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The Impact of Orthographic Transparency and Typology on L2 Learner Perceptions

A b s t r a c t

While there is substantial research on literacy in the L1, factors impacting literacy in the L2 remain understudied. Preliminary research indicates that orthographic accuracy and typology influence literacy acquisition, indicating these aspects of linguistic representation need further exploration within the context of second-language acquisition (SLA). Additionally, SLA research on individual learner differences highlights emotional factors such as attitude and motivation, which are widely considered critical indicators of L2 success. Motivation is closely linked to perceptions towards the L2, which indicates learner perceptions of L2 literacy could impact success in learning to read and write. As such, this paper presents a cross-lingual, mixed-methods study that compares the orthographic transparency and typologies of 26 languages against learners' ($n = 217$) perceptions of L2 literacy acquisition, such as perceived difficulty of the orthography and a self-assessment of literacy skills. Results indicated that orthographic transparency has a greater impact on learners' perceptions compared to typology alone.

Keywords: phonology, orthography, L2 literacy, literacy acquisition, learner perceptions, grapholinguistics

Language is multifaceted and comprised of many interdependent systems, with phonology as one of the central pillars. As such, all other aspects of a language are inexplicably tied to phonological inventory and processes, including literacy. Research shows that phonological awareness results in higher levels of reading and improved literacy development in the L1 (e.g., Torgesen, 1999) and stronger phonological awareness and phonological working memory are associated with improved encoding of lexemes and literacy in the L2 (Lau & Rickard Liow, 2005; Meschyan & Hernandez, 2004). However, L2 literacy acquisition is still a relatively understudied subfield in second language acqui-

sition (SLA). It was a small field in the early 2000s (Koda, 2005, 2007) and even now remains a niche area of SLA, preventing researchers and language instructors from having a comprehensive understanding. Additionally, there is even less focus on learner perceptions on literacy and how those perceptions are impacted by the orthography itself. Most studies focus, understandably, on literacy skill acquisition.

Of the literature which does exist on L2 literacy, the majority of studies are on English as a second language (ESL). There is minimal research on literacy of other languages and orthographies from an L2 perspective (Cook & Bassetti, 2005; Koda, 2005; Perfetti & Liu, 2005). Even more recent publications that are not focused on ESL are predominantly focused on either Semitic languages (e.g., Eviatar, Taha, & Shwartz, 2018; Havron & Arnon, 2017) or Chinese languages (e.g., Kim, Packard, & Christianson, 2016; Zhang & Roberts, 2019). This research has, however, established that orthographic typology seems to impact processing and the skills needed for literacy.

To contribute further to this small-but-growing area of SLA, this paper presents a cross-lingual, mixed-methods study that examines how the orthographic transparency and typologies of 26 languages influences learners' perceptions of literacy acquisition in the L2. The specific research questions are as follows.
1. How does the phonological accuracy of an orthography impact learner perceptions towards L2 literacy acquisition?
2. How do differences between L1 and L2 orthographic typology impact learners' perceptions towards L2 literacy acquisition?

Literature Review

Phonological Transparency and Literacy

Phonological awareness has been tied to stronger literacy (Lau & Rickard Liow, 2005; Meschyan & Hernandez, 2004; Torgesen, 1999) and phonological transparency is key to stronger phonological awareness (Carlisle, 2004; Lau & Rickard Liow, 2005). These two concepts are strongly related but also critically different, so it is important to define each. Phonological awareness is a general (i.e., non-metalinguistic) sense of a language's phonological inventory and processes. Some scholars contrast this with phonemic awareness, which is an explicit (i.e., metalinguistic) knowledge of a language's phonological inventory (Torgesen, 1999). Phonological transparency refers to how intact the base form

(stem) of a word is in the derived or inflected form (Carlisle, 2004). For example, ⟨heal⟩ [hil] is the stem in both ⟨healing⟩ [hiliŋ] and ⟨health⟩ [hɛlθ]. In this example, ⟨healing⟩ is phonologically transparent but ⟨health⟩ is phonologically opaque (Carlisle, 2004). Research with children indicates that phonological awareness and orthographic phonological transparency have impacts on L1 literacy development; more phonologically opaque words are seen as more difficult for readers to correctly identify and lower degrees of phonological awareness correlate to lower levels of literacy (e.g., Carlisle, 2004; Torgesen, 1999; Windsor, 2000).

This implies that the more phonologically accurate an orthography is, the easier it will be to learn to read. This paper distinguishes between "phonological accuracy" and "morphological accuracy" in regards to orthographic transparency. An orthography may have high phonological accuracy, in which case everything is written as it is pronounced. An orthography may also have high morphological accuracy, in which case the surface form resulting from morphophonological processes are disregarded in lieu of maintaining accurate representation of the underlying forms. This is a divergence from more general terms such as "orthographic depth" or "orthographic regularity" because the distinction allows discussion about accurate representation of underlying vs. surface forms. The example of ⟨health⟩ above represents higher morphological accuracy and lower phonological accuracy.

It is also important to note the distinction between a writing system and an orthography. Perfetti and Liu (2005) distinguish them by the level to which they apply, which is also an approach used by Cook and Bassetti (2005) and, more recently, Meletis (2020). A writing system is the series of characters that may be used for a multitude of languages, such as the shared writing system of English and German, based on the Latin alphabet, contrasted with the writing system used for Russian and Ukrainian, based on the Cyrillic alphabet. Orthographies, however, are at the language-level and are the specific set of graphemes and rules that govern how a particular language is written. For example, while English and Swedish may share the Latin writing system they have different orthographies, with Swedish having letters that are not used in normal English like ⟨å⟩ and ⟨ö⟩ and the two orthographies representing different phonemes with different letters, like how ⟨j⟩ encodes /dʒ/ in English but /j/ in Swedish. This paper will follow the definitions as outlined by Perfetti and Liu (2005), Cook and Bassetti (2005), and Meletis (2020).

Literacy Development and Processing

There are several models of literacy processing from a range of disciplines, many of which focus on the information processing and decoding aspects of

reading and writing. Two in particular were foundational for the design and analysis of the present study—Dual Route Model (DRM), also known as Dual-Route Hypothesis, and the LaBerge-Samuel's Model of Automatic Information Processing (hereafter referred to as the LaBerge-Samuel's Model). Both models are influenced by more general information processing models.

