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DIFFERENCES IN VOICE-ONSET TIME (VOT) FOR FIRST-LANGUAGE (L1), SECOND-LANGUAGE (L2), AND HERITAGE SPEAKERS OF SPANISH

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Abstract

This study examines how heritage speakers of Spanish who are relearning their L1 in an academic context pronounce English and Spanish words with stops. The heritage speaker group is being compared to adults who are learning Spanish as a foreign language and who have not had previous exposure to learning Spanish as children. To collect data on VOT, novel words and phrases are used with stops occurring in different positions. The researchers hypothesize that VOT may occur on a continuum, with those who moved from a Spanish-speaking environment to an English-speaking environment at an early age having less fully developed L1 skills and having more English-like VOTs than those who moved to an English-speaking environment later on with more fully developed L1 skills. They also hypothesize that VOT for English speakers learning Spanish as a foreign language as adults will exhibit more English like VOTs than the heritage speaker group.

Heritage speakers are individuals who acquire their first language (L1) in a naturalistic setting, such as the home. After partial acquisition of the L1, they experience a change in linguistic environments and acquire a second language (L2) in the new environment, such as school, usually before the onset of adolescence. It is "the second language that manifests ultimate attainment" (Polinsky, 2015, p.163). Thus, heritage speakers' language abilities exist on a continuum that includes the L1 they acquired from birth and the L2 that they adopted later on, which serves as the primary language. A heritage speaker's history with an L1 endows them with unique language experiences that may assist them when they relearn their L1 as an L3 later in life.

Thus, heritage speakers can be informative for L2 researchers in terms of describing and learning about how multiple languages develop and what functions underpin heritage speakers' language learning. For heritage speakers, the L1 is no longer the dominant language. Nevertheless, the non-dominant L1, which they learned in childhood, can affect the process of relearning the L1 as an L3. The question that researchers ask is whether the L1, which could have been learned at various levels of proficiency in childhood, is helpful when heritage speakers return to the L1 as an L3.

Heritage Speakers

Heritage speakers are not bilinguals, but they are not monolinguals either. A bilingual speaker would have been exposed to their two languages more or less throughout their childhood, whereas a heritage speaker is exposed to one language before some circumstance, such as immigration, which may be either voluntary or involuntary, abruptly halted L1 language development. Heritage speakers have different individual profiles relative to their L1 and L2, with some heritage speakers learning an L2 before reaching puberty while others do so after puberty. Heritage speakers experience both benefits and hindrances when attempting to relearn or improve their L1 and have language characteristics that may be somewhere between their primary language, which is the heritage language, and their dominant language, which is their L2.

There are some issues in identifying heritage speakers. For example, drawing the line between who is and is not a heritage speaker can prove difficult, especially in situations where speakers are born into multilingual environments. When some heritage speakers move to a new linguistic environment, they may find that their new environment does not entirely exclude the L1 of the former environment. This situation is quite different from a situation where the L1 of

the former environment is rarely, if ever, used in the new linguistic environment. These different profiles can make heritage speakers a group with diverse language experiences and, thus, make it difficult to study the effects of heritage language environments and the L2 development of heritage speakers. Nevertheless, it is also likely that similar life experiences relative to multiple language use and age of acquisition will create similarities in in language development.

Unique Characteristics of Heritage Speakers

In spite of the difficulties associated with identifying heritage speakers, the unique linguistic profile of heritage speakers makes them ideal participants for research studies in second language acquisition (SLA). In particular, studying heritage speakers' language can reveal critical information about the long-term effects of L1 development in young children. As opposed to their bilingual counterparts who were raised in bilingual environments, heritage speakers use one language primarily and then switch to a different language, which becomes the dominant language. Because some heritage speakers relearn their L1 as an L3, the age at which they switch from one language environment to another can be informative in helping researchers understand the effects of age of acquisition on SLA, as well as how different environments, such as naturalistic vs. instructed SLA, impact L2 development. Studies of heritage speakers can also answer specific questions about the importance of vowel and consonant development, the stages of development, and the effects of non-traditional development contexts on SLA. The unique characteristics of heritage speakers make them interesting participants in research studies.

