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FROM LANGUAGE TO LITERACY: STRUCTURAL FEATURES OF ACQUIRED LANGUAGES FACILITATING ENGLISH MORPHOLOGICAL AWARENESS

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Dedication

Ambiance. Persistence. Peace. Antidisestablishmentarianism. Hypothetically. Inspiration. Free. Each word represents a memory from a chapter of my life, and the people who were a part of that chapter. If you were a part of these chapters, know that you will forever be appreciated, and you will always hold a special place in my heart.

To my parents, who taught me my first words and have stood by me amid the torrent of words that eventually became this thesis. Thank you for taking every late-night phone call, helping me sort through piles of papers, and pointing me back to Jesus in every moment through your words of encouragement and prayer. You are so dearly loved.

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And, most of all, to God, the Living Word, who was there in the beginning and spoke all things into existence. May this thesis be a reverberation of the beauty and diversity you placed within the world's languages, and may the findings herein be a reminder that one day, every tribe, nation, and tongue will confess Jesus Christ is Lord, to the glory of God the Father.

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Abstract

Morphological awareness is a crucial metalinguistic skill, specifically for English Language Learners (ELLs). Since languages differ widely in degree of orthographic opacity, degree of morphological fusion, and degree of morphological synthesis, this thesis sought to evaluate the impact of the structural features of other languages upon ELLs' levels of English morphological awareness. Additionally, the study investigated the relationship between morphological awareness and perceived levels of literacy and oracy proficiency. Multilingual individuals responded to an online survey containing a morphological awareness task and a language history questionnaire. Each language represented in the sample was coded according to its structural features. Subsequently, the relationship between the features and morphological awareness was analyzed. Morphological awareness was impacted by a confluence of all three structural features. Knowledge of languages with higher degrees of morphological synthesis or higher degrees of orthographic opacity was found to predict higher levels of morphological awareness. Additionally, perceived English literacy proficiency explained a larger degree of the variance in English morphological awareness than perceived English oracy proficiency, though both were statistically significant. The findings indicate the acquisition of English may be impacted by familiarity with other languages and by perceptions of English proficiency.

KEY WORDS: morphological awareness, English language learners, perceived language proficiency, literacy, oracy, orthographic opacity, morphological fusion, morphological synthesis

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Introduction

The English language has a widespread sphere of influence across the globe, impacting international communication and commerce. Around the world, English serves as a *lingua franca*, which refers to the "various languages used as common or commercial tongues among peoples of diverse speech" (Merriam-Webster, n.d.a). Proficiency in English is a crucial skill for both American residents and individuals around the globe who use English to communicate.

In America, *Limited English Proficient* (LEP) is used by the United States government to describe individuals who speak English less than "very well" (Gambino et al., 2014, p. 2). According to the results of the US Census, the size of the United States' LEP population in 2019 was 25.5 million individuals, comprising approximately 8.2% of the entire US population (Batalova et al., 2021). Data gathered by the Census Bureau's 2013 American Community Survey indicated the United States' LEP population was generally "less educated and more likely to live in poverty" than the English-proficient population (Zong & Batalova, 2015, para. 4). While the LEP population is overrepresented in sectors such as construction, maintenance, and service, the LEP population faces underrepresentation in fields related to business, science, management, and sales (Zong & Batalova, 2015). Being literate in the English language is an important prerequisite for gaining employment in sectors that offer upward mobility. Programs which teach English to Speakers of Other Languages (ESOL) provide English Language Learners (ELLs) with the opportunity to develop the English language skills necessary to obtain jobs offering higher pay and opportunities for promotions (Horwitz, 2013). Given the current educational and professional implications of being fluent in English, the United States government has a sufficient impetus to increase the educational opportunities available for individuals who speak English as an additional language in the United States. Since many ELLs

must use English to communicate at the grocery store or to get jobs, it is essential that ELLs learn English as a survival language in the United States. ESOL programs are designed to teach English as a second language so ELLs can survive and thrive in a country where the dominant language is not the same as the ELLs' home language. Through the implementation of intentional language-learning supports which are mindful of the structure of an ELL's dominant language and an ELL's language-learning experiences, ESOL programs and academic support programs can assist ELLs as they pursue opportunities for academic and vocational success through the use of the English language.

Around the globe, many individuals have learned to speak the English language in addition to the native languages of their home countries. English is used globally for a plethora of functions. For example, international corporations conduct business in English, members of the Peace Corps use both English and local languages to communicate, and international airline pilots speak to control tower personnel in English. In addition, many other individuals around the globe use English to complete work of an academic or professional nature. Since English is prominent around the globe, English proficiency is crucial for individuals who wish to be employed in sectors where English use is common. In places such as Europe, where the European Union promotes travel and commerce across the borders of countries, being multilingual enhances an individual's opportunities for employment, travel, and academic study. Since English is not the primary language of most European countries, individuals who learn English in these countries learn English as a foreign language. Therefore, an individual who learns English while living in France will not likely use English to communicate when buying groceries, ordering food at a restaurant, or worshipping at a local church. English is considered a foreign language in France because it is not used by the majority of the country to complete

everyday activities. For individuals who have learned English as a Foreign Language (EFL), developing a robust English vocabulary is essential because individuals who have a large vocabulary are more likely to be able to use their vocabulary in academic or professional settings.

Most individuals would concur with the summation that English is an important language within the United States and across the globe. Since proficiency in English may impact many aspects of an individual's life, it is essential for ESOL and EFL programs to utilize vocabulary-building techniques which are efficacious. An efficacious vocabulary-building technique is one which teaches vocabulary naturally and systematically while increasing metalinguistic knowledge. Metalinguistic knowledge is knowledge of the rules and principles of language, and the "ability to focus attention on language as an object in and of itself, to reflect upon language, and to evaluate it" (Schönpflug, 2001, p. 1174). One type of metalinguistic knowledge is *morphological awareness*, defined as the ability to understand and manipulate morphemes. Morphemes, which can be defined as words or word parts which hold meaning, include full words, roots, and affixes which may either stand alone or be bound together (Gleason & Ratner, 2009). In theory, morphological awareness facilitates vocabulary growth.

As this thesis's review of the literature suggested, the characteristics of an individual's other languages are believed to impact the language learner's morphological awareness. Additionally, the literature further suggested individual language learner characteristics, such as an individual's perceived level of proficiency in English, may impact an individual's morphological awareness. The objective of this thesis was to understand and quantify the extent to which ELLs' perceived levels of English language proficiency and characteristics of ELLs' native and acquired languages impacted ELLs' level of English morphological awareness. The

purpose of this study was to inform the practices used by ESOL and EFL programs to incorporate morphological awareness-building exercises into their curriculums to increase curricular efficacy. The researcher hypothesized the results of this study would reveal a positive correlation between individual perceptions of proficiency in English and English morphological awareness. The researcher also hypothesized the structural features of native and acquired languages would be positively correlated with levels of English morphological awareness. The researcher conducted a review of literature outlining historical and contemporary studies which were examined to elucidate linguistic principles pertaining to second language acquisition, psychological models of reading, and morphological awareness. A specific methodological framework directed the development of the survey tool, the distribution of the survey, and the classification of the languages represented in the sample according to the languages' structural features. Finally, the data were analyzed using descriptive, inferential, and predictive statistical methods. The extent to which first-language characteristics and individual learner experiences were correlated with variations in morphological awareness was evaluated, and implications for ESOL programs were discussed.

Review of Literature

Information can be communicated by both oral and written modalities. Spoken and written modes of communication are organized into structured systems which dictate the organization of sounds (*phonemes*) or characters (*graphemes*) into words, sentences, and messages. Though oral and written language have slight differences in organization, both are closely related.

Taxonomy of Language

Words take shape when phonemes, the unique speech sounds which signal differences in word meaning, are combined to form distinctive strings of sounds (Gleason & Ratner, 2009, p. 477). Words are comprised of one or more *morphemes*, the minimal units of meaning in language which convey grammatical and semantic information (Gleason & Ratner, 2009, p. 465). Each word conveys a specific *semantic* meaning when it is spoken (Gleason & Ratner, 2009). *Syntactic* rules govern the form of sentences, ensuring words are sequenced systematically according to grammatical rules (Gleason & Ratner, 2009). Sentences can be used to achieve *pragmatic* goals in social and conversational contexts (Gleason & Ratner, 2009).

Bloom and Lahey's Taxonomy of Language (1978) groups the five domains of spoken language into three functional categories of language. Spoken words have three components – a recognizable form, defined meaning, and functional use. Phonology, morphology, and syntax govern the form of words and sentences (Bloom & Lahey, 1978). Semantic rules govern the meaning of words and phrases, and pragmatic rules govern the use of sentences to achieve social goals (Bloom & Lahey, 1978).

The Simple View of Reading (SVR)

To read in any language, an individual must have a thorough knowledge of the conventions which apply to each level of the taxonomy of language. Models of reading, rooted in cognitive and neuropsychological research, provide possible explanations of the dynamic methods of interaction which integrate the information encoded within each taxonomic level of spoken and written language during the process of reading.

The Simple View of Reading (SVR) model, one of the most prominent models of reading, portrays reading as the result of two processes: decoding and comprehension (Rose, 2006). Decoding is the ability to pair each grapheme in a written word with its corresponding phoneme, allowing a reader to identify the word and recall its meaning (Rose, 2006). Comprehension is the process of understanding the meaning of a text by analyzing the grammar and content of the sentences and paragraphs in the text (Rose, 2006). Readers with strong decoding skills are able to read with fluency and accuracy, and readers with strong comprehension skills are able to understand the gestalt meaning of the text (Rose, 2006). Chronologically, decoding precedes comprehension.

Models of Decoding

The objective of decoding is to successfully identify a word from its written form. To achieve the objective, the written word must be compared against a bank of words stored in the reader's memory. The reader's memory bank, which Dr. Charles A. Perfetti (2017) calls the *mental lexicon*, operates like a library full of previously encountered words. Each word in the mental lexicon is assigned three tags, called lexical representations, which are used to catalog the word with similar words in the lexicon (Perfetti, 2017). Just as a journal article can be accessed by searching for its title, author, or DOI number in a database, a word can be accessed via its

orthographic, phonological, and semantic representation. When a word is read, a reader uses the word's orthographic and phonological structure, as well as semantic context clues, to locate the correct word in the mental lexicon (Perfetti, 2017). Regardless of the route a reader takes to decode a word, when the correct word is located in the mental lexicon, decoding has successfully occurred.

As research in the fields of cognitive psychology and neuropsychology has progressed, many models have been developed to explain the role of cognition within the decoding mechanism. The dual-route cascaded (DRC) model of decoding is widely accepted, primarily due to the accuracy with which the computer-based model has been able to replicate the characteristic profile of reading abilities of a person with dyslexia (Coltheart, 2001).

The Dual-Route Model of Decoding. In the DRC model, conceptualized by Coltheart et al. in 2001, print information is initially perceived as a sequence of lines and curves, called visual feature input units. In the DRC model, visual features are grouped into grapheme units (Coltheart, 2014). Grapheme units may be the size of individual letters or may be as large as syllables or morphemes (Mousikou et al., 2020). Once visual features have been consolidated into grapheme units, the brain attempts to decode the grapheme units through the simultaneous activation of two independent neural pathways (Coltheart, 2014).

Lexical Route of DRC Model. The first neural pathway, known as the lexical route, operates like the search engine for a database. During a reader's first encounter with an unfamiliar word, mental representations of the word's graphophonemic structure and semantic meaning are stored in the reader's mental lexicon (i.e., the "database") for future reference (Coltheart, 2014). The next time the reader encounters the same sequence of grapheme units, the

lexical route is able to identify the familiar sequence of grapheme units and retrieve the corresponding semantic and phonological information from the lexicon (Coltheart, 2014).

Nonlexical Route of DRC Model. Words are also decoded by way of a nonlexical route, where each letter is matched with its corresponding phoneme through the application of grapheme-phoneme correspondence (GPC) rules (Coltheart, 2014). In the nonlexical route, readers "sound the word out" to identify the word phonologically and pair it with its corresponding semantic representation (Coltheart, 2014).

Implications of the DRC Model. Since a word must be identified before the word's semantic meaning can be retrieved, the lexical and nonlexical routes of the DRC model race to identify words rapidly and accurately. While the lexical route can effectively access orthographic representations of both regularly and irregularly spelled words already familiar to the reader, the nonlexical route of the DRC model allows a reader to use GPC rules to decode both real words and made-up nonwords, so long as the words are spelled regularly (Coltheart, 2014).

Initially, readers do not have a robust lexicon to support reading; therefore, emergent readers cannot utilize the lexical decoding route of the DRC model. In 2018, Pritchard et al. hypothesized that a self-teaching mechanism might allow emergent readers to make and revise predictions about the spelling of unknown words. According to the self-teaching hypothesis, individuals initially learn to read using GPC rules and context clues (Pritchard et al., 2018). After a word has been encountered multiple times and has been successfully decoded via the nonlexical route, the connections between the word's semantic, orthographic, and phonological representations become strong (Pritchard et al., 2018). Once the word is in the reader's mental lexicon, it can be accessed via the lexical route of the DRC model (Pritchard et al., 2018).

In Perfetti's model (2017), words which have more robust orthographic, semantic, and phonological representations within the lexicon can be decoded more efficiently and accurately than words with less robust representations in the lexicon. Perfetti's (2017) model has two implications:

- Metalinguistic skills, which increase the accuracy and efficiency of decoding, may be valuable assets for emergent readers and for individuals who are learning to read English.
- Previous linguistic experience, such as familiarity with another language with different structural features, may impact both decoding and comprehension in English.

