Beginner-Level Learners

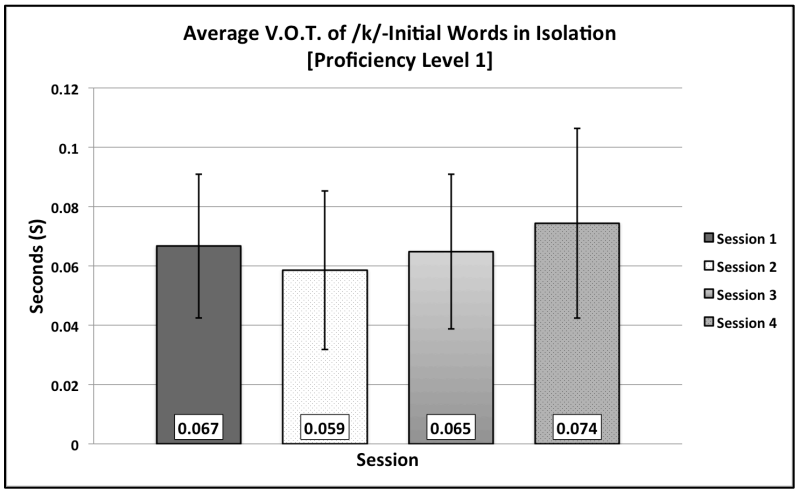


Table 6.13: T-test of /k/-Initial Words in Isolation of All Beginner-Level Learners

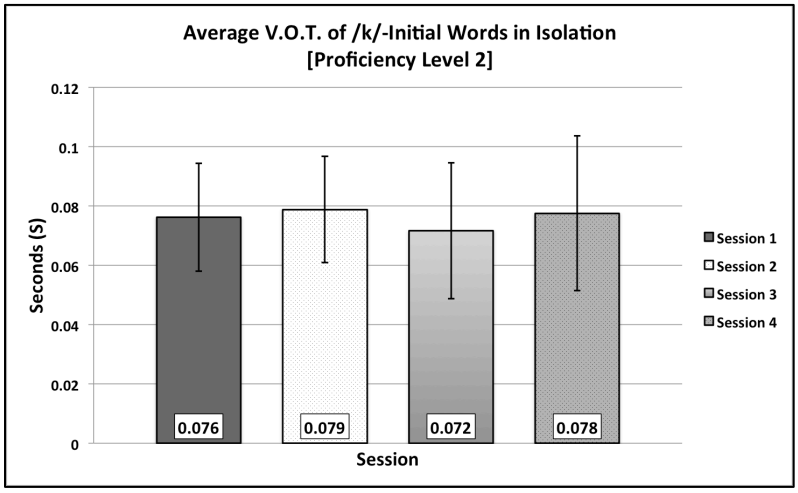
Sessions	P-value
S1→S2	0.104454
S1→S3	0.3825905
S2→S3	0.1729305
S2→S4	0.0247665
S3→S4	0.1101685
S1→S4	0.1538005

As shown in Table 6.13, the only significant difference in VOT duration of /k/-initial stop consonant words in isolation produced by beginner-level learners was at Sessions 2 and 4. However, no significant difference is observed for S1 and S4; therefore, the beginner-level

students produced velar-initial stop consonant words the same at the beginning of the study compared with at the end of the study. Figure 6.10 shows velar-initial stop consonant words in isolation for intermediate-level learners.

In Figure 6.10, the average V.O.T. for all intermediate-level learners is shown. At Session 1, the average V.O.T. was 76 milliseconds. At Sessions 2 negligible change is observed. At Session 4 and Session 4, moderate change is shown.

Figure 6.10: Average V.O.T. /k/-Initial Words in Isolation of All Intermediate-Level Learners



In Table 6.14, a T-test indicates whether any of the individual sessions are distinctly different from one another.

As shown in Table 6.14, no session is distinctly different from the other; therefore, the intermediate-level learners produced velar-initial stop consonant words roughly the same from S1 to S4. This supports my hypothesis that the intermediate-level learners are more resilient to change and thus their VOT of velar-initial stop consonant words is more consistently produced over the four sessions with very minimal change.

Table 6.14: T-test of /k/-Initial Words in Isolation of All Intermediate-Level Learners

Sessions	P-value
S1→S2	0.2820085
S1→S3	0.193828
S2→S3	0.08475
S2→S4	0.4094245
S3→S4	0.170392
S1→S4	0.405561

In Table 6.15, a T-test is used to compare the two levels to one another at each session to statistically see whether or not the data are significantly produced differently for the beginner- or intermediate-level learners.

Table 6.15: T-test Comparison of /k/-Initial Words in Isolation Across Proficiency Levels

Sessions	P-value
S1 LVL1→S1 LVL 2	0.039988
S2 LVL1→S2 LVL 2	0.0003745
S3 LVL1→S3 LVL 2	0.133517
S4 LVL1→S4 LVL 2	0.341714

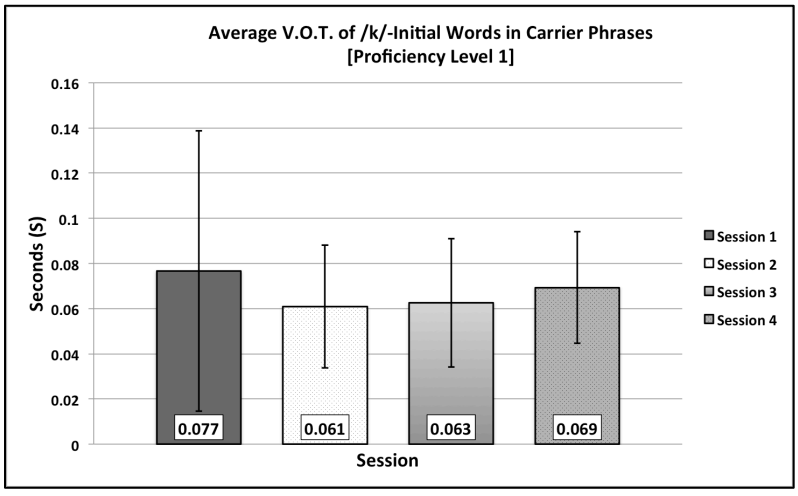
As shown in Table 6.15, there is significant difference between how intermediate- and beginner-level learners produced /k/-initial words in isolation at Sessions 1 and 2. At Session 4, the production of /k/-initial words in isolation are not produced differently between the intermediate- and beginner-level learners; the beginner-level learners produced a slightly lower VOT duration (at 74ms) as compared to the intermediate-level learners (at 78ms). As was observed for other POAs, VOT for /t/-initial stop consonant words in isolation is more stable for intermediate-level learners than for beginner level learners with very minimal change.

Turning to velar-initial stop consonant words in carrier phrases, the beginner-level learners are shown in Figure 6.11.

In Figure 6.11, the average V.O.T. for all beginner-level learners is shown. At Session 1, the average V.O.T. was 77 milliseconds. At Sessions 2, great change in VOT is observed and at Session 3, negligible change is observed. At Session 4, moderate change is shown.

In Table 6.16, a T-test determines whether any of the individual sessions are distinctly different from one another.

Figure 6.11: Average V.O.T. /k/-Initial Words in Carrier Phrases of All Beginner-Level Learners



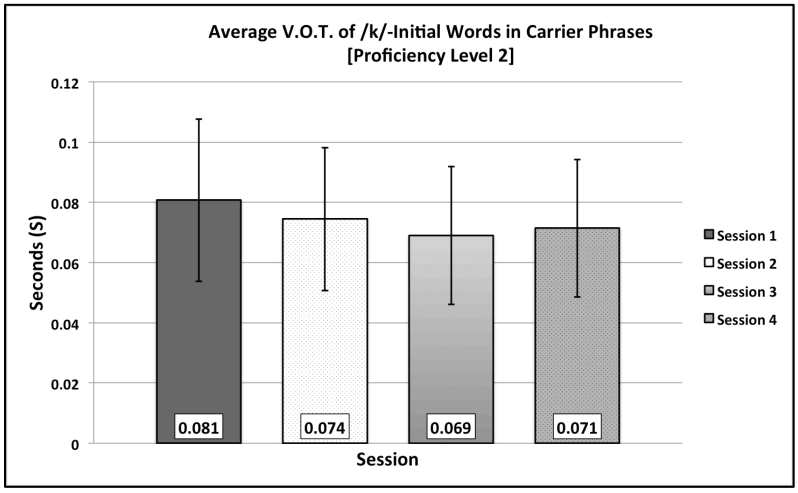
As shown in Table 6.16, Session 1 is significantly different from Session 2. However, for S1 and S4, no significant change in the VOT of velar-initial stop consonant words is observed; therefore, the beginner-level learners produced velar-initial stop consonant words roughly the same from S1 to S4.

