THE INFLUENCE OF EXPLICIT INSTRUCTION ON FAILURE TO ACQUIRE A PHONOLOGICAL RULE DUE TO ORTHOGRAPHIC INPUT: THE CASE OF NATIVE ENGLISH SPEAKERS LEARNING GERMAN

by

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ABSTRACT

Recent research indicates that knowledge of words' spelled forms can affect the underlying phonological forms in second language learners. Notably, the research suggests that second learners can use orthographic input to infer information about the phonological forms of words. A familiar orthography with grapheme-phoneme correspondences inconsistent with those of the first language may cause learners to create nontarget-like lexical representations.

In German, word-final obstruents are systematically devoiced. Word-final devoicing (WFD) is not represented orthographically. For example, <Rat>, 'advice' and <Rad>, 'wheel', are both pronounced [rat]. Research suggests that access to spelled forms delays native English speakers' acquisition of this phonological pattern. Other research has found that phonetic training about phonological patterns may help learners' productions become more target-like. This study investigates whether phonetic training helps learners overcome the delay in acquiring WFD by giving explicit instruction on pronunciation.

Native English speakers were randomly assigned to one of four groups: Spell-Instruction; Spell-No Instruction; No Spell-Instruction; and No Spell-No Instruction. They were taught six German nonword minimal pairs, differing in the voicing of the final consonant (kreip/kreib). Learners in the spell groups saw spelled forms of the words and

learners in the instruction group saw instructions about pronunciation (“a ‘b’ at the end of a word is pronounced ‘p.’”).

Words spelled with voiced final consonants were more likely to be produced with voiced final consonants than those whose final consonants were spelled voiceless. Participants in both Spell conditions were less likely to devoice targets with voiced final consonants than those in the No Spell conditions, confirming a relationship between seeing spelled forms and not acquiring WFD. Finally, learners in the Instruction conditions (NI and SI) devoiced voiced final consonants at no greater rate than learners in the No Spell conditions, suggesting that instruction provided no clear benefit for acquiring WFD.

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CHAPTER 1

INTRODUCTION

Recent research in second language acquisition has begun to investigate the link between orthographic input and the development of underlying phonological forms in second language (L2) learners. Notably, the research indicates that L2 learners can use orthographic input to infer information about the phonological forms of words (Bassetti, 2006; Escudero, Hayes-Harb, & Mitterer, 2008; Hayes-Harb, Nicol, & Barker, 2010; Showalter & Hayes-Harb, 2013).

Learning new words via a familiar orthography can sometimes cause learners to create nontarget-like lexical representations when the spelled forms do not follow the conventions of the learners' first language (L1) (Hayes-Harb et al., 2010). In addition, learners may also make incorrect inferences about phonological forms based on spelling (Bassetti, 2006). Access to spelled forms in the input can help learners perceive difficult contrasts absent in their L1s (Escudero et al., 2008) even when some of the orthographic information they receive is unfamiliar (Showalter & Hayes-Harb, 2013).

In addition to learning new L2 contrasts, second-language learners must often learn new phonological patterns. Young-Scholten (2002) hypothesized that orthographic input may block the acquisition of a new phonological rule when the spelling of a word is contrary to its auditory form. Brown, Hayes-Harb, and Smith (2013) found this hypothesis to be supported in the case of native English speakers acquiring the phonological rule of word-final devoicing in German. Results from this study indicated that learners who had access to spelled forms of German nonwords were significantly more likely to produce words with word-final voiced obstruents even though all auditory information ended with voiceless consonants.

The present study seeks to further investigate the relationship between orthographic input and the acquisition of phonological rules. Explicit instruction about phonological rules has been demonstrated to help learners produce more target-like forms (Moyer, 1999; Simon, 2010). Therefore, this study will investigate whether explicit instruction about a phonological rule, word-final devoicing in German, will cause learners to produce more target-like forms with voiceless word-final consonants in spite of access to spelled forms that contain voiced word-final consonants. In this study, explicit instruction is operationalized by telling participants at the beginning of the experiment that German words are often not pronounced as they are spelled and giving examples, such as "A b at the end of the word is pronounced 'p.'" Learners are given information about each voiced final consonant; therefore, they are told that a <b> at the end of a word is pronounced [p], a <d> at the end of a word is pronounced [t], and a <g> at the end of a word is pronounced [k].

CHAPTER 2

LITERATURE REVIEW

2.1 Studies of the interaction of phonological representations and orthographic input

L2 learners frequently rely on their L1 grapheme-phoneme correspondences when reading in a second language if the orthography is familiar (Bassetti, 2006). Bassetti (2006) found that this leads learners to make assumptions about the phonological forms of words. Pinyin is the Romanization of the pronunciation of Chinese words, usually written in *hanzi* characters, which represent morphemes but are unreliable phonologically (Shu, Anderson, & Wu, 2000). Pinyin is used both in L2 classrooms (Bassetti, 2006) and in Chinese schools with native Chinese speaking children (Shu et al., 2000) to aid in learning the pronunciation of words. Bassetti's (2006) study focuses on three rimes in Chinese: [uei], [iou], and [uen]. When preceded by a consonant, the rimes are spelled 'ui,' 'iu,' and 'un,' respectively. When word initial, however, they are spelled 'wei,' 'you,' and 'wen.' Eighteen first-year Chinese learners were presented with Hanzi characters and asked to pronounce each character and then count the number of sounds in the word. Bassetti (2006) then computed the number of phonemes counted in each rime. Learners often reported more phonemes in the rimes whose pinyin representation included the main vowel than those whose pinyin representations did not, indicating that learners were using their knowledge of spelled forms to help them identify separate phonemes. To confirm these results, a new group of participants was asked to orally segment the same words into phonemes instead of only counting the number of separate sounds. The results confirmed those of the first experiment. Namely, rimes tended to be segmented into the same number of phonemes represented orthographically via pinyin. For example, when spelled <you>, the rime was segmented as three phonemes but when spelled <liu>, it was only segmented as two.

L2 learners can also use orthographic input to help them encode auditory contrasts which do not exist in their native languages into their underlying representations of L2 words (Weber & Cutler, 2004; Escudero et al., 2008). Weber and Cutler (2004) found that L2 learners appeared to be able to lexically encode novel contrasts even when they seemed unable to perceive them in an online task. The study focused on the English contrast of /æ/ and /ɛ/, which is noted for being difficult for Dutch speakers to perceive. Dutch speaker participants heard auditory forms of English words like ‘panda’ ([pændə]) and ‘pencil’ [pɛnsɪɫ], which contain the /æ/ and /ɛ/ contrast, and were asked to select the correct image for each word while their eye movements were tracked with an eye tracker. Results indicated that learners had an asymmetric lexical activation when hearing these words. They fixated longer on distractor images if the auditory stimuli contained /æ/ than if it did /ɛ/. For example, when participants heard the word ‘panda’ ([pændə]), they fixated longer on the image of a pencil than they would the image of a panda if they heard the word /pencil/. There are several possible explanations for this, including the native status of the category /ɛ/, which may cause Dutch speakers to be more biased towards it. In a follow up study, however, Cutler et al. (2006), suggest that Dutch learners of English may be using spelled forms when creating lexical representations because of the different orthographic representations of /ɛ/ and /æ/. This hypothesis was investigated further by Escudero, Hayes-Harb, and Mitterer (2008).