Heritage Speaker Difficulties

Heritage speakers also encounter difficulties arising from the unique experiences they have with the L1. It is possible that the L1 acquired by a heritage speaker as a child may not be of the same variety as the academic language one taught in a classroom, and this difference may

cause problems for heritage speaker as they relearn the L1. The forces that cause individuals of a certain language variety to change language environments early in life often are not the same forces that raise one language variety to the level of prestige or that cause it to be taught in the context of a classroom. For example, a heritage speaker born in rural Venezuela may encounter cognitive dissonance when attempting to relearn the Spanish language as taught in foreign and second language classrooms in the United States, which is often a prestige variety of Spanish that is spoken in urban centers in either Spain or Mexico. This situation could create a unique set of circumstances for heritage speaker learners in educational contexts. It is possible for heritage speakers to exceed expectations in terms of native-like accent; however, they may fall behind in terms listening comprehension, especially when dealing with language features unique to a prestige variety.

Motivation for the Current Study

Though there have been several studies that have examined the relationship between monolingual and heritage speaker accents in the shared L1, but no studies to date have compared heritage speakers to adults L2 learners, who are essentially monolinguals, especially in circumstances where heritage speakers are relearning their L1 as an L3. This study attempted to fill that gap in the research by comparing how heritage speakers of Spanish who are relearning their L1 as an L3 to young adult English speakers who are learning Spanish as a foreign language and who have not had previous exposure to learning Spanish as children. The comparison was focused on the features of pronunciation for English and Spanish words with stops, specifically voice-onset time (VOT). VOT is a feature of the production of stop consonants. It is the duration of time between the release of a stop and the beginning of vocal

fold vibration for the following vowel. English and Spanish have different VOTs for the voiced and voiceless pairs of stop consonants.

 To collect data on VOT, novel words and phrases were used with stops occurring in different positions. The research questions that frame this study are the following:

1. Does the accent of a heritage speaker relative to VOT more closely resemble a monolingual speaker of the heritage language or an adult monolingual speaker of the L2?

2. Does the accent of a heritage speaker relative to VOT more closely resemble a monolingual speaker of the heritage language or an adult speaker of the L2 who is learning the heritage language as an L2?

In terms of length of VOT, I hypothesize that heritage speakers of Spanish will have VOTs more closely related to L1 Spanish speakers than L1 English speakers. I further hypothesize that adult foreign language learners of Spanish, who learned Spanish later in life, will have VOTs more closely related to L1 English speakers. I expect the VOTs produced by monolingual speakers to be located at the opposite ends of the VOT continuum.

Literature Review

Researchers in the field of SLA have traditionally been interested in studying the differences between a learner's L1 and other non-native languages (e.g., L2, L3, etc.). Studying L3 learners is relatively new area of research in SLA, particularly, the study of heritage speakers who are relearning their L1 as an L3. Heritage speakers who are language learners have the following language profiles: (1) an L1, which they were first exposed at home; (2) an L2, which has become their dominant societal language; (3) an L3, which is their L1, which they are relearning, and which is most often the standard academic variety of the L1. As more heritage speakers are beginning to relearn their L1s in formal classroom environments, researchers have

become more interested in studying the L3 of the heritage speakers to understand the ways in which the process of learning an L3 may be subtly different from the process of learning an L2. Therefore, heritage speakers who are relearning their L1 as an L3 are seen as valuable participants in SLA studies as they can help researchers understand the long-term effects of age of acquisition. In other words, even if heritage speakers do not reach native-like proficiency in the L1 before they shift to the socially dominant L2, the L1 may still have an effect on the process of learning an L3 even years later and into adulthood.

It is often true that heritage speakers have a more native-like accent when relearning the L1 as an L3 than adult L2 learners. For example, VOT is more native-like in heritage speakers when speaking the L1 than the VOT for adult learners when speaking the same language as an L2. Polinsky (2015) showed that heritage speakers of Spanish, Korean, and Arabic were nearly indistinguishable from the corresponding L1 speakers who have no additional language experience, particularly in terms of VOT. English and Spanish have different VOT for the voiced and voiceless pairs of stop consonants. It appears that sounding like native speakers relative to VOT is the heritage speaker's most obvious advantage. Thus, when a heritage speaker later returns to their L1 to relearn or improve it, they find that they have a great advantage in comparison to their peers who are learning an L2. Though they may not consciously remember their language, it seems that the minds of heritage speakers have stored native VOT in some capacity and uses the information to advantage during language refinement.