Table 6.16: T-test of /k/-Initial Words in Carrier Phrases of All Beginner-Level Learners

Sessions	P-value
S1→S2	0.048009
S1→S3	0.069655
S2→S3	0.382394
S2→S4	0.066028
S3→S4	0.1186055
S1→S4	0.2428765

Turning now to velar-initial stop consonant VOT for intermediate-level learners in carrier phrases, Figure 6.12 shows the average duration across the four different sessions.

Figure 6.12: Average V.O.T. /k/-Initial Words in Carrier Phrases of All Intermediate-Level Learners



In Figure 6.12, the average V.O.T. for all intermediate-level learners is shown. At Session 1, the average V.O.T. was 81 milliseconds. At Sessions 2, and at Session 3, moderate change is observed. At Session 4, negligible change is shown.

In Table 6.17, a T-test is run to statistically test whether any of the individual sessions are distinctly different from one another.

Table 6.17: T-test of /k/-Initial Words in Carrier Phrases of All Intermediate-Level Learners

Sessions	P-value
S1→S2	0.1052725
S1→S3	0.0091045
S2→S3	0.1164595
S2→S4	0.2553705
S3→S4	0.295187
S1→S4	0.0301285

As shown in Table 6.16, Session 1 is different from Session 3. S1 and S4 are also significantly different and thus the change in the VOT of velar-initial stop consonant words is observed; therefore, the intermediate-level learners produced velar-initial stop consonant words distinctly different VOTs for velar-initial stop consonants from S1 to S4.

In Table 6.18, a T-test compares the two levels to one another at each session to see whether or not the data are significantly produced differently for the beginner- or intermediate-level learners.

Table 6.18: T-test Comparison of /k/-Initial Words in Carrier Phrases Across Proficiency Levels

Sessions	P-value
S1 LVL1→S1 LVL 2	0.3340515
S2 LVL1→S2 LVL 2	0.0040595
S3 LVL1→S3 LVL 2	0.1052725
S4 LVL1→S4 LVL 2	0.3413955

As shown in Table 6.18, there is significant difference between how intermediate- and beginner-level learners produced /k/-initial words in carrier phrases at Session 2 but no

other session. Therefore, the production of /k/-initial words in carrier phrases are produced differently between the intermediate- and beginner-level learners; the beginner-level learners produced a much lower VOT duration (at 77ms) as compared to the intermediate-level learners (at 81ms). However, no notable difference is observed for velar-initial stop consonant words in carrier phrases at Sessions 1 and 4; therefore, the proficiency level does not seem to be a consistent factor to the degree of significance and variance for velar-initial stop consonant words in carrier phrases.

Overall, /k/-initial stop consonants are observed to be more stable when produced by an intermediate-level speaker than a beginner-level speaker, no matter the context of the word, whether it is in isolation or within a carrier phrase. Interestingly, although not a significant difference, Figure 6.10, shows the hypothesis of a decrease in VOT over time; however, the students in the intermediate-level were not comprised solely of students in the experimental group but of both: three were in the experimental and one was in the control group. Further individual analysis is conducted in a future section to see whether or not individual variation can attest to this hypothesis.

Section 6.2.4: Summary

Recall the questions proposed at the beginning of this chapter:

1. Which group shows more progression towards French-like VOT in production, across sessions, beginner-levels, or intermediate-levels?
2. Is there a noticeable difference between VOT in words produced in isolation versus in carrier phrases?
3. Do we see a continuous, linear progression in French-like VOT through time, or is the change plateaus in this progression between Sessions 1 and 4?

In the previous section, questions 2 and 3 were discussed.

We do see a change in VOT, but not exactly as I had predicted; sometimes, VOT becomes greater through time. In addition, there was not any noticeable difference between VOT in words produced in isolation versus in carrier phrases—both showed a tendency towards greater VOT across the sessions.

In addition, proficiency level does seem to play somewhat of a role in the production VOTs of stop consonants. Table 6.19 shows the places of articulation and context in which VOT production was significantly different between S1, the beginning of the study, and S4, the end of the study.

Specifically bilabial-initial stop consonants show the highest degree of difference between the two proficiency levels. One the one hand, the beginner-level learners produced significantly different bilabial-initial stop consonant words in isolation and in carrier phrases, and on the other, the intermediate-level learners produced bilabial-initial stop consonant words in isolation and in carrier phrases without too much variety, i.e. the VOT duration for bilabial-initial stop consonant words in isolation and in carrier phrases was not distinct from Session 1 to Session 4.

Table 6.19: S1→S4 Proficiency Level Significance Comparison

	Proficiency Level 1		*Proficiency Level 2*	
	Isolation	*Carrier Phrase*	*Isolation*	*Carrier Phrase*
Bilabial-Initial	Yes	Yes	No	No
Alveolar-Initial	Yes	No	Yes	No
Velar-Initial	No	No	No	Yes

What is most interesting was the intermediate-group remained more-or-less stable and more resilient to the change; however, this is not to be mistaken for a more French-like VOT production. In all the cases, the intermediate-level learners produced higher VOT values but remained more stable with minimal change, whereas, the beginner-level learners were more unsystematic.

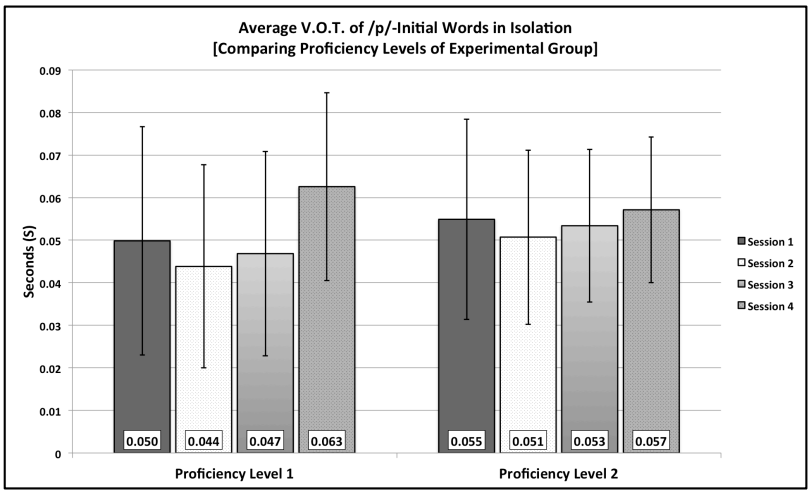
Next, I will look at the experimental group individually and the proficiency levels of the learners within. Therefore, I will segment the experimental group to see if there is a similar pattern of a resistance by the intermediate-level learners and a greater degree of variability by the beginner-level.

Section 6.3: A Closer Look at the Experimental Group Only

In this section, I will explore whether or not the proficiency level impacted the overall averages of the experimental group's VOT. In order to do this, I took the five experimental group learners (F1, F2, F3, F6, and F7) and split them up according to their proficiency level. Thus, I had an experimental group comprised of two beginner-level learners (F3 and F6) and three intermediate-level learners (F1, F2, and F7). In the previous section, proficiency level appeared to have some impact on the VOT production of the learners, specifically their resilience to change, i.e. remaining more-or-less stable across the different sections. In this section, we will see if this is a trend of the intermediate-level learners in the experimental group. This section seeks to answer the following question: Does audiovisual stimuli exposure facilitate the acquisition of L2 production aspects, namely VOT duration and is this facilitated more by a specific proficiency level? For the sake of limits, I will not give as minute details as prior chapters had, but rather give a comparison chart followed by the analyses of the t-tests conducted. Figure 6.13 shows the /p/-initial words in isolation for the

beginner-level experimental group learners as well as intermediate-level experimental group learners.