Escudero et al. (2008) taught English nonwords to native Dutch speaker participants, such as <tenzer> and <tandek>, pronounced [tɛnzə] and [tændək], respectively. Words were assigned meanings via nonobject line drawings. The control group received only auditory forms of the word, whereas the experimental group received auditory forms and spelled forms. Participants were asked to choose the correct picture on a grid that contained both the target and distracters and received feedback on whether or not they had chosen the correct picture. The testing phase was a similar task except that participants wore eye-tracking equipment. In this study, participants who saw spelled forms of the nonwords patterned after those from the Weber and Cutler (2004) study. They were more likely to focus on distractor images containing /ɛ/ when they heard /æ/ than they were distractor images containing /æ/ when they heard /ɛ/. Crucially, this pattern was not replicated in the participants that only heard auditory forms. They were equally likely to be distracted by images containing /æ/ when they heard /e/ as they were by images that contained /ɛ/ when they heard /æ/. These results suggest that the participants were, in fact, using orthographic input in the form of spelled forms to help the encode the contrast in their lexical representations.

Hayes-Harb, Nicol, and Barker (2010) established that learners can use orthographic input not only to help them infer phonological information about words, such as the number of phonemes a word contains, but also to help them build underlying lexical representations of novel words. Native English speakers were taught nonwords in one of three learning conditions. One group received only auditory forms while the other two groups saw spelled forms. One group saw spelled forms that were consistent with English spelling conventions and while the other group saw spelled forms that were inconsistent. For example, for the auditory word [faʃə] the congruent group would receive the spelled form <fasha> while the incongruent group would receive the spelled form <faza>. When tested, learners in the incongruent group were less likely than learners in the control group to respond “incorrect” to an auditory form if it matched the spelled form shown to them.

L2 learners frequently face the challenge of incongruent phoneme-grapheme correspondences in their L2 when the orthography is familiar (Young-Scholten & Langer, 2015). For example, and L2 learner might encounter a grapheme from their L1 that corresponds to a new sound in the L2, such as English learners encountering <ch> in German, which corresponds to the new phoneme /ç/. Furthermore, L2 learners must sometimes associate graphemes from their L1 with familiar phonemes but new grapheme-phoneme correspondences. Young-Scholten and Langer (2015) focus on this in the form of native English speakers learning to associate the grapheme <s> representing the phoneme /z/ when word initial in German.

In their study, Young-Scholten and Langer (2015) followed three adolescents during a year they spent studying in different German high schools. At the beginning of their program, the participants received four weeks of language instruction. After the four weeks, however, they went to live with German families, began attending high school, and received no further formal language instruction. Over the course of the year, Young-Scholten interviewed each participant several times and used the recordings to analyze and make inferences about the phonological development of each participant. Her analysis indicates that English learners of German may have relatively little difficulty with acquiring a new phoneme when it corresponds to a familiar grapheme but a familiar grapheme corresponding to a familiar but different phoneme may hinder learners' phonological acquisition.

One of the study's area of focus was the participants use and production of the new phonemes [ts] and [ç]. Over the course of the year, all participants improved in their target-like use of /ts/. In German, /ts/ corresponds to the grapheme <z>. In the case of /ts/, one participant, George, produces /ts/ in a target-like manner only a third of the time in session six but 46% of the time in session 11. Joan correctly produced the target 62% of the time during session six and 66% of the time in session 11. Paul showed the largest improvement, jumping from correct production 65% of the time at 6 months to 82% of the time at the end of his stay in Germany. Their improvement indicates that participants were able to correctly infer that <z> corresponds to /ts/ even though it corresponds to /z/ in English.

Participants, however, did not demonstrate the same improvement in their production of word initial /z/. Participants appeared to initially associate <s> with /s/ instead of the target /z/. This initial assumption was pervasive throughout the entire study. During session 6, George correctly produces [z] in only 5 out of 26 tokens (19%) and improves only modestly by the end of his stay when he produces 25% of tokens correctly. Paul only begins using word initial [z] at the end of the year and then only produces 5% of tokens correctly. Joan, while more accurate than Paul, produces [z] only 6% of the time in session 6 and 16% of the time in session 11. These results indicate that despite the abundance of aural input available to participants, orthographic input may still hinder their phonological development when in the L2 familiar phonemes and graphemes have associations incongruent with those in the L1.

L2 learners even appear to be able to use novel orthographic symbols to help them learn new phonological contrasts (Showalter & Hayes-Harb, 2013). Showalter and Hayes-Harb (2013) demonstrated that learners could use novel tone markers to help them distinguish Mandarin lexical tones. English speakers with no knowledge of Mandarin were placed in one of two groups: a group that was exposed in the word-learning condition to pinyin spelled forms of Mandarin nonwords with tone marks and a control group that was exposed to pinyin spelled forms with no tone marks. After learning the words, participants took a test that asked if the auditory form they heard matched the picture on the screen. This test looked at their ability to identify lexical items distinguished by tones. Learners who saw tone marks when learning the new words, even though they received no instruction on what the tone marks meant, were more likely to respond “incorrect” to mismatched items in the testing phase than those in the control group.

Even though learners’ exposure to novel orthographic symbols appears to help them perceive a contrast and incongruent L1 and L2 grapheme-phoneme correspondences might cause them to infer incorrect phonological forms, evidence suggests that learning an L2 via a new orthography may not help them perceive new contrasts any more accurately than if they learned the L2 via a familiar orthography or no orthography at all (Pytlyk, 2011). Pytlyk (2011) investigated the use of pinyin and zhuyin, a syllabic orthographic used in Taiwan, to teach learners Mandarin contrasts that do not exist in

English. While zhuyin is similar to pinyin in that it contains information about the initial and final sounds and tone of the syllable, zhuyin does not use a Romanized alphabet, making it novel to most native English speaking learners of Mandarin. Pytlyk hypothesized giving learners a novel orthography would help them establish new contrasts and sounds faster than those that were given a familiar one, pinyin. Zhuyin learners, it was argued, would not make incorrect assumptions about sounds and contrasts because they would not be accessing L1 grapheme-phoneme correspondences that were incongruent with those of the L2. Pytlyk also hypothesized that learners who received no orthographic input would also perform better than those receiving input via a familiar orthography also because they would not be activating incongruent L1 grapheme-phoneme correspondences.

In Pytlyk's study, participants were assigned to one of three groups: pinyin, zhuyin, and control. Each group received 4.5 hours of language training in Mandarin over the course of a week. The pinyin group learned the new Mandarin phonemes via pinyin and the zhuyin group learned them via zhuyin. The control group was given no spelled forms. In addition, the control group received explicit instructions to not write anything down to minimize the chances that group members would attempt to map the new sounds onto their L1 alphabet. The zhuyin group also was not allowed to write approximations for the new zhuyin symbols into English orthography. A pretest of perceptual sensitivity was administered to all participants as well as a posttest to measure if their ability to perceive new sounds increased.

Contrary to her hypothesis, Pytlyk found that on the posttest, there were no significant differences in perceptual sensitivity between groups. Furthermore, the interaction effect of orthographic group was also not significant. These findings indicate that learning contrasts via a new orthography may not be any more beneficial than learning the contrasts via a familiar one. Pytlyk suggests that this may be due to the robustness of what she called "entrenchment of the orthographic code." The participants, she argues, despite having no exposure to English orthography during the experiment, might still have been using it to learn the new contrasts, providing further evidence of the robust nature of orthographic input.

