

Third Language Phonological Acquisition: Comparison of Simultaneous and Sequential
Bilinguals' Acquisition of Voice Onset Time

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ABSTRACT

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The process of third language acquisition (TLA) differs from the process of second language acquisition (SLA) due to the learners' additional language experiences and temporal possibilities, creating a much more complex model of development (De Angelis, 2007; Falk & Bardel, 2010; Cenoz, 2003). Despite the recent growth in the body of TLA research, and more specifically L3 phonological acquisition, results are insufficient to provide a clear picture of L3 phonological development. Whereas most research has focused on sequential bilinguals, with the exception of a few recent studies investigating heritage learners (e.g., Llama & López-Morelos, 2016; Cabrelli & Pichan, 2019; Geiss et al., 2021), very few have focused on simultaneous bilinguals. Moreover, despite the variety of methodological designs and tasks found in TLA research, studies investigating the effect of different types of tasks remain scarce; in addition, they provide mixed results regarding task effects on the L3 production of bilinguals.

This study, a partial replication of Llama, Cardoso and Collins (2010) and Llama and Cardoso (2018), set out to investigate sequential *and* simultaneous bilinguals' acquisition of Voice Onset Time (VOT) in L3 Spanish in two different types of tasks in order to determine whether type of bilingualism and task type modulate L3 phonological acquisition. 15 sequential L1 French/L2 English, 13 sequential L1 English/L2 French and 6 simultaneous French/English bilinguals learning L3 Spanish completed word-reading and a picture-descriptions tasks. Findings indicate that simultaneous bilinguals have a *partial* advantage in L3 production: They are more accurate in their L3 VOT productions than sequential bilinguals in the picture-description task,

but not in the word list task. Findings also indicate that type of task modulated L3 productions in that all participants produced lower VOT values in the picture-description task.

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Chapter One

From as far as I can remember, I have always been fascinated by languages. As a native speaker of French, I learned English from a very early age and by the time I reached Cégep, I was fully bilingual. I then continued my language learning journey and studied Spanish and German as well as enrolling in linguistic classes. Quickly, I became fascinated by how languages *worked*. A few years later, I added Japanese to my repertoire and for the first time, I became aware of my acquisition process (I was not aware of the concept of metalinguistic awareness at that time). Unexpectedly, I found learning Japanese much easier than learning Spanish and German. At the same time, to my surprise, I found myself blurting Spanish words when my Japanese vocabulary was lacking. *Why Spanish?* I was learning Japanese in an English university, so the basis of my instruction was in English. Why was I not relying on English? Or even French, my first language? This is one of the first metalinguistic question that stuck with me throughout my undergraduate years.

A few years later, I started my graduate studies in Applied linguistics and delved into the fields of third language acquisition (TLA) and cross-linguistic influence (CLI). An important premise of these fields is that a *third* language learner is inherently different from a *second* language learner due to their additional language learning experiences (De Angelis, 2007; Falk & Bardel, 2010). Additionally, multilinguals seem to have an advantage over monolinguals when learning a foreign language (Antoniou et al., 2015), and no multilinguals are the same because of the unique features of each language in their repertoire (Sypiańska, 2016). This made me go back to my Japanese learning experience and reflect on that acquisition process. Did I find it easy learning it because I had already learned other foreign languages? Was my experience different from that of my peers because my language repertoire was different from (or more varied than)

theirs? These questions opened a Pandora box of many more questions regarding the acquisition process of multilingual learners.

This is what this thesis is about. Part of a larger scale project delving into cross-linguistic influence, this study attempts to provide answers to some of the many questions that were raised throughout my experience as a multilingual language learner.

Third Language Phonological Acquisition

As mentioned above, *third* language acquisition is different from a *second* language learner due to the additional language experiences and linguistic knowledge carried by multilingual learners (De Angelis, 2007; Falk & Bardel, 2010). Moreover, whereas L2 acquisition presents only two possible temporal possibilities (simultaneous or sequential), L3 acquisition presents four (i.e., $L1 \rightarrow L2 \rightarrow L3$, $L1/L2 \rightarrow L3$, $L1 \rightarrow L2/L3$ and $L1/L2/L3$ – Cenoz, 2003), creating a much more complex developmental path. There is thus an evident need for research that emphasize the acquisition process of multilingual learners. In this regard, the field of third language phonological acquisition has witnessed a boom in research in the past few years and is now recognized as its own field. However, due to the very complex nature of third language acquisition and its relative recency, research in the field remains insufficient to provide us with a clear picture of L3 phonological acquisition (Cabrelli Amaro & Wrembel, 2016).

Whereas most research in L3 phonological acquisition so far has focused on sequential bilinguals, mirroring temporal possibilities found in SLA ($L1 \rightarrow L2$), more research is needed with different bilingual learners (e.g., simultaneous bilinguals) to fully understand the process of L3 phonological acquisition. In addition, despite the growing body of research in the field which calls for a variety of methodological designs and tasks, the effects of different types of tasks remain under-investigated. As recognised by the sociolinguistic literature (e.g., Tarone, 1982), data elicited from tasks where speakers pay less attention to form (e.g., spontaneous speech, as

found in picture description tasks) are not the same as those elicited from tasks that require careful attention to speech (e.g., in the reading aloud of word lists).

Current Study, Goals and Hypotheses

This study aims to contribute to the bigger body of research on L3 acquisition by investigating whether different types of bilingual learners produce different Voice Onset Time (VOT) values in L3 Spanish. As will be described in Chapter 2, VOT is a feature of the production of voiceless stops, defined as the length of time that passes between the release of the consonant and the onset of voicing (i.e., the vibration of the vocal folds for the production of the following segment). VOT values allow us to contrast an aspirated stop (i.e., found in English voiceless stops /p/, /t/, and /k/) with a non-aspirated stop (i.e., found in Spanish and French). Another goal of this study is to investigate the possible effect of task (i.e., the reading aloud of words vs. spontaneous speech) on bilinguals' L3 productions.

The scarcity of research investigating sequential vs simultaneous bilinguals makes it difficult to hypothesize which would have an advantage on the production of VOT. However, in line with previous findings (e.g., Kopečková, 2016), we predict that simultaneous bilinguals will have an advantage over sequential bilinguals and produce lower VOT that are closer to those of monolingual Spanish speakers. We also expect that our participants will produce different mean VOT values across tasks. More specifically, we hypothesize that participants will produce higher VOT values (further from target/expected values) in the more complex task, as found in Kopečková (2014) and Patience and Qian (2022).

As per the guidelines for a manuscript-based MA thesis, the next section constitutes “a full submittable draft of a manuscript” that presents the full literature review, methodology, results, and discussion of the abovementioned research.

Chapter Two

The process of third language acquisition (TLA) differs from the process of second language acquisition (SLA) due to the additional language experiences and linguistic knowledge carried by multilingual learners (De Angelis, 2007; Falk & Bardel, 2010). In this regard, research has witnessed in the past few decades a growth in the body of research focusing on TLA in areas such as lexis, morphology and syntax, mirroring trends in SLA (Rothman, Alonso & Puig-Mayenco, 2019). More recently, however, L3 phonological acquisition has seen substantial development and is now recognized as its own field (Cabrelli Amaro & Wrembel, 2016).