Figure 6.13: Comparing Beginner-Level Experimental Group Learners' /p/-Initial Words in Isolation to the Intermediate-Level Experimental Group Learners



As shown in Figure 6.13, the intermediate-level experimental group learners' /p/-initial averages for words in isolation remained between 51ms and 57ms; whereas, the beginner-level experimental group learners /p/-initial averages for words in isolation remained between 44ms and 63ms. This means that the intermediate-level learners' averages for bilabial-initial words vary 6ms across the sessions and the beginner-level learners' averages for bilabial-initial words varies 19ms. This difference in variation seems to mean that the way that the intermediate-level learners produced /p/-initial words in isolation is significantly different than the way the beginner-level learners produced /p/-initial words in isolation. A T-test was conducted on the averages of all four sessions across the two proficiency levels, which reports a p-value of less than .05 (more accurately- 0.034151). This

means that the way the beginner-level learners produced /p/-initial words in isolation was indeed statistically different from the intermediate-level learners.

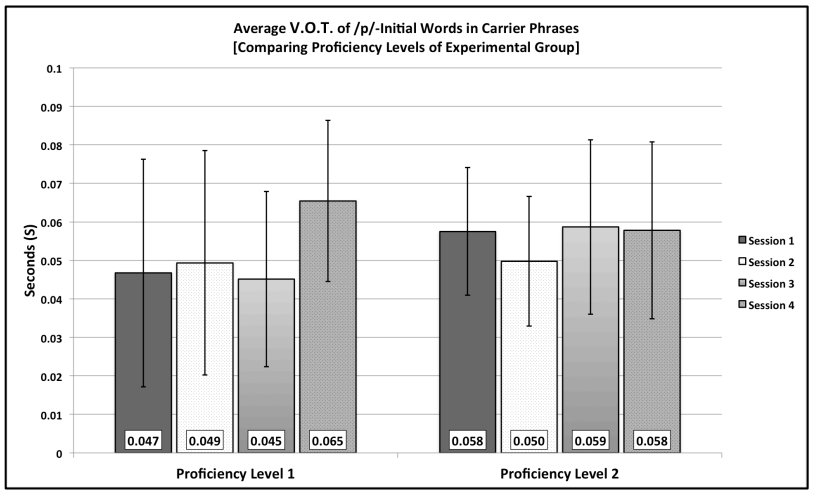
It cannot be assumed that either one produced the "more-French-like" production of /p/-initial words in isolation because, on the one hand, we have the beginner-level learners who produced some shorter VOT values, however, the variation was greater, and on the other hand we have the intermediate-level learners who produced longer VOT values but had less variation. Either way, this does seem to show that there is a resistance to change at the intermediate level. Next, /p/-initial words in carrier phrases are evaluated in Figure 6.14.

As shown in Figure 6.14, the intermediate-level experimental group learners' /p/-initial averages for words in carrier phrases remained between 50ms and 59ms; whereas, the beginner-level experimental group learners /p/-initial averages for words in carrier phrases remained between 45ms and 65ms. This means that the intermediate-level learners' averages for bilabial-initial words vary 9ms across the sessions and the beginner-level learners' averages for bilabial-initial words varies 20ms. This difference in variation seems to mean that the way that the intermediate-level learners produced /p/-initial words in carrier phrases is significantly different than the way the beginner-level learners produced /p/-initial words in carrier phrases. A T-test was conducted on the averages of all four sessions across the two proficiency levels, which reports a p-value of less than .05 (more accurately- 0.0094365). This means that the way the beginner-level learners produced /p/-initial words in isolation was indeed statistically different from the intermediate-level learners.

As was the case aforementioned, it cannot be assumed that either one produced the "more-French-like" production of /p/-initial words in isolation because, on the one hand, we have the beginner-level learners who produced some shorter VOT values, however, the variation was greater, and on the other hand we have the intermediate-level learners who

produced longer VOT values but had less variation. Either way, this does seem to show that there is a resistance to change at the intermediate level.

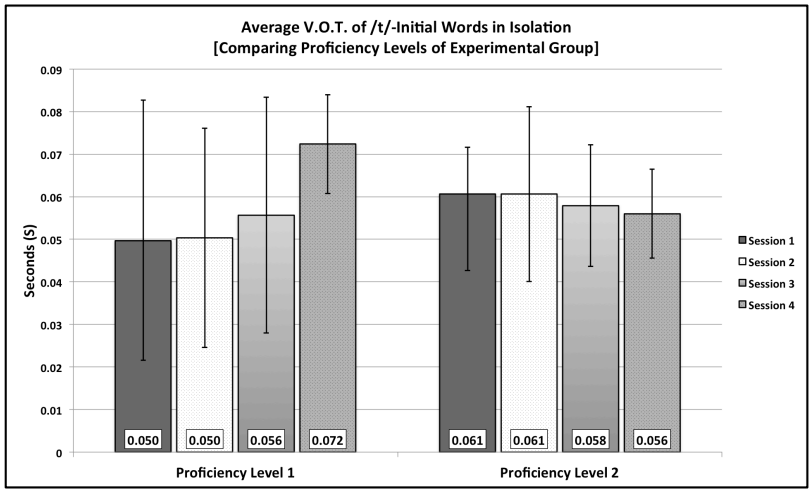
Figure 6.14: Comparing Beginner-Level Experimental Group Learners' /p/-Initial Words in Carrier Phrases to the Intermediate-Level Experimental Group Learners



In summary, for /p/-initial words in any context, whether it is in isolation or within carrier phrases, beginner-level learners and intermediate-level learners show different trends: the beginner-level learners show more variety in averages across the four sessions but shorter VOT averages at different sessions and the intermediate-level learners show more consistency but longer VOT averages. It is does appear that the intermediate-level learners are more resilient or more unlikely to change their VOT duration as shown throughout the study.

Turning to alveolar place of articulation, words in isolation were examined across the fours sessions by proficiency level, as shown in Figure 6.15.

Figure 6.15: Comparing Beginner-Level Experimental Group Learners' /t/-Initial Words in Isolation to the Intermediate-Level Experimental Group Learners



As shown in Figure 6.15, the intermediate-level experimental group learners' /t/-initial averages for words in isolation remained between 56ms and 61ms; whereas, the beginner-level experimental group learners /t/-initial averages for words in isolation remained between 50ms and 72ms. This means that the intermediate-level learners' averages for alveolar-initial words vary 5ms across the sessions and the beginner-level learners' averages for alveolar-initial words varies 22ms. This difference in variation seems to mean that the way that the intermediate-level learners produced /t/-initial words in isolation is significantly different than the way the beginner-level learners produced /t/-initial words in isolation. A T-test was conducted on the averages of all four sessions across the two proficiency levels, which reports a p-value of more than .05 (more accurately- 0.1549635). This means that the way the beginner-level learners produced /t/-initial words in isolation was not statistically different from the intermediate-level learners. However, the reasoning for this could be attributed to the beginner-level learners long S4 value, which brings the average of all four sessions up to 54ms; whereas the intermediate-level learners average for

S1-S4 was 58ms. Thus, it was shown to be insignificant. If I simply compare S4 values, to answer where or not they were significantly different at the end of the study; the p-value is less than .05, which means they are significant from one another. In other terms, the way the intermediate-level learners produced alveolar-initial stop consonant words in isolation was indeed different from the way the beginner-level learners' production.

