An analysis of global and local crosslinguistic influence in L1 Mandarin-L2 English learners of L3 Spanish*

Uma análise da influência interlinguística global e local em aprendizes de Espanhol como L3, falantes de mandarim como L1 e inglês como L2

Un análisis de la influencia interlingüística global y local en el aprendizaje de español como L3, por hablantes de mandarín como L1 e inglés como L2

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ABSTRACT
The present study investigated L3 phonetic crosslinguistic influence (CLI) in L1 Mandarin-L2 English-L3 Spanish speakers. The objective was to determine whether the L1 or the L2 was a stronger source of CLI in trilingual speakers of three typologically distinct languages, and to examine the extent to which L2 and L3 proficiency play a role. Two analyses were performed. In the global analysis, Spanish-speaking judges (N=22) listened to passages read by L1 Mandarin-L2 English-L3 Spanish speakers (N=17) with varying levels of L2 and L3 proficiency and attempted to identify the speakers' native language. In the local analysis, the L3 production of the Spanish trill was examined, with the goal of determining whether the L1 or L2 was a more frequent source of transfer. The two analyses revealed that both the L1 and L2 were possible sources of transfer, although the L1 was a stronger source overall. L2 and L3 oral proficiency were not significant factors, revealing that other factors may be better predictors of the source of transfer. These findings are discussed

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in reference to their compatibility with the Typological Primacy Model and the L2 Status Factor Model.

KEYWORDS: L3 acquisition; L3 phonetics; Mandarin; Spanish; crosslinguistic influence.

RESUMO

O presente estudo investigou a influência fonética interlinguística (CLI) em falantes de mandarim como L1, inglês como L2 e espanhol como L3. O objetivo foi determinar se a L1 ou a L2 era uma fonte mais forte de CLI em falantes trilíngues de três línguas tipologicamente distintas, e examinar até que ponto a proficiência de L2 e L3 desempenham um papel. Duas análises foram realizadas. Na análise geral, juízes hispânicos (N = 22) escutaram passagens lidas por falantes de mandarim como L1, de inglês como L2 e de espanhol como L3 (N = 17) com diferentes níveis de proficiência da L2 e da L3, e tentaram identificar o idioma nativo dos indivíduos. Na análise local, a produção da vibrante múltipla alveolar da L3 foi examinada, a fim de determinar se a L1 ou a L2 foi uma fonte mais frequente de transferência. As duas análises revelaram que tanto a L1 quanto a L2 foram possíveis fontes de transferência, embora a L1tenha sido uma fonte mais forte no geral. A proficiência oral de L2 e L3 não foi um fator significativo, revelando que outros fatores podem ser melhores preditores da fonte de transferência. Essas descobertas são discutidas em referência à sua compatibilidade com o Modelo de Primazia Tipológica e o Modelo do Status da L2 como fator.

PALAVRAS-CHAVE: Aquisição de L3; Fonética L3; Mandarim; Espanhol; Influência interlinguística.

RESUMEN

El presente estudio investigó la influencia fonética interlingüística (CLI) en hablantes de mandarín como L1, inglés como L2 y español como L3. El objetivo fue determinar si la L1 o la L2 eran una fuente más fuerte de CL1en hablantes trilingües de tres lenguas tipológicamente distintas e investigar hasta qué punto el dominio de L2 y L3 tiene un papel en el aprendizaje. Para ello, se realizaron dos análisis. En el análisis general, oyentes hispanohablantes (N = 22) escucharon producciones leídas por hablantes de mandarín como L1, de inglés como L2 y de español como L3 (N = 17) con diferentes niveles de dominio de la L2 y de la L3, e intentaron identificar el idioma nativo de los individuos. En el análisis local, se observaron solamente las producciones de la L3 para determinar si la L1 o la L2 fue una fuente más frecuente de transferencia. Los dos análisis revelaron que tanto la L1 como la L2 fueron posibles fuentes de transferencia, aunque la L1 haya sido una fuente más fuerte en general. El dominio oral de L2 y L3 no fue un factor significativo, lo que revela que otros factores pueden ser mejores predictores de la fuente de transferencia. Se discuten esos hallazgos a partir de su compatibilidad con el Modelo de Primacía Tipológica y el Modelo del Status de L2 como factor.

PALABRAS CLAVE: Adquisición de L3; Fonética L3; Mandarín; español; influencia interlingüística.

1 Introduction

One of the major questions in L3 phonetics and phonology (L3PP) is which of previously learned languages are the most likely sources of crosslinguistic influence (CLI), and what factors determine this (see WREMBEL, 2015, CABRELLI AMARO; WREMBEL, 2016). The last ten years has seen a significant amount of work conducted on L3PP and the conclusions reported in these studies are not always consistent. Some studies have observed greater L1 CLI (e.g., PYUN, 2005; WREMBEL, 2012; 2013, LLAMA; LÓPEZ-MORELOS, 2016, 2018), a mix of L1 and L2 CLI (e.g., BLANK; ZIMMER, 2009, WREMBEL, 2014; SYPIÁNSKA, 2016), primarily L2 CLI in initial stages followed by L1 CLI (e.g., HAMMARBERG; HAMMARBERG, 2005, LLAMA ET. AL, 2010, WREMBEL, 2010), and primarily L2 CLI (e.g., CHANG, 2015). One of the gaps in the field of L3PP, as highlighted in Cabrelli Amaro and Wrembel (2016), is the limited combinations of languages that have been examined. Chinese languages are mostly absent, with the exception of Qin and Jongman (2016), who examined the perception of tones in L1 English-L2 Mandarin-L3 Cantonese speakers (see also KUPISCH; SEOUDY, 2016). Moreover, numerous studies have investigated language combinations where at least two of the languages were from the same typological family (e.g., L2 English-L3 Swedish, in PYUN, 2005; L2 German-L3 Swedish in HAMMARBERG; HAMMARBERG, 2005). As a result, it is difficult to tease apart CLI due to typological similarity from CLI due to other factors. The current paper investigates CLI in speakers of a unique language triad involving a Sinitic L1 (Mandarin), Germanic L2 (English) and Romance L3 (Spanish). Two analyses were performed. In the "global"[1] analysis, Spanish speaking judges listened to passages read by learners of L3 Spanish (who had varying levels of L2 English and L3 Spanish proficiency) and identified what they believed the native language of the speakers to be (similar methodology to HAMMARBERG; HAMMARBERG, 2005, WREMBEL, 2010, 2012, 2013, CHANG, 2015, LLOYD-SMITH, 2017). The goal was to establish which of the two previously learned languages was a more prevalent source of CLI in the speakers' L3 Spanish, and to examine the role played by L2 and L3 oral proficiency. In the "local" analysis, transfer of L1 Mandarin and L2 English segments were examined in L3 Spanish trill production[2]. Previous research has found that L1 Mandarin speakers tend to transfer [l] in place of the Spanish rhotics, whereas L1 English speakers tend to transfer English [ɹ]. Therefore the goal was to examine which of these two segments was more frequently used as a substitute for the L3 Spanish trill, and whether the source of transfer was associated with differences in L2 and L3 oral proficiency. The primary contribution of the present paper is that it presents findings from a language triad involving three typologically distinct languages. Moreover, in the majority of previous studies using a global analysis, L2 oral proficiency was not reported. Therefore, an additional contribution of the present study is the use

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[1] The term "global analysis" will be used to refer to CLI based on perceptions of foreign accentedness, due to the fact that perceptions of foreign accentedness are based on a combination of many segmental and suprasegmental features. In contrast, "local analysis" will be used to refer to the analysis of transfer of a single target segment (i.e., /r/).