Dual-Route Model shows two procedures that readers can leverage during reading—one at the lexical level and one at the sub-lexical level (Angelelli et al., 2018; Coltheart, Curtis, Atkin, & Haller, 1993; Cook & Bassetti, 2005; Paap & Noel, 1991). The lexical procedure is when readers recognize a lexeme as a whole unit and do not break apart each sub-part into phonemes, syllables, morae, etc. The sub-lexical procedure is when subunits are decoded individually to achieve full lexeme decoding. The model has been used widely in literacy acquisition and developmental psychology research, especially in studies focusing on dyslexia. The Dual-Route Model has also been applied to writing, by which writers will either take the sub-lexical route and remember spellings based on individual grapheme-phoneme correspondences and sub-lexical chunks or take the lexical route and remember spellings based on complete wordforms (Cook & Bassetti, 2005).

Dual-Route Model makes the distinction between lexical processing and sub-lexical processing, which is also a feature in the LaBerge-Samuel's Model (Samuels, 1994). This model has multiple procedures by which a reader decodes a text by leveraging visual, phonological, and semantic memory. Similar to the Dual-Route Model, a reader may decode more at the grapheme and subunit level through recognition of spelling patterns, or at the word level through recognition of an entire word unit. This recognized visual stimuli is then connected to phonological information which then links to the meaning of the word (Samuels, 1994). While some other models of literacy processing recognize that decoding of text is not always so bottom-up and linear (e.g., Rumelhart, 1994) and literacy research has indicated that there are more cognitive processes at work than merely decoding visual stimuli (see Doyle, 2013), the LaBerge-Samuel's Model cleanly models the decoding process of literacy by which the reader converts visual stimuli into linguistic information.

Both models indicate that decoding happens more granularly when a word is unfamiliar or when an individual is just beginning to learn to read and write. Then, once spelling patterns and words become more familiar, words can begin to be recognized as a single unit. However, the level of reliance on phonological decoding at the sub-lexical level appears to differ across orthographies (Angelelli et al., 2018; Cook & Bassetti, 2005; Koda, 2008; Perfetti & Liu, 2005). For example, phonological activation occurs prior to word identification for languages such as English but not Chinese (Perfetti, Zhang, & Berent, 1992). This is explored further in the following section.

Dual-Route Model and the LaBerge Samuel's Model are primarily about the cognitive procedures used for encoding and decoding language. If one takes the stance that the core function of an orthography is to encode a particular language, then it is also assumed that the core process behind reading is decoding linguistic information from written symbols. In other words, reading is "converting graphic input to linguistic concepts" (Perfetti & Liu, 2005). It is important to note that this encoding to linguistic information may not always be at the phoneme or even the syllable level (Bassetti, 2005; Cook & Bassetti, 2005; Koda, 2005; Lau & Rickard Liow, 2005). A review of writing systems which are pictographic and ideographic in nature, such as Chinese and Japanese, show that not all orthographies encode simple phonemic information (Perfetti & Liu, 2005). Rather, some orthographies encode a mix of phonemic and semantic information. As an example, the Japanese word for "to think (about)" is /kaŋgaɛɾɯ/ and written as ⟨考える⟩, with an ideographic symbol – 考 – and two syllabary graphemes – え /ɛ/ る /ɾɯ/. Analysis of other levels of encoding, such as this, leads to the proposal of the Universal Phonological Principle (UPP), which states that during reading, phonological information is activated at the lowest level allowed by that language's orthography (Perfetti, Zhang, & Berent, 1992; Perfetti & Liu, 2005). This may be at the level of the phoneme (e.g., Russian), syllable (e.g., Cherokee), morpheme (e.g., Chinese) or even word (e.g., Japanese gikun words). An important note is that this does not mean readers decode a single grapheme as a single unit, since some orthographies use multiple graphemes for a single phonological unit. As an example, English encodes /t/ as ⟨t⟩ but /ʃ/ as ⟨sh⟩ (Perfetti, Zhang, & Berent, 1992). This ties to the concept of "grain size," which is the smallest amount of orthographic information needed to successfully decode the orthography into linguistic units (Cook & Bassetti, 2005, p. 16). For example, Italian has a very small grain size due to the very simple phoneme-grapheme correspondence in the orthography. Conversely, English has a higher grain size which sometimes requires multiple graphemes making up a full syllable to be decoded as a chunk (Cook & Bassetti, 2005), such as the ⟨ough⟩ /u/ in ⟨through⟩ /θɹu/.

These ideas raise interesting questions about the potential influence of phonological accuracy and orthographic typology on literacy. Much research tying phonological transparency and phoneme awareness to literacy has been focused on English and other alphabetic languages, where phonological information is encoded at the phoneme level. These ideas also highlight the importance of phonological activation for literacy, regardless of the orthographic typology.

There is some disagreement in the literature about the role of phonological activation for literacy and exactly when in the reading process phonological activation occurs. It is fairly well established that phonological activation is a part of the reading process, regardless of writing system typology (Cook & Bassetti, 2005; Perfetti, Zhang, & Berent, 1992), but the typology can im-

pact when this activation occurs in relation to activation of other linguistic features (Cook & Bassetti, 2005). Assuming this is true, then this implies the more easily readers can identify phonological segments during phonological activation, the easier the word form itself can be successfully decoded. This leads to the idea that an orthography that is ideal for literacy is one that best facilitates the most efficient encoding and decoding of wordforms. As can be seen, phonological activation is a part of this encoding and decoding process and strong phonological awareness appears to be a better indicator of literacy skills in young English L1 readers than morphological awareness (Windsor, 2000), though the importance of morphological transparency and awareness should not be forgotten.

There is a disjunction between phonological and morphological accuracy in orthographies, with the two often being two ends of a spectrum. Some languages that have minimal morphophonological processes tend to be both phonologically and morphologically transparent, allowing the orthography to also be both phonologically and morphologically accurate. However, morphophonological processes result in opacity of underlying forms, which in turn results in either a morphologically or phonologically inaccurate orthography. So, which is better for literacy processing? Is it better for an orthography to represent the underlying morphemes, disregarding phonological processes, or provide a more accurate phonological representation, obfuscating underlying morphemes?

Literacy studies, including the present study, seem to suggest that phonologically accurate orthographies should be easier to read. Early writing on phonology and orthographies took this approach to the extreme. For example, from Pike's 1947 guide *Phonemics: A Technique for Reducing Languages to Writing:* "Once the native learns an orthography which is closely correlated with his sound units, there is no 'spelling' problem. Everything is spelled as it is pronounced and pronounced as it is spelled" (Pike, 1947, p. 57). Swadesh (1934) took a similar stance by suggesting that orthography development should be a mere phoneme-to-grapheme relationship.