Montrul and Foote (2012) highlight this idea and expand upon it and by showing that heritage speakers have advantages in terms of lexical access. This advantage expresses itself as an increase response time in lexical decision-making tasks, even though the advantage did not result in an increase in response accuracy. The accuracy for both late bilinguals and heritage

speakers was not significantly different. Polinsky (2015) shows that there is an advantage for heritage speakers in phonological production. She conducted a test on Russian heritage speakers and found that the VOT production of heritage and L2 speakers was significantly different, indicating that there was a clear boundary between the two groups.

Studying heritage speakers offers researchers a glimpse into child language acquisition. Au et al. (2002) and Kent and Murray (1982) found that infants have distinctive periods of phoneme development. Kent and Murray studied infants at three, six, and nine months and found that infant sounds rapidly evolve during this period of development, from disorganized vocalizing to organized and language-specific babbling. Au et al. (2002) sought to uncover the advantages of exposure to phonemes without necessarily reproducing them, and the effect it has on native-like productions of Spanish. They also found that the early years are formative in learning phonemes for infants. There was a good deal of variation for the overhearers that heard Spanish regularly before age two, and the longer the speaker had heard Spanish, the better their productions became.

The act of studying heritage speakers also proves to be mutually beneficial for heritage speakers that participate. As mentioned in Polinsky (2015), which was expanded version of original research conducted Valdés (2005), heritage speakers have unique learning needs distinct from the needs of non-heritage speakers. For example, a small amount of variation between the language varieties exposed to as a child and as an adult can cause learners to fixate on some differences, thereby making it difficult to relearn the heritage language. Instead of using the L1 to form mental representations, heritage speakers seem to form new mental representations for a third unique language, even though the third language (L3) is similar to the L1. Valdés (2005) encourages language educators to take advantage of the knowledge of how heritage speakers

process language to create higher-quality educational experiences, for example, explicit guidance for heritage speakers in making connections between their L1 and the L3.

In summary, the research already conducted on heritage speakers found mixed benefits and challenges that are unique to the heritage speaker group. While heritage speakers may experience challenges related to learning different dialects and varieties for their L1 and may experience intrusive transfer (Ringborn & Jarvis, 2011) with their dominant L2, they also experience benefits from more native-like production. These differences set them apart from traditional learners of Spanish as a foreign language in academic contexts and create a unique learning experience for heritage speakers. An awareness of the potential advantages that heritage speakers have as language learners, as well as knowledge of the pitfalls associated with relearning the L1 as an L3, can help them adjust and create language learning experiences that will help them reap the greatest benefits.

Methodology

This section presents the methodological framework for this study and provides a description of the research design, participants, the procedures for data collection, and processes for data analysis. The current study seeks to provide empirical data to contribute to our understanding more about the heritage speaker advantage in language learning. The research design that we have chosen to integrate the different components of the study and address the research questions is a descriptive study.

Participants

The participants were recruited through the undergraduate linguistics and Spanish courses at the University of Utah or through personal contacts made by the first author. They fell into four different groups: (1) monolingual Spanish speakers, (2) monolingual English speakers, (3)

adult L1 English speakers who were learning Spanish as their first foreign language, and (4) heritage speakers of Spanish who were relearning their L1 as an L3 in an academic context. To determine the categorization of each participant, they were asked to self-report whether they were bilingual in English and Spanish or not, in other words, whether or not they used both English and Spanish in their daily lives. Participants were also asked if they were fluent in any other languages and were asked to provide information about the extent of their formal training in those languages. This process was carried out because a knowledge of other languages could affect pronunciation and, therefore, could influence the results of the study.

There were 48 individuals who provided data for this study. Twenty-one adult learners of Spanish (L2 Spanish), 13 speakers with no Spanish experience (L1 English), 11 heritage speakers (Heritage), and three native Spanish speakers (L1 Spanish). To balance the number of participants in each category and due to constraints on time, the following number of participants were selected—three L1 Spanish and L1 English speakers were selected for Groups 1 and 2, four heritage speakers for Group 4, and four L2 Spanish speakers for Group 5 were selected. These speakers were selected by eliminating participants who had experience with additional languages and randomly selecting individuals from the remaining speakers.