[2] See Patience (2018) for a full analysis of L3 Spanish rhotic production, which was performed on the same speakers that are included in this study. However, the focus of the present paper is the source of transfer in the L3 trill production, and the comparison of the findings from the global and local analysis.

of L2 oral proficiency measures, which are necessary to determine at which point L2 CLI can be expected, if at all. Finally, while several studies have examined L1/L2 to L3 transfer at the global level (via perception of foreign accents) or at the local level (via transfer of segments/properties), the present study combines both analyses.

2. Background

2.1 Theoretical background on L3 acquisition

While several models have been discussed extensively in the L3 acquisition literature, we will focus here on the two models[3] that have received the most discussion: The L2 Status Factor model (L2SF) (BARDEL; FALK, 2007; 2012), and the Typological Primacy Model (TPM) (ROTHMAN, 2011; 2015). The L2 Status Factor model (L2SF) (BARDEL; FALK, 2007; 2012) predicts initial L2 transfer. The model is based on the fact that post-puberty languages are acquired using similar cognitive processes (i.e., declarative memory), whereas languages learned before puberty are acquired using procedural memory. The L2SF would therefore predict transfer from L2 English in the L3 learners of the present study. The Typological Primacy Model (TPM) (ROTHMAN, 2011; 2015) would also predict transfer from the L2 English, albeit for different reasons. The TPM predicts that learners will initially transfer the psychotypologically most similar language, which is determined according to a subconscious process by an L3 learner's linguistic parser. The parser compares the L1 and L2 to the L3, considering four domains in a hierarchical progression (1 - the lexicon, 2 - the phonology, 3 - the functional morphology, and finally, 4 - the syntax) until sufficient similarity is encountered (for a more detailed description, see Rothman 2015). In the present study's language combination, a learner would classify the L2 English as more similar to the L3 Spanish, given the similarities in the lexicon (many shared cognates in English and Spanish), which are not present between the L1 Mandarin and L3 Spanish. The parser would therefore stop at the lexicon, and would not proceed to compare the phonology, morphology, or syntax of the three languages, as sufficient similarity would have been found between the lexicons. The learner's L2 English would then function as the initial state of their L3 Spanish.

Note that both models are designed to predict syntactic/morphosyntactic transfer, thus do not necessarily apply to phonetic and phonological transfer in L3 speakers. Moreover, the TPM's predictions apply only to initial state learners. Consequently, these models are not testable in the present study. However, it is important to note that two of the three models would predict L2 transfer initially, thus the L2 should be considered as a possible source of CLI. Moreover, the predictions of the TPM demonstrate that despite English and Spanish being from different language families, an L1

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[3] While the Cumulative Enhancement Model (CEM)(FLYNN; FOLEY; VINNITSKAYA, 2004) has been discussed extensively in the L3 acquisition literature, the evidence in favor of the model is limited, and a recent project reviewing 71 studies on morphosyntactic transfer found that the CEM was only compatible with 5.9% of the studies analyzed (PUIG-MAYENCO; GONZÁLEZ ALONSO; ROTHMAN, 2018). Moreover, the model assumes no negative transfer, yet negative transfer is expected, based on findings from previous studies investigating non-native phonetic acquisition (e.g., WREMBEL, 2010, JOHNSON, 2008).

Mandarin-L2 English-L3 Spanish learner would consider English to be more similar to Spanish than Mandarin. While there is evidence supporting both models, a review of 71 studies on L3 morphosyntactic transfer revealed that typological similarity was compatible with the most studies (60.5%). L2 transfer was the second most reliable, being compatible with 28.2%, followed by L1 transfer (14.1%). (PUIG-MAYENCO ET AL., 2018). These results strongly suggest that, for the learners of the present study, the L2 is a more likely source of transfer, if L3PP functions in the same way as L3 morphosyntax.

2.1 Previous studies on L3PP

Two levels of analysis have been used to investigate CLI in L3PP. (1) The global analysis: L1 identifications based on foreign accentedness (e.g., Hammarberg & Hammarberg, 2005; Wrembel, 2013; Lloyd-Smith, Gyllstad, & Kupisch., 2017); (2) The local analysis: phonetic analysis of individual segments or features, such as VOT (e.g., Llama Cardoso, & Collins, 2010; Wrembel, 2014). In (1), judges who speak the target language listen to passages produced by L3 speakers, and identify what they believe the native language to be. In (2), speakers are tested on the production of a single segment in all three languages (in most cases). Phonetic analysis is then used to determine whether characteristics from the L1 or L2 are present.

Both methods have advantages and disadvantages. The advantage of the global analysis is that it takes into account a combination of segmental and suprasegmental features from previously learned languages, and therefore can indicate which of the two previously acquired languages results in a stronger source of CLI overall (even if it is not necessarily the only source). The disadvantage is that it is not possible to know what the underlying representation of a speaker's linguistic system is. For example, L3 speakers who have lower L2 proficiencies may be transferring an L1 accented-L2 system into their L3. Consequently, characteristics from the L1 may be present in the L3, even when the speaker is transferring their L2 system. Therefore while this method of analysis can effectively reflect CLI due to phonetic transfer and articulatory motor routines, it does not necessarily reflect a speaker's underlying phonology. While this limitation can be avoided by analyzing individual segments, a segmental analysis is limited in scope because it only demonstrates transfer of a single structure. Transfer of a single segment cannot be interpreted to denote that a speaker's entire language system was transferred, and therefore only provides a small piece of evidence supporting theories that claim transfer of an entire system (as in the TPM). In order to achieve a comprehensive understanding of L1 and L2 influence in L3 speech, both at an individual and more global level, a combination of both analyses is preferable, which is the approach taken in the present paper. A summary of previous work using both types of analyses is presented below.