However, Carlisle (2004) argues for the opposite—more morphological accuracy. Carlisle (2004) and others have shown the importance of morpheme awareness on literacy processing (Bryant & Nunes, 2006; Koda, 2005, 2007). She gives the example of how confusing it may be to recognize the English plural suffix if English spelled words with too much phonological accuracy, such as [kæts ænd dɔgz] being encoded as *⟨cats and dogz⟩ rather than ⟨cats and dogs⟩ (Carlisle, 2004). Another example of higher morphological accuracy in a different writing system is from Korean, which uses Hangul. In Korean, the formal indicative form of a verb has the suffix ⟨ㅂ니다⟩, which could be literally transcribed as /b.ni.da/, as in 줍니다 "give" /dʒumnida/. 줍니다 is spelled with ⟨ㅂ⟩ /b/, which becomes [+nasal] when preceding an nasal. The underlying

morpheme is retained by writing 줍니다 rather than *줍니다, using the Hangul letter for /m/ – ⟨ㅁ⟩.

Snider (2014) proposes a sort of compromise—one which appears to be strongly supported by the collective research on literacy development. He proposes that in cases of derivational morphology, more phonological accuracy should be preferred whereas in cases of inflectional morphology, more morphological accuracy should be preferred. The reason for this is that speakers are likely more sensitive to morphophonological changes in cases of inflectional morphology (Snider, 2014). This is likely because inflectional morphology is often a more productive part of the language, meaning the surface forms are more readily accessible and, therefore, do not need to be represented as accurately. This is echoed by Willis Oko (2018) when discussing orthography development for unwritten languages. Her stance is that if the target audience of readers are native speakers, then it could be assumed that phonological changes due to productive morphology could be represented with their underlying forms, seeing as native speakers will be fluent in these alternations. However, if the target audience of readers are semi-fluent or new learners then a more phonologically transparent orthography would be preferred so that those without native speaker intuitions could still accurately decode the text sub-lexically into correct pronunciation. Transferring this to foreign language students, it could very well be the case that more morphologically transparent orthographies serve native speakers very well but provide more difficulties for learners of the language. It is possible that new learners of an orthography rely heavily on sub-lexical decoding and cannot yet decode entire morphemes and lexical units. A more phonologically accurate orthography would better enable this sub-lexical route of processing.

Literacy Development in the L2

Despite substantial research on literacy development in the L1, there remains sparse literature focusing on literacy acquisition in the L2, much of which has been focused on L1 transfer to the L2 (Cook & Bassetti, 2005). While research on L1 literacy does provide insight, literacy acquisition for the L2 is impacted by the L1 and, as a result, it is different and more complex (Bassetti, 2005; Cook & Bassetti, 2005; Koda, 2005, 2007). The Transfer Facilitation Model (TFM) assumes that all reading is filtered through L1 metalinguistic knowledge and L1 literacy experience (Koda, 2005). It is common for learners to already have some level of literacy in their L1, which can result in transfer that impacts processing of the L2 orthography (Koda, 1998, 2005, 2007).

As an exercise, examine the grapheme ⟨j⟩. In some languages like Spanish this grapheme encodes /h/, in some like Swedish it encodes /j/, and in others

like English it encodes /dʒ/. The phonological activation of ⟨j⟩ for readers who speak Swedish and English both will likely differ than readers who only speak one of these languages. Additionally, the activation of ⟨j⟩ will also be different for speakers of Swedish and English compared to readers who know Swedish and Danish (which also encodes /j/ with ⟨j⟩). As a more specific example, a popular German tourist destination is the town of Rothenburg, which is read [ʁotn̩bʊʁk] in German but is often mistakenly read as [ɹɑθɪnbɹg] by English speakers due to, among other things, incorrect decoding of ⟨th⟩ as [θ] from L1 interference. Meschyan and Hernandez (2004) explore this in detail, focusing on phonological working memory and other cognitive processes impacting both vocabulary and literacy acquisition in the L2. They define "phonological working memory" as "temporary storage for unfamiliar sound forms until more permanent representations are constructed" (p. 74). In other words, a reader must store newly learned phoneme and grapheme correspondences in their working memory until long-term retention (LTR) is achieved. As in the above example, remembering to read ⟨th⟩ in German as [t.h] instead of [θ] requires use of phonological working memory for beginner German readers with an English L1 background. Similarly, learning completely new graphemes and associating these symbols to phonemic units requires phonological working memory, like when a student is learning to read Russian and must remember that ⟨я⟩ encodes /ja/ until LTR is achieved. Phonological ability is considered a combination of phonological working memory alongside phonological awareness, which has been linked to better acquisition of new lexemes and literacy in the L2 (Meschyan & Hernandez, 2004). The examples of ⟨j⟩ and ⟨th⟩ demonstrate how the L1 can influence the L2, which can in turn influence literacy acquisition and decoding accuracy. It may be easy to assume that learning to read an L2 orthography with the same writing system as the L1 should be an easy task, but the above examples show that things are not so clear-cut.

Koda (1998, 2005) has explored the transfer of L1 literacy to the L2 and found that L1 phonological processing behaviors seemed to carry from the L1 to the L2, meaning the orthographic typology of the L1 comparative to the L2 can also impact L2 literacy acquisition. In her study, Koda compared English L2 orthography decoding behavior between students of alphabetic (Korean Hangul) and non-alphabetic (Chinese Hanzi) L1 backgrounds. The relationship between phonemic awareness and decoding of written words was stronger for Korean L1 readers compared to Chinese L1 readers (Koda, 1998). This corroborates prior research that indicated phonemic awareness transfers between Spanish and English, both of which use the Latin writing system (Koda, 1998).

This does not mean there is identical processing across alike typologies–there is still different processing from one orthography to the other even within the same writing system. For example, German readers tend to rely more on phoneme-grapheme decoding during reading compared to English readers, who

tend to also rely on whole-word decoding due to the inconsistencies of English spellings (Perfetti & Liu, 2005). Koda also cites prior research on young English and Japanese readers, comparing an alphabet to a syllabary, which indicated that alphabetic literacy better promotes phonemic awareness (Koda, 1998). These studies and others (e.g., Bassetti, 2005, Lau & Liow, 2005), demonstrate that not only phonological and morphological accuracy impact L2 literacy acquisition but also the typology of the L1 orthography. This is yet another way L2 literacy is more complex than that of the L1.