In their state-of-the-art review article, Cabrelli Amaro and Wrembel (2016) highlight the main contributions to the field, mainly in the area of cross-linguistic influence (CLI), but they concede that these are insufficient to provide a clear picture of L3 phonological acquisition. Whereas most research in L3 phonological acquisition so far has focused on sequential bilinguals, with the exception of a few recent studies investigating the L3 production of heritage learners (see for example Llama & López-Morelos, 2016; Cabrelli & Pichan, 2019; Geiss et al., 2021), more research is needed on different populations to fully understand the process of L3 phonological acquisition. To my knowledge, only one study so far directly compares sequential and simultaneous bilingual speakers of the same language pair (Aoki, 2007). Moreover, despite the growing body of research on L3 phonological acquisition which calls for a variety of methodological designs and tasks, studies investigating the effect of different types of tasks remain scarce and provide mixed results.

This study, part of a larger scale project delving into cross-linguistic influence and a partial replication of Llama, Cardoso and Collins (2010) and Llama and Cardoso (2018) will aim to fill these gaps by comparing the L3 phonological acquisition of Spanish in simultaneous bilinguals and sequential bilinguals across two types of tasks. Comparing simultaneous and

sequential bilingual speakers of the same language pair in different speech styles will allow us to investigate an understudied population and consider whether different types of bilingualism and tasks modulate L3 phonological acquisition.

Literature Review

L3 Phonological Acquisition

Research on CLI has seen the most substantial development in L3 phonological acquisition research. Despite not being the main focus of our current project, reviewing research on CLI will allow us to gain a clearer picture of L3 phonological development and its conditioning factors as well as make predictions regarding the L3 productions of our groups. Early work in the field of CLI has attempted to identify which language between the L1 or the L2 is the strongest source of CLI in the L3. These studies have yielded mixed results in identifying the source of influence (see forthcoming discussion). More recently, however, research seems to provide evidence for a combined CLI, or what De Angelis (2007) describes as “a type of transfer that occurs when two or more languages interact with one another and concur in influencing the target language, or whenever one language influences another, and the already influenced language in turn influences another language in the process of being acquired” (p.29).

Research on Cross-Linguistic Influence

Llisterri and Poch Olivé (1986) investigated the influence of L1 Catalan and L2 Castilian on L3 French phonological acquisition. The researchers analyzed the learners' production of isolated vowels and words in carrier sentences from the three languages and compared them to native realizations. They found similarities between the productions of L1 Catalan and L2 Castilian mid-central vowels and the same similarities between L1 Catalan and L3 French. They also found similarities between the productions of the neutral vowel schwa between the L1 and the L3, which they attributed to the lack of this sound in the L2. The authors found similar results

in a following study (Llisterri & Poch Olivé, 1987). Through a series of similar experiments, they investigated the sources of influence in the production of L3 learners, but this time by comparing Castilian monolinguals and Catalan-Castilian bilingual learners' production of vowels and fricatives during their acquisition of French or English. During the experiments, the learners' productions of the different segments were analyzed by comparing the formant values of the vowels and the frequency and energy of the fricatives across the three respective languages. No statistical difference was found in regard of the influence of the previous languages for both groups of learners; consequently, the researchers concluded that both monolingual and bilingual learners exhibited the same pattern of influence, that is, they both demonstrated influence from the L1 but not from the L2.

Similar results were found by Wrembel (2012), who investigated the source of influence in the perceived accented speech of L3 English elementary and intermediate learners with French as an L2 and Polish as an L1. Recorded samples of a read-on-your-own task and spontaneous speech were judged by native and near-native Polish speakers. Results showed that the L1 had a stronger influence on the participants' accentedness regardless of English proficiency. However, the author reported some L2 influence, although not significant.

A seminal study in the field is a longitudinal case study by Hammarberg and colleagues (Hammarberg & Hammarberg, 1993, 2005; Hammarberg, 2001) which followed and documented the acquisition of an L3 Swedish learner with English as an L1 and German as an L2. Among the experiments, two picture story narrations recorded one year apart were judged by Swedish speakers who were asked to identify the learner's native language. She was found to have a German (L2) accent in the first recording, but an English (L1) accent was observed in the second recording, as her proficiency in the L3 Swedish increased. Moreover, when focusing on the articulatory properties of the learner's production of L3 Swedish segments, they found that in the

first week of learning, the learner transferred German vowel rounding, intervocalic voicing of /s/, as well as syllabic nasals into her L3 productions. However, these L2 German articulatory processes decreased as the learner became more proficient in her L3, and the rate of L1 English articulatory processes increased. The researchers also found that the learner's reliance on L2 was task-related. For instance, while performing read-on-your-own tasks, she was found to exhibit a stronger L2 influence than in read-after-me tasks. Finally, another interesting finding was that the learner, when commenting retrospectively on her learning process, admitted that she attempted to avoid the use of her L1, thus relying on her L2. Through their documentation of a single learner's acquisition of L3 Swedish, the authors concluded that multiple factors such as proficiency, task, and L2 status, came into play and influenced the learner's L3 phonological acquisition process.

Results pointing to (partial) L2 influence were also found in Gut (2010), who investigated the sources of CLI in the acquisition of vowel reduction and speech rhythm by L2 German and L2 English speakers learning L3 English and L3 German respectively. Data was collected from three speaking styles: a reading passage, a retelling task, and an interview. Results across all tasks showed no indication that L3 vowel reduction and speech rhythm were influenced by the L1, but mixed evidence was found regarding L2 influence. Although there was no clear evidence of a full L2 transfer, some participants demonstrated some vowel reductions, which the author analyzed as a possible source of L2 influence, due to the phenomenon being non-existent in the L1 of the participants. The author concluded that, although there was no clear evidence of any CLI, this could be explained with the learners' lack of awareness of the different phonological properties in the languages.

In a study by Tremblay (2007), VOT productions of four L1 English and L2 French beginner learners of L3 Japanese were analyzed. Irrespective of the type of tasks administered (a word-reading and a delayed repetition tasks), similar VOT values were found in L2 French and

L3 Japanese, which the author interpreted as an L2 influence, although the L3 VOT values approximated the native Japanese target norms as well. However, the author highlighted the possibility that the L2 was already influenced by the L1, thus leading more towards a combined influence, an analysis supported by the majority of recent research.

Wrembel (2010, 2015) have argued that the L2 could not be the only source of CLI, and that when it did have an influence, it was in combination with the learner's L1. In her 2010 study, partially replicating Hammarberg and Hammarberg (2005), she investigated the accent of L3 English learners with Polish as an L1 and German as an L2. Her results showed that both the L1 and the L2 played a role in CLI. Another interesting finding was that native speakers, when performing accent judgements on a reading and a spoken task, identified more non-native speakers as German in the low proficiency group and in the spoken task. The researcher thus explained her combined CLI results in relation to proficiency and task, hypothesizing that the L2 has a stronger influence on the L3 when learners are in early stage of acquisition and when they perform oral tasks. Although those factors were not the main focus of the study, the results are consistent with those of Hammarberg and Hammarberg (2005). Contrastively, in a follow-up study that investigated the VOT production values of learners of L3 French with German as an L1 and English as an L2, Wrembel (2015) found no clear distinction between L1 and L2 influence. In data elicited from a word list in carrier sentences, the author found L3 French values that were intermediate between monolingual French values and L1 German/L2 English values, which she hypothesized were the result of the typological closeness between English and German. Because the two languages are relatively close, this could have led to a combined or hybrid CLI.