Role of Metalinguistic Skills in the Simple View of Reading

Metalinguistic skills, the competencies which allow individuals to consider and evaluate the structural features of language, such as phonological or semantic features, have been found to play a role in facilitating the decoding-comprehension interaction described by the SVR (Nagy, 2007, as cited in Cartwright et al., 2017). When researching the combined impact of active reading skills, such as executive functioning and metalinguistic awareness, upon reading comprehension, Duke and Cartwright (2017) found active reading skills played an important role in facilitating the integration of decoding and comprehension during reading. In response, Duke and Cartwright (2021) developed an active version of reading which expanded upon the SVR model by explaining the role of metalinguistic skills during reading. Duke and Cartwright's model conceptualized reading ability in terms of the interaction between decoding skill, language comprehension, and *bridging functions* (i.e., metalinguistic awareness and executive functioning abilities) which support the integration of decoding and comprehension. According to Duke and Cartwright (2021), most successful readers use executive functions and reading strategies to actively self-regulate decoding and comprehension.

Morphological awareness is one of Duke and Cartwright's bridging skills (2021). Morphological awareness facilitates the integration of phonological, syntactic, and semantic information during both the decoding and comprehension components of the reading process.

Morphological Awareness

Morphemes are tripartite sources of linguistic information, providing valuable information about a word's semantic meaning and syntactic function through the word's graphophonemic form. Morphemes provide a level of systematicity to linguistic organization by providing a recognizable link between word form and word meaning. Morphological awareness, the conscious ability to recognize, manipulate, and identify morphemes, is a facilitator of decoding (Verhoeven & Perfetti, 2003). Morphological awareness enables readers to break down unfamiliar multimorphemic words into recognizable constituent morphemes, thereby enhancing the efficiency and accuracy of decoding and comprehension during reading. Efficient decoders are able to retrieve and integrate stored knowledge of a morpheme's form, meaning, and function during word recognition (Verhoeven & Perfetti, 2003). Since approximately 60% of the new words encountered by an emerging reader are morphologically complex, morphological awareness facilitates the learning of new words and is, therefore, a critical component of developing academic reading proficiency (Angelelli et al., 2014). Academic and ESOL interventions which support the development of morphological awareness for ELLs are rooted in knowledge of morphological processing models, as research on morphological processing directly impacts the implementation of morphological interventions into ESOL pedagogy and practice.

Principles of Morphology. Morphology, the set of rules governing the morphemes of a language, is a complex area within the field of linguistics. Systems of morphology vary widely

between languages, and most languages have some irregular word forms which do not follow prescribed morphological rules. Despite morphological variation, several basic principles govern the majority of morphological systems found in the world's languages. First, morphemes can either be free or bound. Free morphemes can stand alone as individual words (e.g., "cat") morpheme (Gleason & Ratner, 2009). Bound morphemes are word parts which cannot stand alone but can form words when attached to free morphemes or other bound morphemes (Gleason & Ratner, 2009). Second, bound morphemes can either be classified as base morphemes, which hold the core semantic meaning of a word but do not function independently as words (e.g., "vis-" or "flor-"), or as affixes, endings which can be bound to a word or to a base morpheme to modify its meaning or grammatical function (Gleason & Ratner, 2009). Affixes include prefixes, which precede the base morpheme, and suffixes, which follow the base morpheme (e.g., "pre-" and "-ing") (Gleason & Ratner, 2009). Third, affixes are considered to be either derivational or inflectional. Derivational affixes are affixes which change a word's meaning or part of speech (Gleason & Ratner, 2009). For example, the word "title" is a noun. When the derivational prefix "en-" is bound to the noun "title", the verb "entitle" is formed, changing the word's part of speech and meaning. Inflectional affixes function as grammatical markers. Inflectional affixes do not change a word's part of speech; rather, an inflectional affix reveals information about tense, person, number, gender, mood, voice, and case, though inflectional systems vary from language to language (Gleason & Ratner, 2009).

Compared with other languages, English has few inflectional morphemes, but many of the inflectional morphemes found in English are irregular. The basic principles of morphology apply to every language, although some languages have more straightforward morphological

systems than others. The universality and complexity of morphology set it apart as a unique area of focus within the studies of linguistics, language acquisition, and literacy development.

Morphological Preservation. Preservation of a morpheme's spelling, or orthography, is a factor which enhances the recognizability of a morpheme, thereby increasing a reader's ability to access morphological-orthographic/phonological knowledge during decoding. However, while orthographic preservation enhances the recognizability of a morpheme, orthographic preservation also increases the likelihood that a word's phonology and orthography will not match as the word's orthography will remain constant even when the word's phonetic context changes (Miller, 2019).

According to the isomorphism principle of linguistics, the binding of an affix to a root will result in as little alteration to a word's spelling as possible, as long as the resulting word does not violate phonetic constraints and render the word unpronounceable (Verhoeven & Perfetti, 2011). If the affixation of a morpheme to a base violates a phonological rule, the phonetic structure of the word will shift to align with the phonological rules of the language; however, the multimorphemic word's orthographic form will remain unchanged unless the binding of the morpheme has also violated an orthographic rule (Miller, 2019). If an orthographic rule is violated, the spelling of the bound affix will typically be preserved, while the spelling of the base will be altered so the word's grapheme sequence no longer violates a phonological rule (Miller, 2019). The isomorphism principle explains why English affixes are often more recognizable and decodable than English roots (Miller, 2019).

In an orthographically opaque language like English, morphological preservation promotes decoding as a word's semantic meaning and pronunciation can be inferred from cues provided by the vestigial features of preserved morphemes (Miller, 2019). However, the benefits

of morpheme recognizability may be offset by increases in orthographic opacity which result from morphological preservation (Miller, 2019).

Morphological Productivity. Morphological productivity is, to some extent, both an aid and an obstacle to decoding. Morphological productivity is measured by the number of derived and inflected words created from a singular base through the addition of a prefix or suffix (Verhoeven & Perfetti, 2011). Productive morphemes follow patterns and may bind with many other morphemes to form many real words. Hence, in the lexicon, productive morphemes are associated with many related words (e.g., the affix "-ful" appears in the words "joyful", "playful", and "thoughtful"; likewise, the root "cert-" appears in the words "certificate", "certainty", and "certitude".).

During the decoding process, a reader must search through many related words which have similar appearances before the target word is located; thus, morphological productivity can decrease the efficiency of decoding (Lupker, 2005). However, words with highly productive morphemes may also occur with a high surface frequency within the language, increasing the rapidity with which the word can be identified (Lupker, 2005). As a result, words containing productive affixes may be more rapidly accessed and identified during the decoding process if they have high surface frequencies (Lupker, 2005). If a multimorphemic word is unknown, the word can be decoded in a piece-wise fashion (Baayen et al., 2011). The recognition of even one familiar productive morpheme in an unfamiliar multimorphemic word is correlated with shorter decoding times (Baayen et al., 2011). In summary, morphological productivity and surface form frequency both interact to influence the speed with which words are identified.

Form-Meaning Congruence in Morphology. Form-meaning congruence also facilitates decoding and semantic recognition. Dawson et al. (2021) found semantic recall of nonsense

definitions for novel words increased when the invented word was attached to a recognizable derivational morpheme. The derivational morpheme indicated that the invented word acted as a specific part of speech (Dawson et al., 2021). Recognition of a word's part of speech and semantic meaning through morphological cues was associated with higher levels of decoding and comprehension.

Multiple Dimensions of Morphological Knowledge. Since morphology affects the structure, function, and use of words, multiple domains of morphological knowledge exist. Each domain of morphological knowledge pertains to one facet of morphology. Goodwin et al. (2021) grouped the domains of morphological knowledge into four categories: morphological awareness, morphological-syntactic knowledge, morphological-semantic knowledge, and morphological-orthographic/phonological knowledge. According to Goodwin et al. (2021), morphological awareness relates to the ability to consider the features of morphemes and manipulate morphemes flexibly. The researchers defined morphological-syntactic knowledge as knowledge of how morphemes cause shifts in the parts of speech of words (Goodwin et al., 2021). Morphological-semantic knowledge was defined as the ability to use the semantic knowledge embedded in morphemes to decipher the meanings of words (Goodwin et al., 2021). Finally, morphological-orthographic/phonological knowledge was defined as the strength of a morpheme's grapheme-phoneme correspondences (Goodwin et al., 2021). Since each of the four domains of morphological knowledge pertains to a different competency, each must be assessed by a different tool. Several researchers have pioneered tools to measure competency in each domain of morphological knowledge. Goodwin et al. (2021) designed and successfully validated a tool for the assessment of each of the four dimensions of morphological knowledge among children in grades five through eight in the United States. Other researchers have developed

similar tools for the assessment of morphological knowledge among adults and among ELLs (Ku & Anderson, 2003; Mahony, 1994; Nunes et al., 2012; Webb & Sasao, 2013; Zhang, 2021). The measures used include a morpheme discrimination task and a morpheme recognition task to measure morphological awareness (Goodwin et al., 2021; Ku & Anderson, 2003; Mahony, 1994; Zhang, 2021), a morpheme-form recognition task and a morpheme-based spelling task to assess morphological-orthographic/phonological knowledge (Goodwin et al., 2021; Nunes et al., 2012; Webb & Sasao, 2013), a morpheme-meaning identification task to measure morphological-semantic knowledge (Goodwin et al., 2021; Webb & Sasao, 2013), and a morpheme-function identification task to assess morphological-syntactic knowledge (Goodwin et al., 2021; Webb & Sasao, 2013).

Models of Morphological Processing During Decoding. While graphophonemic awareness contributes to decoding via the nonlexical route, morphological awareness contributes to both the lexical and nonlexical routes of decoding. Historically, several hypotheses, such as the decomposition and full-listing hypotheses, have been developed to explain the role of morphological processing mechanisms during decoding (Verhoeven & Perfetti, 2003).

Morphological Decomposition Hypothesis. The morphological decomposition hypothesis was formulated after Taft and Forster (1975, 1976) completed seminal research on the relationships between morpheme order, morpheme frequency, and the speeds at which adults identify and categorize polymorphemic and polysyllabic nonwords. Taft and Forster (1975, 1976) presented adults with word and nonword stimuli and compared the impacts of the presence of affixes on the rate of word and nonword classification. In the 1975 experiment, adult readers rapidly identified real multimorphemic words as being valid English words but were delayed in classifying nonwords as invalid, specifically when the nonwords contained recognizable

morphemic components in incongruous combinations (i.e., an English prefix combined with a nonword root, or two recognizable affixes arranged in a combination that does not form a real word). In the 1976 experiment, when participants were presented with morphological nonwords (i.e., nonwords comprised of two common English morphemes) and with nonwords containing no recognizable English morphemes, the participants identified the nonwords more rapidly than the morphological nonwords (Taft & Forster, 1976, p. 608). The lexical status of the morpheme components likely was a contributing factor to the delayed response. If Taft and Forester's hypothesis is correct, morphemes have lexical status within the mental lexicon; consequently, multimorphemic words are consistently decomposed into separate morphemes in both the lexical and nonlexical routes of the decoding process (Verhoeven & Perfetti, 2003).

Full-Listing Hypothesis. In contrast with the decomposition hypothesis, the full-listing hypothesis proposes a model of the mental lexicon in which the complete derived form of each word in a language is listed according to the frequency with which it occurs in the language, without segmenting the words into constituent morphemes (Butterworth, 1983; Henderson, 1985; Manelis & Tharp, 1977). The full-listing hypothesis accommodates several research findings. First, the model provides a potential explanation as to why words with frequently occurring surface forms are identified more rapidly than rare words (Verhoeven & Perfetti, 2003). Additionally, research findings are consistent with the idea that words with highly productive base morphemes (i.e., bases which can be successfully combined with many morphemes to form real words) are generally decoded more slowly than words stemming from less-productive bases (Verhoeven & Perfetti, 2003). Since productive bases are associated with many related lexical entries (e.g., "time", "times", "timed", "timely", and "timetable"), a reader must evaluate each related lexical entry in the list while searching the mental lexicon for the correct entry, thereby

increasing the time required to locate the correct word (Verhoeven & Perfetti, 2003). The full-listing hypothesis may also offer a solution to the problem posed by spelling and sound shifts which occur during the binding of morphemes. When a morpheme is bound to a word, the morpheme retains as much visual resemblance to the morpheme's original form as possible, but the morpheme's phonetic structure adjusts to accommodate the phonetic context of the entire word (Verhoeven & Perfetti, 2003). For example, when the morpheme "-ation" is added to the word "pronounce", phonological and orthographic shifts result, forming the word "pronunciation". If a reader decomposes "pronunciation" into "pronunce" and "-ation", the reader may have difficulty making the connection between "pronunce" and "pronounce", decreasing the accuracy of semantic identification via the morphological parsing mechanism.