Learner Perceptions and Motivation

The current study seeks to explore L2 learner perceptions and attitudes towards literacy, primarily due to the strong relationship between learner attitudes and learner motivation (Dörnyei, 2005; Gardner, 1985). These attitudes may be in relation to the language community or the language itself. In the case of the present study, the focus will be on attitudes towards the language, especially the orthography. Perceptions of the orthography being easy or difficult could potentially put learners in a positive or negative frame of mind when engaging in literacy practice. Additionally, frustration over orthography difficulty could lead to negative emotions being related to literacy. This is important because motivation is tied to emotional factors (Dörnyei, 2009). These factors could be positive emotions such as confidence or negative emotions such as frustration (Dörnyei, 2009). Therefore, negative emotions associated with an orthography or, conversely, positive emotions associated with an orthography could influence learner motivation to learn to read and write. These emotions and perceptions could even influence learners' decisions about trying to achieve literacy at all. As an example of this, the Japanese orthography is generally considered extremely challenging to learn and literacy is often the most difficult aspect of acquiring the language (Paxton & Svetenant, 2014). As a result, it is not unusual to see certain Japanese instructional books avoid the orthography altogether to cater to those learners who do not want to struggle with it. *Japanese for Busy People* is a popular self-study book series that offers a fully "Romanized" version where all Japanese words are transcribed using the Latin alphabet (Association for Japanese-Language Teaching).

In addition to SLA research on more general emotional factors, there has been substantial focus on individual differences, of which motivation is a component. Individual differences refer to unique or personal factors that make each learner different and, thus, make each learner approach language learning slightly differently. These differences are believed to impact how successful an individual may be at learning the L2 (Dörnyei, 2003). Commonly examined individual differences include language aptitude, attitude, motivation, and

learning styles (Dörnyei, 2003). Of these, motivation is considered among the most critical indicators of L2 success (Gass, Behney, & Plonsky, 2013, p. 453).

Considering the importance of motivation on L2 learner success and the close relationship between attitude and emotion on motivation, this study seeks to better understand attitudes and perceptions of learning L2 orthographies. It is hoped that results will provide insight that can aid in motivational techniques for foreign language students as well as give educators a better understanding of potential circumstances which may necessitate early intervention for student success.

Methods

To address the research questions, the author performed a pilot study to inform the present study, which uses two components—a semi-structured survey and an analysis of orthographies. The pilot study was a small, simplified online survey of eight questions. The survey focused on testing the questions and assessing the validity of the data analysis. The data from the pilot was fully analyzed to identify potential gaps or shortcomings of the nature of data collected. Additionally, it allowed for a test of the survey content to ensure that participants understood the questions and that the questions yielded the desired type of data.

The pilot survey was semi-structured with a mix of quantitative and qualitative questions that focused on learner perceptions of difficulties with L2 literacy acquisition. The survey also collected basic information regarding the learner's L1, their L2, and self-assessments for general fluency and literacy.

The pilot study had a total of 55 respondents, 35 of which were English L1. The 55 respondents collectively gave answers about 14 different languages. The orthographies of these 14 languages were then assessed for phonological accuracy and typology to compare against the transparency and typology of the corresponding L1. Preliminary results from the pilot indicated that more accurate orthographies are easier to learn, regardless of the orthographic typology. The present study attempts to verify these initial findings from the pilot using an improved survey and larger data set.

Like the pilot, the present study leveraged a semi-structured online survey modeled after the version used in the pilot. Based on the results from the pilot study, more biodemographic questions were added and the phrasing of one question was modified to avoid confusion that was encountered by respondents in the pilot. Being semi-structured, the survey was a mix of qualitative and quantitative questions, though the quantitative questions were largely in

place to capture descriptive statistics and control variables such as L1 and self-assessments of the L2. To assess learner perceptions, the below two questions were asked about the respondents' identified target languages:

"Please describe any difficulties with learning the writing system, including learning new symbols and learning the proper spelling of words."

"What frustrated you most about learning to read the language?"

Following data collection, an analysis was performed on both the L1 and the L2 orthographies reported by respondents of the survey. The analysis focused on the phonological accuracy of the orthographies themselves which, as discussed in the literature review, is the degree to which a word's written format accurately reflects its pronunciation. Until recently, there was not a strong way to quantify phonological transparency or orthographic accuracy with much confidence (Borleffs, Maassen, Lyytinen, & Zwarts, 2017). However, very recent developments in research using artificial technology have shown some promising results. Marjou (2021) used artificial intelligence to give different orthographies a score for orthographic transparency. While this research is still preliminary and the results are not exhaustive for all languages captured in the survey, it does serve as a good baseline for analysis and is more reliable than the subjective analysis performed for the data gathered from the pilot. Additionally, since specific percentage scores from Marjou (2021) are not available for all languages, the full analysis was partially subjective and could not be as accurate as the data from Marjou (2021). Therefore, languages were merely given a Low, Medium or High ranking that was meant to be largely relative for the purposes of comparing against the survey data set. For example, even though Italian was shown to have a higher transparency score than Spanish (Marjou, 2021) both were given an orthographic accuracy score of High due to their relative accuracy compared to many other orthographies such as French, English, and Japanese. Additionally, some orthographies that are sometimes considered more "regular," such as French, still have lower orthographic phonological accuracy in terms of grapheme-phoneme correspondence and reflecting surface form vs. underlying form so they received a lower ranking. Ultimately, it was also decided that a Very Low ranking should be used for writing systems that encoded meaning over phonological information and are therefore much less phonologically transparent and difficult to learn, such as Japanese kanji. A ranking of Very High was not deemed necessary and was thus not added to the ranking system. For the purposes of comparing rankings, these values were also given corresponding numbers, Very Low = 0, Low = 1, Medium = 2, High = 3. While not perfect, this method allowed for key patterns to be isolated among the survey results and provide a basic foundation on which

to ground the following analysis. Appendix A includes the rankings given to each orthography. The results of the analysis were then compared against the answers from the survey to find possible patterns.