Contrastingly, Escudero (2015) argues that the effects of orthographic input may be limited at best. Escudero (2015) compared the performance of two different listening populations, native Spanish speakers and native Australian English speakers, on their ability to discriminate Dutch vowel contrasts via a word-recognition task. Learners from each population were separated into two word-learning conditions. In one condition, participants saw the spelled forms and heard the auditory forms of the novel words they were learning and in the other, participants only heard the auditory forms. The fifteen minimal pairs that participants were exposed to were separated into two categories. Eight minimal pairs were considered easy and seven were classified as difficult to discriminate based on previous research (Escudero, 2014.) Escudero hypothesized that all learners would exhibit higher accuracy if orthographic input had a positive effect but also speculated that the effect of orthographic input might differ between different listener groups and certain minimal pair types. For example, the availability of orthographic input might have a stronger effect on perceptually difficult minimal pairs. She also hypothesized that native orthography might have an impact as well. Spanish speakers, whose native orthography is relatively transparent like Dutch orthography, might better utilize the orthographic input than English speakers whose native orthography is relatively opaque.

Results indicated that all groups responded more accurately when discriminating between perceptually easy minimal pairs than perceptually hard ones. Both Spanish groups outperformed the English groups on both types of minimal pairs. Listeners in the groups that were exposed to spelled forms had marginally higher accuracy than those that were not but only for perceptually difficult pairs. This advantage, however, was limited to only two of the seven difficult minimal pairs, /ɪ -y/ and /ɪ - ʏ/. Therefore, results indicate that the impact of orthographic input ranges from minimal to nonexistent.

2.2 Morpheme-level effects of exposure to orthographic input

There are also morpheme-level effects of exposure to orthographic input (Bassetti & Atkinson, 2015). In their study, Bassetti and Atkinson (2015) survey many effects of orthographic input, including epenthesis of "silent letters," vowel duration, morpheme-level effects, and the pronunciation of homophones.

Italian orthography is phonologically transparent, meaning that there is a one-to-one phoneme-grapheme correspondence. In contrast, English has a relatively opaque orthographic system where there are one-to-many phoneme-grapheme correspondences. For all portions of the study, participants were high school learners of English. Italian speakers were chosen because there is evidence suggesting that speakers of languages with phonologically transparent orthographies may rely more heavily on orthographic representations than those whose native languages use opaque orthographies. In the epenthesis portion of the study, which was a word-repetition task, learners were more likely to epenthesize “silent letters” such as the <l> in <salmon> during the read-aloud task than the word-repetition task. In the vowel duration portion of the study, for which a new group of participants was used, participants produced longer vowels when the word was spelled with a vowel digraph than a word spelled with a singleton vowel.

Of particular importance to this study are the morpheme-level effects of orthographic input. A different pool of participants was used than the previous parts of the study. In this portion, the pronunciation of the English past tense morpheme /ed/ was analyzed. In English, the pronunciation of the morpheme is dependent on the previous phoneme. When preceded by a voiceless consonant, excepting [t], the morpheme /ed/ is produced as [t]. When it is preceded by a voiced stop, vowel or nasal it is produced [d] and when preceded by [d] or [t], an epenthetic vowel is added. The authors hypothesized that learners would replace [t] with [d] and [t] and [d] would be pronounced with an epenthetic vowel.

Results showed that learners performed almost at ceiling when the morpheme followed [d] or [t], accurately producing /ed/ as [Vd], although the actual vowel produced varied. Learners were less accurate in producing /ed/ as [d] when following a voiced consonant, but they still only produced one out of every four tokens with an epethentic vowel. Learners were least accurate when producing /ed/ as [t] after a voiceless consonant, with only a third produced correctly as [t], a third produced as [d] and a third produced as [Vd]. The only correlation the researchers found between a learner and his or her target-like productions was the length of time he or she had learned English under a native English instructor. The more experience a learner had with a native English speaking teacher, the more likely he or she was to produce the morpheme in a target-like manner.

The previously reviewed studies all focused on the role of orthographic input in the building up of underlying lexical phonological representations or the establishment of new L2 contrasts in the lexicon. Also crucial in the development of interlanguage phonology is the learning of phonological patterns, such as the devoicing of word-final obstruents in German.

2.3 Word-final devoicing in German

Word-final devoicing in German is the systematic devoicing of word-final obstruents. This devoicing is not represented orthographically (Young-Scholten, 2002). For example, the words <Rad> ‘wheel’ and <Rat> ‘advice’ are homophonous, produced [rat]. Young-Scholten (2002) was one of the first to suggest a direct link among orthographic input, German spelling conventions that maintain voiced consonant letters in spelled forms, and the failure of English speakers to acquire word-final devoicing in German.

Of particular interest to this study, in Young-Scholten (2002), she notes that English speakers often exhibit difficulty in acquiring word-final devoicing. Using the same participants from her 2015 study, she tracked the participants’ use of word-final devoicing, noting an indirect correlation between orthographic input and participants’ rate of word-final devoicing. Namely, she found that the participant who was exposed to the most orthographic input, as determined by a self-reported amount of reading, exhibited word-final obstruent devoicing the least out of the three participants. Joan, who reported that about 35% of her time was devoted to reading and writing activities, compared to George’s 31% and Paul’s 25%, never devoices underlyingly voiced final consonants over the course of the entire study. George and Paul, while never reaching target-like production of devoicing all final stops, still show improvement over the course of the year with Paul, who reported the least exposure to orthographic input, improving the most. Because familiar yet incongruent graphemes appeared to hinder the participants’ acquisition of segmental phonology, Young-Scholten questions whether orthographic input may also negatively affect the acquisition of suprasegmental phonology but reports the need for a strictly controlled study on the matter.

While Young-Scholten notes a correlation between reading and failure to devoice, her observations were limited to a very small (n=3) sample size. In addition, her study measured orthographic input by participants self-reporting their amount of reading. Conclusions from the Young-Scholten (2002) study are limited to correlations between orthographic input and the acquisition of the word-final devoicing pattern. The present experimental study aims to examine a possible causal relationship.

Brown, Hayes-Harb, and Smith (2013) experimentally tested whether orthographic input affects native English speakers’ acquisition of German word-final devoicing. Twenty-six native English speakers with no knowledge of German were randomly placed into two groups: Spell and NoSpell. During a word learning phase, both groups saw line drawings of nonobjects assigned meaning via German nonwords presented aurally. The nonwords formed six minimal pairs differing only in the underlying voicing of the final consonant, for example, the minimal pair ‘trop’ and ‘trob’, both of which are both produced as [trop]. The Spell group also saw the spelled form of the word. After the word learning phase and criterion test, participants completed a production task where they saw the nonobject line drawings and were instructed to say the word associated with them. Participants' responses were recorded and the tokens were used in a coding task. For the coding task, ten native English speakers, who were not part of the original study, heard the tokens produced by the participants. They were shown two letters on a computer screen which differed only in voicing, for example, p and b, and asked to indicate which letter the word they heard ended with. The proportion voiceless responses were then calculated for both groups.

A significant interaction of word-learning condition and spelled target was found. Participants who saw spelled forms in the word-learning phase of the experiment were more likely to voice final consonants than those that only received auditory forms. Both groups heard the same auditory forms, produced naturally by native German speakers, suggesting that the group that saw spelled forms were voicing final consonants in spite of the auditory information available to them. This finding indicates, as did Young-Scholten's (2002) study, that exposure to spelled forms affects learner's acquisition of a phonological rule.