Verhoeven and Perfetti's Model of Morphological Processing. Whether decoding occurs via morphological decomposition, a full-listing method, or a combination of the two is subject to debate; however, any successful model of morphological decoding must be capable of being integrated with existing models of decoding, such as the DRC model, and must account for existing knowledge about the lexicon, GPC rules, and the constraints placed upon decoding by morpheme frequency and structure. In 2011, prominent literacy researchers Ludo Verhoeven and Charles A. Perfetti proposed a functional model of morphological processing designed to integrate morphology within decoding. Verhoeven and Perfetti (2011) described the existence of a cognitive mechanism for morphological processing, which functions by way of a "universal response of the reader to the quasiregular characteristics [of morphology] in a given language" (p. 462). Morphological decomposition, according to Verhoeven and Perfetti's theory (2011), can be viewed as a self-teaching mechanism by which emerging readers use knowledge of both base words and morphology to infer the meanings of words. In Verhoeven and Perfetti's model

(2011), the complex orthographic form of a word enters the word decoding system and is decomposed into constituent morphemes (p. 458). Simultaneously, the complex word is processed as a series of individual orthographic units (Verhoeven & Perfetti, 2011). The information contained in the constituent morphemes feeds back into the orthographic processing system, and the orthographic system likewise provides feedback to the morphological decomposition system (Verhoeven & Perfetti, 2011). The orthographic and morphological systems each provide input to drive the identification of the component morpho-phonological units that complete the word (Verhoeven & Perfetti, 2011). Lastly, in Verhoeven and Perfetti's model (2011), the sequence of efficient mappings between orthographic, phonological, and morphological sources of information within the mental lexicon provides access to the word's semantic meaning.

Verhoeven and Perfetti's (2011) model is important because its dual routes align with aspects of both the decomposition and full-listing hypotheses. The model accounts for the effects of lexical connectedness, exposure to a word, and orthographic familiarity upon the decoding process by way of a singular framework which permits the decoding of both morphologically complex words and morphologically simple words (Reichle and Perfetti, 2003). The model's integrated orthographic and morphological processing routes also explain a reader's ability to decode words which have undergone orthographic shifts due to the addition of a bound morpheme (Verhoeven and Perfetti, 2011). In the model, affix preservation facilitates morphological decomposition by providing a recognizable boundary between the affix and the base (Verhoeven and Perfetti, 2011). After morphological decomposition takes place, the morphemes can be identified (Verhoeven and Perfetti, 2011). However, the model simultaneously accommodates the existence of an alternative lexical-search route for decoding

the entire word (Verhoeven and Perfetti, 2011). Additionally, the model integrates well with prominent models of decoding, such as the DRC model, to form a fully operational decoding model (Verhoeven & Perfetti, 2011).

Morphological Problem-Solving Strategies. Morphological problem-solving strategies serve as a metacognitive tool to support conscious morphological decomposition and evaluation. Pacheco and Goodwin (2013) interviewed middle school students to determine how developing readers in middle school broke down multimorphemic words. Pacheco and Goodwin identified five morphological problem-solving strategies used by the readers. The first strategy, known as parts-to-whole, was used most frequently by proficient readers to decompose unknown words into several familiar component morphemes, each contributing information to a composite definition of the word (Pacheco & Goodwin, 2013). The second strategy, known as the part-to-whole strategy, was used primarily among struggling readers. In this strategy, readers predict the meaning of an entire word from the information provided by one of the component morphemes (Pacheco & Goodwin, 2013). If the primary semantic information is gleaned from the base of the word, the reader is more likely to be successful during the attempt at morphological problem-solving. Readers who base predictions of word meanings solely upon affixes, however, are less successful because bases provide the bulk of the word's semantic information while affixes do not. A third strategy used by the students was the strategy of analogy (Pacheco & Goodwin, 2013). In this strategy, emerging readers relate a morpheme in a word to the meaning of another known word with the same morpheme (Pacheco & Goodwin, 2013). Choosing the correct morpheme from which to draw this comparison will impact the accuracy of the semantic prediction, and less-proficient readers who used this strategy showed less success in predicting word meanings than more-proficient peers. A fourth strategy of whole-to-part interpretation is

typically utilized when a reader is already familiar with the meaning of a word and instead uses morphological cues to support his or her existing idea of the word's meaning (Pacheco & Goodwin, 2013). Finally, a fifth strategy of cross-language scaffolding allows a reader to use knowledge of roots and affixes from another language to support his or her prediction of the word's meaning (Pacheco & Goodwin, 2013). The strategy of cross-language scaffolding is similar to the part-to-whole and parts-to-whole strategies. The benefit of being able to use existing linguistic knowledge from another language to decode words has been found to be an asset to ELLs who are learning to read English texts.

Variation in Structural Features Across Languages

Every language has a distinctive phonological, morphological, and grammatical structure which impacts its written form. The multiple dimensions of a language's structure act like a code, and each structural component contributes to the code's complexity. Therefore, some languages possess structural features which facilitate reading, while other languages have features which are more difficult for readers to decode. For language learners, two structural features are of specific interest, regardless of the language: orthographic structure and morphological structure.

Orthographic Structure

An orthographic system can be categorized according to the type of graphemes used in the language and whether the graphemes can be decoded through the straightforward application of grapheme-phoneme correspondence (GPC) rules (Frost, 2005). Around the world, most languages are transcribed with either a logographic or an alphabetic orthography, though several languages are transcribed using syllabic orthographies (Frost, 2005). When transcribing a logographic orthography, such as the orthography of Mandarin Chinese, each grapheme

represents a complete word or concept (Ijalba & Obler, 2015). In contrast, English has an alphabetic orthography comprised of sets of graphemes which can be arranged in sequences to represent the phonetic structure of a word (Ijalba & Obler, 2015).

Generally, each symbol in an alphabetic orthography represents a sound. Some alphabetic orthographies are more transparent, or orthographically shallow, because one grapheme corresponds directly with one phoneme (Sgall, 1987). Transparent orthographies have one-to-one grapheme-phoneme correspondences (GPCs) (Sgall, 1987). Spanish is orthographically transparent and has few irregularly spelled words (Dressler et al., 2019). Consequently, the pronunciation of a Spanish word typically corresponds to the word's written form.

In contrast with orthographically transparent languages like Spanish, orthographically opaque, or deep, languages lack direct GPCs (Sgall, 1987). English is a language with an opaque orthographic system (Sgall, 1987). Although some English words are transparent, irregular spellings are prevalent in English due to the language's historical etymology. In English, one phoneme can be written using a single grapheme or a sequence of graphemes (Sgall, 1987). Additionally, in English, many phonemes have several possible spellings depending on phonetic context and the word's etymology (Sgall, 1987). Logographic orthographies, such as Mandarin Chinese, are also considered opaque orthographies (Sgall, 1987).

Morphological Structure

Morphemes play a role in sentence construction, grammar, and word formation. The technique by which a language binds morphemes together is closely related to a language's grammar and word order. While the impact of morphology on sentence construction is undisputable, it remains difficult to categorize languages according to their morphological structures because the categories of morphological structure are imperfectly defined. Almost all

languages have words or phrases which are exceptions to the languages' grammatical and morphological rules. Even when the boundaries between different categories of morphology are defined robustly, exceptions to grammatical and morphological rules still prevent the languages from fitting perfectly into the categories.

Though languages are difficult to categorize according to morphological structure, many linguists have done their best to demarcate distinct typological categories which can be used to classify the morphological features of most languages. From the 1820s to the 1920s, most linguists subscribed to the work of Friedrich von Schlegel, August Wilhelm von Schlegel, and Wilhelm von Humboldt, who developed a morphological typological system which classified languages into the categories (a) "isolating/analytic;" (b) "agglutinating;" (c) "flexive;" or (d) "incorporating / polysynthetic" (Arkadiev, 2020, p. 2). While the terms used by the three researchers are still used today, the researchers' definitions were not thorough enough to sufficiently categorize languages with irregular morphological systems.

Structural linguist Edward Sapir contested previous models of morphology in his 1921 book, *Language*. Sapir critiqued the previous model's conflation of two distinct constructs: degree of morphological fusion and degree of morphological synthesis (Sapir, 1921, as cited in Arkadiev, 2020, p. 4). Sapir developed a revised system for categorizing languages according to degree of morphological fusion and degree of morphological synthesis. Sapir's system is methodical, yet the system's nuance does not compromise its versatility or usefulness when categorizing the morphological structures of languages. Sapir's typological system can be used to assign a binomial categorical label to most languages, even those which have complex or uncommon morphological structures. While Sapir (1921) conceded that speech is too variable and elusive to neatly fit into definitive categories without ignoring certain differences which

exist within languages, he nonetheless considered the development of a morphological classification system to be worthwhile so long as the classification system was detailed enough to capture many of the languages' nuances.

Degree of Morphological Fusion. According to Sapir, morphological fusion refers to the "relative firmness with which the affixed elements are united with the core" of a word (1921, p. 127). A language's degree of morphological fusion is determined by the language's technique for affixation, which may be termed *isolating*, *agglutinating*, *fusional*, or *symbolic* (Sapir, 1921). While Sapir's classification system is comprised of four distinct categories, Sapir suggested that overlap may exist between categories, producing languages with hybrid morphological structures like "agglutinative-isolating" or "fusional-symbolic" (Sapir, 1921, as cited in Arkadiev, 2020, p. 5).

In an *isolating* language, words function as unalterable radical elements of grammar (Sapir, 1921). While agglutinating or fusional languages encode grammatical information within words through the addition of bound morphemes to a base, each word in an isolating language has its own specific, unchanging grammatical and semantic function (Sapir, 1921). To convey a different message in an isolating language, one word is exchanged for another word, without alteration of bound morphemes in an agglutinative or fusional pattern (Sapir, 1921). For example, the semantic content of the English sentence, "I pet the cat," is altered when the word *cat* is replaced with the word *dog*. Yet, in exchanging the word *cat* for *dog*, no bound morphemes were altered in either of the words or in the sentence.

Agglutination is a process of word formation in which morphemes retain a consistent shape when combined, resulting in a low degree of morphological fusion and infrequent changes in morphophonemic shape (Dictionary.com, n.d.a.). In a word formed through agglutination,

each morpheme has a separate grammatical function (Sapir, 1921). Since morpheme shapes are not altered during agglutination, the morphemes in agglutinative words can be more readily parsed apart into distinct single-morpheme chunks than the morphemes in fusional words.

Unlike agglutinative languages, morpheme boundaries in *fusional* languages are difficult to identify because the morphemes are fused together (Payne, 1997). In a fusional language, grammatical information is encoded within a word through a change in the word's shape, spelling, or sound (Sapir, 1921). Some fusional languages display a higher degree of fusion between base and affix than others (Sapir, 1921).

Of the four affixation techniques, languages which are categorized as *symbolic*, such as Hebrew or Arabic, exemplify the greatest degree of morphological fusion. In a symbolic language, morphological information is encoded in a word through "internal changes [such as] reduplication, vocalic and consonantal change, [and] changes in quantity, stress, and pitch" (Sapir, 1921, 126). The base of the word typically retains its general shape; however, the internal phonetic or syllabic structure of the word is altered through processes of infixation, alternation, reduplication, or prosodic modification.

Degree of Morphological Synthesis. According to Sapir, degree of morphological synthesis can be measured along a continuum from *analytic* to *synthetic* to *polysynthetic* (Sapir, 1921, as cited in Arkadiev, 2020). In Sapir's system, languages with lower degrees of morphological synthesis are considered analytic, while extremely synthetic languages are considered polysynthetic (Sapir, 1921).

Analytic languages combine morphemes economically; thus, each word holds only a small portion of the semantic or syntactic information expressed in the sentence (Arkadiev, 2020). In English, an analytic language, a sentence is greater than the sum of its parts, since

individual words do not capture the breadth of the semantic information encoded within a sentence (Sapir, 1921).

In a *synthetic* language, a single word contains multiple morphemes (Sapir, 1921). However, each word does not function independently as a sentence. Rather, each word functions as a single part of speech or a single phrase (Sapir, 1921). A synthetic word does not convey as broad a range of semantic meaning as a word in a polysynthetic language, but it conveys more semantic information than a word in an analytic language (Arkadiev, 2020).

In a *polysynthetic* language, a single word contains many affixes (Sapir, 1921). In English, a word has a singular grammatical function, but in a polysynthetic language, a single word may contain a combination of many morphemes which serve a variety of grammatical functions (Sapir, 1921). A single polysynthetic word can convey an amount of information equivalent to the information held within a complete sentence or clause in an analytic language.

Language Acquisition

Many linguistic factors impact the process of language acquisition. Although some languages may have structural similarities, many languages differ drastically in phonology, morphology, syntax, and orthography. Mutual intelligibility, or the degree to which a speaker of one language can be comprehended by non-native speakers, is based on the extent of the grammatical, phonological, and morphological similarities between the two languages (Gooskens, 2021). Mutual intelligibility is often determined by both the structure and content of two languages. English has a low degree of intelligibility with other languages (Gooskens, 2017); thus, individuals acquiring proficiency in English must become familiar with the uniquely challenging structural features which characterize the English language.

Krashen's Theory of Language Acquisition

Language acquisition theorist Stephen Krashen suggests that several factors may either help or hinder language learners who are navigating the structural and social challenges posed by communication in a new language (Krashen & Terrell, 1998). According to Krashen, the end goal of a language learner is to acquire the target language (L2) (Krashen & Terrell, 1998). Krashen's language acquisition theory differentiates between language learning and language acquisition. Krashen states that conscious language learning is a prerequisite to subconscious language acquisition (Krashen & Terrell, 1998). Language learning occurs when an individual memorizes the grammar rules of their L2 (Krashen & Terrell, 1998). At first, conscious language learning is beneficial, as it increases an individual's awareness of metalinguistic principles and initially increases the individual's success during language practice (Krashen & Terrell, 1998). Language learning transitions into language acquisition when language learners begin to practice the language (Krashen & Terrell, 1998). Through practice, language learners internalize the metalinguistic principles they have learned consciously (Krashen & Terrell, 1998). By reading, writing, speaking, and listening in the L2, learners utilize and subconsciously internalize the L2 grammar rules they have learned. After sufficient practice, an acquired L2 will eventually be spoken with as much ease as a first language (L1) during conversations.