Results and Analysis

The survey for the present study had 233 completed responses recruited through online language learning communities and social media. Once responses were reviewed, 16 responses were thrown out due to malformed data or invalid responses, resulting in a final total of 217 responses for analysis ($n = 217$). SPSS 25 was used to perform the quantitative analysis and run descriptive statistics. Of the 217 respondents, 116 (53.5%) identified as female and 87 (40.1%) as male, with the remaining 14 (6.4%) identifying as non-binary or preferring not to answer. 121 (55.8%) respondents were between the ages of 18 and 34, which is likely a result of the recruitment methods. All but 26 respondents (88%) were under the age of 55. Education level was a mix, with 69.1% of the respondents having completed college and 30.4% of those also having completed graduate school. Across all 217 responses, there was a total of 30 unique native languages identified, with 145 (66.8%) being L1 English. For target language, there were 26 unique languages identified. The writing systems and writing system typologies for each language were identified and are listed in Tables 1 and 2. A more detailed breakdown of L2 languages among the responses are listed in Appendix A. In addition to the primary target languages identified, respondents frequently listed additional languages they had exposure to or had learned. For the purposes of the present study, only the primary target language was the focus for each respondent's answers.

Table 1

L1 Writing Systems and Typologies in Responses

L1 Writing System	Typology	Frequency	Percent
Arabic	Abugida/Abjad	3	1.4
Brahmic	Abugida/Abjad	4	1.8
Cyrillic	Alphabet	12	5.5
Hanzi/Kanji	Picto-/Ideographic	2	0.9
Latin	Alphabet	196	90.3

Table 2

L2 Writing Systems and Typologies in Responses

L2 Writing System	Typology	Frequency	Percent
Arabic	Abugida/Abjad	8	3.7
Brahmic	Abugida/Abjad	1	0.5
Cyrillic	Alphabet	12	5.5
Greek	Alphabet	1	0.5
Hangul	Alphabet	1	0.5
Hanzi/Kanji	Picto-/Ideographic	35	16.1
Latin	Alphabet	159	73.3

As seen in Tables 1 and 2, the majority of the respondents had a Latin-based Alphabet for their L1 and their L2, and there were a few incidents of L2 writing systems with minimal responses. Rather than looking specifically at writing systems, much of the following analysis was focused on L1 and L2 writing system typologies, which is a broader category (e.g., Greek and Hangul both fall under Alphabet). When comparing the L1 writing system typology to that of the L2, the typologies mismatched in 50 (23%) of the responses while matched in the remaining.

In a self-assessment of L2 literacy abilities, which was prompted with a 0–10 sliding scale, 146 (67.3%) indicated they felt they at least a moderate (> 5) level of literacy. Scores of self-assessed literacy skill were higher on average (6.11) than the self-assessment of general fluency (4.94), possibly due to the fact that, generally, it is faster to learn the L2 orthography than the entirety of the L2. This was also seen in the data collected from the pilot survey.

Additionally, 37.8% of the respondents assessed their reading abilities at 8–10 compared to only 20.3% of the respondents giving an 8–10 score on self-assessment of fluency, which also follows the pattern seen from the pilot. The exceptions to this were the responses with a target language of Chinese (Mandarin) or Japanese, with much more complex orthographies that can take years to master. For these two target languages, no respondents indicated a 9–10 for literacy skills and 77.1% put 5 or lower compared to only 62.9% put 5 or lower on general fluency. It is important to remember these are self-assessments only, so while they may not indicate actual fluency and literacy abilities, they do provide insight into learners' perceptions of their own skills, which is more relevant for the present study.

The answers to the two open-ended questions were coded to determine patterns across respondents' perceptions. The codes were designed to capture the presence or absence of difficulty with literacy acquisition and, if present, the nature of the difficulty. The codes for difficulty indicated whether the

respondent had problems with general spelling, diacritics, phoneme-grapheme correspondence, or the writing system itself. General spelling covers memorizing spelling patterns and remembering "silent" letters, etc. There is some overlap between the general spelling and the phoneme-grapheme correspondence difficulty code, but the grapheme-phoneme correspondence was specific to difficulty remembering correspondences or learning new correspondences, such as in one response from an English L1 learner of Dutch: *Some letter combinations produce different sounds than they do in English*. A distinct code was used for problems with diacritics due to the frequency of comments about accent marks and umlauts (12%). The difficulty code for writing system was used for responses which explicitly stated difficulty learning new symbols for writing, such as one respondent who was an English L1 learner of Arabic: *Different alphabet and right to left writing*. Table 3 shows the complete breakdown of the difficulty codes from the data set. Of the 47 responses coded for writing system difficulty specifically, 37 were for a target language of Chinese (Mandarin) or Japanese.

Table 3

Descriptive Statistics for Difficulty Codes

Nature of Difficulty	Frequency	Percent
None	105	48.4
Spelling	29	13.4
Diacritics	26	12
Phoneme-Grapheme Correspondence	10	4.6
Writing System	47	21.7

The free-form answers to the open-ended questions in the survey also provide some interesting insight. While many respondents put brief answers, stating they had no issues with learning to read and write, others gave more in-depth responses. Some of the more notable results from both the quantitative analysis and qualitative answers are provided in the following sections.

Difficulty and Self-Assessed Literacy

A Univariate Analysis was run to compare the literacy self-assessment score with reported difficulty given based on qualitative answers. There was a statistically significant correlation with perceived difficulty and the self-assessment of literacy skills ($F = 25.938$, $p = .00000076964604651431$, $\eta^2 = .108$) with an observed power of 0.999. In other words, if a respondent expressed difficulty

with learning to read their target language, then they were more likely to also rate themselves as less literate compared to the respondents who expressed no issues with learning to read or write. Since the literacy assessment was a self-assessment, it is not clear whether difficulty with L2 literacy acquisition actually results in lower levels of literacy skill or merely a perceived lower level of literacy skill. Additional research would be necessary to determine whether this difficulty merely results in a lack of confidence in one's own literacy or if there is actually an impact to literacy abilities. If the latter, it would be valuable to explore whether this impact was related to difficulty of the L2 itself or due to avoidance of literacy practice stemming from frustration or poor experience with learning. Another possible explanation is that learners who are still not very literate are still in the midst of learning to read and write, so they perceive the difficulty more strongly compared to more literate respondents who may have forgotten some of their early struggles.