In addition to orthographic input affecting the acquisition of the word-final devoicing pattern, there may be another factor complicating the pattern's acquisition. There has been much debate in the literature over the status of word-final devoicing in German. Namely, is it a complete or incomplete neutralization? This is a relevant question because we need to understand the type of auditory input that learners receive while establishing the pattern in their interlanguages.

Some evidence suggests the neutralization is, in fact, incomplete (e.g. Piroth & Janker, 2004; Kleber, John, & Harrington, 2010). Piroth and Janker (2004) found that the region a German speaker is from has an effect on the completeness of neutralization. Six speakers of Standard German (3 male, 3 females) were chosen from three regional areas (Southern Germany, Western Germany, and Berlin/Brandenburg). While all participants spoke Standard German, the three regions have different dialectal influences. Dialects from southern Germany are influenced by Upper German while those from both west Germany and Berlin/Brandenburg are influenced by Mid German, although the dialect from west Germany also has elements from Low German. Participants were recorded reading sentences with sentence medial or sentence final target words. The target words had voiced obstruents either word-finally or word-medially. Filler words contained liquids and nasals, which are never devoiced in German. The final obstruents in the target words were then analyzed for preceding vowel duration, voicing into closure/friction, occlusion, burst duration, aspiration duration, fricative duration, and voicing of burst/friction. The Bavarian speakers were shown to only partially neutralize word-final plosives by preserving the distinction of coda duration by voicing word-final voiced consonants longer than word-final voiceless consonants.

While Piroth and Janker's acoustic analysis indicates that some differences between underlyingly voiced and voiceless final consonants might be maintained, English speakers might not be able to perceive them. Smith, Hayes-Harb, Bruss, and Harker (2009) investigated the speech of native German speakers learning English and to determine if the pattern of word-final devoicing was present in their production of English words. The speech of thirteen native speakers of German was subjected to an acoustic analysis to see to what degree they were voicing underlyingly voiced final consonants, both in German and in English. The tokens were orthographically similar words from English and German such as *Tod,* ‘death’ and toad. In addition, 13 native English speakers produced the target English token and an acoustic analysis of their productions was done as well for comparison. The acoustic analyses measured cues commonly used for voicing by English speakers: preceding vowel duration, final stop consonant closure duration, duration of voicing of final stop consonants, and final stop consonant release burst duration.

When speaking English, German speakers lengthened vowels preceding voiced final consonants by 24% on average compared to those preceding voiceless final consonants. When measured, English speakers produced vowels 20% longer when they preceded a voiced final consonant than when they occurred before a voiceless one. When speaking German, however, the German speakers only produced vowels occurring before a final voiced consonant only 9% longer than those before voiceless final consonants. Concerning final consonant closure, Germans demonstrated no significant difference between voiced and voiceless final consonants when speaking German and “a small but significantly longer closure duration” of 17% when speaking English. This is in comparison to English speakers, whose closures were, on average, 67% longer for voiceless final consonants than voiced final consonants. When speaking German, the native German speakers voiced word-final voiced consonants, on average, 4 ms (24%) longer than those that were voiceless. This was shorter than the 11 ms longer voicing they exhibited in English, which was 69% longer than the voicing when producing voiceless final consonants. It is important to note that the 11 ms exhibited by German speakers was still significantly shorter than native English speakers, who voiced final consonants 29 ms longer than voiceless final consonants. Finally, when speaking German, release bursts for voiceless final consonants were 22% longer than for voiced ones and 86% longer when speaking English. For native English speakers, release bursts were 60% longer for voiceless final consonants than voiced final consonants.

The second part of the experiment focused on whether English and German listeners could distinguish between voiced and voiceless final consonants of the German and English speakers. Speech samples of six of the German speakers and six of the English speakers from the first experiment were presented to 15 native English listeners and 15 native German listeners. Listeners were asked to identify which word they heard using a two-way forced choice word identification task. For example, a listener would press a key indicating whether he or she heard “bad” or “bat.” Listeners were also asked to rate speakers for accentedness. Contrary to expectations, native German listeners were no better at identifying the tokens by other native German speakers than were the English listeners. Also of importance is that the German speaker rated as being the least accented differed from the other five German speakers primarily in voicing duration of the final consonant, suggesting that this was the most robust cue for voicing for English listeners.

Further evidence that English speakers are unable to distinguish between underlyingly voiced and voiceless consonants in German was found in two follow-up experiments to the Brown, Smith, and Hayes-Harb (2013, in prep) study. Participants listened to the original speaker productions and coded them as ending in a voiced or voiceless consonant. Analysis indicated that they could not detect a difference between the two words. In a second follow-up experiment, participants were placed in a word learning condition before performing the coding task to see if the nature of the task affected their ability to distinguish between underlyingly voiced and voiceless consonants. Again results indicated that native English speakers were unable to detect a difference.

Despite not initially learning the word-final devoicing pattern, most English learners of German will acquire it eventually. However, their path to devoicing appears to be indirect (Smith & Peterson, 2012). Smith and Peterson found that English learners of German appear to have an intermediate, nontarget-like, stage when acquiring word-final devoicing, possibly influenced by incomplete neutralization. Exposure to incomplete neutralization in the input could cause learners to make incorrect assumptions about the word-final devoicing pattern. Namely, learners might fail to infer it at all, instead learning the incomplete neutralization they receive in the input. As early as their second semester of college-level German, English learners of German demonstrated a tendency towards devoicing in German by comparing their production of German words to orthographically similar English ones (Tod 'death'/toad or tot 'dead'/tote.) Twelve participants read German sentences that had two different target words per sentence, one word embedded and the other sentence-final. The same participants then read a list of English carrier sentences which contained 20 different target words, again with one target word embedded in the sentence and one sentence-final. Smith and Peterson then measured vowel duration preceding final stop consonants, final stop consonant closure duration, glottal pulsing duration during the final stop consonants and the release burst of the final stop consonants. They determined there was a significant main effect of language was a significant difference in the length of vowels preceding voiced consonants in English versus German. Vowel duration before voiced consonants in English averaged 216 ms compared to 177 ms in orthographically similar German words.

2.4 Effects of phonetic training

Even though most learners do acquire the word-final devoicing pattern to some degree (Smith & Peterson, 2012), they exhibit varying patterns while acquiring it and different ultimate levels of attainment (Young-Scholten, 2002). Many factors can affect the acquisition process and can include things such as individual motivation, attitudes toward learning the language, and instruction (Moyer, 1999). Instruction, particularly that focusing on pronunciation, seems particularly relevant because it is a factor that instructors can directly influence.

Moyer (1999) surveyed several factors that could be responsible for ultimate L2 phonological attainment, including phonetic training. Moyer (1999) noted that there were many "individual factors affecting the acquisition process, such as instruction and exposure, motivation, attitudes toward learning, and personal success in linguistic and cultural assimilation in the target language country" (p. 82). The participants of her study were graduate students in German, chosen because graduate students are typically highly motivated language learners with extensive backgrounds of coursework and language immersion. Participants were recorded reading word lists and passages and asked to speak freely on a topic of their choice. Their speech was then rated by native German speakers on a scale of 1-6 with 1 being "definitely native" and 6 being "definitely nonnative." The chosen words and passages were designed to elicit sounds typically difficult for native English speakers to learn such as the front rounded vowels and also to elicit word-final devoicing, although Moyer noted that at this stage in the language learning process, she assumed that most of the learners would be proficient at word-final devoicing. Participants then completed a questionnaire that included questions about their background, motivations for learning German, and the type of pronunciation training, if any, that they had received.