2.2.1 Global level of analysis

Table 1 displays the language combinations and results of five studies that have been conducted using a global analysis.

Table 1. Summary of previous studies investigating CLI using a global analysis

Study	L1	L2	L3	CLI primary source
Wrembel (2010)	Polish	German	English	L2 then L1
Wrembel (2012)	Polish	French	English	L1
Wrembel (2013)	Polish	English	French	L1
Hammarberg; Hammarberg (2005)	English	German	Swedish	L2 then L1
Chang (2015)	English	Japanese	Korean	L2
Lloyd-Smith et al. (2017)	Turkish/ German	n/a	English	German

Hammarberg and Hammarberg (2005), Wrembel (2010), and Chang (2015) found that CLI from the L2 was stronger initially. Hammarberg and Hammarberg (2005) and Wrembel (2010) also observed that as speakers became more advanced, the L1 became a stronger source of CLI. Hammarberg and Hammarberg argue that CLI is initially more prevalent from the L2 because speakers use it as a coping strategy to deal with unfamiliar phonetic forms. As they become more advanced, they no longer need to rely on the L2. CLI from the L1 then becomes more pominent due to persistent L1 articulatory routines. These studies are important because they demonstrate that L2 CLI in initial stages is possible under certain conditions in L3 speech; however, one of the limitations of these studies is the typological similarity between the L2 and L3. Consequently, the L2 CLI observed in these studies may have been due to typological similarity, and raises the question of whether the L2 would still be a stronger source of CLI in early learners with typologically different L2/L3 combinations.

Wrembel (2012) and (2013) address this issue, by investigating speakers of three typologically distinct languages (L1 Polish-L2 French-L3 English in the former, and L1 Polish-L2 English-L3 French in the latter). The author found that while some influence of the L2 was observed, the L1 was clearly a stronger source of CLI, regardless of L3 proficiency. These results suggest that language dominance should be considered as an important predictor of CLI, if languages are unrelated. Evidence supporting the primary role of language dominance was also found in Lloyd-Smith et al. (2017), who investigated global CLI in the L3 English produced by Turkish-German heritage-speaking bilinguals (with varying levels of language dominance – some were dominant German and others were dominant Turkish speakers). In general, the bilinguals tended to be identified as native German speakers, suggesting that German was overall a stronger source of CLI, which may have been partly due to the typological similarity of German and English. However, the level of Turkish dominance was found to be a significant factor; the more Turkish dominant the speakers were, the more likely they were to be identified as L1 Turkish speakers.

Overall, the results of the few studies conducted using a global level of analysis appear to indicate that L1 status and language dominance are the most likely predictors of CLI when languages are not related typologically. However, only two studies involving three somewhat typologically unrelated languages (acquired sequentially) have been conducted (WREMBEL, 2012; 2013). Consequently, it is not clear whether these observations will hold with a different set of languages. Would CLI from the L1 still be strongest when the L1 and L3 are typologically very distant, as in the present study's language combination? Moreover, while some evidence has been found supporting a role for L3 proficiency when the L2 and L3 are typologically similar, the question remains whether L3 proficiency is a factor when languages are less similar.

2.2.2. Local level of analysis

More research has been conducted by analyzing CLI of individual segments. However, studies have tended to focus on VOT or vowel production. As a result, our understanding of transfer at the segmental level is limited, and research investigating a larger variety of segments is needed. Similar to findings reported in the global analysis, results are inconsistent. Some recent findings suggest that the L1 may play a privileged role. For example, Kopečková (2014) investigated the L3 acquisition of the Spanish rhotics by L1 German-L2 English speaking children (ages 11-12). She found that the L1 German was a more prevalent source of transfer, based on the presence of German uvular fricative or approximant substitutions. Other studies that reported primarily L1 transfer include Pyun (2005), Llama and Cardoso (2018), and Llama and López-Morelos (2016). While these studies support a proposal that the dominant language is a more likely source of CLI, other studies have found support for combined CLI (BLANK; ZIMMER, 2009, SYPIÁNSKA, 2016), and in some cases, primarily L2 transfer (TREMBLAY, 2007, LLAMA ET AL., 2010). The variable findings reported in L3PP demonstrate that additional research is necessary for determining when L1 or L2 transfer is more likely. One of the primary goals of the present paper is therefore to present new data from an understudied language triad, using two different methods of analysis.

In the next section, a summary of the phonetic and phonological characteristics of Spanish, Mandarin, and English will be presented, in order to outline how the trill is produced (and therefore what must be acquired), and which L1 and L2 segments might influence the acquisition of the trill.

2.3 Relevant Phonetic and Phonological Characteristics of Spanish, Mandarin, and English

Spanish has two rhotics, a voiced alveolar tap /ɾ/ and a voiced alveolar trill /r/, which are contrastive in intervocalic position (HUALDE, 2005). The trill is produced by a rapid contact of the tip of the tongue against the alveolar ridge, 2-6 times in rapid succession. It is an articulatorily complex segment due to the precise aerodynamic requirements that are required for its production (SOLÉ, 2002). The trill is represented by the grapheme <rr> (in intervocalic

position; e.g., pero /ˈpeɾo/ 'but' versus /ˈperro / 'dog'; caro /ˈkaɾo/ 'expensive' versus carro /ˈkaro/ 'car') or <r> (word initial, e.g., rata /ˈra.ta/ 'rat', and syllable initial following /n, l/, e.g., honra /ˈon.ra/ 'honour').

The speakers of the present study were living in Eastern Canada. Therefore, the English dialect that we will focus on here, and that the participants were immersed in, is Canadian English. Canadian English has one rhotic phoneme, a voiced, retroflex or bunched-tongue approximant /ɹ/. It is also represented by the grapheme <r> (or <rr>), and, like the trill, occurs in intervocalic (e.g., merry /mɛ.ɹi/) and word-initial positions (e.g., rain /ɹejn/), as well as in codas (e.g., poor /pɔɹ), and stop-liquid clusters (tree /tɹi/). The fact that the English and Spanish rhotics have similar phonotactics, and are represented by the same grapheme, are generally considered to be the reasons why L1 English-L2 Spanish speakers tend to substitute the English [ɹ] for the Spanish rhotics (e.g., WALTMUNSON, 2005). English also has a voiced alveolar stop /d/ and a voiced alveolar lateral /l/. These segments share a place of articulation with the trill, and, in the case of /l/, the liquid class. Nevertheless, these segments are not generally substituted for the trill by L1 English-L2 Spanish speakers (See Section 2.4 for details). Note that English also has a [ɾ] allophone, which surfaces in intervocalic position in place of /t/ or /d/ after a stressed vowel (LADEFOGED; MADDIESON, 1996), such as in water /wɑtəɹ/ [ˈwɑ.ɾɚ]. This flap allophone is nearly identical to the Spanish tap, and also shares a place of articulation with the trill.