Those who self-identified as bilingual, in other words, they spoke English and Spanish to some degree and at varying levels of proficiency, were asked to complete the Bilingual Language Profile (BLP), which is an instrument that is provided to researchers by the University of Texas at Austin (Birdsong, Gertken, & Amengual, 2012). This profile provides a score of language dominance and provided the information necessary to determine how the participants fit the profile for a heritage speaker. From this survey, the participants were divided into two groups of speakers; heritage speakers and adult learners of Spanish. Also, the data that were

collected from monolingual speakers of English and Spanish were retained to use as a baseline.

These categories did not account for other potential language fluencies, though other language

fluencies were captured in the survey.

Data Collection Procedures

To carry out the experiment we asked participants to read through four lists of words: (1)

isolated words in English and Spanish, (2) isolated words that were experimental and not real

words, (3) phrasal verbs and phrases in English or Spanish, and (4) phrasal verbs or phrases that

were experimental. The English/Spanish lists[1] had tokens representing all possible combinations

of four continuums: language, place, manner, and word position. The voiced/voiceless

continuum had tokens that were minimal pairs of each other. The experimental lists[2] included

tokens representing all possible combinations of four continuums: (1) place of phoneme of

interest, (2) manner of phoneme of interest, (3) place of filler consonant, and (4) word position.

All the vowels were represented as /o/. The isolated lists had one word per line, whereas the

phrasal lists inserted the words into either an English environment (e.g., Is this (a) ___ or not?) or

a Spanish environment (e.g., ¿Es esto (un/a) ___ o no?). In order to maintain a natural English or

Spanish environment, determiners were included or deleted depending on whether they made the

sentence correct according to English or Spanish syntax. If adjusting the determiner was

insufficient to create a natural English or Spanish sentence, an alternative sentence was used that

placed the token in a similar phonological environment based on the four continua.[3]

Data Analysis

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[1] See Appendix A.
[2] See Appendix B.
[3] See Appendix C.

The recordings of the participants were saved originally as .m4a files, which were then converted into .wav files using Adobe Premiere. The .wav files could then be analyzed by Praat, and the voice-onset times could be extracted using its text grid function. The voice-onset times were then saved in Microsoft Excel for further analysis.

Results

The results of the Bilingual Profile Survey appear in Table 1. L1 Spanish speakers also shared that they had some English experience although, as the data show, it was not enough to change their dominance in favor of English. Tables 2 and 3 show the spectra that were present in both the Spanish and English conditions, respectively.

Table 1

Bilingual Language Profile Results

Category		Heritage	L1 Spanish	L2 Spanish
History	Spanish	64	110	12
	English	83	29	109
Use	Spanish	15	3	46
	English	35	11	47
Proficiency	Spanish	20	24	13
	English	23	14	24
Attitudes	Spanish	23	24	12
	English	22	13	24
Global	Spanish	143	209	64
	English	179	85	208
Dominance		37	-124	144

Each category is rated on its own unique scale. The scale for History has a maximum of 120, the maximum for the Use scale is 50, for Proficiency and Attitudes the maximum is 24, and for Global the maximum is 218. These scores were then weighted and averaged to produce Dominance scores that can range from -218 to 218. A negative score suggests Spanish dominance, whereas a positive score suggests English dominance. As age of language acquisition plays a role in the differences in ability between heritage speakers and L2 language learners, the participants were initially sorted by age of acquisition, using age 12 as the cutoff age. This age proved to be a natural cutoff age as well, as participants either started learning both English and Spanish before age 10, or they learned one language before age 10 and one language after age 13. This cutoff was reflected in the Dominance score; heritage speakers had Dominance scores between 15 and 60 while L2 learners had Dominance scores over 125.

The VOT of the participants are shown in Tables 2 and 3 as continua for each phonemic environment. Table 2 represents the phonemes as produced in Spanish environments, whereas Table 3 represents the phonemes as produced in English environments. Separating the languages in this way is appropriate because the linguistic environment influenced how speakers handled the tokens given. This influence was made apparent by verbal reports from the participants after participation and observation by the researcher.

Table 2

The continuum of speaker VOT's in Spanish.