A hindrance to language acquisition is the monitor, a mechanism by which a language learner monitors – or continuously checks for linguistic correctness or incorrectness – speech in the L2. The monitor impacts language learning by causing language learners to either overcorrect their productions or to underperform in the L2 (Krashen & Terrell, 1998). Confidence is key: language learners who are well-equipped with metalinguistic knowledge and confidence-building strategies which facilitate fluency in challenging conversation scenarios are less likely to consciously self-monitor or limit speech during the conversation (Krashen & Terrell, 1998).

Language acquisition occurs naturally when learners are exposed to comprehensible input, spoken or written input that is at a level just above the learner's current comprehension level (Krashen & Terrell, 1998). Cummins (1979) suggests that beginners utilize Basic Interpersonal Communication Skills (BICS) when communicating with others about everyday activities. Gradually, as language learners become more proficient, they can comprehend more academic input, which falls into the category of Cognitive Academic Language Proficiency (CALP) (Cummins, 1979). Academic vocabulary is especially challenging for language learners to acquire due to infrequency of exposure to academic language; however, when academic vocabulary words contain recognizable morphemes, the meanings of the words are more likely to be elucidated by the language learners. Therefore, morphemes may make input more comprehensible.

Krashen hypothesized language learners acquire target languages in a sequence similar to the natural course of childhood language development (Krashen & Terrell, 1998). Hence, according to Krashen's natural order hypothesis, effective ESOL or EFL programs ought to organize lessons in a sequence which allows language learners to practice basic linguistic concepts before practicing more complex skills. When linguistic concepts are taught in a developmentally appropriate sequence, language learners may feel less intimidated when speaking (Krashen & Terrell, 1998). In Krashen's theory, language learners who are more comfortable when speaking have lower affective filters (Krashen & Terrell, 1998). Affective filters are the psychological barriers which inhibit language learners from comfortably producing elements of a second language (Krashen & Terell, 1998). A language learner's experiences when acquiring a second language are enhanced by having a low affective filter. A low affective filter

increases a learner's confidence in the language, which, in turn, increases the learner's frequency of language use while simultaneously enhancing the learner's knowledge of the language.

Because linguistic and interpersonal factors interact during the process of language acquisition, Krashen's theory provides an important framework for understanding how language learners acquire a target language and subsequently develop literacy skills in the language.

Perceptions of Literacy and Oracy in an Acquired Language. Morphological awareness correlates with scores on measures assessing proficiency in an acquired language. Among fourth- and fifth-grade students, Zhang et al. (2020) found a positive correlation between L2 proficiency level and morphological analysis ability, vocabulary knowledge, and reading comprehension, contributing to overall literacy success (Zhang et al., 2020). Zhang et al.'s findings suggest morphological awareness is a tool increasingly utilized by ELLs as they become more proficient in the language.

In a longitudinal study of adult learners of English as a Foreign Language (EFL), Jiang and Kuo (2019) found that when the addition of a morpheme to a word lead to changes in the phonology and orthography of the base form of a word, ELLs had more difficulty decoding the semantic meaning of the word. All participants in the study, even the participants with higher levels of English proficiency, initially demonstrated gaps in morphological knowledge related to the process of suffix addition (Jiang & Kuo, 2019). Over time, however, learners who were initially more proficient in English made larger gains on measures of morphological awareness and vocabulary knowledge than the learners who were initially less proficient, even though both were exposed to the same intervention over the course of one academic year (Jiang & Kuo, 2019). The widening of the gap in proficiency levels between the two groups indicated a

relationship between level of proficiency in the L2 and the ability to apply morphological awareness to receptive and productive language. Therefore, the acquisition of morphological knowledge not only enhances literacy but also facilitates overall proficiency in the L2.

Morphological Awareness and ELLs

Metalinguistic processes, such as phonological and morphological awareness, are known to moderate decoding and semantic comprehension in the Simple View of Reading (SVR) by enabling readers to think consciously about the linguistic properties of words. The development of conscious morphological knowledge and morphological processing strategies increases morphological awareness.

Specific Role of Morphological Awareness in English Decoding.

In 2020, Mousikou et al. studied groups of developing readers and skilled adult readers who were monolingual speakers of either English, French, German, or Italian. During the assessment process, the researchers presented the participants with a decoding task in which words and nonwords were combined with both real suffixes and non-suffixes (Mousikou et al., 2020). The stimulus lists were equivalent for each language, and word decoding times were recorded as a measure of decoding speed (Mousikou et al., 2020).

Of the languages in the study, English was the most orthographically inconsistent language. According to the researchers' hypothesis, if the use of morphology in decoding was solely a developmental strategy, developing readers in each language group would be more likely to rely upon morphological decoding strategies during reading than skilled adult readers (Mousikou et al., 2020). The researchers found, however, English-speaking children and adults displayed faster decoding times when reading multimorphemic words than the children and adults who spoke the other languages (Mousikou et al., 2020). The findings imply the use of

morphological awareness to facilitate decoding may be a linguistic strategy specific to English. Furthermore, the findings lend support to the Psycholinguistic Grain Size Theory, which proposes that breaking words into coarse, morpheme-sized chunks during decoding may increase the consistency of mappings between spelling and sound because using morpheme-sized chunks during decoding lessens the phonological and orthographic ambiguity which results from unclear morphological boundaries (Mousikou et al., 2020). Therefore, morphological awareness may play a more prominent role in facilitating English decoding than in facilitating decoding in other languages.

Phonological Decoding and Morphological Awareness.

The role of morphemes in reading comprehension is an area of emphasis within the literature related to morphology. In addition to providing clues to the meaning and grammatical function of a word, morphemes also strengthen the connections between graphemes and phonemes during the decoding process, increasing the accuracy of decoding in scenarios where words cannot be decoded solely by GPC rules. For example, morpheme recognition may aid in the parsing of complex words, such as *misheard* and *misshaped* (Nunes et al., 2012). In the word *misheard*, /s/ and /h/ are split across a morpheme boundary, providing a cue that the two phonemes are pronounced separately, rather than as /ʃ/, which is heard in the word *misshaped* (Nunes et al., 2012). When readers encounter a novel word, the word may be parsed into familiar grapheme units or may be parsed into familiar morphological units (Nunes et al., 2012). While a coarse-grained version of the DRC model suggests GPC rules and morphological knowledge are both utilized during the decoding process, research provides further confirmation of coarse-grained models, as Nunes et al. (2012) found evidence suggesting GPC rules and morphemic units are both significant contributors to decoding in English.

In 2012, Nunes et al. published the results of a longitudinal study of monolingual English-speaking children in the United Kingdom, which observed the development of a group of children throughout a four-year period from ages eight to 13. The researchers presented the children with tasks measuring verbal IQ, word and nonword decoding skill, word spelling, and reading comprehension (Nunes et al., 2012). The test stimuli consisted equally of words and nonwords containing larger phonic units (such as digraphs), as well as words and nonwords containing morphemes (Nunes et al., 2012). The stimuli were orthographically complex, comprised of words containing split digraphs (i.e., a word in which a vowel is separated from a word-final "silent e" which alters the pronunciation of the preceding vowel) (Nunes et al., 2012). Correctly decoding the orthographically irregular words required the ability to parse graphemes within a word, apply grapheme-phoneme correspondence rules, and determine the accurate pronunciation of the word (Nunes et al. 2012). The word list was also comprised of multimorphemic words which possessed orthographically opaque junctures between morphemes. Therefore, the words could only be accurately decoded when morphological knowledge was utilized to identify the boundary between separate morphemes (e.g., *misheard, electrician, kindness*) (Nunes et al., 2012).

Nunes et al. (2012) found the structure of a word's phonic units and the structure of a word's morphological units uniquely contributed to variance in reading fluency and comprehension. Nunes et al. interpreted the results as suggesting that "children's understanding and use of phonic units and of morphological units in reading and spelling affected… reading comprehension independently of each other" (2012, p. 967). Furthermore, the results indicated knowledge of morphology and phonic units had approximately equal influence-on variation in reading rate; however, the children's reading comprehension was influenced more heavily by

level of morphological knowledge than by level of phonic knowledge (Nunes et al., 2012). While graphemes and morphemes both facilitated participants' decoding, morphemes provided additional access to semantic information during the decoding process, enabling participants to access their lexicons more rapidly during decoding. Using morphological units during decoding was a developmental strategy used by the participants during reading, as the contribution of morphology to reading fluency and comprehension increased as the children in the study became more proficient readers (Nunes et al., 2012). Therefore, the ability to draw parallels between familiar and unfamiliar words which share morphemes may be a developmental word learning strategy which aids children in parsing unfamiliar words to identify semantic and phonological information.

Similar to the study completed by Nunes et al. (2012), additional research further affirmed the role of morphology as a tool used by ELLs to decode words with orthographic and phonological irregularities in English. In 2019, Jiang and Kuo published the results of a longitudinal study of adult EFL learners at a university in Taiwan. The participants each spoke a dialect of Chinese as their L1 and had varying levels of English proficiency (Jiang & Kuo, 2019). The researchers recognized Chinese has a limited number of derivational suffixes, making English morphology substantially different from Chinese morphology (Jiang & Kuo, 2019). The researchers examined vocabulary, morphological awareness, and knowledge of relationships between morphology, phonology, orthography, and semantics. One test assessed morphological-syntactic knowledge of parts of speech (Jiang & Kuo, 2019). A separate word association measure used by Jiang and Kuo (2019) required participants to pair a word with the correct definition among four possible options. The test was comprised of low-frequency morphologically simple words, high-fr-quency morphologically simple words, and

morphologically complex words (Jiang & Kuo, 2019). The morphologically complex words were comprised of derived words with a base and suffix, and half of the derived words were phonologically and orthographically different from their underived forms (Jiang & Kuo, 2019). Jiang and Kuo (2019) found ELLs to be most proficient in decoding and comprehending monomorphemic and multimorphemic words with high frequency bases. The readers demonstrated the greatest difficulty in decoding low-frequency morphologically simple words and unbound affixes (Jiang & Kuo, 2019). Students of all proficiency levels experienced difficulties decoding derived words in which phonological and orthographic shifts were present. The participants' assessments of the meaning of the base morpheme were impacted by the phonological and orthographic changes resulting from the addition of an affix (Jiang & Kuo, 2019).

Semantic Decoding and Morphological Awareness

The impact of morphology upon the DRC mechanism of decoding may differ slightly between languages, depending upon the specific structural features of the language being read. Morphology may provide cues to a word's phonological structure or a word's semantic and syntactic function, depending upon the depth of the language's orthography. In orthographically opaque languages, morphology may facilitate phonological decoding; in orthographically transparent languages, morphology may provide cues to semantic meaning and syntactic function. D'Alessio et al. (2019) examined the differential impact of morphological awareness on decoding and semantic comprehension among fourth-grade Spanish-speaking children, elucidating the nature of the relationship between first-language characteristics and the mechanisms used for applying morphological knowledge when reading in another language.

In 2019, D'Alessio et al. studied the relationship between morphological awareness, reading comprehension, and decoding using a path analysis model. The participants were fourth-grade students in Buenos Aires, Argentina, whose first language was Spanish (D'Alessio et al., 2019). Assessments measured students' levels of reading comprehension, morphological awareness, phonological awareness, vocabulary, nonverbal intelligence, and accuracy and fluency of word decoding in Spanish (D'Alessio et al., 2019). The morphological awareness task developed by D'Alessio et al. (2019) followed an analogy paradigm (i.e., A:B::C:D) in which pairs of words containing derivational morphemes were presented to readers to assess their awareness of morphemes which were either phonologically opaque, phonologically transparent, or orthographically dissimilar. In each pair, the derivational suffixes shared a common function. For example, the words in each pair may have been related by a nominalization process, but the suffix used to create the nominal form of a word in the first set of words was different than the suffix required to create the nominal form of a word in the second set of words (D'Alessio et al., 2019). The assessment allowed the researchers to measure children's knowledge of derivational processes, beyond simply assessing the children's familiarity with common derivational endings. The researchers found no facilitatory effect of morphological awareness on phonological decoding; nor did the researchers find any impact of decoding on reading comprehension. Based on the findings, the researchers suggested morphological knowledge may not be a fundamental component of the decoding process for Spanish, since Spanish is transparent and has many direct phoneme-grapheme correspondences (D'Alessio et al., 2019). However, the researchers stated that "reflecting on the morphological structure of an unknown word [in Spanish] might provide a tool to access its meaning (semantic level) or its part of speech (syntactic level), which subsequently contributes to overall reading comprehension" (D'Alessio et al., 2019, p. 508). The

researchers also postulated Spanish morphological awareness may have had a large facilitatory effect on decoding and comprehension in English because English morphology and English spelling patterns are closely related (D'Alessio et al., 2019). In English, the structure of affixes is preserved over the structure of roots. Thus, the addition of an affix to a root may result in a shift in the orthography of the root while the orthography of the affix remains unchanged. While Spanish readers may utilize familiar morpheme patterns to provide semantic cues during decoding, English readers may utilize familiar morpheme patterns to provide cues about a word's pronunciation during the decoding process.

Impact of L1 Structural Features on L2 Morphological Awareness.