Similar to English, Mandarin has one rhotic phoneme. It is generally characterized as either a voiced apical post-alveolar approximant /ɻ/ (LEE, 1999), but has also been described as a voiced retroflex fricative (DUANMU, 2000). The Mandarin /ɻ/ occurs in initial position, including intervocalically, and is represented by the grapheme <r>, just like the English and Spanish rhotics. Mandarin also has a voiced alveolar stop [d], an allophone of /t/ that surfaces after an unstressed syllable (DUANMU, 2007), and a voiced denti-alveolar lateral /l/. While the Mandarin rhotic shares some similarities with the Spanish trill, previous work has not found any evidence of the rhotic being produced as a substitute for the trill by L1 Mandarin speakers. However, [l] substitutions are common (CORTES-MORENO, 2002; 2014), and are therefore expected in the present study.

2.4 Acquisition of Spanish trill

Several studies have examined the L2 acquisition of the Spanish trill, although they have generally focused on L1 English speakers, with only one experimental study examining L2 Spanish production by L1 Mandarin speakers. Ortí Mateu (1990) found that L1 Mandarin learners had difficulty producing the tap-trill contrast when producing minimal pairs such as coro /koɾo/ 'choir' – corro /koro/ 'I run'. While a detailed error analysis was not performed and it is not clear which of the two segments of the minimal pair the learners had the most difficulty with, the author mentions specifically that learners had difficulty producing the trill. Research on teaching methods has also highlighted the difficulty that L1 Mandarin speakers have with the trill and has revealed that they tend to produce laterals in place of both Spanish rhotics (CORTES-

MORENO, 2002; 2014). Accordingly, we might expect the L1 Mandarin-L2 English-L3 Spanish speakers to follow similar patterns.

While very few studies have examined the acquisition of the Spanish /r/ by L1 Mandarin speakers, a significant amount of work has investigated L2 Spanish /r/ production by L1 English speakers. These studies have found that less proficient L1 English speakers tend to initially produce English [ɹ] substitutions, followed by [ɾ] once they have acquired the Spanish tap (WALTMUNSON, 2005, FACE, 2006, JOHNSON,2008). Finally, learners begin to acquire the trill, but in some cases, even very advanced learners are unable to produce trills (JOHNSON, 2008). This is generally attributed to the complex articulation required to produce a target trill. Given that L1 English-L2 Spanish speakers tend to produce [ɹ] substitutions when acquiring the Spanish /r/, we might expect the same from L1 Mandarin-L2 English-L3 Spanish speakers, especially because L3 models (TPM, L2SF) would predict L2 transfer from these speakers. Specific predictions are presented in the next section.

3. Current study

In the present study, phonetic CLI in the L3 Spanish of L1 Mandarin-L2 English speakers was investigated. The study aimed to answer two questions, which are presented below with their respective hypotheses.

RQ1. What is the primary source of CLI in the L3 Spanish of L1 Mandarin-L2 English speakers? Previous studies on L3PP using a global analysis have revealed that L1 status and language dominance may be the most important predictors in L3PP, especially when all three languages are typologically distinct (as in the present study). All speakers in the present study are dominant L1 Mandarin speakers. If the L1 does indeed have a privileged status, then we should expect primarily L1 Mandarin CLI, regardless of other factors. In contrast, if, as the TPM and L2SF would predict, learners are more likely to transfer from their L2, we should expect primarily L2 English CLI.

RQ2. What role do L2 English and L3 proficiency play? While language status may be the most important predictor, L2 and L3 proficiency could also play a role. Speakers with high L2 oral proficiency will have two well developed sound systems that could result in CLI. We can therefore expect more CLI from the L2 as L2 proficiency increases. Moreover, some previous work has revealed that L2 transfer may be more likely from the L2 initially, followed by the L1 as speakers become more proficient in the L3 (e.g., HAMMARBERG; HAMMARBERG, 2005, LLAMA ET AL., 2010, WREMBEL, 2010). If this is the case, lower L3 Spanish oral proficiency is expected to be associated with greater L2 CLI.

4. Method

Two methods of analysis were used to determine the source of CLI. In the global analysis, CLI was established according to perceptions of a foreign accent. Spanish-speaking judges listened to passages read by L1 Mandarin-L2 English-L3 Spanish speakers; the judges had to indicate what they believed the native language of the speakers to be. Spanish- and English-speaking judges

also rated the strength of the L2 English and L3 Spanish foreign accents (respectively), which were used to determine oral proficiency. A full description of the methodology is included below. For the local analysis, the CLI source was established according to the type of substitute ([l], [ɹ], or [ɻ]) produced for the L3 Spanish trill target. The productions analyzed were elicited from the same participants who produced the passages that the judges listened to. These participants produced isolated L3 Spanish, L2 English, and L1 Mandarin words, which elicited production of: (1) The Spanish /r/; (2) The English /ɹ/ (to ensure that the L2 English /ɹ/ had been acquired, and was therefore a possible source of transfer); (3) The Mandarin /ɻ/ (to determine what type of segment the participants produce in Mandarin, in order to identify any possible L1 transfer. Full details regarding the methodology of the local analysis can be found in Patience (2018).

4.1 Judges

Twenty-two Spanish-speaking judges were included in the study. Ten judges were L1 Spanish-L2 near-native English speakers, whereas 12 judges were L1 English-L2 near-native Spanish speakers. Judges answered a brief questionnaire detailing their language backgrounds and their experience communicating with, and teaching, L1 Mandarin and L1 English speakers of Spanish. All of the judges identified that they were familiar with the Spanish spoken by L1 Mandarin and L1 English speakers. All of the near-native Spanish-speaker judges were also Spanish instructors, and had experience teaching Spanish to L1 English and L1 Mandarin speakers. The judges were therefore expected to be fully capable of identifying an English or Mandarin sounding Spanish accent. Moreover, previous work using a similar methodology reported no differences between native and non-native judges' L1 identifications (WREMBEL, 2010).

In addition to the Spanish-speaking judges, 12 native English speaker judges (not the same as the L1 English-L2 Spanish judges) also participated, in order to rate the accent strength of the L2 English passages.