L1 and L2 Mismatch

To assess a potential relationship between L1 and L2 writing system typologies and perceived difficulty, a Chi-square test was run to compare difficulty from qualitative answers to both L1–L2 writing system mismatch and typology mismatch. Interestingly, while the Chi-square test indicated a statistically significant correlation between perceived difficulty and both typology and writing system, the significance for the typology mismatch—X^2 (1, $n = 217$) = 24.022, $p = .00000095255810167634$—was greater than for the writing system mismatch—X^2 (1, $n = 217$) = 18.001, $p = .00002207434151596157$. This indicates that, while a new writing system in general is usually perceived as more difficult, there is a much stronger chance of perceived difficulty when the typologies of the L1 and L2 writing systems do not match. This was also the case during the pilot.

These results initially seem very significant. However, Chinese and Japanese both have exceedingly more complex writing systems compared to, for example, Arabic or Russian, since they encode linguistic information at the morpheme level as opposed to the phoneme or syllable level. Therefore, to verify the significance of the Chi-square test, responses for L2 Chinese (Mandarin), Chinese (Cantonese), and Japanese were removed and the tests were re-run with the remaining data ($n = 182$). With these more complex writing systems removed, the significance of the relationship between difficulty and typology mismatch vanished—X^2 (1, $n = 182$) = .365, $p = .54548840201428050000$—but the relationship between difficulty and writing system difference remained significant—X^2 (1, $n = 182$) = 1.068, $p = .30138063626919240000$—albeit only at the 0.05 level. This indicates that the level of linguistic information encoded by

the orthography, which often determines complexity, influences the relationship more than typology mismatch alone.

For all of these relationships, tests were also run with age, gender, and education level as controls to confirm these were not significant factors. Results showed that the relationship between L1–L2 writing system and typology mismatch were still statistically significant even when controlling for age, gender, and education level. Additionally, when looking at age, gender, and education level compared to general difficulty, there was no statistically significant relationships, indicating these are not significant factors for learners' perceived difficulty of literacy acquisition in the L2.

Orthographic Phonological Accuracy

Based on the ranking of orthographic phonological accuracy given to each language, results were given a Transparency Offset score, which indicated how much more or less the transparency of the orthography of the L2 was compared to that of the L1. For example, if the L1 was a High (3) transparency and the L2 is a Low (1) transparency, the offset score was –2. This offset was then compared to difficulty scores to examine potential relationships.

A Univariate Analysis was used to compare difficulty to transparency offset scores. There was a significant (F = 17.625, p = .00003938537485147854, η^2 = .076) relationship between difficulty and transparency offset codes that indicated the less transparent the L2 is relative to the L1, the more likely a respondent will report difficulty learning to read.

Figure 1

Chart Comparing Transparency Offset to Reported Difficulty

Reported Difficulty and Transparency Offset
All Responses (n = 217)
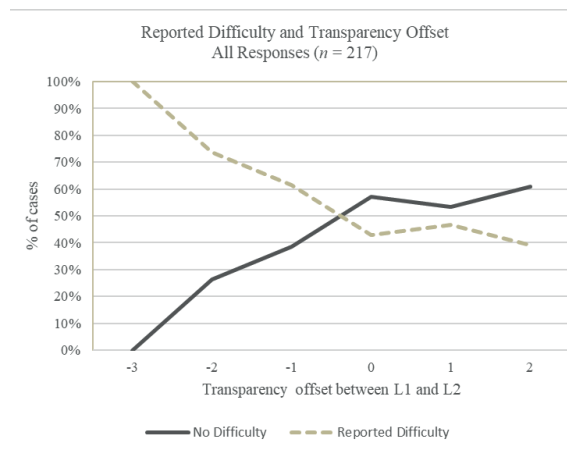
To explore this further, responses for L2 Chinese (Mandarin), Chinese (Cantonese), and Japanese were removed ($n = 182$) and a Univariate Analysis was run again to compare difficulty with transparency offset. As seen with other tests, the correlation between difficulty and transparency offset was not as significant once the more complex writing systems were excluded from the analysis ($F = .738$, $p = .39154513894622280000$, $\eta^2 = .004$).

Figure 2

Chart Comparing Transparency Offset to Reported Difficulty Excluding Chinese and Japanese L2 Responses
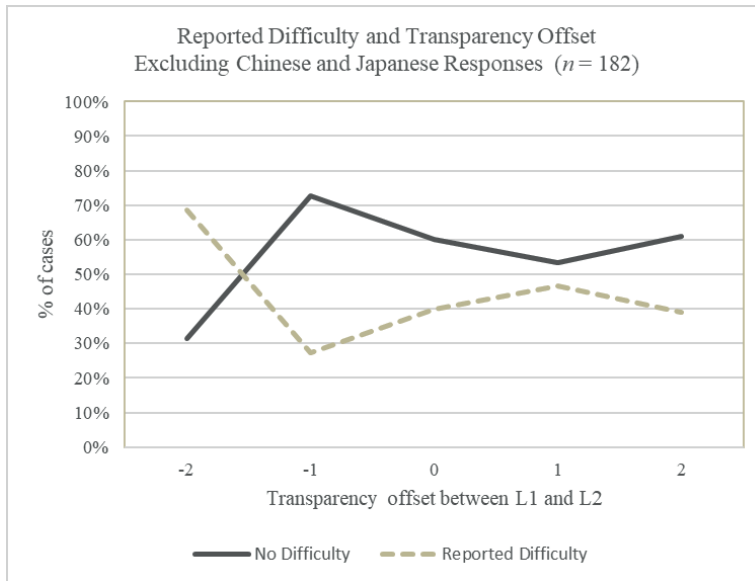
Transparency offset scores were also compared to self-assessed literacy skills using a Univariate Analysis. Transparency offset showed to have a significant relationship with self-assessed literacy ($F = 4.913$, $p = .00028295736452932905$, $\eta^2 = .104$). However, as with other tests run, Chinese (Mandarin), Chinese (Cantonese), and Japanese L2 responses were removed and the tests rerun. With the more opaque writing systems of Chinese and Japanese removed, the correlation between transparency and self-assessed skill did not show to be as strong, but still significant ($F = 6.017$, $p = .00014579934867490815$, $\eta^2 = .120$). Figure 3 summarizes the significant relationships (*p*-values) between tested variables when all responses were considered ($n = 217$). However, considering the impact more opaque writing systems Chinese and Japanese had on the analysis, Figure 4 shows how the relationships changed when those L2 responses were removed ($n = 182$).