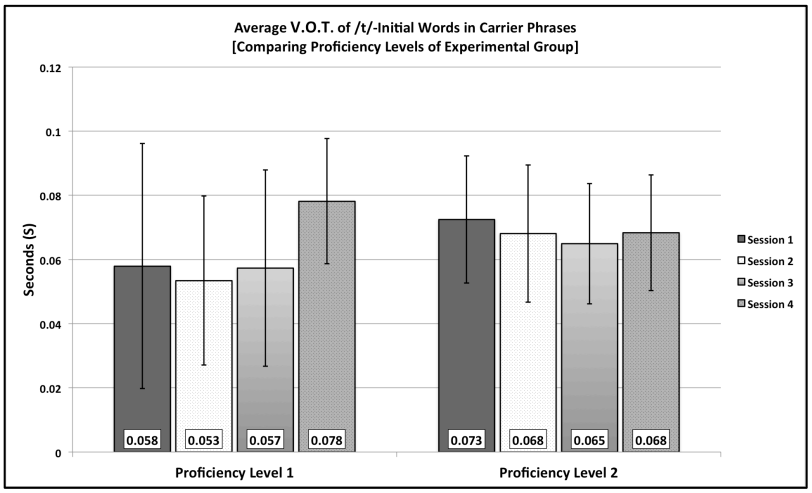
In addition, although very minute, the intermediate-level learners conformed to the hypothesis. Their VOT values became smaller from S1 to S4, wherein S1 was the longest value and S4 was the shortest. This is important to note but the difference from S1 to S4, 5ms, is only a slight change and thus could or could not be contributed to the audiovisual stimuli. In addition, the intermediate-level learners did remain more consistent in their production of /t/-initial stop consonant words in isolation than the beginner-level learners.

Looking at alveolar-initial stop consonant words in carrier phrases across the four sessions by the experimental group, Figure 6.16 shows the average VOTs.

As shown in Figure 6.16, the intermediate-level experimental group learners' /t/-initial averages for words in carrier phrases remained between 65ms and 73ms; whereas, the beginner-level experimental group learners /t/-initial averages for words in carrier phrases remained between 58ms and 78ms. This means that the intermediate-level learners' averages for alveolar-initial words vary 8ms across the sessions and the beginner-level learners' averages for alveolar-initial words varies 20ms. This difference in variation seems to mean that the way that the intermediate-level learners produced /t/-initial words in carrier phrases is significantly different than the way the beginner-level learners produced /t/-initial words in carrier phrases. A T-test was conducted on the averages of all four sessions across the two proficiency levels, which reports a p-value of less than .05 (more accurately- 0.009708). This

means that the way the beginner-level learners produced /t/-initial words in carrier phrases was indeed statistically different from the intermediate-level learners.

Figure 6.16: Comparing Beginner-Level Experimental Group Learners' /t/-Initial Words in Carrier Phrases to the Intermediate-Level Experimental Group Learners



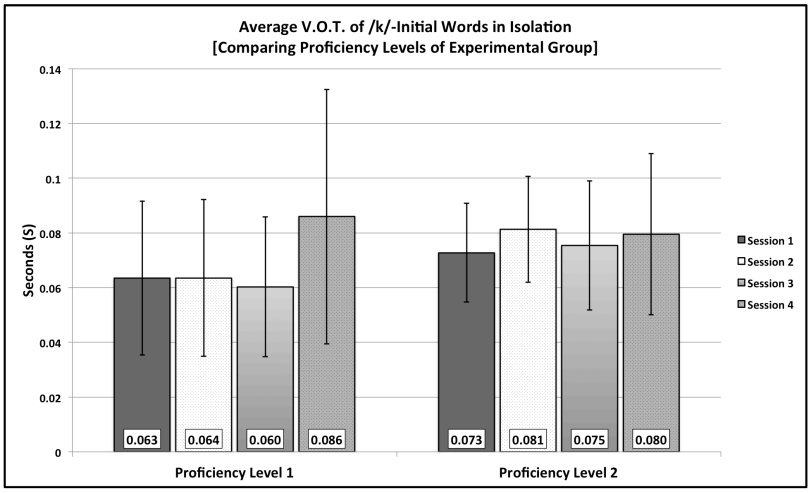
As was the case, aforementioned, it cannot be assumed that either one produced the "more-French-like" production of /t/-initial words in carrier phrases because, on the one hand, we have the beginner-level learners who produced some shorter VOT values, however, the variation was greater, and on the other hand we have the intermediate-level learners who produced longer VOT values but had less variation. Either way, this does seem to show that there is a resistance to change at the intermediate level.

In summary, for /t/-initial words in any context, whether it is in isolation or within carrier phrases, beginner-level learners and intermediate-level learners show different trends: the beginner-level learners show more variety in averages across the four sessions but shorter VOT averages at different sessions and the intermediate-level learners show more consistency but longer VOT averages. It is does appear that the intermediate-level learners

are more resilient or more unlikely to change their VOT duration as shown throughout the study.

Turning to velar place of articulation, words in isolation were examined across the fours sessions by proficiency level, as shown in Figure 6.17.

Figure 6.17: Comparing Beginner-Level Experimental Group Learners' /k/-Initial Words in Isolation to the Intermediate-Level Experimental Group Learners



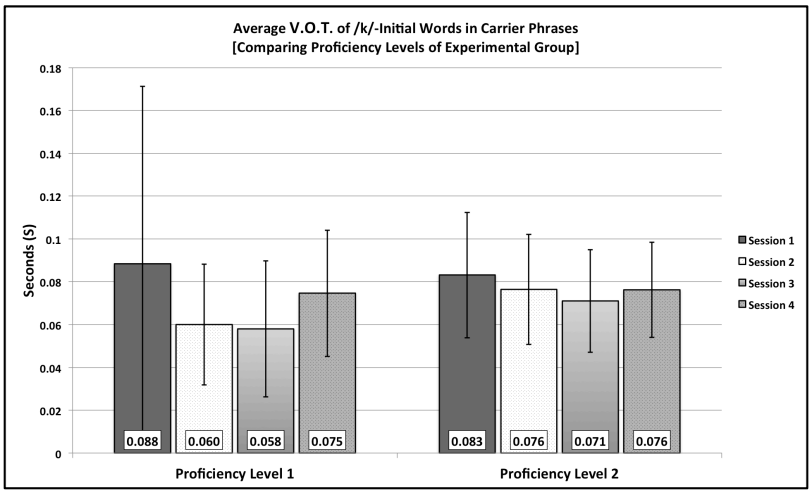
As shown in Figure 6.15, the intermediate-level experimental group learners' /k/-initial averages for words in isolation remained between 73ms and 81ms; whereas, the beginner-level experimental group learners /k/-initial averages for words in isolation remained between 60ms and 86ms. This means that the intermediate-level learners' averages for velar-initial words vary 8ms across the sessions and the beginner-level learners' averages for velar-initial words varies 26ms. This difference in variation seems to mean that the way that the intermediate-level learners produced /k/-initial words in isolation is significantly different than the way the beginner-level learners produced /k/-initial words in isolation. A T-test was conducted on the averages of all four sessions across the two proficiency levels, which reports a p-value of more than .05 (more accurately- <.0001).

It cannot be assumed that either one produced the "more-French-like" production of /k/-initial words in isolation because, on the one hand, we have the beginner-level learners who produced some shorter VOT values, however, the variation was greater, and on the other hand we have the intermediate-level learners who produced longer VOT values but had less variation. Either way, this does seem to show that there is a resistance to change at the intermediate level. Next, /k/-initial words in carrier phrases are evaluated in Figure 6.18.

As shown in Figure 6.18, the intermediate-level experimental group learners' /k/-initial averages for words in carrier phrases remained between 71ms and 83ms; whereas, the beginner-level experimental group learners /k/-initial averages for words in carrier phrases remained between 88ms and 58ms. This means that the intermediate-level learners' averages for velar-initial words vary 11ms across the sessions and the beginner-level learners' averages for velar-initial words varies 30ms. This difference in variation seems to mean that the way that the intermediate-level learners produced /k/-initial words in carrier phrases is significantly different than the way the beginner-level learners produced /k/-initial words in carrier phrases. A T-test was conducted on the averages of all four sessions across the two proficiency levels, which reports a p-value of more than .05 (more accurately- 0.0769955). This means that the way the beginner-level learners produced /t/-initial words in isolation was not statistically different from the intermediate-level learners.