4.2 Stimuli and L3 Spanish speaker profiles

4.2.1 Speaker profiles

Recordings of Spanish and English passages were elicited from 17 native Mandarin speakers (average age = 19.7 years) who had previously acquired English. All were native speakers of Mandarin that grew up in China, and all but one (M04) had similar experiences learning L2 English. The speakers attended English language courses for 3-6 hours per week in both elementary school and early high school. M04 was educated in an English immersion school (starting at age 5), thus spoke primarily English at school, and Mandarin outside of school. As a result, this speaker is not fully comparable to the other speakers, which should be considered as a possible explanation for any observed differences in the results. All speakers were immersed in English after moving to Canada (between ages 13-18; M = 15.5), where they were living for an average of 3.6 years at the time of testing. All 17

speakers were enrolled in first year (N = 12), second year (N = 2), or third year (N = 3) university-level Spanish courses. All speakers, regardless of L2 experience, claimed to be most comfortable speaking their L1 Mandarin, and reported speaking it on a regular basis. L2

English and L3 Spanish oral proficiencies were determined according to accentedness ratings. These ratings were obtained from the judges, and will be presented in the results section.

4.2.2 Stimuli

To elicit the passages in English and Spanish, the participants were recorded while reading "The North Wind and the Sun" passage in Spanish first, and then English. Note that the participants performed additional production tasks in Spanish, English, and Mandarin, to elicit the target rhotics; details can be found in Patience (2018).

Recordings were also included from four L1 Spanish and four L1 English-L2 Spanish speaker controls, to ensure that the judges were able to identify native Spanish speakers, and to ensure that at least some speakers sounded like L1 English learners of Spanish.

4.3 Procedure

The judges completed the task online at surveygizmo.com. The 24 passages were presented in a different random order to each of the judges, who answered questions (1) – (4) after each passage. The fourth question is outside of the scope of this paper, and will not be discussed further.

(1) How would you rate this speaker's foreign accent?
      1 – very strong foreign accent
      2 – strong foreign accent
      3 – noticeable foreign accent, but not too strong
      4 – almost no foreign accent
      5 – no accent (native speaker)
(2) What do you think the native language of this speaker is?
      English
      Spanish
      Mandarin
      Arabic
(3) How sure are you that what you selected is the speaker's native language?
      1 – Not at all sure
      2 – Not too sure
      3 - Relatively sure
      4 - Quite sure
      5 - I have no doubt
(4) What characteristics of the passage influenced/made you believe that the native language of the speaker is what you selected?

Note that speakers were given four possible options for Question 2: English, Chinese, Arabic, and Spanish. The Arabic option was included because

judges were not expected to be familiar with the Arabic accent.[4] They would therefore potentially select Arabic when the accent was not clearly from Mandarin or English. Another possibility would have been to include an "other" option, as in Lloyd-Smith et al. (2017). However, in their study, judges selected this option somewhat frequently (21% for their target group, who were German-Hungarian bilinguals), and identified the speakers as L1 Swedish, Danish, Polish, Russian, and Ukranian. These identifications were problematic, because they suggested that the judges were actually perceiving CLI from German when selecting Swedish or Danish, given the similarity of these languages to German. However, this can only be speculated. Such a problem is avoided with a forced choice option. If the speakers selected 'Arabic' as the L1, they must not have perceived clear CLI from English or Mandarin. The disadvantage of the forced-choice methodology is that L1 English or L1 Mandarin identifications may represent guesses. However, 'guessed' responses were controlled for in two ways. First, speakers were expected to primarily select 'Arabic' when unsure of the accent (given their limited experience with L1 Arabic-L2 Spanish speakers).

Second, speakers were also asked to identify how sure they were of their selection (on a scale from 1-5). The responses can therefore be filtered to remove any 'uncertain' responses ('1' or '2' certainty rating). In the present study, the entire set of responses and the responses with a certainty of '3' or higher are compared in two separate analyses.

The procedure used to obtain the accent ratings in English was the same as that used in Spanish. The only difference was that the English judges only answered a single question: how strong they believed the accent of the speakers to be, on the same scale from 1-5.

4.4 Data preparation and analysis

All data were extracted from surveygizmo.com, and subsequently imported into SPSS v23.0.0.0, which was used for the statistical analysis. Twenty-two judges participated in the study, resulting in a total of 550 total responses (22 judges x 17 recordings by L1 Mandarin-L2 English-L3 Spanish speakers, 4 by L1 English speakers, and 4 by L1 Spanish speakers).
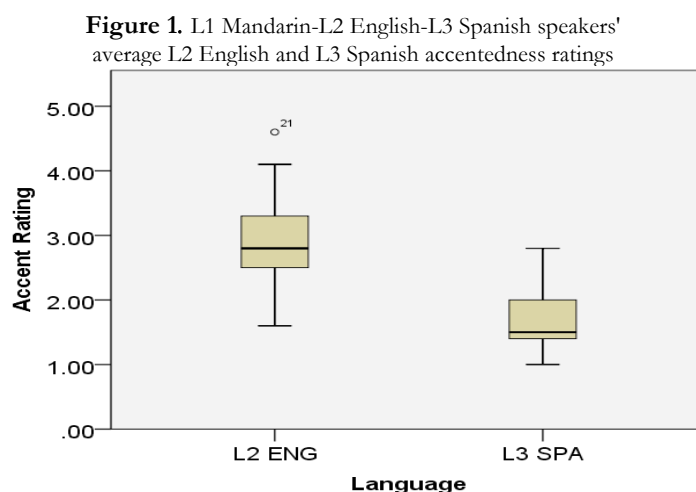
5 Results

In this section, the results of the Spanish and English accent ratings are presented first, as these were used to determine oral proficiency in the L1 and L2. The L1 identification findings will then be presented, beginning with the group results, followed by the individual results.

5.1 Accent ratings

The average English and Spanish accent ratings are displayed in Figure 1. As expected, the overall average English proficiency (M = 3.0; SD = .76)

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[4] The judges' familiarity with L1 Arabic speakers of Spanish was determined according to their responses to the questionnaire they were provided with. Possible responses ranged from '0' (no experience) to '4' (a great deal of experience). All judges selected either '0' (N = 14) or '1' (N = 8).

was significantly higher than the Spanish proficiency (M = 1.7; SD = .61), according to a dependent samples two-tailed t-test (*t* = -8.244, *df* = 16, *p* < .001). Cronbach's Alpha was calculated for both sets of ratings in order to determine interrater reliability. Results were α = .951 and α = .924 for the Spanish and English accent ratings, respectively, both of which indicate a high degree of interrater agreement on accent strength.