Task Effect in L3 Productions

As evidenced above, research in L3 acquisition has employed a variety of task designs to elicit non-native data, ranging from isolated phonemes productions to spontaneous speech. However, only a subset of these studies has considered the effect of task when analyzing results (Hammarberg & Hammarberg, 1993, 2005; Tremblay, 2007; Wrembel 2010), and most findings seem to point towards a stronger L2 reliance as task complexity increases and in more natural (e.g., spontaneous) speech. To my knowledge, only a very limited body of research has explicitly looked at the effects of task on L3 acquisition (e.g., Bondarenko, Butera & Rao, 2022; Kopečková, 2014; Patience & Qian, 2022).

Bondarenko et al. (2022) investigated the L3 Spanish VOT productions of heritage speakers (HSs) of Ukrainian and Polish who were English dominant. The goals of their study were to observe potential effects of the heritage languages as well as tasks on L3 VOT productions. Results showed that participants exhibited influence from their heritage languages in L3 Spanish due to perceived structural proximity between the languages. But to particular interest for our study, results also showed that L3 productions were modulated by task. Participants completed three tasks: a nonce word reading task, a sentence-reading task, and a narrative task. Results showed that Ukrainian HSs produced higher (English-like) VOT values for /p/ and /t/ in more formal tasks. Interestingly, Polish HSs produced higher VOT values for /p/ in more formal tasks, but VOT values decreased for /t/ and /k/ as task formality increased. The author interpreted these results in relation to the HSs proficiency in Spanish, which was lower for the Polish group.

Kopečková (2014) investigated possible sources and conditioning factors in the L3 Spanish acquisition of rhotics (/r/ and /r/) by 20 native-speaking children of German after three years of English instruction. Analysing /r/ in a picture naming task, a reading task and an interview, she found a more prevalent L1 influence in /r/ production in the picture naming task

whereas the reading task yielded the least L1 influence, but no native-like productions. In addition, both the reading task and the interview showed combined L1/L2 influence, in line with previous work which evidenced a stronger reliance on the L2 in more complex tasks (Hammarberg & Hammarberg, 1993, 2005; Wrembel 2010). As for the segment /r/, most productions were native-like, although some degree of variability was found due to L2 experience.

Contrastively, Patience and Qian (2022) tested the hypothesis that a more dominant language (here the L1) would exert more influence on an L3 as task complexity increases. To do so, they investigated the rhotic productions of 17 L1-Mandarin/L2-English/L3-Spanish speakers in a sentence-reading task and compared them with results of a word-reading task reported in Patience (2018). Results partially confirmed their hypothesis in that positive L2 influence decreased in the more complex task, but negative L2 influence did not. They also reported that /l/ substitutions from their dominant language Mandarin increased in the more complex task.

Types of Bilingualism and L3 Phonological Acquisition

As opposed to sequential bilinguals who learn their L1 before infancy and their L2 after infancy, often in a school setting, simultaneous bilinguals are exposed to two L1s during infancy, albeit often to different degrees of exposure. Interestingly, although these speakers comprise an important part of the multilingual population, they have been heavily neglected in TLA research. As highlighted in the introduction, third language (L3) acquisition is inherently different from second language (L2) acquisition due to the addition of foreign languages creating a much more complex model of development. As Cenoz (2003) observes, whereas L2 acquisition presents only two possible temporal possibilities (simultaneous or sequential), L3 acquisition presents four:

1. The three languages can be acquired sequentially (L1 → L2 → L3)
2. The three languages can be acquired simultaneously (L1/L2/L3)

3. Two languages can be acquired simultaneously, followed by the L3 (L1/L2 → L3)
4. Two languages can be acquired simultaneously after L1 acquisition (L1 → L2/L3)

As indicated previously, research in the field of third language phonological acquisition has traditionally focused on learners falling into the first category, sequential bilinguals, although we have seen a boom of research on simultaneous bilinguals, mainly heritage language speakers, in the past few years (but see Iverson 2009, Giancaspro, Halloran & Iverson, 2015 and Child, 2017 for a comparison of heritage speakers and sequential bilinguals involving L3 syntax). Among the few studies that investigated this population, the focus has been mainly on heritage language learners. Only a handful of studies examined sequential *and* simultaneous bilinguals, although with different foci (e.g., Iverson, 2009; Cabrelli & Pichan, 2019; Kopečková, 2016; Aoki, 2017).

L3 Acquisition in Early Bilinguals

Llama and Lopez-Morelos (2018) investigated the VOT productions of Spanish HSs with English as a dominant language who were learning L3 French. They found that, when compared to monolingual control groups, the experimental group created one distinct category for the stops in Spanish and one for English and French. In addition, all of their participants achieved native-like VOT values in their two strongest languages, but deviated from the norm in their L3 French. The researchers thus hypothesized that dominance might have conditioned the influence from the participants' dominant L1 English to L3 French.

Geiss et al. (2021) investigated the VOT productions of HSs of Italian with German as a dominant language and English as an L3. They found that the heritage bilinguals created separate categories in the typologically distant languages and that they behaved like German and English monolinguals in their production of L3 English VOTs. These participants also differed from their

monolingual Italian controls, from whom they had an advantage in L3 VOT productions, pointing towards a facilitative CLI from German, possibly due to German being the dominant language.

Different results were found by Gabriel, Krause & Dittmers (2018), who investigated the VOT productions of Turkish and Russian HSs with German as a dominant language and French as an L3. Results showed that HSs produced hybrid VOT values in their two L1s (i.e., they fell in the middle of the values expected for each language), albeit to a lesser degree for the Turkish-German bilinguals. In addition, both HSs groups were closer to target L3 values than their monolingual counterparts, but facilitative CLI was only found in the Russian-German group and only for voiceless stops, pointing only to a partial language and feature-specific advantage.

Moving away from VOT, Lloyd-Smith et al. (2017) examined perceived accentedness in Turkish HSs who were dominant in German and L3 English learners of various proficiency. Results showed that participants were in majority identified as German L1 speakers, but their accent was milder when compared to monolingual Turkish speakers. In addition, when looking at the effect of age of onset of acquisition in German, results showed that this factor did not contribute to accent strength (strong or mild) and accent source (German or Turkish). However, the authors concede that this might be due to the fact that all participants were early bilinguals and that the reported age of onset might have depended on the HSs perception of exposure.

Simultaneous vs Sequential Bilinguals

In the domain of phonological acquisition, Cabrelli and Pichan (2019) investigated the production of intervocalic voiced stops by three groups of Spanish-English bilinguals learning Brazilian Portuguese or Italian as an L3. The three groups were comprised of English-dominant heritage Spanish speakers, L1 English/L2 Spanish speakers and L1 Spanish/L2 English speakers. Results showed that overall, all three groups transferred Spanish intervocalic stops regardless of their type of bilingualism and despite the feature being similar in English. The authors thus

concluded that global structure similarity overrides other factors such as language status, dominance or type/sequence of bilingualism. These results are consistent with previous work in the domain of syntax, which showed that HSs and sequential bilinguals all transferred from their typologically close language.