Environment	Shortest VOT			Longest VOT
/b/ (Word-Initial)	L1 English	L2 Spanish	L1 Spanish	Heritage
/p/ (Word-Initial)	L2 Spanish	Heritage	L1 English	L1 Spanish

/d/ (Word-Initial)	L1 English	L2 Spanish	L1 Spanish	Heritage
/t/ (Word-Initial)	L2 Spanish	L1 Spanish	Heritage	L1 English
/g/ (Word-Initial)	L1 English	L1 Spanish	L2 Spanish	Heritage
/k/ (Word-Initial)	L1 Spanish	Heritage	L1 English	L2 Spanish

In Table 2, only word-initial VOT are presented. Word-final VOT is not reported because Spanish phonology doesn't allow for word-final stops, and so there are no tokens available to test this environment in Spanish naturally. Word-medial VOT is removed because Spanish phonology causes underlying word-medial stops to be presented on the surface as fricatives. Though some of the participants did not produce fricatives in these environments, there were some who did, thus making it difficult to compare the two groups.

In Table 2, the group with the shortest VOT is shown on the left and the group with the longest VOT is shown on the right. L1 English speakers had the shortest VOT in seven environments and the longest VOT in two. L2 Spanish speakers had the shortest in four environments and the longest in three. L1 Spanish speakers had the shortest in one environment and the longest in one. Heritage speakers never had the shortest VOT and the longest in six. When averaging these results, L1 English speakers had the shortest VOT, L2 Spanish speakers had the next shortest, L1 Spanish speakers had the second longest, and Heritage speakers had the longest VOT.

Table 3

The continuum of speaker VOT's in English.

Environment	Shortest VOT	Longest VOT

/b/ (Word-Initial	L2 Spanish	Heritage	L1 Spanish	L1 English
/b/ (Word-Medial)	L1 Spanish	L1 English	L2 Spanish	Heritage
/b/ (Word-Final)	L2 Spanish	L1 English	L1 Spanish	Heritage
/p/ (Word-Initial	L2 Spanish	L1 English	Heritage	L1 Spanish
/p/ (Word-Medial)	L2 Spanish	Heritage	L1 Spanish	L1 English
/p/ (Word-Final)	L2 Spanish	Heritage	L1 Spanish	L1 English
/d/ (Word-Initial	L1 Spanish	L2 Spanish	Heritage	L1 English
/d/ (Word-Medial)	L2 Spanish	Heritage	L1 Spanish	L1 English
/d/ (Word-Final)	L1 English	Heritage	L1 Spanish	L2 Spanish
/t/ (Word-Initial	L1 Spanish	L2 Spanish	Heritage	L1 English
/t/ (Word-Medial)	Heritage	L2 Spanish	L1 Spanish	L1 English
/t/ (Word-Final)	L1 Spanish	L2 Spanish	L1 English	Heritage
/g/ (Word-Initial	Heritage	L1 English	L1 Spanish	L2 Spanish
/g/ (Word-Medial)	L2 Spanish	Heritage	L1 Spanish	L1 English
/g/ (Word-Final)	L1 English	Heritage	L1 Spanish	L2 Spanish
/k/ (Word-Initial	L2 Spanish	L1 Spanish	Heritage	L1 English
/k/ (Word-Medial)	L1 English	L1 Spanish	L2 Spanish	Heritage
/k/ (Word-Final)	L2 Spanish	L1 Spanish	L1 English	Heritage

The group with the shortest VOT is shown on the left and the group with the longest

VOT is shown on the right. L1 English speakers had the shortest VOT in three and the longest in

nine. L2 Spanish speakers had the shortest in nine environments and the longest in three, L1

Spanish speakers had the shortest in four environments, and the longest in one, and heritage speakers had the shortest VOT in two environments and the longest in five.

The data presented above shows that heritage speakers have VOT that more closely match the VOT of L1 Spanish speakers than L1 English speakers, though not in the pattern hypothesized. It is most frequently the case that the Heritage speakers lie at the long extreme of the VOT continuum, with L1 Spanish speakers being the next longest group. In addition, the data shows that Heritage speakers have VOT closer to L1 Spanish speakers than L2 Spanish speakers. Though L2 Spanish speakers were not as different from Heritage speakers as their monolingual English counterparts, they were more different than their monolingual Spanish counterparts.