Figure 1. L1 Mandarin-L2 English-L3 Spanish speakers' average L2 English and L3 Spanish accentedness ratings


5.2 Global analysis

The first question of interest (RQ1) was whether the L1 Mandarin or L2 English would be a stronger source of CLI. A confusion matrix of the L1 identifications of the three groups of L1 speakers is displayed in Table 2. The L1 English speakers were correctly identified 74% of the time, whereas L1 Spanish speakers were correctly identified 98% of the time, demonstrating that the judges were capable of recognizing L1 English learners of Spanish, as well as L1 Spanish speakers.[5] The target L1 Mandarin-L2 English speakers were correctly identified as L1 Chinese 73% of the time, indicating that characteristics of Mandarin were the most prevalent in the L3 Spanish passages. Moreover, they were only identified as L1 English speakers 16% of the time, revealing that L1 English characteristics were minimal. Note that speakers were also identified as L1 Arabic 11% of the time, which suggests that some judges had difficulty identifying the L1 of certain speakers, which could potentially have been due to a combination of CLI from the Mandarin and English.

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[5] The four L1 English-L2 Spanish speakers had accent ratings of 1.4, 2.5, 3.1, and 3.2, revealing that two of the four speakers were more advanced Spanish speakers than all of the L1 Mandarin-L2 English-L3 Spanish speakers, and one was at the upper end of the L1 Mandarin speakers' Spanish proficiency. The identification rates would likely have been higher if the L1 English-L2 Spanish speakers had been less advanced (note that the least proficient speaker [1.4 oral proficiency] was identified 95% of the time as L1 English), given that the more advanced a speaker is, the less accented their speech, and thus the more difficult they are to identify.

Table 2. Proportion of L1 identifications for each language group

| Speakers	Identified as:			
	L1 Chinese	**L1 Spanish**	**L1 English**	**L1 Arabic**
L1 Mandarin (n = 17)	273 (73%)	0 (0%)	60 (16%)	41 (11%)
L1 Spanish (n = 4) (controls)	0 (0%)	78 (98%)	1 (1%)	1 (1%)
L1 English (n = 4) (controls)	4 (5%)	1 (1%)	59 (74%)	16 (20%)

The second question of interest (RQ2) was whether L3 Spanish and L2 English oral proficiency were associated with L1 identifications. Figure 2 displays the proportion with which each Mandarin speaker was identified as either L1 Chinese, L1 English, L1 Spanish, or L1 Arabic, arranged in increasing order of L3 Spanish oral proficiency according to the accentedness scores.

Figure 2. Proportion of L1 identifications by speaker, ordered by L3 Spanish oral proficiency.
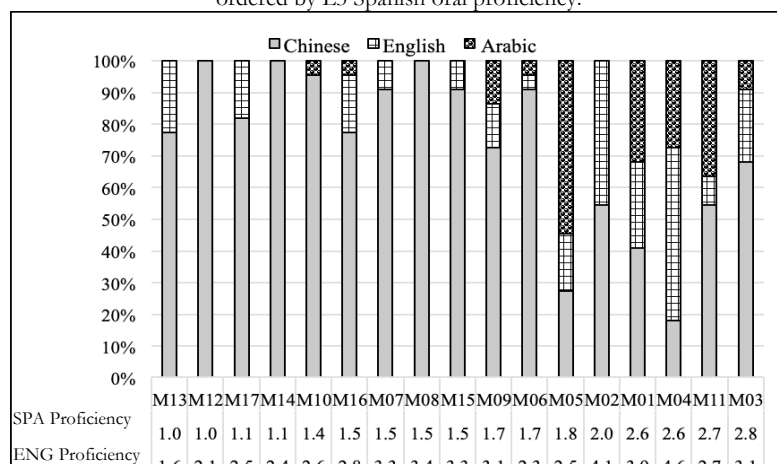
Regarding L3 proficiency, Figure 2 demonstrates that speakers with low oral L3 Spanish proficiency had strong Mandarin accents when speaking Spanish, based on the observation that the 11 least proficient speakers were all identified overwhelmingly as L1 Chinese speakers, with little variability. As they became more advanced, the L3 speakers were identified with some frequency as L1 Arabic (0 – 54.5%) or L1 English (0 – 54.5%).

Figure 3 displays the same L1 identifications ordered by L2 English oral proficiency. The results suggest that L2 proficiency may be a predictor of L2 English identifications, given that the two most proficient L2 speakers (M02, M04) were identified most frequently as L1 English speakers. Note that the lack of L1 English identifications in less proficient speakers may be due to low L2 proficiencies overall.

Figure 3. Proportion of L1 identifications by speaker,
ordered by L2 English oral proficiency.
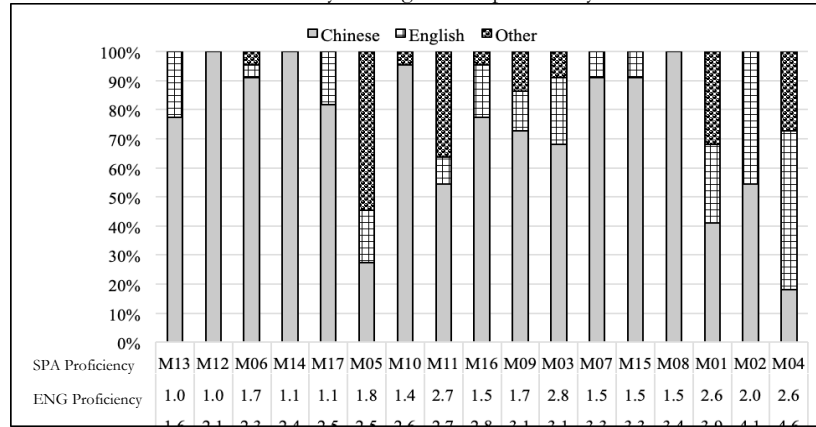
A statistical analysis was conducted to analyze in more detail whether L2 and L3 proficiency played a role in the L1 identifications. A mixed effects multinomial logistic regression model was run on the results of the Mandarin speakers, with L1 identification (Arabic, English, or Chinese) as the outcome variable. 'Chinese' was the reference variable against which the other two possible outcomes (English, Arabic) were compared. L2 and L3 proficiency, and an interaction between the two, were included as the predictors. 'Judge' was included as a random intercept, in order to control for potential variation amongst the judges. Results are displayed in Table 3. While neither L2 nor L3 proficiency on their own were significant predictors, an interaction between L2 and L3 was (β = .759; SE = 0.293; t = 2.587; p = .046). The significant interaction demonstrates that speakers with higher oral L2 and L3 proficiencies were more likely to be identified as L1 English speakers.