Kopečková (2016) investigated the acquisition of rhotic sounds in L3 Spanish by 19 multilingual children over the course of three years. All children were native speakers of German who learned English as an L2, but four of them were raised bilingually in German and another language and one was a Spanish heritage speaker. The author thus divided them into two groups: active bilinguals (or simultaneous bilinguals) and foreign language users (or sequential bilinguals). The author conducted a picture-naming task, a reading task and an interview and provided collapsed results to ensure that the type of task did not affect the results. She found that the active bilinguals had a superior phonetic ability (an “advantage”) at all testing times, albeit modulated by the degree of similarities of sounds present in the multilinguals’ repertoire and the universal difficulty of the features learnt (i.e., rhotics). However, she observed that the only heritage speaker behaved like the sequential bilinguals; i.e., that participant did not benefit from the added native language. She hypothesized that this might be due to the fact that the learner had little exposure to her heritage language.

As stated earlier, the only comparison between sequential and simultaneous (non-heritage) bilinguals was done by Aoki (2017). The researcher investigated whether L3 English VOT productions of a group of 16 bilinguals was different from the productions of monolinguals, and whether their age of arrival (early vs late bilingualism) affected their productions. The analysis of VOT values produced in a word-list task revealed that bilinguals produced native-like L3 English VOT values, except for the production of /t/ by late bilinguals. Both groups also produced different VOT values for /t/ and /k/ in L3 English. It was also found that early bilinguals’ VOT

productions were distinct from their L2 Japanese monolingual counterparts’, and that late bilinguals differed from their L1 Mandarin counterparts. The author concluded that early bilinguals attempted to avoid being influenced by L2 Japanese, their dominant language, whereas late bilinguals tried to avoid being affected by Mandarin, their L1.

Voice Onset Time

As defined by Lisker and Abramson (1964) and revisited by Abramson and Whalen (2017), VOT is “the temporal relation between the moment of the release of the stop and the onset of glottal pulsing” (p.76). More concretely, a voiced stop is characterized by a voicing lead, represented by a negative VOT value whereas a voiceless stop is characterized by a voicing lag, represented by a positive VOT value. Measured in milliseconds, these VOT values, or the length of the voicing lag, is what allows us to contrast an aspirated stop (i.e., found in English voiceless stops /p/, /t/, and /k/) with a non-aspirated stop (i.e., found in Spanish), the former exhibiting a longer lag and the latter exhibiting a shorter lag.

Voice Onset Time in L1 Spanish

In monolingual Spanish, VOT values fall within the range of 0 and +30 ms (Llama, et al., 2010) and are thus considered non-aspirated. Literature has reported monolingual VOT means of 13.10 ms for /p/, 14 ms for /t/ and 26.50 ms for /k/ (Rosner et al., 2000). However, we will follow recommendations from Cenoz (2011), who proposed the *focus on multilingualism* approach to investigate learners who know more than two languages. Due to the fact that these learners possess two different competences, they should not be compared to a monolingual speaker. In this regard, when pertinent to contextualize our results, we will refer to Spanish “functional” monolingual values that come from Llama and Cardoso’s (2018) corpus. These “functional” monolinguals are learners who have been instructed in an L2 but that do not use it in their

everyday life. They are a more appropriate population to be compared with in that they have been exposed to more than one language and thus share a more similar bilingual competence.

Mean VOT values for Spanish found in the literature are reported in table 1 below.

Although our current study does not directly address CLI, we will refer to these measures when commenting on our participants' L3 productions.

Table 1

Monolingual Spanish VOT Values Reported in the Literature

Stops	Monolingual speakers (Rosner et al., 2000)	“Functional” monolingual speakers (Llama et al., 2018)
/p/	13.10 ms	15.82 ms
/t/	14 ms	18.18 ms
/k/	26.50 ms	30.58 ms

Voice Onset Time in L3 Spanish

Although VOT has received a lot of attention in L3 acquisition research, as have been showed in the previous sections of this literature review, of particular interest to our current study are those that focused specifically on L3 Spanish.

Wunder (2010), for instance, analyzed the VOT production values of syllable-initial consonants of beginner learners of L3 Spanish with German as an L1 and English as an L2. Although the author hypothesized a stronger influence of the L2, she found an underlying effect of the L1 in both the L2 and the L3. She concluded that the potential effect of the L2 was only visible when combined with L1, arguing then for a source of mixed CLI.

Llama, Cardoso and Collins (2010) focused specifically on the effect of L2 status and typology in L3 phonological acquisition. The main goal of their study was to find which factor was a stronger predictor of CLI. They investigated the VOT values of word-initial voiceless stops produced by Francophone and Anglophone learners of L3 intermediate Spanish. They found L2

status to be a stronger predictor of CLI, as the participants did not transfer the similar and typologically close L1 French VOT values into their L3 Spanish. Instead, the percentages of aspirated segments were similar in both L2 and L3. However, because of this similarity in L2 and L3 VOT values (involving French and Spanish), the researchers also hypothesized a possible underlying L1 French effect influencing L2 English, which then influenced L3 Spanish. A combined source of CLI was explained in relation to an L2 status effect. These results are in line with those of Wrembel (2011) and Gut and Wrembel (2014) who also evidenced intermediate VOT values in L3 French.

Llama and Cardoso (2018) further explored the role of the L1 and the L2 in L3 Spanish VOT productions, this time by investigating advanced L3 learners. Contrary to their previous work, they found a more predominant L1 influence in both experimental groups, due to the increase in L3 proficiency. Interestingly, both Francophones and Anglophones produced Spanish VOT values that were lower than their respective French L1 and L2, which the authors interpreted as L3 VOT acquisition with retention of L1 traits in the two non-native languages.

Current Study

As indicated above, L3 acquisition is a complex phenomenon due to the added temporal possibilities of acquisition. Yet, despite the recent growing body of research investigating heritage language learners, most studies have focused on sequential bilinguals, which only allows us to draw an incomplete picture of L3 phonological acquisition. Moreover, the handful of studies that have examined the effects of task as well as the mixed results provided makes it difficult to generalize the available findings. The current study attempts to address these gaps by answering the following research questions:

1. Is L3 VOT acquisition modulated by the type of bilingualism? In other words, are simultaneous bilinguals more accurate than sequential bilinguals in their L3 VOT productions?
2. Do sequential and simultaneous bilinguals' L3 VOT productions vary across tasks?

Regarding our first research questions, it is quite difficult to make predictions *a priori* due to the very small body of research that has explored the effect of type of bilingualism. However, in line with previous work, we hypothesize that simultaneous bilinguals will produce VOT values that are lower than those found in sequential bilinguals, thus being closer to mean values reported in the literature for “functional” monolinguals (refer to Table 1). Nonetheless, we expect these VOT values to still be higher than “functional” monolingual norms for all groups, in line with previous findings (Llama et al., 2010). Finally, we expect to observe different VOT means across tasks. As such, we hypothesize that our participants will produce mean VOT values that are further from the norm in tasks that require a lesser amount of attention to speech: the picture-description task.