As was the case, aforementioned, it cannot be assumed that either one produced the "more-French-like" production of /k/-initial words in carrier phrases because, on the one hand, we have the beginner-level learners who produced some shorter VOT values, however, the variation was greater, and on the other hand we have the intermediate-level learners who produced longer VOT values but had less variation. Either way, this does seem to show that there is a resistance to change at the intermediate level.

Figure 6.18: Comparing Beginner-Level Experimental Group Learners' /k/-Initial Words in Carrier Phrases to the Intermediate-Level Experimental Group Learners



In summary, for /k/-initial words in any context, whether it is in isolation or within carrier phrases, beginner-level learners and intermediate-level learners show different trends: the beginner-level learners show more variety in averages across the four sessions but shorter VOT averages at different sessions and the intermediate-level learners show more consistency but longer VOT averages. It is does appear that the intermediate-level learners are more resilient or more unlikely to change their VOT duration as shown throughout the study. To summarize Section 6.2.3, Table 6.20 synthesizes the results.

As Table 6.20 shows, for all POAs and contexts, with exception to velar-initial words in carrier phrases, the proficiency level appears to have significance in the production of VOT. For all cases where there was significant difference between the beginner-level and the intermediate-level, it was always shown that the intermediate level was more stable and had a lesser degree of variation in their production of VOTs and that the beginner-level had more variety in their VOTs of stop consonants but their VOTs were shorter than the intermediate-level's in some sessions.

Table 6.20: A Recapitulation of the Significance of Proficiency Level on L2 VOT Production

	Isolation	*Carrier Phrases*
Bilabial-Initial	Yes	Yes
Alveolar-Initial	Yes	Yes
Velar-Initial	Yes	No

It should also be noted that for each S4 for each POA, with exception to velar-initial words in carrier phrases, and context, the beginner-level's VOTs were always longer than the intermediate's. This is important because, although the beginner-level learners did have shorter VOT values at some sessions, it was never noted at S4, with the exception of 1ms for /k/-initial words in carrier phrases.

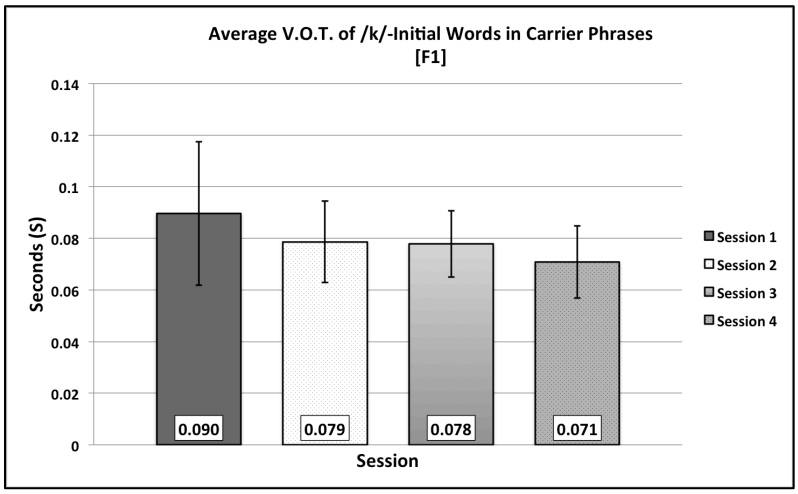
Section 6.4: A Closer Look at Selected Individuals

In this section, I will look at individuals who showed characteristics of the hypothesis of audiovisual stimuli exposure facilitating the acquisition of L2 phonological aspect, i.e., voice-onset time. In addition, I will present individuals who showed selected support of the hypothesis, as well as individuals who showed evidence contra to the hypothesis. Also, if there are any individuals in the control group who showed characteristics of a decreasing VOT over time, I will present them, as they were not exposed to the audiovisual stimuli. I do this in order to compare similar results despite the different stimuli environments.

Section 6.4.1: F1

Speaker F1, a participant of the experimental group, is an intermediate-level learner who showed a lowering of VOT for /k/-initial words in carrier phrases, as shown in Figure 6.19.

Figure 6.19: Average VOT of /k/-Initial Words in Carrier Phrases for F1



As shown in Figure 6.19, F1's VOT duration of /k/-initial words in carrier phrases is significantly different at S4 compared with S1. In addition, there is a gradual decrease across all four sessions. This supports to my hypothesis that audiovisual stimuli facilitates the acquisition of L2 production of French VOT, and that the values at S4 are significantly different from at S1. In Table 6.21, an overview of the speaker's VOT significance is shown.

In Table 6.21, bilabial-initial words in isolation and alveolar-initial words in isolation are shown to have lower VOT values at S4 at S1, however, as noted in the footnote, the decrease in VOT is not incremental, i.e., there is one session that is higher in between S1 and S4. This is important to note, however, at the end of the study, their production was significantly different at S4 than at S1.

Table 6.21: F1's VOT Values Supporting the Audiovisual Stimuli Hypothesis

	Isolation	*Carrier Phrases*
Bilabial-Initial	Yes*	No
Alveolar-Initial	Yes**	No
Velar-Initial	No	Yes

*S3 is higher
**S2 is higher

Therefore, it seems as though F1 has benefited from the audiovisual stimuli exposure but not equally across all POAs or contexts. Although, it cannot be proven that the audiovisual stimuli is the cause of this change from S1 to S4 without further testing.

There were a few cases where S4 displayed shorter VOT's than that of S1 but as was the case with bilabial- and alveolar-initial words for F1, S2 or S3 had longer VOT's and therefore there was not an incremental decrease from S1 to S4. In Table 6.22, an overview of the individuals in the experimental group is shown.

As shown in Table 6.22, the experimental group learners showed a decrease from S1 to S4 in several contexts and POAs. It is important to note the bold-faced cells (F6 and F1 in carrier phrases for velar-initial stop consonant words) support the hypothesis. F3 showed the most demonstrated S4 results with lower VOTs than at S1. However, all of the changes were non-linear, i.e., as shown in Figure 6.20, the VOT durations for became greater at S2 than at S1 and at S3 the VOT durations became shorter than at the preceding two sessions.

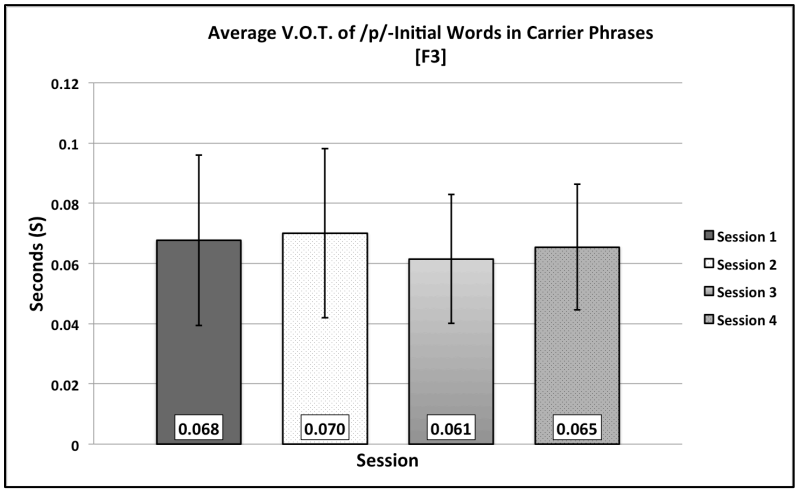
Table 6.22: Experimental Individuals Supporting the Audiovisual Stimuli Hypothesis

		Isolation	*Carrier Phrases*
F1	**Bilabial-Initial**	Yes*	No
	Alveolar-Initial	Yes*	No
	Velar-Initial	No	**Yes**
F2	**Bilabial-Initial**	No	No
	Alveolar-Initial	Yes*	No
	Velar-Initial	Yes*	No
F3	**Bilabial-Initial**	Yes*	Yes*
	Alveolar-Initial	No	Yes*
	Velar-Initial	Yes*	Yes*
F6[1]	**Bilabial-Initial**	Yes*	No
	Alveolar-Initial	No	No
	Velar-Initial	Yes*	**Yes**
F7	**Bilabial-Initial**	No	No
	Alveolar-Initial	No	Yes*
	Velar-Initial	No	Yes*

*Indicates non-incremental decrease; however, S4 is indeed shorter than S1 for each highlighted.