Moyer found a significant correlation between formal phonetic training and native-like speech ratings, with participants who had received any phonetic training typically rated as more native-like than those who had received no training. Suprasegmental training appeared to be particularly effective with participants who had received it being rated as more native-like than those who had only received segmental training. It should be noted that ratings considered many factors, including front rounded vowels, so it is difficult to make assumptions about only word-final devoicing, but the results indicate that suprasegmental training might help learners have more target-like production of word-final consonants in German.

While Moyer (1999) looked at learners learning a phonological rule, Simon (2010) focused on learners whose native language had phonological patterns not found in their L2 and what factors determined if the learners transferred those patterns into the L2. Simon (2010) studied the transfer of L1 voicing assimilation rules into L2 speech via native Dutch speakers learning English. Dutch, like German, exhibits word and syllable final devoicing of obstruents as well as voicing assimilation across word boundaries. In Dutch, the voicing of word-final obstruents and fricatives assimilates to the following sound. For example, <twaalf> ('twelve'), which would normally be realized as [twa:lf], is produced as [twa:lv] when preceding the word <dozen> ('boxes'), because <dozen> begins with a voiced consonant.

Participants were found to be much more likely to produce nontarget-like forms due to regressive voicing assimilation than they were final devoicing. Simon attributes this to a course all participants had taken the year before which explicitly drew their attention to voiced final obstruents in English and the maintenance of the voicing contrast, but no instruction was given on regressive voicing assimilation. Further evidencing the influence of orthographic input on production, though, was the observation that participants were much less likely to devoice in a word reading task than they were in conversational speech, perhaps indicating that the more attention they paid to their speech, the less likely they were to devoice word-final obstruents.

Although the previous studies indicate that pronunciation training can benefit learners, there is also evidence that it provides no clear benefits (Lord, 2005; Saalfeld, 2012). Lord (2005) focused exclusively on whether explicit instruction about pronunciation helped L2 learners of Spanish produce more target-like sounds, both at the segmental and suprasegmental level. Lord's study focused on nine Spanish sounds and processes that are particularly difficult for native speakers of English. These included the nonaspiration of /p,t,k/, the fricative allophones [β], [ð], and [ɣ] of the stop consonants [b,d,g], trilled [r], diphthongs within words, and diphthongs between words. Of particular difficulty for English speakers is the production of [p,t,k] in Spanish. In English, VOT is considerably longer than in Spanish. The vibrant trill also presents difficulties because it does not exist in English. In Spanish, diphthongs are more common than in English, which "seems to prefer vowels in hiatus" (p. 560). In addition, Spanish also frequently creates diphthongs between two words, a process not common to English. Participants in the experimental group were recorded at the beginning of the semester, before any instruction had taken place, and again at the end of the semester. The participants read an elicitation paragraph for the recordings and repeated the paragraph an additional three times throughout the semester as part of a self-analysis project designed to bring focus and awareness to how their pronunciation differed from that of native speakers.

Participants in the experimental group were 17 undergraduate students enrolled in an upper-division Spanish phonetics class. The control group consisted of ten native Spanish speakers. The Spanish speakers' VOT values for /p,t,k/ were used for comparison with the experimental group. Tokens from the reading were then analyzed for pronunciation and VOTs were measured in milliseconds. For VOT measurements, tokens were taken from each subject to create an average for each subject. To assess changes in pronunciation accuracy, the results were subjected to paired t-tests and the VOT values of /p,t,k/ were subject to a series of two tailed t-tests, which compared the experimental group's preinstruction values to their postinstruction values and compared the values to those of the native Spanish speakers.

In the case of unaspirated /p,t,k/, the differences participants displayed in VOTs was not significant [p], [t] or [k]. When compared to the native speakers' values, however, the participants did show significant improvement. During the preinstruction readings, VOT values for /p,t,k/ were all significantly different than those of the native speakers. The participants' posttest VOTs, though, were not significantly different than those of the native speakers, indicating that the participants did improve in their pronunciation of unaspirated /p,t,k/. Regarding the trill [r], participants did significantly improve their accuracy levels from 26.47% to 39.22%. Likewise, participants improved significantly in their production of diphthongs within words and between words. Finally, while participants' production of the fricatives [β], [ð], and [ɣ] still did not resemble those of native speakers, they did demonstrate a significant improvement. While participants in the experimental group did improve significantly, there was no group of participants that did not receive explicit instruction, making it difficult to determine whether they improved because of the phonetic training or if the improvement was caused by the increased exposure to and practice speaking Spanish.

Saalfeld (2012) investigated the role of explicit instruction in the perception of native English speaking learners of Spanish, concluding that explicit instruction did not appear to facilitate learners perceiving Spanish stress placement. Both English and Spanish allow for variable word stress, but research indicates that native speakers of Spanish and English perceive stress differently. In English, stress placement is usually highly predictable, often indicating whether a word is a noun or a verb. In addition, the words are semantically related. This means that stress placement is often not crucial to understanding in English with misplaced stress often only resulting in temporary confusion. In Spanish, stress placement is a crucial to the verbal morphology system. For example, *háblo* (I speak) is the first person present indicative tense while *habló* (he/she spoke) is the third person preterite indicative tense. Subject pronoun dropping is quite common in Spanish, meaning that the stress placement on the verb is crucial to understanding the meaning of the sentence. Therefore, the ability to correctly perceive stress placement is crucial for L2 learners of Spanish.

Saalfeld's study focused on two questions: Do learners given instruction on Spanish stress demonstrate significant gains in accurately perceiving Spanish stress and do learners enrolled in Spanish courses perceive Spanish stress contrasts better than native English speakers without any Spanish experience? To test her hypothesis, Saalfeld designed and administered a pretest and a posttest to all participants. Participants (n=42) were divided into four groups: the experimental group (n=15), the control group (n=11), native English control group (n=8), and native Spanish control group (n=8). The control and experimental groups were students enrolled in two second semester introductory Spanish classes at a community college. Both classes were taught by the same instructor with the experimental group receiving explicit instruction on Spanish stress. Both groups received correction on segmental errors as they occurred and took the pretest and posttest 4 weeks apart. The pretests and posttests were ABX discrimination tasks where the subject heard three sentences that differed only in the location of verbal stress. There were 30 sentences, so each subject heard 90 sentences.

There were significant differences on the pretest between the four groups which indicated that native English speaking learners of Spanish were not any better at distinguishing Spanish stress contrasts than native English speakers with no Spanish experience. Native Spanish speakers performed significantly better than all other groups on the pretest. On the posttests, the researcher found a main effect of time but no main effect for group. Both the control group and experimental group means increased over the course of four weeks, indicating that explicit instruction on Spanish stress did not make learners any more sensitive to it than those that received no instruction. Instead, perceptual sensitivity to stress seems linked to the amount of Spanish exposure that an L2 learner has received. Another factor in perceptual sensitivity, Saalfeld hypothesizes, is learner motivation. When course grades were added as a covariate “groups were statistically indistinguishable during the posttest.”

The studies reviewed above indicate that there is a substantial relationship between orthographic input and L2 phonological acquisition (Bassetti, 2006; Escudero et al., 2008; Hayes-Harb et al., 2010; Showalter & Hayes-Harb, 2013). The relationship between orthographic input and phonological acquisition is so robust that L2 learners appear to be able to use even novel orthographic marks to help them perceive new contrasts (Showlter & Hayes-Harb, 2013), even though some research has indicated that L2 learners who learned a novel contrast via a new orthography were not any more accurate at perceiving the contrast than those that learned it via a familiar one (Pytlyk, 2011).