Methodology

Participants

34 participants between the age of 18 and 68 ($M = 26.8$, $SD = 12.3$) were recruited from Spanish classes in Montreal universities and private language schools. They were all currently enrolled in a beginner or elementary Spanish course or had completed one in the previous year. They were divided into three groups: sequential bilinguals speaking French as an L1 and English as an L2 (group SeqFR), sequential bilinguals speaking English as an L1 and French as an L2 (group SeqEN) and French/English early simultaneous bilinguals (group SimBIL). Participants from the Seq groups all had an advanced/near-native level of their L2: English or French (see forthcoming discussion). Only four participants had knowledge of a fourth/fifth language, but not

past the beginner level; in addition, they were not exposed or using it at the time of the study.

Table 2 provides a summary of the participants and their linguistic profiles.

Table 2

Participants' Linguistic Profiles

Group	n	L1	L2	L3
SeqFR	15	French	English (advanced/near-native)	Spanish (beginner /elementary)
SeqEN	13	English	French (advanced/near-native)	Spanish (beginner /elementary)
SimBIL	6	French/English	N/A	Spanish (beginner/elementary)

The rationale for the selection of these particular linguistic profiles is that they are mirror images of each other, which allows us to control for possible conflating factors such as a language effect on the acquisition of Spanish VOTs. For example, if simultaneous French/English bilinguals were only compared with English L1 speakers, they could have an advantage on a typological standpoint, French and Spanish being typologically much closer in their VOT realizations. Having those two sequential groups thus allow us to tease apart typology and type of bilingualism (sequential vs simultaneous). Finally, these linguistic profiles allow us to add to previous VOT studies, which employed the same mirror groups; this includes research by Llama et al. (2010) and Llama and Cardoso (2018), of which our study is a partial replication.

Target Feature

The study examined the aspiration of the voiceless stops /p/, /t/ and /k/, operationalized as Voice Onset Time values, in stressed onset position of monosyllabic or disyllabic words.

Instruments

Bilingual Language Profile

A slightly adapted version of Birdsong et al. (2012) Bilingual Language Profile (BLP) was used to collect participants' biographical information and linguistic background. Although its primary use is to assess language dominance, it provides an in-depth portrayal of the participants' linguistic background through self-reports of language history, proficiency, use, and attitudes for each language tested. Results from the BLP were used to place our participants into the different sequential bilingual and simultaneous bilingual groups, and to ensure that they had similar proficiency and use across all languages.

Word List Reading Task

A word list of 35 Spanish words adapted from Llama et al. (2010) and Llama and Cardoso (2018) was used in this experiment. The list included four training items and the remaining words were selected to elicit the voiceless stops /p/, /t/ and /k/ in stressed onset position (e.g., *pato* 'duck', *perro* 'dog'). Following considerations highlighted in Llama and Cardoso (2018), sequences of /t+i/ were removed from the list due to the affrication that /t/ undergoes in Canadian French when /t/ is followed by a high front vowel; this could affect the target VOT values, as consonant lengthening is one of the effects of affrication. Finally, we attempted to evenly distribute tokens of each target consonant (/p/, /t/, /k/) per vowel (/a, e, i, o, u/; see Appendix A for the full list of words).

Picture-Description Task

14 pictures depicting elements targeting words with the voiceless stops under investigation were used (see samples in Appendix B). The target words (represented by pictures) were the same as those used in Llama et al. (2010): *pato* (duck), *perro* (dog), *parque* (park), *pelo* (hair), *pez* (fish), *toro* (bull), *taza* (cup), *tarta* or *torta* (pie), *tabla* (board), *torre* (tower), *cara*

(face), casa (house), coche or carro (car), caja (box) and coco (coconut). Among the 14 pictures, 13 were selected after being piloted with 8 Spanish learners. Because one picture did not generate the target word pez (most participants produced “pescado” instead), another picture depicting the target word pez (fish) was selected to replace it. Moreover, in order to elicit as many tokens as possible, pictures depicting two of the target items were selected whenever possible (e.g., a picture of a dog [perro] looking at a pie [torta]).

Procedure

The Bilingual Language Profile was completed remotely prior to the recording session. The data collection then took place at the researcher’s office. Words were presented one at a time on a computer screen and randomized for each participant. Following the word list tasks, participants completed the picture-description task, during which they described each picture for approximately one minute. To prime participants in the target language, instructions were given in Spanish. Data were collected in a quiet room using a Sennheiser EK-100 Lavalier microphone kit and an Olympus WS802 digital voice recorder.

Analysis

The software PRAAT (version 6.1.03) was used to obtain acoustic measurements in milliseconds (ms) of the stressed onset consonants /p/, /t/ and /k/ in L3 Spanish, operationalised as voice onset time (VOT) values. Mean VOT values produced by our three experimental groups for the three stops in both tasks and submitted to Kruskal-Wallis tests. When group differences were found, we performed post hoc unpaired two-samples Wilcoxon tests to reveal any significant differences between groups and between tasks, specifically. Because we compared more than two groups, the p-value was Bonferroni adjusted to 0.017. We first present the results of VOT means comparisons within each task to see if our groups performed differently based on

their type of bilingualism, and then we turn to VOT means comparisons across tasks to see if L3 productions are modulated by task.

Results

VOT Productions and Types of Bilingualism

Word List

The word list yielded a total of 1172 tokens: 517 tokens for group SeqFR, 444 tokens for group SeqEN and 211 tokens for group SimBIL (the reduced number of tokens is due to the small number of participants in group SimBIL, $n=6$). Table 3 provides a summary of descriptive results. As illustrated, the three experimental groups produced quite similar VOT means for all target consonants. Group SeqFR produced the following VOT means: 28.44 ms for /p/, 31 ms for /t/ and 50.46 ms for /k/, while Group SeqEN produced VOT means of 29.58 ms for /p/, 31.14 ms for /t/ and 50.74 ms for /k/. Finally, Group SimBIL produced the following VOT means: 27.37 ms for /p/, 30.98 ms for /t/ and 45.99 ms for /k/. VOT means for each consonant per group are illustrated in Figure 1 below.

Table 3

VOT Means, SD and Number of Tokens in the Word List Task

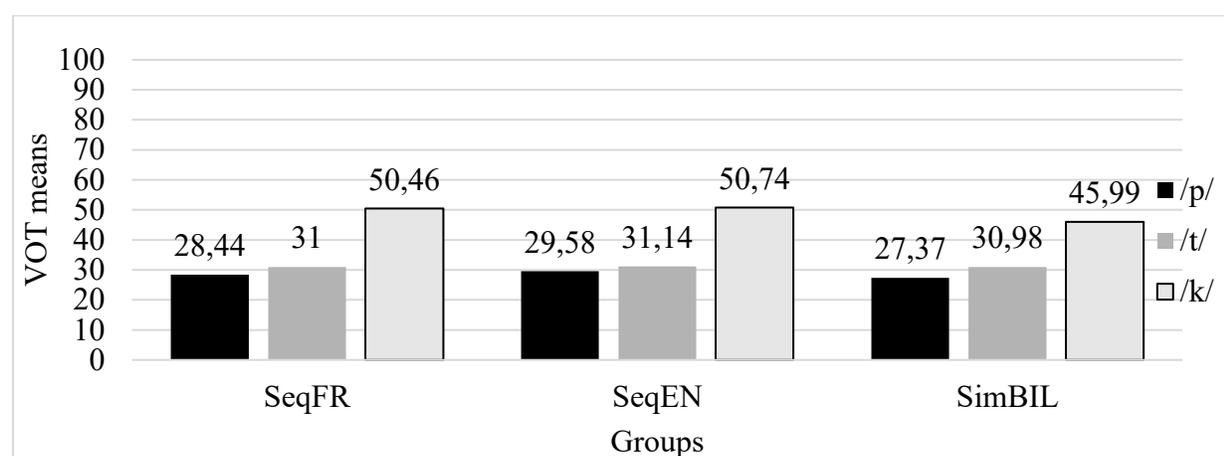
Groups	/p/			/t/			/k/		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
SeqFR	177	28.44	16.20	129	31	16.05	217	50.46	16.63
SeqEN	155	29.58	16.94	111	31.14	15.02	180	50.74	18.51
SimBIL	72	27.37	20.68	57	30.98	18.05	87	45.99	17.36