Figure 3

Model of Significant Relationships across all Responses
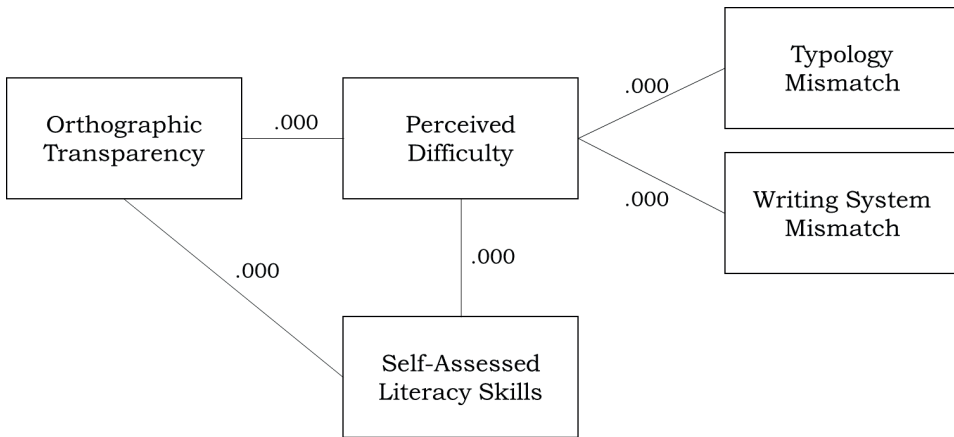
Figure 4

Model of Relationships Excluding Chinese and Japanese L2 Responses
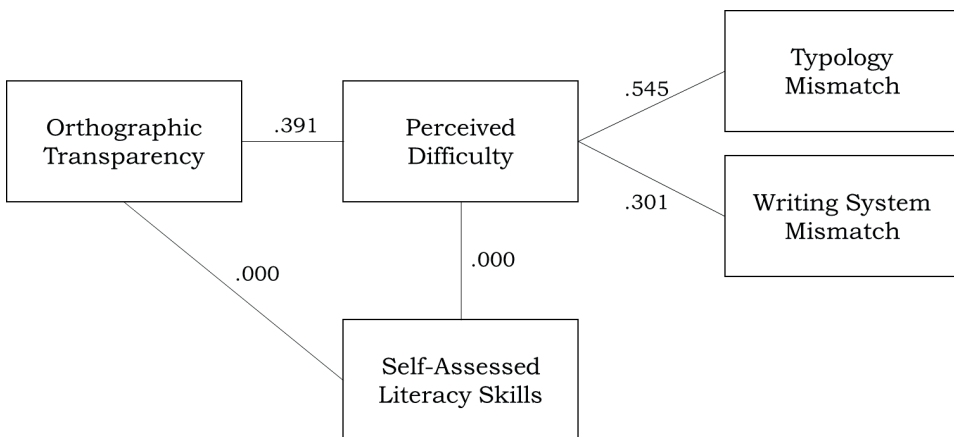
This is further evidence that it is not merely the typology and writing system alone but also the level of complexity of the orthography. The remaining results sections are largely excerpts from the qualitative answers.

Perception of Phonological Accuracy

A common complaint among responses was about phonological accuracy and, when responses mentioned learning to read was easy, they sometimes attributed this to the phonological accuracy of the orthography. The following responses are a mix from the present study and the pilot.

"The writing system in Spanish is very easy, in fact it seems more phonetic than English" (L1 English, L2 Spanish)

"[...] if you know the alphabet in Spanish, you can read it." (L1 English, L2 Spanish)

"[…] words aren't spelt the way they are pronounced." (L1 Russian, L2 English)

"I have had three main difficulties with the writing system" […] "There are a number of spelling rules/irregularities, such that it isn't always possible to correctly pronounce unknown words." (L1 English, L2 Korean)

"It is difficult to know whether a word finishes with a d or a t, as they sound the same." (L1 English, L2 Dutch)

Diacritics

There were several responses noting difficulty around the representation of suprasegmental features, such as accent marks for stress. This difficulty could merely be due to lack of accent marks/diacritics in their L1 orthography, making the graphemes harder to remember. However, it could also be due to the L1 orthography not encoding suprasegmental features at all, so these phonological attributes are not paid much attention to. The necessity to now encode these features in the orthography is challenging because it requires more attention be given to these phenomena. Therefore, it is not merely remembering the graphemes themselves but a greater burden on phonological working memory to remember suprasegmental features that are not a focus in the L1.

"Accent marks are sometimes difficult as they vary greatly depending on the conjugation of the verb." (L1 English, L2 French)

"Accents above vowels have no apparent reason/logic as to where they'll be." (L1 English, L2 Spanish)

"It's very hard to remember how to spell words with accents because in English accents don't matter at all." (L1 English, L2 French)

Discussion and Future Research

In addition to the brief discussion given in the previous sections, the following section will synthesize major themes from the results and discuss potential pedagogical applications, study limitations, and future research.

The present study was aimed at addressing the following research questions:

1. How does the phonological accuracy of an orthography impact learner perceptions towards L2 literacy acquisition?
2. How do differences between L1 and L2 orthographic typology impact learners' perceptions towards L2 literacy acquisition?

For question 1, phonological accuracy of the L2 orthography does appear to impact students' perceptions of difficulties, but this accuracy is relative to that of the L1. In other words, the level of transparency of the L2 relative to that of the L1 is inversely correlated with the difficulty students are likely to report. While this may seem intuitive, it is interesting when considering the findings for question 2. Based on the results of the study, different writing systems and different writing system typologies do not seem to result in difficulties for foreign language students but, rather, the orthographic transparency of the L2 compared to the L1 is a greater factor to predict student difficulty.

Prior research has shown that typology seems to have some impact on literacy (Bassetti, 2005; Cook & Bassetti, 2005; Koda, 2005; Lau & Rickard Liow, 2005), but the present study indicates that either this impact is not as apparent to the learners themselves or the nature of the relationship between typology and literacy is more complex. Additionally, much of the prior literature examining the impact of typology was focused on Chinese or Japanese being either the L1 or L2. As indicated by the results of the present study, when these two languages are compared to others, the typology *does* have a significant impact. However, that is more likely due to the complexity of these writing systems and the fact that they require acquisition of a larger number of units rather than being indicative of an impact of typology itself. In other words, is the difficulty actually due to how linguistic units are encoded or the sheer number of graphemes in the orthography? More research would be necessary to explore this further.