Table 3. Results of a mixed effects multinomial logistic regression,
with English (top) and Arabic (bottom), compared to Chinese (reference value)

English compared to Chinese							
						95% Confidence Interval	
Variable	Coefficient	S.E.	t	p-value	β	Lower	Upper
Intercept	0.852	1.657	.514	0.547	2.344	0.090	60.976
ENG Oral Proficiency	0.816	0.607	-1.344	0.153	0.442	0.013	1.459
SPA Oral Proficiency	-1.441	0.924	-1.559	0.130	0.237	0.038	1.456
ENG*SPA Oral Proficiency	0.599	0.299	2.000	0.046	1.820	1.010	3.281
Arabic compared to Chinese							
						95% Confidence Interval	
Variable	Coefficient	S.E.	t	p-value	β	Lower	Upper
Intercept	-0.414	1.796	-0.230	.818	0.661	0.019	22.623
ENG Oral Proficiency	-0.676	0.666	-1.015	.311	0.509	0.137	1.884
SPA Oral Proficiency	-0.153	0.966	-0.158	.874	0.858	0.128	5.738
ENG*SPA Oral Proficiency	0.318	0.325	0.979	.328	1.375	0.725	2.607

Recall from Section 4.3 that the judges were required to indicate how certain they were of each L1 identification. The overall 'certainty' rating was 3.87 / 5 (SD .70), indicating a high degree of certainty overall, but with some variability per speaker. A second analysis was conducted to analyze whether the trends would remain the same after removing uncertain judgements (certainty of '1' o '2'), which potentially represent guesses. Figure 4 reveals comparable trends, with slightly more English identifications in place of Arabic. The same mixed model was run on the new data. Results were similar, although the L2*L3 interaction was only approaching significance (β=0.672; SE=0.362; t=1.853; p=.065). This was most likely due to the smaller sample size (N = 287).

Figure 4. Proportion of L1 identifications by speaker when judges' certainty level was high (i.e. above 3), ordered by L3 Spanish oral proficiency.
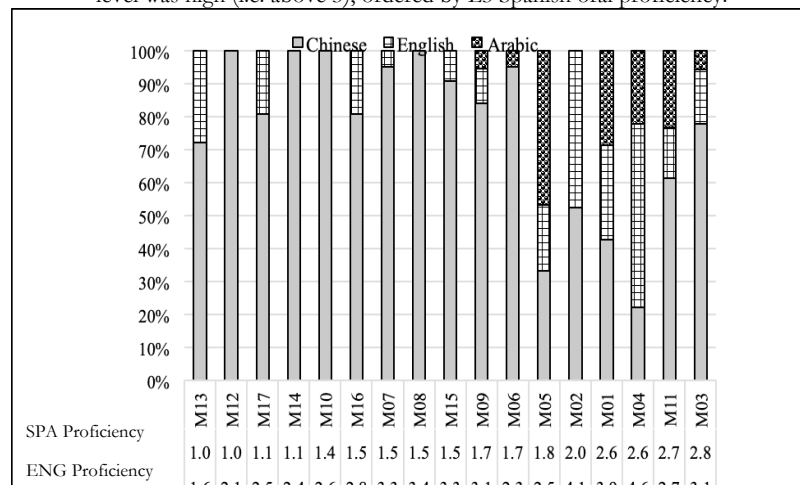

5.3 Local analysis

Figure 5 displays the proportion of each variant produced for the trill target. Native speakers produced a targetlike trill 89.2% of the time, in addition to fricatives 10.8% of the time. In contrast, the L3 Spanish speakers produced target trills only 11.9% of the time. The non-target productions consisted of primarily [l] (24.5%), [dɾ] (18.7%), [ɹ] (15.9%), and [ɾ] (14.9%), as well as a small percentage of [ð] (5.6%), [ð] (4.8%), [d] (2.8%), and [dz] (0.5%). No Mandarin rhotics were observed.

Given that the goal of the present study was to examine L1 and L2 transfer, the substitutions of greatest interest were [l] and [ɹ]. The former was considered to represent L1 transfer, due to the fact that L1 Mandarin, but not L1 English speakers, transfer [l] for the Spanish /r/[6]. The latter was considered to represent L2 transfer, due to its phonemic presence in English. Note that all speakers were able to produce the English [ɹ] when performing the L2 English

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[6] Note that English also has an /l/, which is very similar to Mandarin /l/. Consequently, any [l] substitutions could in theory be transferred from the L2 English. However, the fact that L1 English-L2 Spanish speakers never transfer [l], whereas L1 Mandarin-L2 Spanish speakers frequently do, strongly suggests that the learners are transferring from their L1, or, at the very least, are behaving in the same way that L1 Mandarin-L2 Spanish speakers do.

word reading task, thus [ɹ] substitutions were possible for all participants. The other substitutions were not easily attributable to transfer from either language, and could represent combined transfer, or, in the case of [ɾ], [ð̞] and [ð], L3 transfer.

Figure 5. Percentage realization of each segment for the Spanish trill target, as produced by L1 Mandarin–L2 English–L3 Spanish speakers (M01–17) and native Spanish speakers.
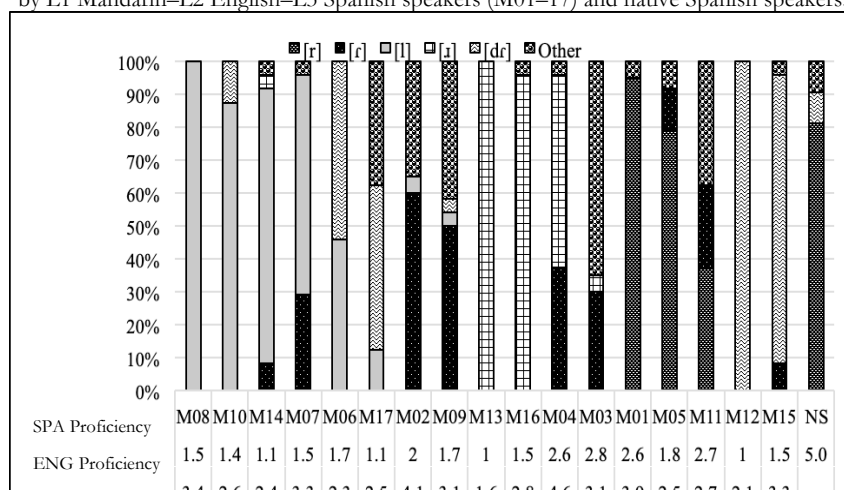
(NS; average results presented in the final column).

Results are ordered by percent realization of [l], followed by percent realization of [ɹ], from lowest to highest. 'Other' refers to [ð̞], [ð], [d], or [dz]. [l] substitutions were more frequent overall, revealing that the L1 was a stronger source of transfer. However, [ɹ] substitutions were also observed, revealing some L2 transfer. To determine whether the L2 or L3 oral proficiency were associated with either L1 or L2 transfer, a Pearson's Rho correlation analysis was performed, comparing L1 and L2 proficiency with [l] and [ɹ] substitutions (Table 4).