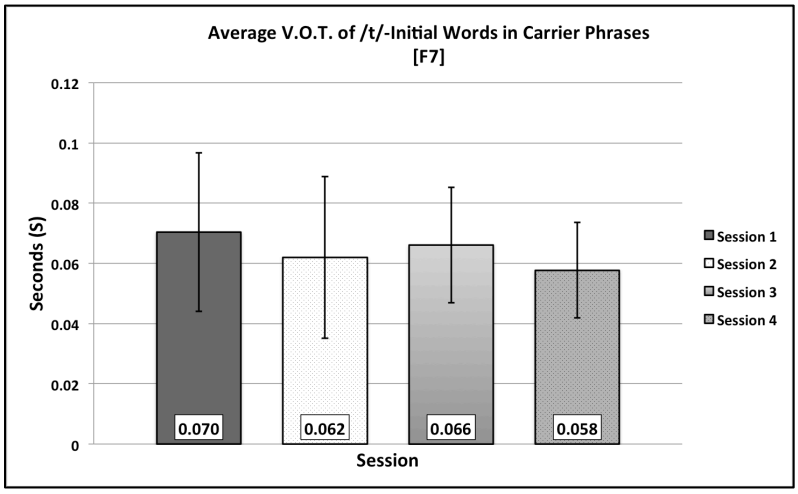
[1]F6 was not available for S4; therefore, S3 was her last test. In lieu of S4, S3 was used.

Figure 6.20: Average VOT of /p/-Initial Words in Carrier Phrases for F3



An example of this phenomenon may be seen for speaker F3, a participant of the experimental group who was enrolled in FR101, in Figure 6.20. This speaker's VOT values for bilabial-initial words are lower at S4 than at S1, although this is a non-significant change. Further complicating the picture, her values at S2 are in fact *greater* than S1, so a rise in VOT values across sessions.

Figure 6.21: Average VOT of /t/-Initial Words in Carrier Phrases for F7



Then at session three (S3) we again see shorter VOT values, which then rise slightly than again at S4. A second example, with speaker F7, a participant of the experimental group who was enrolled in FR201, is shown of this in Figure 6.21.

As shown in Figure 6.21, this speaker's VOT values for alveolar-initial words are lower at S4 than at S1. Further complicating the picture, her values at S2 are in fact *lower* than S1. Then at S3, we see *greater* VOT values, which then decrease than again at S4.

Section 6.4.2: F6

Turning now to one additional individual in the experimental group, who was enrolled in FR101, and whose VOT was constantly lower than all of the other participants, we may examine speaker F6. The values for this learner were extremely short when compared to the rest of the participants. This is shown in Figure 6.22.

As shown in Figure 6.22, F6 shows a considerably shorter VOT duration for all sessions and, with an exception to S1, considerably limited variation, as shown with the short error bars. F6 is somewhat special in comparison to the other learners included in this study. Specifically, F6's language background is Tagalog, as her mother spoke it as her L1. As noted by Cheng, 2013, there are no aspirated stops in Tagalog (196). In addition, the *Essential Tagalog Grammar: A Reference for Learners of Tagalog* note that voiceless stops are not aspirated, "that is, there is no puff of air after them" (18). Bowen (1965) also support that aspiration is absent in Tagalog (150). Morrow, in his Filipino pronunciation guide states that, "[voiceless stop consonants in Filipino] are not as explosive."

Turning to the individual learners who were in the control group, Table 6.23 summarizes those individuals who showed a trend toward a decreasing VOT values across sessions even though there was not any exposure to the audiovisual stimuli.

Figure 6.22: Example of F6's VOT

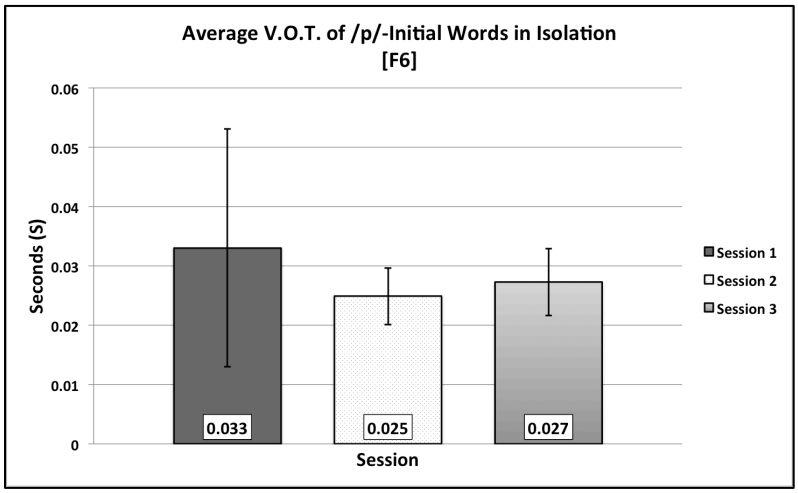


Table 6.23: Control Group Individuals with Decreasing VOT from S1 to S4

		Isolation	*Carrier Phrases*
F4	**Bilabial-Initial**	No	No
	Alveolar-Initial	No	No
	Velar-Initial	No	No
F5	**Bilabial-Initial**	No	No
	Alveolar-Initial	No	No
	Velar-Initial	Yes*	No
F8	**Bilabial-Initial**	No	Yes
	Alveolar-Initial	Yes*	No
	Velar-Initial	Yes*	**Yes**

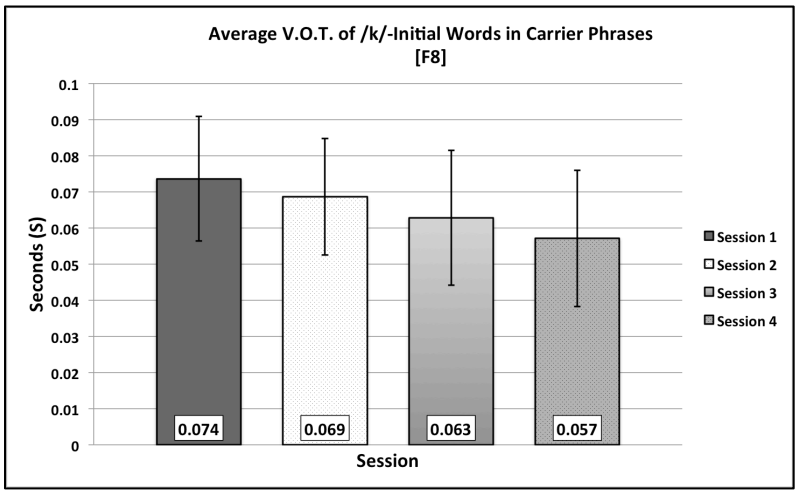
As shown in Table 6.23, the control group individuals, for the most part, did not show a VOT value decrease from S1 to S4, with exception to F8, whose velar-initial stop

consonant words in carrier phrases did show this decrease across the four sessions. In addition, F8's VOT for alveolar-initial and velar-initial stop consonant words in isolation did decrease from S1 to S4 but non-incrementally decreased, i.e., S2 and S3 either increased or decreased. However, for the most part, the control group seems to not decrease their VOTs for any POA.

Section 6.4.3: F8

To look at F8, individually, Figure 6.20 shows the velar-initial stop consonants in carrier phrases. This is important because it shows that even learners who are not exposed to the audiovisual stimuli can decrease their VOT duration incrementally due other factors.

Figure 6.23: Average V.O.T. for /k/-Initial Words in Carrier Phrases



As shown in Figure 6.23, F8's VOT for velar-initial words in carrier phrases incrementally decreases, or become shorter, as the sessions progressed, wherein S4 was the shortest and S1 was the longest. This is extremely important to note because this would be the perfect picture for the experimental group, who were exposed to the audiovisual stimuli,

but F8 was not exposed to the stimuli; however, it would be negligible to think that a participant of the control group's VOT could not have decreased linearly being that they are learning French and thus this decrease can be attributed to their learning the language in class.