As expected after a quick glance at Figure 1, a Kruskal-Wallis test revealed no significant group difference between overall VOT values ($H(2) = 5.1903$, $p = 0.07463$). Similarly, when looking at consonants separately, no group difference was found for /p/ ($H(2) = 2.8204$, $p = 0.2441$) and /t/ ($H(2) = 0.6267$, $p = 0.731$). However, results almost reached significance in the

case of /k/ ($H(2) = 6.4572$, $p = 0.03961$). Post-hoc Wilcoxon tests traced this result to the SimBIL group, whose difference from group SeqEN ($W = 8715$, $p\text{-value} = 0.01938$) and group SeqFR ($W = 10294$, $p\text{-value} = 0.01912$) almost reached significance in respect to /k/. No difference was found between both SeqEN and SeqFR groups ($W = 18702$, $p\text{-value} = 0.9444$). These results show that, in the case of the word list task, the type of bilingualism (sequential vs simultaneous) did not have any effect on VOT productions. Thus, the sequential bilinguals did not have an advantage over the sequential bilinguals.

Figure 1

VOT Means in the Word List Task



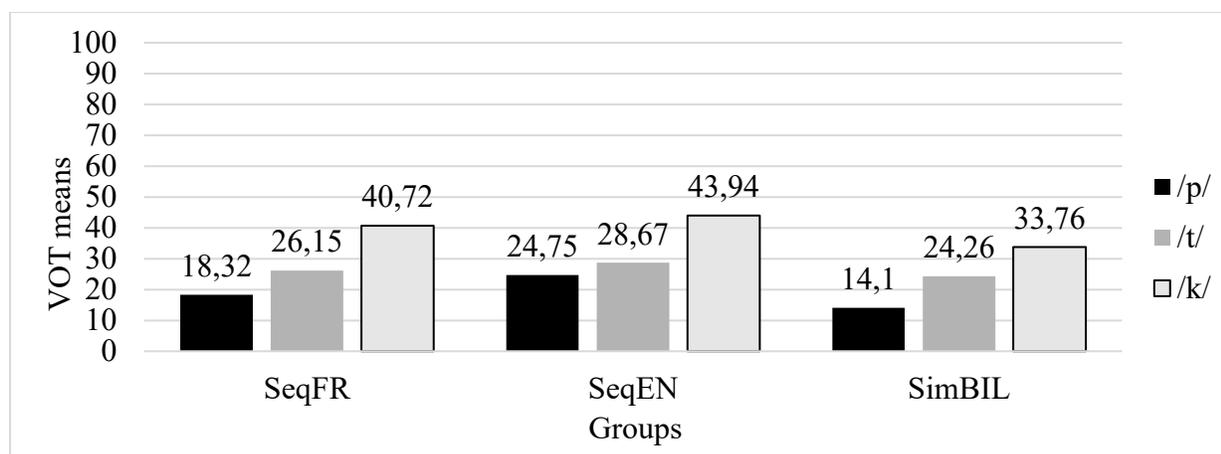
Picture Description Task

The picture description task yielded a total of 996 tokens: 406 tokens for group SeqFR, 409 tokens for group SeqEN and 181 tokens for group SimBIL. As summarized in Table 4, Group SeqFR produced the following VOT means: 18.32 ms for /p/, 26.15 ms for /t/ and 40.72 ms for /k/. Group SeqEN, on the other hand, produced the following VOT values: 25.74 ms for /p/, 28.67 ms for /t/ and 43.94 ms for /k/. Finally, Group SimBIL produced the following VOT means: 14.1 ms for /p/, 24.26 ms for /t/ and 33.76 ms for /k/. Again, to help the reader visualize the results, VOT means calculated for each consonant per group are reported in Figure 2.

Table 4***VOT Means, SD and number of Tokens in the Picture-Description Task***

Groups	/p/			/t/			/k/		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
SeqFR	135	18,32	11,16	104	26,15	12,1	167	40,72	15,74
SeqEN	155	24,75	16,08	76	28,67	17,48	178	43,94	19,16
SimBIL	67	14,1	7,14	35	24,26	10,05	79	33,76	13,68

A Kruskal-Wallis test revealed significant group differences between overall VOT values ($H(2) = 30.116$, $p = 2.887e-07$). Post-hoc Wilcoxon tests were then used to trace this difference to one or more experimental groups. These tests revealed that all groups produced significantly different VOT values when compared to each other: SeqEN differed from SeqFR ($W = 93733$, p -value = 0.00144) and SimBIL differed from both SeqEN ($W = 26813$, p -value = 9.106e-08) and SeqFR ($W = 31288$, p -value = 0.004034). Results show that, when looking at overall VOT productions, group SeqFR produced statistically significant lower VOT values than group SeqEN, while group SimBIL produced statistically significant lower VOT values than both sequential groups (i.e., SeqFR and SeqEN).

Figure 2***VOT Means in the Picture-Description Task***

When looking at consonants separately, a Kruskal-Wallis test revealed significant group differences for /p/ ($H(2) = 27.462$, $p = 1.088e-06$) and /k/, ($H(2) = 19.24$, $p = 6.638e-05$) but not for /t/ ($H(2) = 1.0776$, $p = 0.5834$). Once again, post hoc Wilcoxon tests were used to trace these differences to our experimental groups. Regarding /p/, significant differences were found between groups SeqFR and SeqEN ($W = 13036$, $p\text{-value} = 0.0002993$) and between groups SeqEN and SimBIL ($W = 3087$, $p\text{-value} = 1.623e-06$). No significant difference was found between groups SeqFR and SimBIL ($W = 3701.5$, $p\text{-value} = 0.0355$). As for /k/, significant differences were found between groups SeqEN and SimBIL ($W = 4649.5$, $p\text{-value} = 1.478e-05$) and SeqFR and SimBIL ($W = 4993.5$, $p\text{-value} = 0.002094$), but not between groups SeqFR and SeqEN ($W = 16434$, $p\text{-value} = 0.0898$). The results, which are summarized in Table 5, show that group SeqFR and SimBIL produced similar VOT values for /p/, both lower than values produced by group SeqEN. In the case of /k/, group SimBIL produced VOT values lower than both sequential groups, meaning that among all our experimental groups, they produced the lowest values.