Table 4. Spearman's rho correlations comparing L1 Mandarin-L2 English-L3 Spanish speakers' L1 Spanish and L2 English oral proficiency with the proportion of non-target [l] and [ɹ] productions.

	L3 Spanish Prof.			L2 English Prof.	
	[ɹ]	[l]		[ɹ]	[l]
ρ	-0.13	-0.37		-0.13	-0.09
p-value	0.616	0.150		0.597	0.728
Notes. * = p < .05					

There was no correlation between L1 or L2 oral proficiency and the realization of either [ɹ] or [l] substitutions. Therefore, while many of the L1 Mandarin-L2 English-L3 Spanish speakers tended to exhibit production patterns similar to either L1 Mandarin-L2 Spanish or L1 English-L2 Spanish speakers, these tendencies did not increase with higher L2 or L3 oral proficiency. It should be noted that while both [l] and [ɹ] substitutions were

observed, speakers tended to produce either one or the other, and only very rarely produced both variants.

6 Discussion

The objective of the present study was to determine which of two previously learned languages was a more likely source of CLI (RQ1), and whether L2 English and L3 Spanish oral proficiency influenced the source of CLI (RQ2). Regarding RQ1, the results from both analyses suggest that CLI was strongest from the L1 Mandarin, based on the fact that the speakers were predominantly perceived to be L1 Chinese speakers, and the fact that lateral [l] substitutions were more common than English [ɹ] substitutions, as would be expected in L1 Mandarin-L2 Spanish speakers.

The results from the global analysis suggest that some speakers may transfer from both their L1 and L2, which could explain why they were identified as both L1 Chinese and L1 English speakers. However, this can only be hypothesized, and the results from the local analysis do not clearly support or reject this possibility. While the local analysis revealed both L1 and L2 transfer, the learners tended to transfer only from one of the two languages. Almost no evidence of combined transfer from both the L1 and L2 was observed. Nevertheless, results from the global analysis suggest that there may have been some combined transfer. Future work should analyze the acquisition of multiple segments, to examine the possibility of L1 and L2 transfer by the same individual.

Regarding RQ2, in both analyses, L2 and L3 proficiency were not found to be significant predictors. The results from the two analyses therefore indicate that oral proficiency is not a reliable predictor of the source of transfer, and that other factors must be involved. Nevertheless, the global analysis did reveal an interaction of L2 and L3 proficiency, indicating that L2 CLI was more likely as both L2 and L3 oral proficiency increased. This suggests that oral proficiency can play a important role, but that it is dependent on other factors.

6.1 Comparison to previous studies

The findings reported in previous studies on L3PP using a similar methodology (WREMBEL, 2012; 2013) indicated that the L1 was a stronger source of CLI when the three languages were typologically distinct. The results of the present study do not fully support these findings. While L1 transfer was strongest overall in the global analysis, the speakers with high L2 proficiency were identified with similar frequencies as L1 Chinese and L1 English speakers. The different findings may be due the fact that some previous studies using the global accent methodology did not report the L2 oral proficiency of the speakers, which makes it difficult to establish which speakers had a sufficiently developed L2 sound system without any L1 properties. It is thus possible that the present study obtained similar results to those of Wrembel (2012; 2013), but differences in the L2 proficiency measures reported make them difficult to compare. Interestingly, Wrembel (2010) and Hammerberg and Hammarberg (2005) found that L2 CLI was greater in less proficient L3 speakers, and decreased relative to L1 transfer as they became more proficient in the L3. The

results of the present study are not consistent with these findings. Indeed, the opposite was found (L2 CLI/identifications increased with increased L3 proficiency). While the dissimilar findings could be due to different methods used for determining proficiency, they could also be due to the languages involved. In both Wrembel (2010) and Hammarberg and Hammarberg (2005), the L2 and L3 were from the same typological family, which was not the case in the present study.

6.2 Implications for L3 acquisition theories

In the global analysis, the speakers with high L2 English proficiency are of greatest interest, because the accent ratings reveal that their L2 English is nearly-nativelike, and therefore either system could potentially be transferred. While a sample size of three speakers is small, the results suggest that both languages were equally likely sources of CLI (in speakers with sufficient L3 experience). The results from the local analysis also indicate that both languages were potential sources of transfer (although the L1 was more common). These findings can be explained in (at least) two scenarios. (1) There is CLI from both languages initially, which persists throughout acquisition. (2) As proposed in the TPM model (ROTHMAN, 2011; 2015), speakers may initially transfer one system (e.g., the L2 in the current study's language combination). As they gain more exposure to the L3, some L1 segments/properties may be transferred as well, which could then explain the presence of L1 and L2 characteristics in the L3. The results are therefore compatible with the TPM, although as stated in Section 2.1, the study was not designed and is unable to directly test the TPM, because the learners were not tested in their initial state of acquisition. Nevertheless, if speakers do indeed initially transfer a single system (e.g., the L2), it raises the question of why speakers would begin transferring characteristics of their other spoken language (e.g., the L1) as they become more advanced in the L3, especially if the new segments being transferred are no more similar to the target than the segments they originally transferred upon first acquiring the L3. Accordingly, the scenario described in (1), in which both languages are sources of CLI throughout acquisition, is perhaps more plausible in L3PP. This scenario would suggest that learners transfer on a property-by-property basis, from either previously acquired language. Future work on L3PP should determine which of the scenarios is more accurate via a developmental study, examining learners in initial and subsequent stages of acquisition, acquiring multiple segments.

While the results of the present study are compatible with the TPM, they are less compatible with the L2SF (BARDEL; FALK, 2007; 2012), given that the L2SF does not predict CLI from the L1. Note, however, that the L2SF predicts L2 transfer because it assumes that both the L2 and L3 are acquired explicitly, using declarative memory, in contrast to the L1, which is acquired implicitly using procedural memory. Non-native phonology is not necessarily acquired explicitly, thus the L2SF may not be applicable here.

7. Conclusion

The results of the present study have the following implications for research on L3PP. (1) Speakers may transfer from their L1 or their L2, regardless of typological or perceived typological similarity. (2) The

manifestation of L1 or L2 transfer is not necessarily determined by L1 or L2 oral proficiency. (3) Theories must be able to account for the possibility of both L1 and L2 transfer.

Future research should determine why speakers with similar linguistic profiles might transfer from their L1, whereas other speakers transfer from their L2. Moreover, there is a need for studies that investigate the perception/production of multiple segments to achieve a greater understanding of how transfer of previously learned sounds or phonological systems may function, and whether learners initially transfer an entire system, or transfer on a property by property basis.

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