Section 6.5: Summary

Recall the previous question proposed at the beginning of the chapter.

1. Which group shows more progression towards French-like VOT in production, across sessions, beginner-levels, or intermediate-levels?
2. Is there a noticeable difference between VOT in words produced in isolation versus in carrier phrases?
3. Do we see a continuous, linear progression in French-like VOT through time, or does the change plateau in this progression between Sessions 1 and 4?

While the beginner-level learners showed more of a decrease across the four sessions, their variability was not as predictable, i.e. non-linear. Sessions 2 and 3 were shown with unpredictable VOT durations. The intermediate-level learners showed more consistent VOT values across all sessions with minimal variance; however, their average VOTs for stop consonants were higher than the beginner-level learners' average VOTs. In isolation, the average VOT for all stop consonants was considerably greater than VOTs in carrier phrases. This can be contributed to careful vs. fast/casual speech. Words in insolation are produced more carefully because it is the only element being recorded; whereas, the words in carrier phrases are produced more naturally in fast/casual speech because the token is embedded and less obvious to the speaker. Finally, we note that the progression is plateaus for the intermediate-level learners for all places of articulation, particularly in carrier phrases.

CHAPTER VII
DISCUSSION & CONCLUSION

Section 7.1: Summary

In this paper, I analyzed the acquisition of L2 target-like production of stop consonant VOT produced by L1 English learners of French. The main goal was to examine whether French-like aspiration could be facilitated by the exposure to audiovisual stimuli. As such, the macro-group was divided into two sub-groups: those who were exposed to audiovisual stimuli in the form of a series of short French language videos, and those who were not exposed to these stimuli. Measurements of word-initial voiceless stop consonants were taken from these learners' pronunciations of French words at four different times during the semester (Sessions one through four).

At the macro level, as an undifferentiated group, the learners showed no significant change in VOT duration for alveolar-initial and velar-initial voiceless stop consonants in isolation or in carrier phrases from Session 1 to Session 4. Bilabial-initial voiceless stop consonants in isolation and in carrier phrases both showed significant change from Session 1 to Session 4; however, the result was that the VOT duration at S4 was *greater* than at S1, indicating that the target-like production of French /p/-initial words was not acquired or learned.

Looking closer at the control group (the group which had no audiovisual stimuli), no significant change was noted between S1 and S4 for any place of articulation, in any context. Therefore, it appears as though the control group, as a whole, produced non-target-like French VOTs consistently throughout the study. In addition, it was noted that contrary to prediction, context of pronunciation (words produced in list format vs. in carrier phrases) did not seem to play an active role in shortened VOT through time. Also, the control group's

production of consonants actually increased through time, across sessions, for some learners and in general became more aspirated than the initial S1 VOT.

For the experimental group, as a whole, a significant change in VOT duration between S1 and S4 was noted for p-initial words in carrier phases and k-initial words in isolation. However, this change results in a more English-like pronunciation and less French-like pronunciation in terms of aspiration where VOT rose through time. No significant change in VOT duration for t-initial words was noted in either context. Much like the control group, the experimental group's production of stop consonants increase through time, across the sessions, for some learners and in general becomes more aspirated than the initial S1 VOT. Contrary to the hypothesis, the experimental group's VOT values did not change from exposure to the audiovisual stimuli, as a whole.

Then, I looked at the groups according to their proficiency level at the macro level and found that this showed more significance in terms of VOT duration changes from S1 to S4. For beginner-level learners, in both the control and experimental groups, VOT duration changed significantly from S1 to S4 at the following places of articulation and contexts: bilabial-initial words in isolation and in carrier phrases and alveolar-initial words in isolation. However, these changes were for also towards *greater* VOT value at S4 for each POA and, therefore, the change was not toward a target-like production of stop consonant VOT. Therefore, the beginner-level learners, as a whole, showed no significant change in stop consonant VOT toward the target-like production.

For intermediate-level learners, in both the control and experimental groups (undifferentiated), VOT duration changes significantly from S1 to S4 at the following places of articulation and contexts: alveolar-initial words in isolation and velar-initial words in

carrier phrases. For both of these places of articulation, the change from S1 to S4 was a decrease in duration, therefore, the production become more French-like.

However, because the intermediate-level learner group was comprised of participants who were in both the control and experimental groups, it was important to look more closely at the experimental group only by proficiency level, to see if a similar trend appeared. Therefore, for alveolar-initial words in isolation, it was found that the intermediate-level learners of the experimental group did decrease their VOT duration from S1 to S4. Although it was noted that it was not a significant change from S1 to S4, it was still a step toward more French-like production. For velar-initial words in carrier phrases, it was found that the intermediate-level learners of the experimental group did decrease their VOT duration from S1 to S4, however it was not linear because S4 was slightly *greater* than S3. Again, a T-test compared the data and found that the resulting p-value was not significant, however, it was a step toward the right direction.

In addition, it was noted that beginner-level learners for all groups were more apt to have drastic changes in the production of stop consonant VOTs across the sessions; whereas, the intermediate-level learners were more apt to remain consistent in their values, with minimal variation, thus becoming more plateaus. It is important to note that at the macro level, it appears that the experimental group's production only becomes more English-like, thus *greater* VOT durations for stop consonants; however, when the group is split apart by proficiency level, it becomes apparent that the beginner-level learners, when change was noted, produced more English-like VOTs for stop consonants. When change was noted for the intermediate-level learners, the result was toward a more French-like VOT, even though this was a small change.

To gain an even more individualized perspective, I examined individuals who showed unique characteristics. F1, a female intermediate-level participant of the experimental group, showed a decrease of aspiration for 50% of the possible contexts: bilabial-initial and alveolar-initial words in isolation, and velar-initial words in carrier phrases. However, the only context of those to show a longitudinal decrease, from S1 to S4, was the velar-initial words in isolation. In addition F6, a beginner-level participant of the experimental group showed significant change from S1 to S4 for velar-initial words in isolation. F8, an intermediate-level participant of the control group showed longitudinal decrease in VOT from S1 to S4. One can hypothesize that this change can be contributed to her learning French in the classroom, however, since she did not view audiovisual stimuli, this change happened despite this input.

Moreover, as a whole, it does not appear that the audiovisual stimuli exposure had facilitated the acquisition of L2 target-like production for either of the control or experimental groups. However, if one were to split the groups by proficiency levels, it does appear that the intermediate-level produced significantly different VOTs. If one further splits the experimental group into its proficiency levels, one could see that the beginner-level learners became less French-like and the intermediate-level learners became slightly more French-like. This opposite direction for the two different proficiency levels could contribute to why the group as a whole does not appear to change because on the one hand, the beginner-level learners are increasing their VOTs whereas the intermediate-level learners are decreasing their VOTs; thus it averages them back out to a more neutral position.

Section 7.2: Implications for Foreign Language Teaching Pedagogy

Because the data show that the change occurs most with intermediate-level learners exposed to the audiovisual stimuli, however limited, this may imply that the utilization of film in L2 classrooms would be beneficial to intermediate-level classes at least where pronunciation is concerned. However, given that the prior studies on vocabulary-acquisition and grammar-acquisition have shown positive results, I would not say that film is best used only when it is in a intermediate-level course because any authentic input is beneficial. However, it is important to note that a student is unlikely to pick up sub-phonemic aspects by watching a film, over a short period of time, and even more unlikely to if they are new to language, i.e. at the beginner-level.

For my specific study, the role of audiovisual stimuli exposure for foreign language learning is mixed. One student showed tantalizing clues that it could be useful, but by and large, the use of this stimulus in the way that I used it is inconclusive without further study. However, recall that CALL is still being tested. It has shown that video/machine learning is not a replacement for a formal teacher and some students do not actively learn through video because of its passive nature. Felix (2008) notes that while CALL has been shown as effective for spelling, reading and writing, its efficacy in pronunciation and other dimensions of grammar are still debated.