Discussion

The description of the results shows that VOTs showed more variation in the different continua than the hypothesis predicted. The hypothesis was that the monolingual speakers would form the ends of a VOT continuum with heritage speakers closer to the Spanish end than the English end and the adult learners of Spanish being closer to the English end than the Spanish end. The results suggest, however, that all speakers modify their VOTs, and do so more frequently than was predicted. For example, English speakers learning Spanish as a foreign language had the shortest VOTs in Spanish, which may suggest that as they consciously try to obtain a native-like accent, they are overcompensating for VOT.

Word-initial /g/ in Spanish environments takes a different pattern that the other Spanish environments. Whereas L1 English speakers and L2 Spanish speakers cluster around the short end of the continuum and L1 Spanish speakers and Heritage speakers cluster around the long end, /g/ shows L1 Spanish speakers having a shorter VOT than L2 Spanish speakers. One possible explanation for this effect is that the data presented was unable to produce a large

enough effect size to overcome individual differences in the L1 Spanish speakers. As two of the L1 Spanish speakers came from Venezuela and one came from Spain, it's possible that regional differences are showing through in the data.

It is worth noting that due to language history many participants were eliminated from the study. The largest group was the of participants was the L1 English speakers learning Spanish; however, to balance the groups, I selected only four participants for data analysis. There was range of proficiency levels, which may have also affected the results. In addition, Spanish is the second most commonly spoken language in the world (Eberhard, Simons, & Fennig, 2019) with a great deal of variation among its speakers, so it is natural to assume there would be variation in VOT.

To make inferences to a larger population, I plan on recruiting more participants so that I have at least 20 speakers in each group, which will allow me to compare means using ANOVA and make inferences to a larger population. I also plan to use L2 learners of Spanish with a narrower range of language proficiencies and heritage speakers with similar profiles relative to age at which they began learning the L2 and the exposure to the L1 once L2 learning had begun.

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APPENDIX A: ENGLISH/SPANISH WORDS

English

	/b/	/p/	/d/	/t/	/g/	/k/
word-initial	bee beach bark	pea peach park	den door dart	ten tore tart	gap goal girl	cap coal curl
word-medial	stable mobbing nabbing	staple mopping napping	model wader header	motel water heater	logger wagon begging	locker whackin' baking
word-final	pub robe cub	pup rope cup	ride hard send	write heart sent	bag pig clog	back pick clock

Spanish

	/b/	/p/	/d/	/t/	/g/	/k/
word-initial	bata boca bola	pata poca pola	dos día deja	tos tía teja	gana gaza gola	cana casa cola
word-medial	cabo taba sube	capo tapa supe	boda saldar tienda	bota saltar tienta	vaga pega manga	vaca peca manca

*Spanish does not allow for stops in the word-final coda position.

APPENDIX B: EXPERIMENTAL TOKENS

/l/

	/b/	/p/	/d/	/t/	/g/	/k/
word-initial	bolo	polo	dolo	tolo	golo	kolo
word-medial	lobo	lopo	lodo	loto	logo	loko
word-final	lolob	lolop	lolod	lolot	lolog	lolok

/n/

	/b/	/p/	/d/	/t/	/g/	/k/
word-initial	bono	pono	dono	tono	gono	kono
word-medial	nobo	nopo	nodo	noto	nogo	noko
word-final	nonob	nonop	nonod	nonot	nonog	nonok

/r/

	/b/	/p/	/d/	/t/	/g/	/k/
word-initial	boro	poro	doro	toro	goro	koro
word-medial	robo	ropo	rodo	roto	rogo	roko
word-final	rorob	rorop	rorod	rorot	rorog	rorok

APPENDIX C: ALTERNATIVE PHRASES USED

Token	Phrase
baking	They were surely baking over in Franklin.
begging	They were surely begging over in Franklin.
deja	Por favor, deja la mascota.
mobbing	They were surely mobbing over in Franklin.
mopping	They were surely mopping over in Franklin.
nabbing	They were surely nabbing over in Franklin.
napping	They were surely napping over in Franklin.
poca	Bebí poca horchata.
pola	No pola la ventana.
saldar	¿Quiere saldar este argumento?
saltar	¿Quiere saltar en el hueco?
send	They will surely send Olivia a letter today.
sent	They surely sent Olivia a letter today.
sube	Por favor, sube la caja.
supe	Yo supe que no está aquí.
tore	They surely tore Olivia's backpack today.
whackin'	They were surely whackin' over in Franklin.
write	They will sure write Olivia the letter today.