Many L2 learners, however, learn second languages whose orthography is similar to their own. While research indicates that learners can use the orthographic input to encode a contrast not present in their L1 (Escudero et al., 2008), differing grapheme-phoneme correspondences may cause learners to make incorrect assumptions about phonological forms (Bassetti, 2006) and create nontarget-like lexical representations (Hayes-Harb et al., 2010). In addition, learners appear to be quicker at creating a new grapheme-phoneme correspondence if the phoneme is novel as opposed to a new correspondence between a familiar phoneme and familiar grapheme when the correspondence is inconsistent with that of the L1 (Young-Scholten, 2015).

Crucial to interlanguage development is the acquisition of phonological patterns, such as word-final obstruent devoicing in German. Young-Scholten (2002) noted a correlation between self-reported exposure to orthographic input via reading and a failure to acquire word-final devoicing in native English speakers. Further experimental evidence confirmed the link between exposure to spelled forms and the failure to acquire the pattern (Brown et al., 2013).

Research on phonetic training in an L2 yields mixed results as to its effectiveness.

Moyer (1999) found that graduate students of German who had received phonetic training were more likely to devoice word-final consonants than those who had not received the training. Contrarily, Lord (2005) found that English learners of Spanish who received phonetic training were no more target-like in their production than those who did not receive the training. In addition, learners with phonetic training are no more accurate at perceiving a contrast than those without phonetic training (Saalfeld, 2012).

The studies above focused either on the relationship between orthographic input and phonological acquisition or phonetic training's effects on target-like production and perception. None of the studies focused on whether or not phonetic training can help learners overcome a delay in acquiring a phonological pattern due to orthographic input. Therefore, this study seeks to explore this relationship. Specifically, I wish to see if explicit instruction about pronunciation helps learners acquire a phonological rule in spite of access to spelled forms that might otherwise influence them to produce nontarget-like forms. The research question is:

- Does supplementing the target language input with limited explicit instruction allow native English learners to overcome the blocking of the acquisition of German word-final devoicing that has been attributed to orthographic input?

CHAPTER 3

METHODS/RESULTS

3.1 Word learning experiment

3.1.1 Participants

Sixty native English speakers were recruited from undergraduate courses from a university in the United States. Participants were excluded if they reported hearing, language processing, speech, or neurological disorders on a background questionnaire or if they reported German language learning experience. Participants were randomly assigned to one of four word learning conditions: NoSpell-NoInstruction (NSN), NoSpell-Instruction (NSI), Spell-NoInstruction (SN), or Spell-Instruction (SI).

3.1.2 Stimuli

The auditory stimuli were those used by Brown, Smith, and Hayes-Harb (2013) and consisted of twelve German nonwords, six ending in underlyingly voiced obstruents and six ending in underlyingly voiceless consonants. Two male native speakers of German and two female native speakers of German produced each word three times in isolation. The second production of each word was used. Because speakers were native Germans, nonwords were used to prevent interferences in pronunciation from frequency and/or neighborhood density effects (Wright, 1997).

Table 1 presents information about each of the twelve nonwords, their associated spellings and pictures. Visual stimuli included line drawings of real objects for the NSN group and the NSI group. For the SN and SI groups, the visual stimuli also included written forms of each word. Each of the twelve words was assigned a 'meaning' via real object picture. Real object pictures were used because no participants had German language experience.

3.1.3 Procedure

The experiment had three phases: a word learning phase, a criterion test phase, and a production phase. During the word learning phase, participants in the NoSpell conditions heard the auditory representation and saw the picture. Participants in the Spell conditions heard the auditory representation, saw the picture and also saw an orthographic representation of the word. All four conditions had each word presented four times per block, for a total of 48 items per block. The block was presented four times in a different random order each time and for each participant. All participants were instructed at the beginning of the experiment to learn the words and their meanings as well as possible. In addition, the directions for participants in both Instruction conditions also included the sentences: In German, sometimes the final letter of a word is not spelled the way it sounds. A "b" will be pronounced "p", a "g" will be pronounced "k", and a "d" will be pronounced "t" when at the end of the word. Please try to remember this as you learn the new words.

During the criterion test phase, participants saw a nonobject picture and heard one of the nonwords. They did not receive spelled forms. Each picture was presented twice:

once in a matched condition and once in a mismatched condition. Participants responded whether they thought the auditory form and drawing were matched by pressing YES or NO keys on the keyboard. If a participant did not respond within four seconds, the response was considered incorrect. Participants needed a 90% accuracy rate to continue to the production part of the experiment. Participants could repeat the word learning portion and the criterion test as many times as possible to reach the criterion.

In the production phase, participants were asked to produce the nonwords they had just learned. The words were elicited via the line drawings and telling participants to please say the word that the picture represented. Line drawings were presented via the computer screen. Participants saw each line drawing twice, for a total of 24 productions and they were not given feedback on the accuracy of their productions.

For all phases of the experiment, participants were seated in a sound-attenuated booth. All visual stimuli were presented via a computer screen and auditory stimuli were heard over headphones. Responses were recorded by pressing keys on a computer keyboard.

3.2 Coding task

3.2.1 Participants

Ten native English speakers were recruited from the same population as participants from the word-learning experiment. No participants had participated in the word learning experiment and all were naïve to the purpose of the study. The same background questionnaire was used to ensure that none of the participants had any hearing, language processing, speech, or neurological disorder, or German language learning experience.

3.2.2 Stimuli

Each auditory token was produced by participants from the word learning experiment. Tokens were spliced and coded for accuracy. The criterion used to determine an acceptable level of accuracy was the same used by Brown, Hayes-Harb, and Smith (2013): Tokens could not differ in more than one phoneme from the target production. Crucially, the final phoneme had to match the target production in place and manner of articulation. For example, for the target [tri:k], the productions [tri:k] or [tri:g] would be coded as usable. In addition, one changed phoneme such as [trak] would be coded as usable. The production [tri:d], however, would be considered unusable because the final phoneme did not match the target phoneme in place of articulation (velar versus alveolar).

3.2.3 Procedure

Participants were presented with the auditory stimuli and asked to indicate which letter the word they heard ended with by pressing a key on the keyboard. Letters presented together represented sounds that were alike in manner and place of articulation but different in voicing. For example, participants were asked to choose between <d> and <t>. Each participant heard four blocks in a random order with each token being presented twice. Therefore, each token was coded 8 times by each coder.

For this experiment, participants were seated in a sound-attenuated booth and received all auditory stimuli via headphones. They indicated responses by pressing keys on a computer keyboard.

3.3 Results

The mean number of word-learning cycles needed to reach criterion was 1.8 (range 1-4) for participants in the No Spell-No Instruction condition (NN), 1.8 (range 1-4) for those in the No Spell-Instruction (NI) condition, 1.4 (range 1-2) for those in the Spell-No Instruction condition (SN), and 2 (range 1-4) for those in the Spell-Instruction (SI) condition. There was no significant difference between groups for the number of word learning cycles needed to reach criterion ($F(3,44)=1.57$, $p=.21$, partial eta squared=.09).