The morphological and orthographic structures of an ELL's L1 impact the process by which an ELL learns an L2, leading to a transfer of morphological awareness across languages. Wu and Juffs (2021) analyzed the relationship between the degree of morphological fusion present in an ELL's L1 and the ELL's scores on measures of English morphological awareness. Wu and Juffs (2021) compared the morphological awareness levels of native speakers of English, a language with an isolating morphological structure, with the morphological awareness levels of ELLs whose first languages were Turkish, a morphologically agglutinating language, or Mandarin Chinese, a morphologically isolating language (Wu & Juffs, 2021). The participants, comprised of young adults fluent in English at a university level, completed a battery of English morphological awareness tasks, including affix-choice tasks using word and nonword stimuli, a derivation task, a task of determining morphological relatedness, and a suffix-ordering task (Wu & Juffs, 2021). The study found L1 speakers of Turkish displayed higher morphological awareness scores on tasks of derivation, morphological relatedness, and suffix-ordering than L1 speakers of Chinese (Wu & Juffs, 2021). The Turkish L1 group also outperformed the group of

native English speakers on measures of English morphological relatedness, irrespective of the Turkish ELLs' levels of English proficiency (Wu & Juffs, 2021). Therefore, individuals proficient in languages which have high degrees of morphological synthesis and morphological fusion show higher levels of morphological awareness in English, suggesting a transfer of morphological awareness from the L1 to English.

A substantial body of research suggests a link exists between morphology and orthography. When a language has an extremely opaque orthography, it cannot be decoded via GPC rules. Thus, in theory, to read irregularly spelled words in a language with an opaque orthography, a reader may need to rely heavily upon the use of morphology during decoding to supplement any phonological information in the word which cannot be decoded via GPC rules (Zhang & Ke, 2019). Language acquisition researchers Zhang and Ke (2019) studied three groups of students among fourth-grade learners of English as a foreign language (EFL) in bilingual-biliterate classrooms in Singapore, Thailand: English bilingual students who learned English as a primary home language and a dialect of Chinese as a second language, Chinese bilingual students who learned Chinese as a home language and English as a second language, and Malay bilingual students who learned Malay as a home language and English as a second language. Like English, Malay is an alphabetic language with an opaque orthography, so the Malay bilingual group was hypothesized to outperform the Chinese bilingual group on measures of phonological and morphological decoding since the Chinese language, which has a logographic orthography, does not use the derivational structures found within the Malay and English languages (Zhang & Ke, 2019). Zhang and Ke's experiment (2019) utilized two languages drastically different in orthographic opacity. In the study, the researchers assessed phonemic decoding skill using a pseudoword reading task and assessed morphological decoding

fluency by timing the rate of decoding for derivational words (Zhang & Ke, 2019). Using path analysis methods, the researchers found morphological decoding fluency to be a statistically significant predictor of decoding in the English bilingual and Malay bilingual groups, suggesting morphological decoding strategies are more highly utilized by proficient readers of English or languages similar in structure to English, such as the Malay language (Zhang & Ke, 2019). Given the study's results, Zhang and Ke proposed morphological decoding mechanisms may be more important than phonemic decoding mechanisms for ELLs who are learning to read English.

Transfer of Morphological Awareness Between L1 and L2

The studies completed by Wu and Juffs (2021), Zhang and Ke (2019), and Mousikou et al. (2020) each compared the impact of language structure (i.e., morphology and orthography) on decoding processes between different languages. While the studies suggested that L1 morphological and orthographic structure may impact L1 and L2 decoding strategies, the studies did not describe the extent or characteristics of the transfer of morphological awareness between the L1 and L2. Several studies have further investigated the impact of language structure on cross-linguistic transfer of morphological awareness.

In 2010, Ramirez et al. studied the transfer of morphological awareness between the Spanish and English languages. Spanish is more orthographically transparent than English and has a highly fusional system of inflectional morphology, while an isolating system of inflectional morphology is present in English. Ramirez et al. (2010) assessed Spanish-English bilingual students in fourth and seventh grade in Canada. The researchers administered language history questionnaires in conjunction with tests of nonverbal reasoning, working memory, English phonological awareness, English and Spanish morphological awareness, English and Spanish word reading, and English and Spanish vocabulary (Ramirez et al., 2010). Notably, the measure

of morphological awareness included two subtests: a morphological production task, in which participants were asked to speak the correct derived form to complete a sentence, and a morphological structure task in which participants selected the appropriate derived form of a word from among four choices with the same stem (Ramirez et al., 2010). In the morphological structure task, the stimuli included low-frequency real words and pseudowords to control for the effects of word familiarity while assessing derivational awareness (Ramirez et al., 2010). Of the variables tested, the authors found morphological awareness, specifically the ability to identify and produce the correct derived forms of morphemes, corresponded with variance in reading in both Spanish and English (Ramirez et al., 2010). Spanish morphological awareness was correlated with Spanish word reading and explained a portion of the unique variance in English word reading (Ramirez et al., 2010). However, English morphological awareness – although correlated with English word reading – did not explain any significant variance in Spanish word reading, suggesting morphological awareness unidirectionally transfers from Spanish to English, but not from English to Spanish. Ramirez et al. (2010) suggested Spanish morphological awareness may have uniquely contributed to English morphological awareness by influencing readers' understanding of common morphological principles across the two languages, including the semantic and syntactic properties of morphemes which impact the structure of multimorphemic words, enabling ELLs to "draw on the sensitivity that they developed through experience with the sophisticated Spanish morphological system in order to read English words" (p. 353). Cross-language transfer of morphological awareness between English and Spanish may allow ELLs to utilize robust semantic-syntactic cues derived from Spanish morphological awareness when decoding English words.

While Ramirez et al. (2010) found morphological awareness transferred unidirectionally between Spanish and English, Deacon et al. (2007) found morphological awareness transferred bidirectionally between French and English in a longitudinal study of children in grades 1 through 3. The children in the study spoke English as their L1 and were learning French through French language immersion programs at schools in Quebec, Canada (Deacon et al., 2007). The researchers assessed the children's English vocabularies, nonverbal reasoning skills, English phonological awareness, English and French word reading, and English and French morphological awareness (Deacon et al., 2007). Specifically, the morphological awareness task presented participants with words with various inflectional suffixes using a sentence analogy format (i.e., A:B::C:D) (Deacon et al., 2007). The task instructed the children to determine if the analogy was correct or incorrect, assessing the children's knowledge of the relationships between affixes which served the same inflectional purpose (e.g., run:running::read:reading are related, while jump:jumped::sing:sings are unrelated) (Deacon et al., 2007). Initially, among first-grade students, French inflectional morphological awareness was associated with French word reading only, while English inflectional morphological awareness was correlated with both English and French word reading (Deacon et al., 2007). However, by third grade, English inflectional morphological awareness was solely correlated with English word reading, while French inflectional morphological awareness was correlated with word reading in both English and French (Deacon et al., 2007). Because the children were learning French as a secondary language, over time, the children demonstrated increased proficiency in French reading abilities as the children's knowledge of French increased (Deacon et al., 2007). The researchers proposed the results of the study could have been explained, in part, by the natural developmental course of second-language acquisition (Deacon et al., 2007). "As contributions [to morphological

awareness] from the first language decrease," Deacon et al. suggested (2007), "those from the second language increase" due to an increase in L2 familiarity over time (p. 741). French and English are structurally similar in several ways. Specifically, French is slightly more morphologically synthetic and has a higher degree of morphological fusion than English. While both French and English are orthographically opaque languages, French does not possess the vowel sound inconsistencies found in English (Borleffs et al., 2017). A feature of Deacon et al.'s study (2007) which set it apart from other studies was the researchers' use of inflectional morphemes rather than derivational morphemes to assess morphological awareness. The results of Deacon et al.'s study (2007) did not reveal whether a bidirectional relationship also existed between French and English derivational morphological awareness.

Summary

Word decoding mechanisms operate by utilizing orthographic input to process graphemes and subsequently access semantic and phonological information within the mental lexicon. Morphological cues facilitate the process of decoding. The utilization of morphological, phonological, and semantic cues during decoding differs across languages, depending on the morphological and orthographic structural features of languages. Languages may have varying degrees of orthographic opacity, morphological fusion, and morphological synthesis. The unique structural features of a language may impact an individual's level of morphological awareness. The purpose of this study was to examine the impact of first-language structural features on morphological awareness to provide a more comprehensive understanding of the influence of individuals' linguistic backgrounds upon their linguistic skillsets when acquiring English.

Methodology

Morphological awareness contributes to an individual's proficiency in decoding and comprehending written words (Mousikou et al., 2020; Robinson, 2018). Researchers have found positive correlations between ELLs' performance on measures of first-language morphological awareness and ELLs' performance on measures of semantic and phonological dimensions of English morphological awareness, suggesting morphological awareness is affected by cross-linguistic transfer (D'Alessio et al., 2019; Nunes et al., 2012; Jiang & Kuo, 2019).

Since languages have different structural features, decoding skills and decoding mechanisms may differ slightly between languages (Mousikou et al., 2020). Preexisting mental frameworks for decoding are adjusted to accommodate the written features of a new language. The framework's efficiency is contingent upon many factors, including the structural similarities and dissimilarities between the morphological and orthographic features of both the native and acquired languages. Morphological awareness may facilitate decoding across two structurally different languages. English is a language with an opaque orthography and an isolating, analytic morphological structure; therefore, English is a challenging language to learn to read. Morphological awareness may facilitate literacy development in English, despite English's challenging structural features.

The connection between morphological awareness and self-perceptions of oracy and literacy proficiency is a relatively unexplored area of research, yet it is nonetheless valuable. Krashen's theory of language acquisition holds spoken language is more fluent and less inhibited when a language acquirer has a low affective filter. By extension, therefore, Krashen's theory suggests metacognitive skills, including morphological awareness, may be positively impacted by positive self-perceptions of literacy and oracy proficiency.

Given that multiple dimensions of morphological awareness and graphophonemic awareness have been found to contribute to decoding skill among ELLs, the goal of this study was to determine the extent of the correlation between three components of linguistic structure and morphological awareness. In using multiple linear regression models to analyze the data, the objective was to elucidate a potential facilitatory relationship between the structural features of the languages spoken by an individual and the individual's level of morphological awareness. Furthermore, this study sought to determine the strength and magnitude of the relationship between linguistic structural features and morphological awareness.

An additional objective of this study was to determine the strength of the relationship between study participants' levels of morphological awareness and levels of self-perceived proficiency in English oracy skills and English literacy skills. Krashen's theory suggests a psychological "affective filter" may impact an individual's comfort and performance when using another language to communicate. Therefore, it can be hypothesized that a relationship exists between levels of perceived English proficiency and levels of morphological awareness.

To address this study's research questions, a non-experimental and quantitative design was utilized. The primary research tool of the study was a survey comprised of two sections of questions, and an initial description (see Appendix A). The research tool was created in the Google Forms platform. Once the study's design and materials were approved by the supporting institution's Internal Review Board, and after all investigators provided documentation of Collaborative Institutional Training Initiative (CITI) program certification, the survey was distributed internationally via social media. Specifically, recruitment materials were posted in several subgroups for language learners on Facebook. The administrators of the Facebook groups approved the recruitment materials before the materials were posted in the group. Responses

were collected over the course of two weeks. Following closure of the survey, the Statistical Package for the Social Sciences (SPSS) statistical software platform was used to complete descriptive and inferential statistical analyses of the data.

Study Participants

Participants were recruited for the study using a non-probability, convenient sampling technique. The primary inclusion criteria included: having learned two or more languages for any length of time with any level of proficiency, at least a working knowledge of English, and an age of 18 years or older. Recruitment was directed toward multilingual adult individuals involved in online Facebook groups focused on the topic of language learning. The survey was open to individuals from any country of residence. Participants took the survey on the internet, making the survey available internationally to individuals who speak a large variety of languages.

Survey Development

The survey tool was comprised of two sections. The first section of the survey was designed to elicit responses regarding participants' language-learning histories, while the second section of the survey was designed to elicit responses regarding participants' morphological awareness skills.

Items on the language learning history section were carefully worded and selected through rigorous field testing. Items were designed to assess the length of time and methods by which participants had learned two or more languages. Participants had the opportunity to complete the same set of questions for each of the first three languages the participants had learned. The language learning history section also allowed participants to list their country of origin, age, highest level of education, and self-rated proficiency in both literacy (reading/writing) and oracy (literacy/speaking) skills.

The morphological awareness section of the survey was designed to assess participants' proficiency on a task which instructed the participants to analyze multimorphemic words by dissecting the words into separate morphemes. In 2003, researchers Ku and Anderson used an "odd-man-out" style tool as a measure of the construct of morphological awareness and morphological decomposition. The "odd-man-out" task design instructed participants to select the outlier from a set of three similar words. In each set, two words shared a common morpheme, while one word did not. Because the "odd-man-out" task designed for Ku and Anderson's 2003 study used vocabulary words which were age-appropriate for children in elementary and middle school, new stimulus words were selected for this study with the intent of accurately representing the abilities of the adult survey participants.

One-half of the questions in the morphological awareness section were intended to measure morphological awareness in the presence of a sound shift, while the other half of the questions were intended to measure morphological awareness in the presence of a spelling shift. A word with a *sound shift* was defined as a word which displayed a phonetic alternation, though its spelling remained unchanged. A phonetic alternation is a shift in the pronunciation of one phoneme in the word due to the constraints of the phonetic context evoked by the binding of a morpheme to the base form of the word. A word was not considered to have a sound shift unless alternate pronunciations of the morpheme could be found within other contexts. Likewise, a word with a *spelling shift* was a word in which both the phonetic structure and spelling changed due to the binding of a morpheme to the base form of the word. An alternate spelling and pronunciation of the morpheme must exist in another context for the word to be classified as possessing a spelling shift. To measure awareness of sound shifts and spelling shifts across word

parts, six sets of three questions were developed to assess awareness of both the sound shifts and the spelling shifts which occurred in the prefixes, the suffixes, and the bases of words.