It is also important to reiterate that the present study focuses on self-assessment and personal narratives rather than examining strictly quantitative language competency scores. The purpose of the study was to see how students themselves felt about their literacy abilities and personal struggles learning to read. Further research on student perceptions and literacy that also leverages

quantitative competency scores would help clarify our understanding of these findings.

The present study was also focused primarily on the phonological accuracy of orthographies, rather than the morphological accuracy. While this was intentional, it does narrow the analysis of the data and could be a potential limitation. As previously mentioned, orthographic transparency has two main aspects—phonological accuracy and morphological accuracy, as was illustrated by the examples of ⟨healing⟩ and ⟨health⟩. Snider (2014), Willis Oko (2018), and others (e.g., Carlisle, 2014) have argued that there is benefit to morphological transparency in certain situations and for certain reader demographics.

While phonological accuracy better facilitates sub-lexical decoding, morphological accuracy could better benefit fluent readers with more rapid morpheme and word-level identification. In fact, one respondent who was L1 Czech and L2 English seemed aware of this in their response: "It seems English is geared towards recognition of words, rather than letter sounds, which makes it difficult to construct words by their letters alone." Subsequent research to follow this study would include more comprehensive analysis of both the phonological accuracy and morphological accuracy of orthographies to see if any patterns emerge.

There are potential applications of these findings in the classroom. Based on the present study, more phonologically opaque orthographies are more difficult for learners to acquire. However, if the orthography is morphologically accurate, then teaching morphemes more explicitly could help students jump to morpheme-level decoding faster. If students can more easily identify familiar chunks of words, then this could get them to the lexical processing route more quickly, thus mitigating the difficulties of phonologically opaque text. Students may also benefit from instructors directing their attention to the morphological accuracy of the orthography so they can begin to recognize chunks in written words. Having a better appreciation for how an orthography is encoding the language could alleviate frustration with phonological opacity.

As mentioned throughout the literature review, L2 literacy acquisition remains understudied. Future research could extend this study and improve upon it further, as the present study had some limitations despite being improved after the pilot. One limitation was that the present study made no attempts to get objective language competency scores through any assessments. Subsequent studies could include objective data on respondent fluency to compare against the self-reported, subjective data that was collected for the present study. While subjective data was the focus, to gauge perceptions, comparison with objective data could add value to the overall analysis.

Another limitation of this study was a failure to get a quantitative ranking of difficulty from the respondents. The respondents gave only qualitative answers which had to be coded. Assigning a ranking to a qualitative answer

would have been too subjective, so only the type of difficulty was coded, not the level of difficulty. Conducting a similar study while capturing a difficulty ranking from the respondents, such as with a Likert scale, could yield more accurate quantitative analysis of relationships between variables.

Lastly, while the present study had a fair sample size (n = 217), 30 target languages were identified so the number of respondents for some of the languages was low. A much larger data set would ensure all target languages have more representation, which would verify the transferability of the results. Despite these limitations, it is hoped that the present study provides additional insight into perceptions of literacy among L2 learners.

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Rachel Garton

Der Einfluss von orthografischer Transparenz und Typologie auf die Wahrnehmung von L2-Lernenden

Zusammenfassung

Während die Lese- und Schreibfähigkeit in L1 bereits eingehend erforscht ist, bleiben Faktoren, die sich auf dieselben Sprachkompetenzen in L2 beziehen, von der Forschung vernachlässigt. Vorläufige Untersuchungen deuten darauf hin, dass orthografische Genauigkeit und Typologie den Schriftspracherwerb beeinflussen, was dafür spricht, dass die Aspekte der sprachlichen Repräsentation im Kontext des Zweitspracherwerbs (SLA) weiter erforscht werden müssen. Darüber hinaus werden in der SLA-Forschung zu individuellen Unterschieden zwischen Lernenden emotionale Faktoren wie Einstellung und Motivation hervorgehoben, die weithin als kritische Indikatoren für den L2-Erfolg gelten. Die Motivation steht in engem Zusammenhang mit der L2-Wahrnehmung, was darauf verweist, dass die Wahrnehmung der L2-Lernenden den Erfolg beim Lesen- und Schreibenlernen beeinflussen könnte. Im vorliegenden Beitrag wird eine sprachübergreifende Studie mit gemischten Methoden dargestellt, in der die orthografische Transparenz und Typologien von 26 Sprachen mit Wahrnehmungen der Lernenden (N = 217) in Bezug auf den Schriftspracherwerb in L2 verglichen werden, z. B. mit der wahrgenommenen Schwierigkeit der Orthografie und Selbsteinschätzung der Lese- und Schreibfähigkeit. Die Ergebnisse zeigen, dass die orthografische Transparenz einen größeren Einfluss auf die Wahrnehmung der Lernenden als die Typologie selbst hat.

Schlüsselwörter: Phonologie, Orthografie, Lese- und Schreibfähigkeit in L2, Schriftspracherwerb, Wahrnehmung der Lernenden, Schriftlinguistik

<div align="right">Appendix A</div>

Orthographic Transparency Rankings for Included Languages

Target Language	Transparency	Writing System	Typology
Arabic	Medium	Arabic	Abugida/Abjad
Chinese (Cantonese)	Very Low	Hanzi	Picto-/Ideographic
Chinese (Mandarin)	Very Low	Hanzi	Picto-/Ideographic
Dutch	Medium	Latin	Alphabet
English	Low	Latin	Alphabet
French	Medium	Latin	Alphabet
German	High	Latin	Alphabet
Hindi	High	Brahmic	Abugida/Abjad
Hungarian	Low	Latin	Alphabet
Indonesian	Medium	Latin	Alphabet
Irish	Low	Latin	Alphabet
Italian	High	Latin	Alphabet
Japanese	Very Low	Hanzi	Picto-/Ideographic
Korean	High	Hangul	Alphabet
Latvian	High	Latin	Alphabet
Modern Greek	High	Greek	Alphabet
Norwegian	Medium	Latin	Alphabet
Pashto	Medium	Arabic	Alphabet
Portuguese	Medium	Latin	Alphabet
Russian	High	Cyrillic	Alphabet
Scottish Gaelic	Low	Latin	Alphabet
Spanish	High	Latin	Alphabet
Swedish	Medium	Latin	Alphabet
Turkish	High	Latin	Alphabet
Vietnamese	Low	Latin	Alphabet
Welsh	High	Latin	Alphabet