From participants in the NN condition, 181 tokens were coded as usable. From those in the NI, 196 tokens were usable. The SN and SI groups produced 179 and 228 tokens, respectively. No significant difference was found between groups in the number of usable tokens ($F(3,44)=1.86$, $p=.15$, partial eta squared=.113).

When the target word was spelled with a voiceless consonant, the No Spell-No Instruction group had a mean proportion voiceless response of .76 (SD=.21) and the mean proportion voiceless response of the No Spell-Instruction group was .82 (SD=.17). Together, participants in the No Spell groups had a mean proportion voiceless response of .79 (SD=.19).

Participants in both Spell conditions had a mean proportion voiceless response of 83 (SD=.11) when the target was spelled voiceless. Broken down into instruction conditions, participants in the Spell-No Instruction condition had a mean proportion voiceless response of .84 (SD=.13) while the mean proportion voiceless response of the

Spell-Instruction group was .82 (SD=.09). Figure 1 provides information on the mean proportion voiceless responses by each group, broken down into spelling and instruction conditions.

Together, the No Instruction conditions had a mean proportion voiceless response of .80 (SD=.17) and the Instruction conditions had a mean proportion voiceless response of .82 (SD=.13).

When the target word was spelled with a voiced consonant, the No Spell groups had an average mean proportion voiceless response of .73 (SD=.20). Individually, the No Spell-No Instruction group had a mean proportion voiceless response of .74 (SD=.17) and that of the No Spell-Instruction group was .73 (SD=.13).

Focusing on the Spell conditions, the mean proportion voiceless response of the Spell-No Instruction group was .48 (SD=.28) and that of the Spell-Instruction group was .47 (SD=.25). The average mean proportion voiceless response of both Spell groups was .48 (SD=.26).

When breaking down the data by instruction condition, the No Instruction conditions had an average mean proportion voiceless response of .61 (SD=.27). The average mean proportion voiceless response of both Instruction conditions was .60 (SD=.26). Figure 2 provides information on the mean proportion voiceless responses by each group, broken down into spelling and instruction conditions.

The data were submitted to a three-factor mixed-design ANOVA with spelling (spell or no spell) and instruction (instruction or no instruction) as the between subjects variables, target voicing as the within-subjects variable (final consonant spelled voiced or voiceless), and proportion voiceless responses as the dependent measure.

A significant main effect of spelling was found (F(1,44)=5.294, p<.05, partial eta squared =.107). There was also a significant main effect of target voicing (F(1,44)=38.882, p<.001, partial eta squared=.469), with words spelled with a voiced final consonant less likely to be produced as voiceless than those spelled with a voiceless final consonant. There was no main effect of instruction (F(1,44)=.032, p=.859, partial eta squared=.001). There was a significant interaction of target voicing and spelling (F(1,44)=20.398, p<.001, partial eta squared.317) but no significant interaction between target voicing and instruction (F(1,44)=.196, p=.660, partial eta squared=.004) or spelling and instruction (F(1,44)=.142, p=.708, partial eta squared=.003), indicating that instruction had no significant effect on later production. Finally, there was no significant interaction between target voicing, spelling, and instruction (F(1,44)=.308, p=.582, partial eta squared=.007).

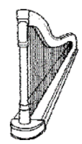
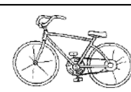
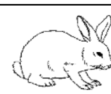
Following up on the significant interaction of target voicing and spelling, the data were submitted to a two-way ANOVA with spelling and instruction as the between subjects variable and proportion voiceless responses as the dependent variable for each of the target voicing types separately.

For targets spelled with a voiceless final consonant, there was no significant main effect of instruction (F(1,44)=.271, p=.605, partial eta squared=.006) or spelling (F(1,44)=.760, p=.388, partial eta squared=.017) and no significant interaction between instruction and spelling was found (F(1,44)=.669, p=.418, partial eta squared=.015).

Crucial to this study, for targets spelled with a voiced final consonant, a significant main effect of spelling was found (F(1,44)=14.037,p<.05, partial eta squared=.242). There was no main effect of instruction (F(44)=.008, p=.931, partial eta squared=.000) and the interaction of spelling and instruction was also not significant ($F(1,44)=.000$, $p=.997$, partial eta squared=.000). The lack of a significant interaction between instruction and spelling indicates that instruction did not mitigate the effects of seeing spelled forms.

In summary, the results strongly suggest that seeing the spelled form of a word is a predictor of how a learner will later pronounce the word. Learners who saw the spelled forms of the words were significantly less likely to produce voiceless final consonants when a word was spelled with a voiced final consonant than those who were not exposed to spelled forms. Instruction, at least in this experiment, did not lessen this effect of seeing spelled forms.

Table 1. Information about the twelve nonwords: Their spelled forms and associated pictures.

Orthographic Form	Object Picture	Auditory Form
trieg		[tri:k]
triek		[tri:k]
trop		[trop]
trob		[trop]
steid		[ʃtajt]
steit		[ʃtajt]
krag		[krak]
krak		[krak]
krad		[krat]
krat		[krat]
kreib		[krajp]
kreip		[krajp]

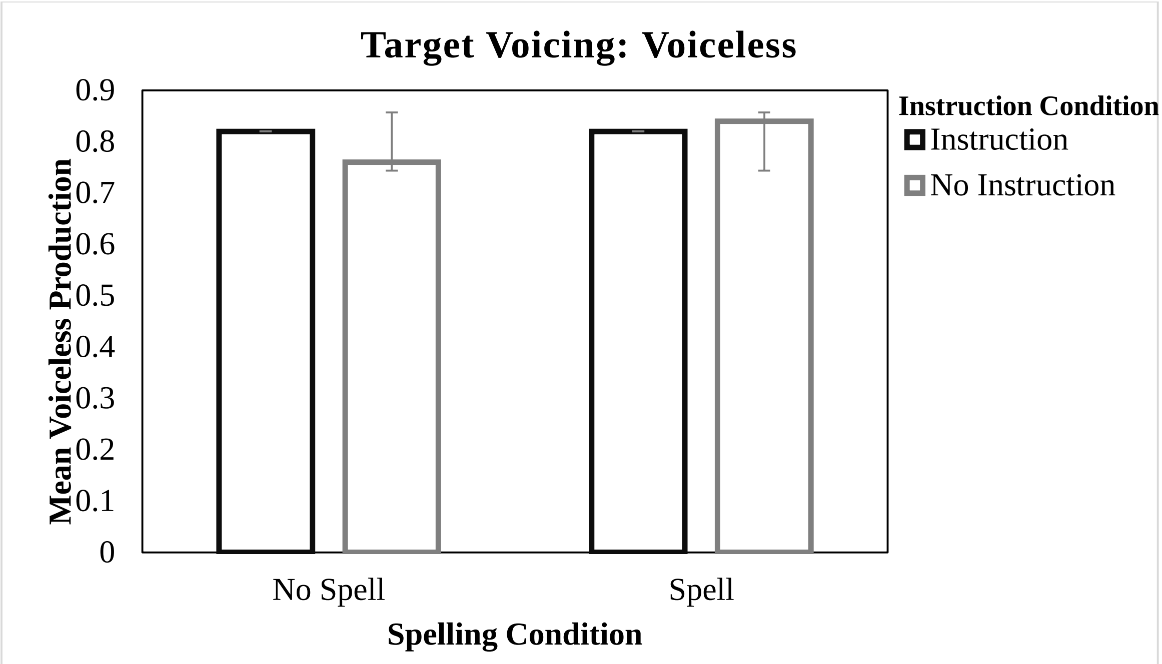


Figure 1. Mean proportion voiceless responses by each learning condition when the target word was spelled with a voiceless final consonant. Bars represent +/- 1 standard deviation.