Codification System

Operationally, morphological awareness was defined as the measurable composite score received by participants on the morphological awareness task. A correct question was given a score of 1.0 units, while an incorrect question was given a score of 0.0 units. The maximum correct morphological awareness score was 18.0 units.

The structural features of the languages represented in the sample were codified through a multi-step process. A codification system was developed to classify languages according to orthographic opacity, morphological fusion, and morphological synthesis. The classification system for morphological fusion and morphological synthesis was based upon Sapir's (1921) system of morphological classification. To codify the languages, comparative linguistic methods were used to analyze the similarities between languages and determine the strength of the relationships between languages by identifying historical, etymological, and linguistic connections between the languages (Rowe & Levin, 2015). Languages which have close etymological relationships often share many structural similarities, but distantly related languages often have extremely different structures (Rowe & Levin, 2015). Linguistic resources, such as language family trees and grammar textbooks, were used to support each classification decision made. Each classification decision was made by comparing and contrasting the language's structural features with the structural features of similar languages.

A language's level of orthographic opacity was determined by referencing sources which evaluated the degree of irregularity in the language's phoneme-grapheme correspondences. Orthographic opacity was measured on a continuum from "most transparent" to "most opaque",

with the addition of a final category which was comprised of all languages with non-alphabetic orthographies, such as languages with logographic orthographies, or languages without a formal orthography (such as sign languages).

Morphological fusion was operationally defined as the degree of fusion present between the morphemes of a language, as determined by referencing the research of linguists regarding the degree of fusion between morphemes for each language in the sample. Languages were categorized as isolating, agglutinating, fusional, or symbolic. Of these four categories, a language was categorized as isolating if the language's words displayed a low degree of morphological fusion or alteration across various semantic and syntactic contexts. A language was categorized as agglutinative if the language's morphemes were bound together without a high degree of orthographic or phonological fusion. A language was categorized as fusion if the language's suffixes were altered depending on the syntactic and semantic role of the word. A language was categorized as symbolic if the vowels in the middle of the word were altered to reflect syntactic and semantic changes.

Operationally, degree of morphological synthesis was determined by identifying the number of morphemes typically found in each word in the language and by identifying the grammatical function of each word within the context of a sentence. Languages were classified as analytic if meaning was determined by syntax, or the order of individual words in a sentence, rather than on the order of morphemes in a word. Languages were classified as synthetic if the languages' morphemes could be synthesized into phrases, such as nominal and verbal phrases. Word order was of moderate importance in each synthetic language. Languages were classified as polysynthetic languages if the languages' morphemes were synthesized into sentence-length phrases which combined multiple parts of speech. The languages were ranked from least to most

synthetic, with the least synthetic languages having a score of 1 and the most synthetic languages having a score of 3. Table 1 shows the classification system used to rank the languages represented in the sample according to the complexity of the languages' orthographic opacity, morphological fusion, and morphological synthesis.

Table 1

System for Ranking Languages from Least to Greatest Complexity of Structural Features

Category	Score
Orthographic Opacity	
Most Transparent Alphabetic Orthography	1
Moderately Transparent Alphabetic Orthography	2
Moderately Opaques Alphabetic Orthography	3
Most Opaque Alphabetic Orthography	4
Non-alphabetic Orthography (i.e., logographic or lacks formal orthography)	5
Morphological Fusion	
Isolating	1
Agglutinating	2
Fusional	3
Symbolic	4
Morphological Synthesis	
Analytic	1
Synthetic	2
Polysynthetic	3

In the multiple linear regression models, each score for orthographic opacity, morphological fusion, and morphological synthesis was averaged to create a composite score which represented the average level of orthographic opacity, morphological fusion, and morphological synthesis across the two or three languages spoken by the individual.

Statistical Methods

This study's research questions were addressed through the collection of quantitative data using an electronic survey tool. Because quantitative data was collected, it became possible to develop multiple linear regression models as a means of analyzing the strength and magnitude of

the relationship between structural linguistic factors and morphological awareness scores. Additionally, a 1x3 ANOVA technique was utilized to analyze the effect size of perceived English literacy proficiency and oracy proficiency upon morphological awareness. The next section of this thesis report details the analysis of the data collected through the administration of the survey.

Analysis of Data

Using the SPSS software program, statistical analysis of the data was initially conducted to provide a summary of the preliminary descriptive statistical findings for the sample. Descriptive, inferential, and associative/predictive analyses of the data were subsequently conducted using the SPSS software program as a means of addressing each of the study's five research questions.

Preliminary Descriptive Statistical Findings

The preliminary descriptive statistical findings of the study include a summary of the study's demographic information, as well as several summaries of findings related to performance on the morphological awareness task. Descriptive statistical techniques were used to analyze response set data for each item of the morphological awareness task. Summaries of findings were also compiled to describe participant performance on the spelling shift items and sound shift items of the morphological awareness task. Finally, preliminary descriptive statistical analyses were conducted to describe performance upon the morphological awareness task by age category and by educational level.

Demographic Information

The study's demographic primary information was specifically evaluated using descriptive statistical techniques. The study's demographic information was addressed using the descriptive statistical techniques of frequencies (*n*) and percentages (*%*). Table 2 contains a summary of findings for the descriptive statistical analysis of the study's demographic identifying information of study participant age category, education level, and self-perceived fluency in reading and writing in the English language, as well as speaking and listening in the

English language (data not shown is a list of the 40 countries of origin represented by the participants).

Table 2

Descriptive Statistics Summary Table: Demographic Identifying Information

Category	*n*	*%*	Cumulative *%*
Age			
18-26	30	32.97	32.97
27-40	30	32.97	65.94
41 & Older	31	34.07	100.00
Missing	0	0.00	100.00
Education			
High School/GED	7	7.69	7.69
AA Degree/Some College	12	13.19	20.88
Bachelor's Degree	33	36.26	57.14
Master's Degree	34	37.36	94.51
Doctoral Degree	4	4.40	98.90
Missing	1	1.10	100.00
English Reading &Writing			
Moderate	12	13.19	13.19
High	32	35.16	48.35
Very High	47	51.65	100.00
Missing	0	0.00	100.00
English Speaking & Listening			
Moderate	10	10.99	10.99
High	37	40.66	51.65
Very High	43	47.25	98.90
Missing	1	1.10	100.00

Language Representation Information

The study's language representation information was specifically evaluated using descriptive statistical techniques. Table B (see Appendix B) contains a summary of findings for the number of speakers of each language as a first, second, or third language. The data was addressed using the descriptive statistical techniques of frequencies (*n*) and percentages (*%*). In the sample, 38 languages were represented. Approximately 88% of the participants spoke 3

languages, while 23% of the participants spoke two languages. English was the language most frequently spoken as a second language in the sample, spoken as an L2 by 56% of respondents.

Table C (see Appendix C) summarizes the total number of speakers of each language represented in the response set using the descriptive statistical techniques of frequencies (*n*) and percentages (*%*). English, French, Spanish, and German were the most frequently spoken languages in the sample. English was spoken as either a first, second, or third language by 97% of participants, French was spoken by 42% of participants, Spanish was spoken by 40% of participants, and German was spoken by 23% of participants.

Using the coding system from Table 1, each language represented in the sample was coded to reflect the structural features of orthographic opacity, morphological fusion, and morphological synthesis. Table D (see Appendix D) contains a list of each language in the response set and lists the codes which correspond to the languages' orthographic opacity, morphological fusion, and morphological synthesis.

Table 3 summarizes the total number of speakers of each language represented in the response set, categorized according to the structural characteristics of the languages. The languages (*n*=291) were addressed according to the frequency in which the languages appeared in the sample as a first, second, or third language. The data was addressed using the descriptive statistical techniques of frequencies (*n*) and percentages (*%*).

Table 3

Descriptive Statistics Summary Table: Language Representation by Structural Features of Orthographic Opacity, Morphological Fusion, and Morphological Synthesis

Language Structural Feature	*n*	%	Cumulative %
Degree of Orthographic Opacity			
Most Transparent	61	23.37	23.37
Moderately Transparent	25	9.58	32.95
Moderately Opaque	19	7.28	40.23
Most Opaque	149	57.09	97.32
Non-alphabetic	7	2.68	100.00
Missing	0	0.00	100.00
Degree of Morphological Fusion			
Isolating	7	2.68	2.68
Agglutinating	7	2.68	5.36
Fusional	238	91.19	96.55
Symbolic	9	3.45	100.00
Missing	0	0.00	100.00
Degree of Morphological Synthesis			
Analytic	101	38.70	38.70
Synthetic	160	61.30	100.00
Polysynthetic	0	0.00	100.00
Missing	0	0.00	100.00

Initial Descriptive Statistical Findings for Morphological Awareness

Descriptive statistical techniques were utilized to assess the study's response set data of 18 morphological awareness items. The study's response set data were addressed using the descriptive statistical techniques of frequencies (*n*), measures of typicality (mean scores), variability (minimum/maximum; standard deviations), and standard errors of the mean (SE_M). Table 4 contains a summary of findings for the descriptive statistical analysis of the study's response set data associated with the 18 morphological awareness items.

Table 4

Descriptive Statistics Summary Table: Morphological Awareness Task Items

Morphological Awareness Item	*M*	*SD*	*n*	SE_M	Minimum	Maximum
Item 1	0.97	0.18	91	0.02	0.00	1.00
Item 2	0.98	0.15	91	0.02	0.00	1.00
Item 3	0.86	0.35	91	0.04	0.00	1.00
Item 4	0.81	0.39	91	0.04	0.00	1.00
Item 5	0.98	0.15	91	0.02	0.00	1.00
Item 6	0.92	0.27	91	0.03	0.00	1.00
Item 7	0.76	0.43	91	0.05	0.00	1.00
Item 8	0.96	0.21	91	0.02	0.00	1.00
Item 9	0.99	0.10	91	0.01	0.00	1.00
Item 10	0.57	0.50	91	0.05	0.00	1.00
Item 11	0.97	0.18	91	0.02	0.00	1.00
Item 12	0.87	0.34	91	0.04	0.00	1.00
Item 13	0.76	0.43	91	0.05	0.00	1.00
Item 14	0.75	0.44	91	0.05	0.00	1.00
Item 15	0.78	0.42	91	0.04	0.00	1.00
Item 16	0.71	0.45	91	0.05	0.00	1.00
Item 17	0.81	0.39	91	0.04	0.00	1.00
Item 18	0.89	0.31	91	0.03	0.00	1.00

Morphological Awareness: Sound and Spelling Shift Findings

Descriptive statistical techniques were utilized to assess the study's response set data associated with sound and spelling shift items of morphological awareness. The study's response set data were addressed using the descriptive statistical techniques of frequencies (*n*), measures of typicality (mean scores), variability (minimum/maximum; standard deviations), standard errors of the mean (SE_M), and data normality (skew; kurtosis). Table 5 contains a summary of findings for the descriptive statistical analysis of the study's response set data associated with the sound and spelling shift items for morphological awareness.

Table 5

Descriptive Statistics Summary Table: Proficiency on Assessment Items by Sound Shift, Spelling Shift, and Total

Awareness Task Category	*M*	*SD*	*n*	SE_M	Min	Max	Skew	Kurtosis
Sound Shift	0.87	0.14	91	0.01	0.22	1.00	-1.56	3.57
Spelling Shift	0.84	0.15	91	0.02	0.44	1.00	-1.00	0.51
Total	0.85	0.12	91	0.01	0.33	1.00	-1.42	2.79

Morphological Awareness: Statistical Findings for Age Category and Education Level

Descriptive statistical techniques were utilized to assess the study's response set data associated with morphological awareness by age category and by education level. The study's response set data were addressed using the descriptive statistical techniques of frequencies (*n*), measures of typicality (mean scores), variability (minimum/maximum; standard deviations), and standard errors of the mean (SE_M).Table 6 contains a summary of findings for the descriptive statistical analysis of the study's response set data associated with morphological awareness by age category.

Table 6

Descriptive Statistics Summary Table: Proficiency on Morphological Awareness Assessment Items by Age Category of Study Participant

Age/Morph. Awareness Proficiency	*M*	*SD*	*n*	SE_M	Min	Max	Skew	Kurtosis
Category 15-26								
Morphological Awareness	15.57	1.92	30	0.35	11.00	18.00	-0.79	-0.14
Category 27-40								
Morphological Awareness	15.03	2.16	30	0.39	10.00	18.00	-1.17	1.17
Category 41 & Older								
Morphological Awareness	15.39	2.51	31	0.45	6.00	18.00	-1.95	5.48

Table 7 contains a summary of findings for the descriptive statistical analysis of the study's response set data associated with morphological awareness by educational level.

Table 7

Descriptive Statistics Summary Table: Proficiency of Morphological Awareness Assessment Items by Educational Level of Study Participant

Age/Morph. Awareness Proficiency	*M*	*SD*	*n*	SE_M	Min	Max	Skew	Kurtosis
High School/GED								
Morphological Awareness	16.57	1.13	7	0.43	15.00	18.00	0.24	-1.23
AA Degree/Some College								
Morphological Awareness	14.62	2.57	12	0.71	10.00	18.00	-0.33	-1.05
Bachelor's Degree								
Morphological Awareness	15.64	1.82	33	0.32	11.00	18.00	-0.98	0.83
Master's Degree								
Morphological Awareness	15.06	2.50	34	0.43	6.00	18.00	-1.91	4.61
Doctoral Degree								
Morphological Awareness	15.25	2.22	4	1.11	13.00	18.00	0.48	-1.70

Dimensions of Linguistic Structure

Descriptive statistical techniques were utilized to assess the study's response set data associated with the three dimensions of linguistic structure – orthographic opacity, morphological fusion, and morphological synthesis – which characterize each of the three languages spoken by participants. The study's response set data were addressed using the descriptive statistical techniques of frequencies (*n*), measures of typicality (mean scores), variability (minimum/maximum; standard deviations), and standard errors of the mean (SE_M). Table 8 contains a summary of findings for the descriptive statistical analysis of the study's response set data associated with the three dimensions of linguistic structure.