Table 5

Results of the Wilcoxon tests for VOT Values between Groups

Groups	<i>p</i>		
	/p/	/t/	/k/
SeqFR vs SeqEN	0.0002993*	0.6398	0.0898
SeqEN vs SimBIL	1.623e-06*	0.3202	1.478e-05*
SeqFR vs SimBIL	0.0355	0.4458	0.002094*

* Asterisks indicate statistical significance.

VOT Productions and Task Effect

As evidence from these results, it seems that the three groups produced different VOT values across tasks. This was confirmed by a Kruskal-Wallis test which revealed significant VOT

differences across tasks ($H(1) = 88.357$, $p = 2.2e-16$). Post hoc Wilcoxon tests revealed that all groups produced significantly lower VOT values in the picture-description task: SeqFR ($W = 133610$, $p\text{-value} = 1.004e-12$), SeqEN ($W = 105016$, $p\text{-value} = 7.641e-05$) and group SimBIL ($W = 25279$, $p\text{-value} = 3.199e-08$).

Focusing on consonants separately, all groups produced significantly lower VOT values for /p/: SeqFR ($W = 17001$, $p\text{-value} = 1.493e-10$), SeqEN ($W = 14258$, $p\text{-value} = 0.004416$) and SimBIL ($W = 3468.5$, $p\text{-value} = 3.383e-06$). Similarly, the three experimental groups produced significantly lower values for /k/: SeqFR ($W = 24237$, $p\text{-value} = 3.507e-10$), SeqEN ($W = 19986$, $p\text{-value} = 1.963e-05$) and SimBIL ($W = 4754.5$, $p\text{-value} = 7.575e-07$). However, this difference was not observed for /t/: SeqFR ($W = 7841.5$, $p\text{-value} = 0.02667$), SeqEN ($W = 4878$, $p\text{-value} = 0.06955$) and SimBIL ($W = 1223.5$, $p\text{-value} = 0.0693$). Results are summarized in Table 6.

Table 6

Results of the Wilcoxon tests for VOT Values between Tasks

Groups	/p/			/t/			/k/		
	WL	PD	<i>p</i>	WL	PD	<i>p</i>	WL	PD	<i>p</i>
SeqFR	28.44	18,32	1.493e-10*	31	26,15	0.02667	50.46	40,72	3.507e-10*
SeqEN	29.58	24,75	0.004416*	31.14	28,67	0.06955	50.74	43,94	1.963e-05*
SimBIL	27.37	14,1	3.383e-06*	30.98	24,26	0.0693	45.99	33,76	7.575e-07*

* Asterisks indicate statistical significance. WL: Word list task. PD: Picture-description task.

Discussion

This study set out to examine whether different types of bilingualism modulate L3 phonological acquisition, and whether L3 productions vary across different tasks. To address these goals, two research questions were elaborated. The first research question asked whether simultaneous bilinguals were more accurate than sequential bilinguals in their L3 Spanish VOT

productions, while the second question inquired about the effects of tasks on the VOT production of bilinguals. Regarding the first question, the findings provide mixed results.

Simultaneous Bilinguals: An Advantage in the Picture-Description Task

We had hypothesized that simultaneous bilinguals would produce lower VOT values and thus be closer to “functional” monolingual norms. Our hypothesis did not hold true in the *word list task*, as we failed to observe any significant difference in VOT productions in the three experimental groups. The sequential Anglophones (Group SeqEN) and Francophones (Group SeqFR) produced similar VOT values in L3 Spanish for the three stops /p/, /t/ and /k/. Similarly, our simultaneous bilinguals (Group SimBIL) produced VOT values that were similar to those produced by both sequential groups. As we had expected, the three groups produced values that are higher than values reported for “functional” monolinguals, producing instead values that are intermediate between those of French and English. These findings are corroborated by previous studies (e.g., Llama et al., 2010 for L3 Spanish; Wunder, 2010; Wrembel, 2011, 2014, 2015; Sypiańska, 2014 for other language pairs); therefore, we cannot conclude that the group of simultaneous bilinguals was more accurate in their productions of VOT.

However, an interesting picture appears when we examine the data elicited from the *picture-description task*. Findings suggest that the three groups produced different VOT values in L3 Spanish. Both sequential Anglophones and Francophones differed from each other, with Francophones producing shorter VOT values. Moreover, simultaneous bilinguals differed from the two sequential bilingual groups by producing values that were even lower than those produced by the Francophones. A closer look at the different consonants indicate that the Francophones produced lower VOT than Anglophones for /p/ and similar values for /k/. Simultaneous bilinguals produced VOT values in line with their Francophone counterparts for /p/, but lower VOT values for /k/. Although no differences were found between all groups

regarding the productions of /t/, results point towards a *partial* advantage for the simultaneous bilingual group.

When comparing the participants' values in the picture-description task with those of "functional" monolinguals, we can observe that the simultaneous bilinguals produced values that are very close to those of native speakers for /p/ and /k/. Our results are thus in line with those of Kopečková (2016), who found that simultaneous bilinguals have a superior phonetic ability. Surprisingly, these findings contradict most previous studies where both simultaneous and sequential bilinguals transferred from a typologically closer language into their L3 productions (e.g., Iverson, 2009; Child, 2017; Cabrelli & Pichan, 2019). However, as discussed earlier, these previous studies focused on *heritage* language learners, while ours consists of simultaneous or sequential bilinguals of two languages that share the same status in Montreal (i.e., they are both considered a majority language to which the participants have been exposed in school settings).

An interesting scenario that we did not anticipate emerged regarding the voiceless stop /t/. As indicated earlier, contrary to results found for /p/ and /k/, no difference in VOT values for /t/ was found between groups in the picture-description task and across tasks. According to markedness theory (e.g., Prince & Smolensky, 1993), coronal /t/ is the least marked of the three stops (labial /p/ and dorsal /k/). As such, it is possible that the markedness status of /t/ is reflected in the participants' VOT behaviour. Unfortunately, due to the scope of the current study, the issue remains a hypothesis that will need to be verified in future research.

A Task Effect on L3 Production

As the results suggest, L3 VOT productions varied across tasks, which our second research question set out to address. Contrary to our initial hypothesis, findings indicate that task type affected the production of L3 VOT in the three groups, since their performance differed between the word list and the picture-description tasks. Sequential Francophones and

Anglophones as well as simultaneous bilinguals all produced lower VOT values in the picture-description task for /p/ and /k/, but not for /t/. Because previous work investigating task effect has focused mainly on L1 vs L2 influence, it is difficult to compare these results with previous studies. For example, Hammarberg and Hammerberg (1993, 2005) and Kopečková (2014) found that L2 influence increased as tasks become more complex. However, in our case, the three groups, regardless of L1/L2 status, produced lower VOT values in the picture-description task. These results are thus somewhat more in line with those of Bondarenko et al. (2022), who found that Ukrainian Heritage speakers produced higher L3 Spanish VOT values in more formal tasks, a pattern that they also observed among their Spanish L1 control group.