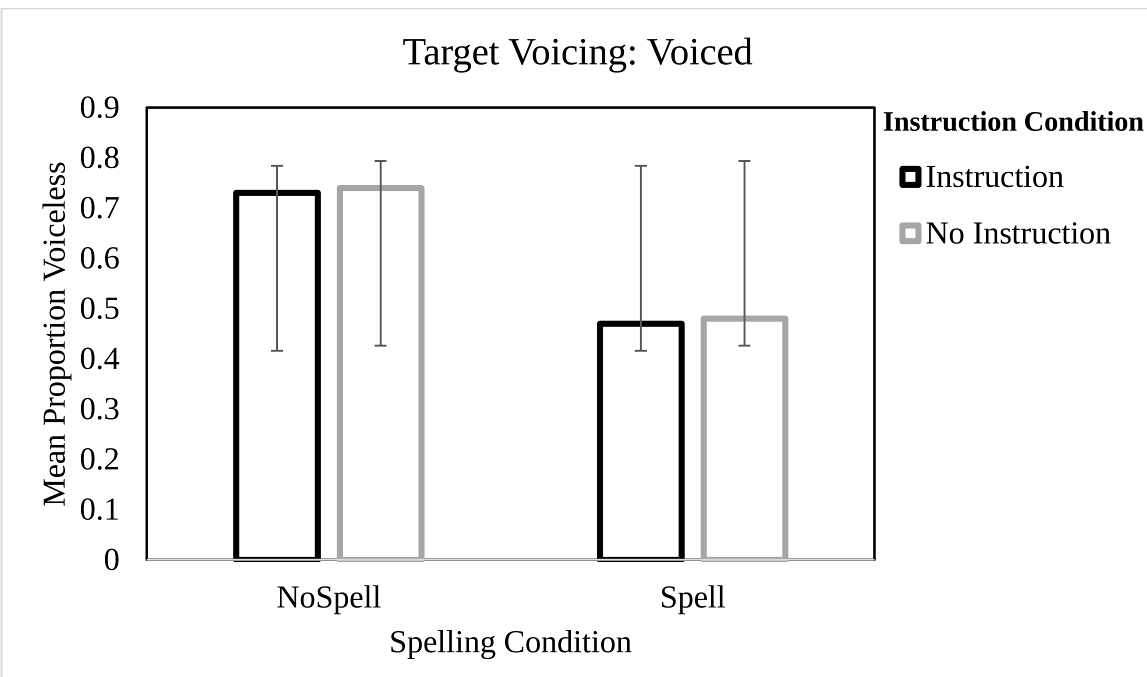


Figure 2. Mean proportion voiceless responses by each learning condition when the target word was spelled with a voiced final consonant. Bars represent +/- 1 standard deviation

CHAPTER 4

DISCUSSION

As in Brown, Smith, and Hayes-Harb (2013, in prep.), results from this study indicate that learners use orthographic input to create underlying phonological forms, even when the auditory input is contrary to the orthographic. This may initially interfere with learners' acquisition of a phonological pattern, such as word-final obstruent devoicing in German. This hindrance to phonological acquisition is consistent with findings of previous studies (Bassetti, 2006; Hayes-Harb et al., 2010).

Participants who saw spelled forms in both conditions, one in which they also received instruction and one in which they did not, performed similarly. Both groups devoiced words with underlyingly voiced final consonants significantly less than learners in the No Spell conditions. Within the No Spell conditions, there was no significant difference in voiceless productions between participants who received instruction and those who did not.

One consideration in this study is the differences in speaker production. Earlier experiments using these productions (Brown, Smith, & Hayes-Harb, 2013, in prep.) indicated that participants were unable to detect whether a word had an underlying voiced or voiceless final consonant even though several participants noted that there were noticeable differences in the productions of the same word. A second consideration is whether the nature of the task caused participants to detect differences, but a third experiment in the Brown, Smith, and Hayes-Harb (2013) study also yielded results that suggested participants were unable to detect whether a word was underlyingly voiced or voiceless. The results from the previous two experiments indicate that it was, in fact, the access to spelled forms that caused subjects in both experiments not to acquire the phonological pattern.

While this study did not seek to evaluate any particular classroom instruction method, the results from it may provide information to second and foreign language instructors as they consider instructional methods for their classrooms. The study adds to a body of literature supporting the robust nature of orthographic input that is sometimes beneficial and sometimes detrimental to learners in the early stages of language acquisition. Orthographic input can help second language learners perceive and encode contrasts not present in their native languages (Escudero et al., 2008; Showalter & Hayes-Harb, 2013). It can, however, interfere with learners' creation of target-like phonological and lexical representations and their learning a phonological pattern acquisition (Bassetti, 2006; Hayes-Harb et al. 2010).

Because "phonetic and pronunciation training" may refer to any of a number of instructional methods, this study was not designed to test the effectiveness of any particular methods. The explicit instruction provided in this study was extremely limited, with participants only seeing the instructions once and their attention not being drawn to form again over the course of the word-learning phase. In addition, participants did not produce words during the word-learning phase, only during the production test. While Moyer (1999) and Simon (2010) found benefits to phonetic and pronunciation training, Saalfeld (2012) saw no difference in perceptual capabilities when learners received the training.

In conclusion, the findings of this study provide further evidence concerning orthographic input and its effects on phonological acquisition by second language learners. Participants appeared to use spelled forms to create incorrect phonological representations despite the auditory information they were exposed to, resulting in a failure to acquire a phonological pattern. Explicit instruction, operationalized by telling learners about the pattern, did not mitigate these effects.

CHAPTER 5

CONCLUSION

The current study investigated the effects of instruction and exposure to spelled forms on the acquisition of a phonological pattern. Specifically, the study investigated whether instruction could moderate the effects of exposure to spelled forms, which can hinder learners' ability to acquire a phonological pattern. It was hypothesized that if learners who received instruction performed in a more target-like manner than those who received no instruction, then learners could use the knowledge from the instruction to moderate the negative effects of seeing spelled forms. Results from this experiment do not support this hypothesis.

Participants' performance in this study was linked closely to whether or not the participant had exposure to spelled forms, with those who saw spelled forms producing words in a target-like manner significantly less than those who did not see spelled forms. Neither of the instruction conditions performed significantly differently than participants in the same spelling condition (Spell or No Spell) who had no instruction.

Results indicate that participants were unable to use information provided by instruction to help them acquire a phonological pattern where sounds were inconsistent with the graphemes they were presented.

CHAPTER 6

LIMITATIONS AND FUTURE DIRECTIONS

There are two notable limitations to this study. The first is that the study was completed over the course of only an hour and the participants only completed the task once. There is no way to determine if the results found here would remain consistent over the course of several days, weeks, or with continued instruction on word-final devoicing. Also of note is that learners did not receive feedback at all during the study.

The second limitation is that participants in the spell learning condition were exposed to orthographic and auditory input with equal frequency. This study can make no claims about the effects of instruction if learners were exposed to different ratios of auditory to orthographic input.

Therefore, the limited nature of this study indicates a need for further research on the effects of time and continued instruction, particularly in the form of feedback to the learner. In addition, further research should investigate if the frequency of auditory to orthographic input or vice versa affects the interference caused by orthographic input or changes the effectiveness of instruction on the rule.

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