Table 8

Descriptive Statistics Summary Table: Classification of Linguistic Structural Features by Order of Languages Learned

Dimension of Linguistic Structure	*M*	*SD*	*n*	SE_M	Min	Max	Skew	Kurtosis
Orthographic Opacity (Lang. 1)	2.51	1.30	91	0.14	1.00	5.00	0.09	-1.62
Orthographic Opacity (Lang. 2)	3.51	1.08	91	0.11	1.00	4.00	-1.80	1.37
Orthographic Opacity (Lang. 3)	3.19	1.34	79	0.15	1.00	5.00	-0.74	-0.97
Orthographic Opacity Mean	**3.06**	**0.59**	**91**	**0.06**	**2.00**	**4.67**	**0.20**	**-0.27**
Morphological Fusion (Lang. 1)	2.10	0.50	91	0.05	1.00	4.00	2.97	9.82
Morphological Fusion (Lang. 2)	2.08	0.34	91	0.04	2.00	4.00	4.66	21.56
Morphological Fusion (Lang. 3)	2.03	0.45	79	0.05	1.00	4.00	1.78	9.00
Morphological Fusion Mean	**2.07**	**0.24**	**91**	**0.03**	**1.33**	**2.67**	**1.13**	**2.27**
Morphological Synthesis (Lang. 1)	1.64	0.48	91	0.05	1.00	2.00	-0.57	-1.67
Morphological Synthesis (Lang. 2)	1.44	0.50	91	0.05	1.00	2.00	0.24	-1.94
Morphological Synthesis (Lang. 3)	1.78	0.41	79	0.05	1.00	2.00	-1.39	-0.08
Morphological Synthesis Mean	**1.61**	**0.15**	**91**	**0.02**	**1.00**	**2.00**	**-0.91**	**3.07**

Table 9 contains a summary of findings for the descriptive statistical analysis of the study's response set data associated with the three dimensions of linguistic structure by age category of study participant.

Table 9

Descriptive Statistics Summary Table: Dimensions of Linguistic Structure by Age Category of Study Participant

Age/Linguistic Feature	*M*	*SD*	*n*	SE_M	Min	Max	Skew	Kurtosis
Category 15-26								
Orthographic Opacity	3.09	0.66	30	0.12	2.00	4.33	-0.05	-0.82
Morphological Fusion	2.10	0.29	30	0.05	1.67	2.67	0.94	0.07
Morphological Synthesis	1.59	0.16	30	0.03	1.33	2.00	-0.32	0.06
Category 27-40								
Orthographic Opacity	3.09	0.56	31	0.10	2.00	4.67	0.30	0.97
Morphological Fusion	2.01	0.20	31	0.04	1.33	2.67	-0.010	6.00
Morphological Synthesis	1.61	0.17	31	0.03	1.00	2.00	-1.67	4.74
Category 41 & Older								
Orthographic Opacity	3.02	0.55	30	0.10	2.00	4.00	0.44	-0.66
Morphological Fusion	2.09	0.22	30	0.04	2.00	2.67	2.00	2.22
Morphological Synthesis	1.62	0.12	30	0.02	1.33	2.00	0.39	2.90

Table 10 contains a summary of findings for the descriptive statistical analysis of the study's response set data associated with the three dimensions of linguistic structure by educational level of study participant.

Table 10

Descriptive Statistics Summary Table: Dimensions of Linguistic Structure by Educational Level of Study Participant

Education Level/Linguistic Feature	*M*	*SD*	*n*	SE_M	Min	Max	Skew	Kurtosis
High School/GED								
Orthographic Opacity	2.95	0.49	7	0.18	2.00	3.33	-1.12	0.06
Morphological Fusion	2.10	0.25	7	0.10	2.00	2.67	2.04	2.17
Morphological Synthesis	1.67	0.19	7	0.07	1.33	2.00	-5.99	0.50
AA Degree/Some College								
Orthographic Opacity	2.99	0.77	12	0.22	2.00	4.00	0.24	-1.46
Morphological Fusion	2.12	0.28	12	0.08	1.67	2.67	0.54	-0.36
Morphological Synthesis	1.53	0.12	12	0.03	1.33	1.67	-0.23	-0.89
Bachelor's Degree								
Orthographic Opacity	3.09	0.57	33	0.10	2.00	4.33	0.02	-0.15
Morphological Fusion	2.07	0.25	33	0.04	1.67	2.67	1.53	1.91
Morphological Synthesis	1.60	0.16	33	0.03	1.33	2.00	-0.55	0.40
Master's Degree								
Orthographic Opacity	3.09	0.60	34	0.10	2.00	4.67	0.46	-0.05
Morphological Fusion	2.02	0.22	34	0.04	1.33	2.67	0.62	5.54
Morphological Synthesis	1.62	0.15	34	0.03	1.00	2.00	-2.01	8.12
Doctoral Degree								
Orthographic Opacity	2.92	0.17	4	0.08	2.67	3.00	-1.15	-0.67
Morphological Fusion	2.25	0.32	4	0.16	2.00	2.67	0.49	-1.37
Morphological Synthesis	1.67	0.00	4	0.00	1.67	1.67	-	-

Findings by Research Question

The study's five research questions were addressed using descriptive, inferential, and associative/predictive statistical techniques. The probability level of $p \leq .05$ represented the threshold value for findings achieved in the study's analyses to be considered statistically significant. Effect sizes achieved in the analyses were interpreted using the conventions of effect size interpretations proposed by Sawilowsky (2009).

Sawilowsky (2009) proposed that effect sizes can be defined as "d (.01) = very small, d (.2) = small, d (.5) = medium, d (.8) = large, d (1.2) = very large, and d (2.0) = huge" (p. 599).

The following represents the findings achieved in the study by research question stated:

Research Question #1

To what degree did study participant perceptions of English literacy proficiency impact variation in morphological awareness task overall scores?

A 1x3 ANOVA was conducted to evaluate the effect which perceptions of English literacy proficiency exerted upon overall morphological awareness. The ANOVA finding was statistically significant (F (2, 88) = 6.19, p = .003), indicating there were significant differences in overall morphological awareness among the levels of English literacy proficiency (see Table 11). The eta squared was 0.12, an approximate large effect, indicating that perceived level of English literacy proficiency explains approximately 12% of the variance in overall morphological awareness.

Table 11

Summary Table: Analysis of Variance for Overall Morphological Awareness by Perceived Level of English Literacy Proficiency

Model	*SS*	*df*	*F*	*p*	$\eta_p 2$
English Literacy Proficiency	0.17	2	6.19	.003**	0.12
Residuals	1.18	88			

***p* < .01

The means and standard deviation of the ANOVA findings are presented in Table 12.

Table 12

Mean, Standard Deviation, and Sample Size for Overall Morphological Awareness by Perceived Level of English Literacy Proficiency

English Literacy Proficiency Level	*M*	*SD*	*n*
Moderate	0.75	0.17	12
High	0.85	0.10	32
Very High	0.88	0.11	47

Follow-up Post-hoc Analysis. Follow-up post hoc analysis using paired sample *t*-tests was conducted between each pair of measurements to further evaluate differences among the variables. Tukey's HSD *p*-value adjustment was used to correct for the effect of multiple comparisons on the family-wise error rate. For the main effect of perceived level of English language literacy on overall morphological awareness, the mean of overall morphological awareness for the moderate level ($M = 0.75$, $SD = 0.17$) was statistically significantly lesser than for the high level ($M = 0.85$, $SD = 0.10$; $p = .02$). For the main effect of English language literacy, the mean of overall morphological awareness for the moderate level ($M = 0.75$, $SD = 0.17$) was statistically significantly lesser than for the very high level ($M = 0.88$, $SD = 0.11$; $p = .002$).

Research Question #2

To what degree did study participant perceptions of proficiency in English oracy impact variation in morphological awareness task overall scores?

A 1x3 ANOVA was conducted to evaluate the effect which perceptions of English oracy proficiency exerted upon overall morphological awareness. The ANOVA finding was statistically significant (F (2, 87) = 3.20, $p = .045$), indicating there were significant differences in overall morphological awareness among the levels of perceived English oracy proficiency (see Table 13). The eta squared was 0.07, a medium effect, indicating perceived level of English oracy proficiency explains approximately 7% of the variance in overall morphological awareness.

Table 13

A Summary Table: Analysis of Variance for Overall Morphological Awareness by Perceived Level of English Language Oracy Proficiency

Model	*SS*	*df*	*F*	*p*	$\eta_p 2$
English Oral Proficiency	0.09	2	3.20	.045*	0.07
Residuals	1.23	87			

*$p < .05$

The means and standard deviation of the ANOVA findings are presented in Table 14.

Table 14

Mean, Standard Deviation, and Sample Size for Overall Morphological Awareness by Perceived Level of English Language Oracy Proficiency

English Literacy Proficiency Level	*M*	*SD*	*n*
Moderate	0.77	0.12	10
High	0.85	0.13	37
Very High	0.87	0.11	43

Follow-up Post-hoc Analysis. Follow-up post hoc analysis using paired sample *t*-tests was conducted between each pair of measurements to further evaluate the differences among the variables. Tukey's HSD *p*-value adjustment was used to correct for the effect of multiple comparisons on the family-wise error rate. For the main effect of English oral proficiency, the mean of overall morphological awareness for the moderate level of English oracy proficiency ($M = 0.77$, $SD = 0.12$) was statistically significantly lesser than for the very high level ($M = 0.87$, $SD = 0.11$; $p = .04$).

Research Question #3

Considering orthographic opacity, morphological fusion, and morphological synthesis, which was most predictive of study participant overall morphological awareness?

The multiple linear regression (MLR) statistical technique was used to assess the predictive viability of the features of orthographic opacity, morphological fusion, and

morphological synthesis for overall morphological awareness. The MLR model was statistically significant (F (3,87) = 3.57, p = .02, R^2 = .11), indicating that 10.95% of the variance in overall morphological awareness is explainable by a confluence of orthographic opacity, morphological fusion, and morphological synthesis. Orthographic opacity was statistically significant in predicting overall morphological awareness (B = 0.05, $t_{(87)}$ = 2.47, p = .02), indicating that on average, a one-unit increase in orthographic opacity will increase the value of overall morphological awareness by 0.05 units. Morphological synthesis was statistically significant in predicting overall morphological awareness (B = 0.19, $t_{(87)}$ = 2.08, p = .04), indicating that on average, a one-unit increase in morphological synthesis will increase the value of overall morphological awareness by 0.19 units.

Table 15 contains a summary of findings for the model used to predict morphological awareness by orthographic opacity, morphological fusion, and morphological synthesis:

Table 15

Predictive Summary Table: Orthographic Opacity, Morphological Fusion, and Morphological Synthesis Predicting Overall Morphological Awareness

Model	*B*	*SE*	95.00% CI	β	*t*	*p*
(Intercept)	0.58	0.17	[0.24, 0.93]	0.00	3.37	.001
Orthographic Opacity	0.05	0.02	[0.01, 0.10]	0.25	2.47	.02*
Morphological Fusion	0.10	0.06	[-0.21, 0.02]	0.19	1.72	.09
Morphological Synthesis	0.19	0.09	[0.008, 0.37]	0.23	2.08	.04*

*p < .05

Research Question #4

Considering orthographic opacity, morphological fusion, and morphological synthesis, which was most predictive of study participant proficiency on morphological awareness assessment items displaying a sound shift?

The multiple linear regression (MLR) statistical technique was used to assess the predictive viability of orthographic opacity, morphological fusion, and morphological synthesis

for the sound shift element of morphological awareness. The predictive model was statistically significant at the $p < .10$ level (F (3,87) = 2.46, p = .07, R^2 = .08), indicating the confluence of orthographic opacity, morphological fusion, and morphological synthesis explained 8.0% of the variance in the sound shift element of morphological awareness. Morphological fusion was statistically significantly predictive of study participant proficiency on assessment items containing a sound shift element (B = 0.14, $t_{(87)}$ = 2.20, p = .03), indicating that on average, a one-unit increase in morphological fusion will increase proficiency on items assessing the sound shift element of morphological awareness by a value of 0.14 units.

Table 16 contains a summary of findings for the model used to predict the sound shift element of morphological awareness by orthographic opacity, morphological fusion, and morphological synthesis:

Table 16

Predictive Summary Table: Orthographic Opacity, Morphological Fusion, and Morphological Synthesis Predicting the Sound Shift Element of Morphological Awareness

Model	*B*	*SE*	95.00% CI	β	*t*	*p*
(Intercept)	0.80	0.20	[0.39, 1.21]	0.00	3.91	< .001
Orthographic Opacity	0.04	0.03	[-0.01, 0.09]	0.15	1.43	.16
Morphological Fusion	0.14	0.07	[0.01, 0.27]	0.25	2.20	.03*
Morphological Synthesis	0.16	0.11	[-0.06, 0.37]	0.17	1.47	.15

*$p < .05$

Research Question #5

Considering orthographic opacity, morphological fusion, and morphological synthesis, which was most predictive of study participant proficiency on morphological awareness assessment items displaying a spelling shift?