Section 7.3: Limitations & Prospects for Future Studies

Because of the small number of available students learning French, as well as, a limited number of native speakers, a larger data sampling and more speakers would be necessary to continue this study. In addition, it may be interesting to look further at the differentiation between the two proficiency levels and even expand it to the third proficiency

level. Due to time constraints, the participants were only able to commit to a four-week experiment, once per week, where we viewed one film. This study might produce more conclusive results if there were more sessions per week over a longer period of time, as well as, more than one film being used. For future studies, it would be beneficial to incorporate a perception study into this experiment; this was not done for the sake of time. This would contribute to a more holistic picture as to whether or not audiovisual stimuli benefit the acquisition of target-like production of the L2 for sub-phonemic aspects.

REFERENCES

Abdelli-Beruh, N. (2004). The Stop Voicing Contrast in French Sentences: Contextual Sensitivity of Vowel Duration, Closure Duration, Voice Onset Time, Stop Release and Closure Voicing. *Phonetica*. 61.4, 201-219.

Bahrani T., Tam S. S. (2012). Audiovisual news, cartoons, and films as authentic language input and language proficiency development. *The Turkish Online Journal of Educational Technology*, 11(4), 56-64.

Berry, D. C. (1992). The role of action in implicit learning. *Quarterly Journal of Experimental Psychology*, 43A, 881–906.

Bourdon, C. (1999). Easing into ESL. *American Libraries*, 30, 2-94.

Brinton, D. & Gaskill, W. (1987). Using news broadcasts in the ESL/EFL classroom. *TESOL Quarterly*, 12(4), 403-413.

Caramazza, A., Yeni-komshian, G., Zurif, E. B., & Carbone, E. (1973). The acquisition of a new phonological contrast: The case of stop consonants in french-english bilinguals. *The Journal of the Acoustical Society of America, 54*(2), 421-428.

Chapelle, C. A. (1998). Multimedia CALL: Lessons To Be Learned from Research on Instructed SLA. *Language Learning & Technology, 2,* 1, 22-34.

Chapple, L., & Curtis, A. (2000). Content-based instruction in hong kong: Student responses to film. *System, 28*(3), 419-433.

De Winter. J. C. F. (2013). Using the Student's "t"-Test with Extremely Small Sample Sizes. *Practical Assessment, Research & Evaluation, 18,* 10.

Delattre, P. (1951). *Principes de phonétique française à l'usage des étudiants anglo-américains*. Middlebury, Vt: College Store, Middlebury College.

Derwing, T. M. (2003). What Do ESL Students Say about Their Accents?. *Canadian Modern Language Review, 59,* 4, 547-66.

Felix, U. (1998). Virtual language learning: Potential and practice. *ReCALL, 10*(1), 53-58.

Felix, U. (2008). The unreasonable effectiveness of CALL: What have we learned in two decades of research? *ReCALL, 20*(2), 141-161.

Flege, J. E., & Brown, W. S., J. (1982). The voicing contrast between english /p/ and /b/ as a function of stress and position-in-utterance. *Journal of Phonetics, 10*(4), 335-345.

Garza, T. J. (1994). Beyond MTV: Music videos as foreign language text. *Journal of the Imagination in Language Learning*, *2*, 106-110.

Gass, S. M., & Selinker, L. (2000). *Second language acquisition: An introductory course*. Mahwah, N.J: Lawrence Erlbaum Associates.

Gips, A., Di Mattia, P., & Gips, J. (2004), 'The effect of assistive technology on educational costs: Two case studies', in K. Miesenberger, J. Klaus, W. Zagler, D. Burger (eds.), Computers Helping People with Special Needs, Springer. pp. 20-213.

Harding, E., & Riley, P. (1986). The bilingual family: A handbook for parents. Cambridge, MA: *Cambridge University Press*.

Hartoyo, Ma, Ph.D. (2006). *Individual Differences in Computer Assisted Language Learning (CALL)*. Semarang: Universitas Negeri Semarang Press.

Hibiya, J., 1996. Pronunciation teaching abroad. J. *Phonetic Soc*. Japan 211, 43-48.

Kawai, G., & Hirose, K. (2000). Teaching the pronunciation of japanese double-mora phonemes using speech recognition technology. *Speech Communication, 30*(2-3), 131-143.

Kohler, K.L. (1979) Parameters in the production and perception of plosives in German and French. Arbeitsber. Institute Phonet. Univ. Kiel *12:* 261-292.

Krashen, S.D. (1981). *Second Language Acquisition and Second Language Learning* (PDF). Oxford: Pergamon.

Laeufer, C. (1992). Patterns of voicing-conditioned vowel duration in french and english. *Journal of Phonetics, 20*(4), 411-440.

Laeufer, C. (1996). The acquisition of a complex phonological contrast: voice timing patterns of English final stops by native French speakers. *Phonetica 53*: 86-110.

Lai, C. C., & Kritsonis, W. A 2006, 'The advantages and disadvantages of computer technology in second language acquisition', Doctoral Forum: *National Journal For Publishing And Mentoring Doctoral Student Research*, vol. 3, no. 1, pp. 1-6.

Lenneberg, E. H. (1967). *Biological foundations of language*. New York: Wiley.

Levy, M. (1997). *Computer-assisted language learning: Context and conceptualization*. Oxford: Clarendon Press.

Lisker, L., & Abramson, A. S. (1967). Some effects of context on voice onset time in English stops. *Language and Speech*, 10, 1–28.

Lonergan, J. (1984). Video in language teaching. *Cambridge University Press*, Cambridge, UK.

Maddieson, I. (1997). Phonetic universals. In W. J. Hardcastle, & J. Laver (Eds.), The handbook of phonetic sciences. *Oxford: Blackwell*. 619-639.

Nearey, T. M., & Rochet, B. L. (1994). Effects of place of articulation and vowel context on VOT production and perception for french and english stops. *Journal of the International Phonetic Association, 24*(1), 1-19.

Pavakanun, U., & d'Ydewalle, G. (1992). Watching foreign television programs and language learning. In F. L. Engel, D. G. Bouwhuis, T. B o sser & G. d'Ydewalle

(Eds.), *Cognitive modelling and interactive environments in language learning*. 193–198.

Pennington, M. C., and Stevens, V. (1992). Introduction: Toward appropriate uses of computers in applied linguistics. In M. C. Pennington and V. Stevens (eds.), *Computers in applied linguistics: An international perspective*. 1-8.

Pienemann, M. (1989). Is language teachable? *Applied Linguistics*, 10, 52–79.

Pienemann, M. (1998a). Developmental dynamics in L1 and L2 acquisition: Processability Theory and generative entrenchment. *Bilingualism*, 1, 1–20.

Pienemann, M. (1998b). A focus on processing. *Bilingualism*, 1, 36–38.

Pienemann, M. (1998c). Language processing and second language development: Processability Theory. Amsterdam/Philadelphia: *John Benjamins*.

Plass, J., & Jones, L. (2005). Multimedia learning in second language acquisition. In *The Cambridge handbook of multimedia learning*, R. Mayer, Ed. New York: Cambridge University Press, pp. 467-488.

Rositskze, H.A. (1943). The articulation of final stop in General American English Am. *Speech*. *18:* 39-42.

Selinker, L. (1972). Interlanguage. *International Review of Applied Linguistics in Language Teaching, 10,* 209-232.

Taniguchi, H. (1991). Results of a survey on Japanese pronunciation teaching. *Prosody and its Role in TJSL*. Ministry of Education, Tokyo. 17-21.

Van Lommel, S., Laenen, A., & d'Ydewalle, G. (2006). Foreign-grammar acquisition while watching subtitled television programmes. *British Journal of Educational Psychology, 76*(2), 243-258.

Whalen, D. H., Levitt, A. G., & Goldstein, L. M. (2007). VOT in the babbling of french- and english-learning infants. *Journal of Phonetics, 35*(3), 341-352.

Wood, D., 1996. Video movies in teaching English as a foreign language. *PASAA: A Journal of Language Teaching and Learning in Thailand 26*, 45-52. Chulalongkorn University Language Institute.