Because a picture-description task elicits speech that is closer to natural speech (e.g., it requires participants to focus on the content of the image rather than on their own speech), it is possible that this type of task allows speakers to tap into the participants' vernacular more easily. As proposed by Tarone (1979, 1982), data elicited in tasks where speakers pay the least attention to form allows us to observe L2 vernacular speech, which is the most systematic style and the least permeable to influence from other systems. It is thus possible that our learners produced lower L3 VOT values in Spanish, regardless of positive or negative influence from their L1s/L2s in the picture-description task, simply because this speech style is less permeable to both L1 and L2 influence overall. All in all, this pattern shows that we cannot rely on a single type of task for eliciting data (see also Cardoso et al., 2021 for similar claims). Future studies should include a variety of tasks in order to elicit different speech styles if we want to have a more accurate and representative picture of L3 development.

Conclusion

Part of a large-scale project that examines cross-linguistic influence in language learning, this study aimed to contribute to the field of L3 phonological acquisition by (1) comparing

simultaneous and sequential bilinguals' L3 productions, and (2) including two different types of tasks in order to observe a potential task effect. Results showed that L3 Spanish VOT acquisition was modulated both by the type of bilingualism and by the task in which the participants were engaged. Simultaneous bilinguals produced VOT values that were closer to the expected norm than sequential bilinguals in the picture-description task. In addition, both groups of participants produced lower VOT values in the picture-description task than they did while reading aloud a list of words.

As is expected in any research of this magnitude, there are a number of limitations that should be considered in future research. First, it goes without saying that a larger and more evenly distributed group of participants would have allowed to us to conduct more robust statistical analyses. In addition, whereas we tested our participants at a single point in time, a longitudinal approach starting at the onset of learning and testing learners at different points in time, at different proficiency levels, would allow us to make more convincing generalizations and draw a clearer picture of the developmental path of L3 acquisition. Finally, we contend that our study only focused on the production of a single phonetic/segmental feature: VOT. Future research should attempt to include suprasegmental features (e.g., stress, intonation) as well as speech perception so that we can gain a more comprehensive understanding of L3 phonological phenomena and acquisition.

In this study, we have demonstrated that simultaneous bilinguals have at least a partial advantage over sequential bilinguals in L3 phonological acquisition and that less controlled speech (a task effect) leads to more accurate productions representative of the learners' interlanguage vernacular.

Chapter Three

This chapter will present a summary of the results presented and discussed in the previous chapter as well as their implications for research in the field of third language acquisition. Future directions for research in the field will then be discussed.

Summary of Goals and Findings

This study aimed to shed more light on the process of L3 phonological acquisition by comparing simultaneous and sequential bilinguals' acquisition of L3 Spanish VOT. More precisely, it attempted to examine whether simultaneous bilinguals had an advantage over sequential bilinguals in L3 phonological acquisition. The study also investigated whether different task modalities would have an effect on the L3 VOT productions of bilingual learners. Our findings showed that simultaneous bilinguals did in fact have an advantage over sequential bilinguals in one of the tasks: picture description. They produced lower VOT values, thus being closer to what would be expected from "functional" monolingual Spanish speakers. This result was not found in the word list task, which confirms that task type can modulate L3 productions. In addition, both sequential and simultaneous bilingual groups produced lower VOT values in the less controlled picture-description task than they did in the word list task, again confirming a task effect.

Implications for Third Language Acquisition Research

A main contribution from this study to the field of L3 phonological acquisition is that it included an understudied population of language user/learners: simultaneous bilinguals. While previous work has mostly focused on sequential bilinguals (with the exception of a handful of recent work involving *heritage* learners, as discussed in Chapter 2), more bilingual profiles are needed to fully understand the process of L3 development. In addition, as Cenoz (2003) highlights, L3 acquisition presents more temporal diversity than L2 acquisition, which makes it

all the more important to investigate learners who fall within different temporal possibilities. Our study is novel in that it compared the L3 phonological productions of participants with the same language pairs, but with different order of acquisition (L1 → L2 → L3 and L1/L2 → L3).

Another important contribution of this study is the inclusion of different task modalities. Whereas previous studies in L3 phonological acquisition have implemented a variety of methodological designs, very few have explicitly addressed the effect of different tasks such as those employed here (reading aloud of word lists and picture description). As demonstrated in our results, had we selected the most frequently used task in L2 studies (i.e., the reading aloud of word lists), we would have failed to observe any differences between our groups.

Future Directions

As indicated above, we encourage future work into the field of L3 phonological acquisition to investigate different bilingual populations and to include different temporal possibilities. For instance, we invite future studies to include simultaneous bilinguals, as they are underrepresented, but also to include bilinguals who may be learning their L2/L3 simultaneously. As evidenced by our results, L3 productions can differ based on the learner's bilingual profile, so it possible that L3 development will manifest differently among learners with different bilingual profiles.

Future work should include less controlled tasks in order to elicit more natural speech, thus allowing researchers to tap into learners' vernacular more effectively (see Tarone 1979, 1982 and the discussion in Chapter 2 for the rationale). Ideally, studies should include *both* controlled and less controlled tasks for the elicitation of variable speech. This way, we can have a more comprehensive view of what learners are able to produce when they pay the most and the least attention to form.

It goes without saying that analysing data taken at a single point in time can only provide a glimpse into L3 competence, so longitudinal studies are needed to better understand the full picture of L3 development. Research that follows participants from the very onset of learning all the way to the advanced level would be ideal; however, we recognize the difficulty in doing so, especially considering the limitations that plague L3 acquisition research (e.g., the difficulty of finding a suitable sample size that meets the profile under consideration regarding L1, L2 and L3 in both sequential and simultaneous bilinguals).

Finally, more research is needed on the perceptual aspects of L3 phonological acquisition; for instance, by examining whether the results observed for production parallel those obtained in perception (e.g., would a simultaneous bilinguals' advantage found in L3 production transfer to L3 perception?). These studies would shed some light on the production–perception interface of L3 acquisition.

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Appendices

Appendix A

Words Selected for the Spanish Word List

Adapted from Llama et al. (2010) and Llama and Cardoso (2018)

Training items: *boca, dado, norte, mano*

Target items		
<i>cada</i> /ka/	<i>padre</i> /pa/	<i>tarro</i> /ta/
<i>cama</i> /ka/	<i>pasta</i> /pa/	<i>taza</i> /ta/
<i>casa</i> /ka/	<i>pato</i> /pa/	<i>techo</i> /te/
<i>quedo</i> /ke/	<i>pelo</i> /pe/	<i>tema</i> /te/
<i>quema</i> /ke/	<i>perro</i> /pe/	<i>tenso</i> /te/
<i>queso</i> /ke/	<i>pide</i> /pi/	<i>torre</i> /to/
<i>quita</i> /ki/	<i>piña</i> /pi/	<i>torta</i> /to/
<i>quinta</i> /ki/	<i>pisso</i> /pi/	<i>tubo</i> /tu/
<i>codo</i> /ko/	<i>poco</i> /po/	<i>túnel</i> /tu/
<i>copa</i> /ko/	<i>pollo</i> /po/	<i>tuyo</i> /tu/
<i>corto</i> /ko/	<i>punto</i> /pu/	
<i>cubo</i> /ku/	<i>puro</i> /pu/	
<i>curso</i> /ku/		

Appendix B

Sample of Images Used in the Picture-Description Task



The images used in this study were downloaded from <https://unsplash.com> and <https://pexels.com>. Images hosted on these websites are all free to use for commercial and non-commercial purposes, without attribution.

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