The multiple linear regression (MLR) statistical technique was used to assess the predictive viability of orthographic opacity, morphological fusion, and morphological synthesis for the spelling shift element of morphological awareness. The predictive model was statistically

significant (F (3,87) = 3.32, p = .02, R^2 = .10), indicating that 10.28% of the variance in performance on assessment items measuring the spelling shift element of morphological awareness is explainable by the confluence of orthographic opacity, morphological fusion, and morphological synthesis. Orthographic opacity was statistically significant in predicting the spelling shift element of morphological awareness (B = 0.07, $t_{(87)}$ = 2.70, p = .008), indicating that on average, a one-unit increase in orthographic opacity will increase performance on items assessing the spelling shift element of morphological awareness by a value of 0.07 units. Morphological synthesis was also statistically significant in predicting morphological awareness of spelling shift (B = 0.22, $t_{(87)}$ = 2.01, p = .047), indicating that on average, a one-unit increase in morphological synthesis will increase performance on items assessing the spelling shift element of morphological awareness by a value of 0.22 units.

Table 17 contains a summary of findings for the model used to predict the spelling shift element of morphological awareness by orthographic opacity, morphological fusion, and morphological synthesis:

Table 17

Predictive Summary Table: Orthographic Opacity, Morphological Fusion, and Morphological Synthesis Predicting the Spelling Shift Element of Morphological Awareness

Model	*B*	*SE*	95.00% CI	β	*t*	*p*
(Intercept)	0.37	0.21	[-0.05, 0.78]	0.00	1.76	.08
Orthographic Opacity	0.07	0.03	[0.02, 0.12]	0.28	2.70	.008*
Morphological Fusion	0.05	0.07	[-0.09, -0.18]	0.08	0.70	.49
Morphological Synthesis	0.22	0.11	[0.003, 0.44]	0.22	2.01	.047*

*p < .01 **p < .05

Discussion of Results

The purpose of this study was to quantify the extent of the relationship, if any, between morphological awareness and several variables: self-perceived proficiency in English literacy, self-perceived proficiency in English oracy, mean orthographic opacity of all acquired languages, mean degree of morphological fusion of all acquired languages, and mean degree of morphological synthesis of all acquired languages. The findings supported the existence of a positive correlation between each independent variable and overall morphological awareness. Inferential and predictive models revealed perceived literacy proficiency explained a larger degree of the variance in morphological awareness than did perceived oracy proficiency. Analysis of the data also indicated variance in overall morphological awareness scores and scores for the spelling shift items of the morphological awareness task could be predicted by the mean orthographic opacity and the mean degree of morphological synthesis of the three languages spoken by participants. Degree of morphological fusion was found to be a significant predictor of proficiency in deciphering the sound shift items of the morphological awareness task.

Discussion of Preliminary Descriptive Statistical Findings

The preliminary descriptive statistical findings provided an initial description of the demographic composition of the sample and the participants' language history. The findings also summarized participant performance on the morphological awareness task.

The ages of the study participants were approximately evenly distributed across the three age categories, lessening the impact of inter-generational differences on the overall composition of the sample. Educationally, approximately 92 percent of the participants had attended an

institution of higher education. The number of participants who had attained a bachelor's (tertiary) degree (*n*=33) was less than the number of participants who had attained a master's (quaternary) degree (*n*=34). The participants' perceived literacy proficiency ratings were clustered around the "high" and "very high" ratings, with comparatively few participants rating themselves as being moderately literate in English. Additionally, over 63% of participants spoke four or more languages, with two participants speaking eleven languages. High levels of participant education and the high number of languages known by the participants may have contributed to the overall level of morphological awareness and perceived linguistic proficiency of the participants.

On average, participants' first languages were moderately orthographically transparent, showed high levels of morphological fusion, and showed a moderate degree of morphological synthesis. For their second language, on average, most participants knew languages with moderate levels of orthographic opacity, high levels of morphological fusion, and a morphological structure which was slightly less synthetic than the morphological structure of participants' first languages. The participants' third languages were moderately orthographically opaque, had high levels of morphological fusion, and had a slightly more synthetic morphological structure. In total, across participants' first, second, and third languages, most languages had moderate levels of orthographic opacity, high levels of morphological fusion, and moderately synthetic levels of morphological synthesis. Most participants, regardless of age or education level, were familiar with languages with similar profiles of orthographic and morphological features. Since English is a language with an opaque orthography, an isolating technique of morphological fusion, and an analytic degree of morphological synthesis, participants may have been more equipped, on average, to decode the orthography of English

than the morphology of English, since many participants had previous experience with decoding other languages with opaque orthography.

On the morphological awareness task, participants demonstrated the highest proficiency on questions assessing awareness of root morphemes. In contrast, participants demonstrated lower proficiency on questions assessing awareness of prefixes or suffixes. Participant scores were higher, though not significantly higher, on the morphological awareness questions containing sound shifts than on the morphological awareness questions containing spelling shifts. From this preliminary information, it appears that participants are more likely to successfully decode the morphological structure of words in which the spelling of the root remains the same, even if the pronunciation of the root is different from the original base form of the root.

Discussion of Findings for Research Question 1

Study participant perceptions of English literacy proficiency had an approximate large effect on variation in morphological awareness task overall scores, explaining approximately 12% of the variance in overall morphological awareness. The participants whose perceived levels of literacy proficiency were “high” or “very high” had significantly higher levels of morphological awareness than participants whose perceived levels of literacy proficiency were “moderate”.

The findings could have several implications. First, higher perceptions of proficiency in English literacy may contribute to a higher level of morphological awareness, as a positive perception of one’s literacy abilities may lower the affective filter, a psychological barrier which Krashen suggested may inhibit language acquisition. ELLs who possess a positive view of their capabilities when learning to read in a new language may be able to utilize morphological

awareness more naturally and efficiently during reading. Alternatively, the converse could be true: when ELLs possess a higher level of morphological awareness, the ELLs may feel more confident in reading in the target language; therefore, the ELLs may have a lower affective filter and may feel more confident when reading in the target language.

The results could also be explained by the relationship between perceived literacy proficiency and experiences with literacy-related skills in the target language. An ELL who has a high level of perceived literacy proficiency in a target language may have had more extensive experience with reading print materials in the target language, exposing the ELL to a more diverse vocabulary while also increasing the ELL's familiarity with the graphophonemic system of the target language. An ELL who is more well-read in the target language is more likely to have encountered the morpheme at some point while reading, which may result in higher levels of morphological awareness. Additionally, over time, ELLs who have read more extensively in the target language may be more confident as readers in the target language and may thus possess a lower affective filter. It can be concluded that ELLs are frequently less intimidated and less inhibited by the affective filter when reading but are more inhibited when speaking. Therefore, being more well-read in the target language and having higher morphological awareness in the target language may lower the affective filter and result in a higher perceived level of literacy proficiency. It is recommended a randomized, controlled experimental study be conducted to determine whether a causal relationship exists between language-learner confidence and language-learner morphological awareness.

Discussion of Findings for Research Question 2

Study participant perceptions of English oracy proficiency had an approximate medium effect on variation in morphological awareness task overall scores, explaining approximately 7%

of the variance in overall morphological awareness. The participants whose perceived levels of oracy proficiency were “very high” had significantly higher levels of morphological awareness than participants whose perceived levels of oracy proficiency were “moderate”. However, the participants whose perceived levels of oracy proficiency were “high” did not have significantly higher levels of morphological awareness than the participants whose perceived levels of oracy proficiency were “moderate”. Therefore, the difference between the “moderate” and “very high” groups is statistically significant because perceived moderate oracy proficiency contributes little to morphological awareness but perceived very high oracy proficiency is a contributing factor to higher levels of morphological awareness. In comparison with perceived English literacy proficiency, perceived English oracy may not have as large an effect on morphological awareness as perceived English literacy unless the level of perceived English oracy is exceptionally high. Therefore, the morphological awareness of individuals enrolled in ESOL programs which utilize literacy-based instructional methods may be higher than the morphological awareness of individuals enrolled in ESOL programs which utilize oracy-based instructional methods.

The findings for research question 2 could be explained by a variety of factors. Higher perceived proficiency in English oracy skills may result in a lower affective filter, thus increasing the ability of the ELLs to utilize morphological awareness skills. The converse may also be true, as a higher level of English morphological awareness may be a causal factor resulting in higher English oracy proficiency and a lower affective filter. Additionally, higher proficiency in English oracy-related skills may be caused by increased opportunities to engage with others in conversational activities. Therefore, an ELL who frequently practices speaking and listening in English will have higher levels of morphological awareness and lower affective

filters than individuals who do not utilize oracy-related skills as frequently. Additionally, individuals who possess higher levels of morphological awareness and have lower affective filters will be more inclined to participate in conversational activities in English. Since each variable may have a reciprocal influence on the other variables, ESOL programs will be more effective if the programs provide a comfortable language-learning environment that highlights morphological awareness skills within the context of many literacy-based activities and some oracy-based activities.

Discussion of Findings for Research Question 3

The responses to the survey indicated approximately 10.95% of the variance in overall morphological awareness is explainable by a confluence of the mean orthographic opacity, mean morphological fusion, and mean morphological synthesis of the languages known by ELLs.

While orthographic opacity, morphological fusion, and morphological synthesis are all factors which impact morphological awareness, independently, orthographic opacity and morphological synthesis predict overall morphological awareness. Orthographic opacity had a strong correlation with morphological awareness, suggesting orthographic opacity has a positive impact on morphological awareness. Knowledge of an orthographically opaque language is associated with a higher level of English morphological awareness. Knowledge of an orthographically opaque language can be used as a tool to predict morphological awareness. If an individual possesses the skills required to decode orthographically opaque words in a language other than English, the individual may be able to access the same skillset when decoding English words. The Dual-Route Cascaded Model of reading postulates that the lexical route of the reading mechanism is typically used to decode orthographically opaque words in English and to decode orthographically opaque words in other languages, as well. Therefore, if an ELL has

learned strategies for rapidly decoding words in an orthographically opaque language, the ELL will be able to draw upon previously established decoding skills to decode orthographically opaque words in English. Therefore, knowledge of an orthographically opaque language other than English enhances the individual's ability to decode and analyze the morphemes of English words.

Morphological synthesis was also a statistically significant predictor of overall morphological awareness, indicating that on average, knowledge of a language with a higher degree of morphological synthesis is related to an increase in the value of overall morphological awareness. Interestingly, degree of morphological synthesis predicted a larger increase in morphological awareness than did degree of orthographic opacity. Since English is an analytic language, monolingual English speakers do not have experience decoding synthetic linguistic structures. Essential grammatical markers and chunks of semantic information are encoded within the bound morphemes of synthetic languages. Therefore, to communicate in a synthetic language, an individual must be able to evaluate the morphemes of words to extract the grammatical and semantic information contained within the word. Since individuals fluent in synthetic languages are equipped with the skillsets necessary to analyze bound morphological structures, individuals who are fluent in synthetic languages have higher levels of English morphological awareness than native English speakers unless the English speakers have developed high levels of morphological awareness through other means.

The strong morphological skillsets of speakers who are fluent in morphologically synthetic languages can be used as an asset during ESOL programs. Similarly, individuals who are fluent in orthographically opaque languages other than English have an advantage when learning English in an ESOL program. When ESOL teachers invest time to become aware of the

structural features of the native languages of participants enrolled in ESOL programs, the teachers can empower program participants to utilize metacognition to think about the similarities between English and the other languages the participants speak. The ESOL teacher can empower ELLs to build a bridge between the metalinguistic skills needed to read English words and the metalinguistic skills which the ELLs already utilize regularly (i.e., decoding and morphological decomposition) in the ELLs' other languages. To support an individual who is not already fluent in an orthographically opaque language or a morphologically synthetic language, the ESOL teacher should provide additional support to aid the ELL in establishing stronger metalinguistic skills in English, despite the many differences which exist between English and the ELL's other languages.

Discussion of Findings for Research Question 4

When two morphemes bind together, the constituent morphemes may remain unchanged, experience a shift which exclusively impacts the word's sound, or undergo a shift in both sound and spelling patterns. When the addition of a morpheme results in a shift which exclusively alters the word's sound pattern without altering the word's spelling, readers are tasked with decoding a word in which sound and spelling are incongruous. Therefore, decoding morphemes which have experienced a sound shift is a uniquely challenging task which activates a reader's prior knowledge of the process of decoding fused morphemes.

The responses to the survey indicated that 8.0% of the variance in the sound shift element of morphological awareness could be explained by a confluence of the levels of orthographic opacity, morphological fusion, and morphological synthesis expressed across the languages spoken by an individual. Therefore, proficiency in other languages which have a high degree of

orthographic opacity, a high degree of morphological fusion, or a high degree of morphological synthesis contributes to the ability to decode words which have undergone a phonological shift.

Morphological fusion was statistically significantly predictive of study participant proficiency on assessment items containing a sound shift element; therefore, knowledge of a language with a high degree of morphological fusion is associated with an increase in the ability to recognize morphological relationships between two morphemes which are spelled the same but pronounced differently in two different words.

Interestingly, knowledge of other languages with a high degree of morphological fusion was not a statistically significant predictor of overall morphological awareness, though it was a statistically significant predictor of morphological awareness in the presence of a sound shift. Degree of morphological fusion may have only been a predictor of morphological awareness in the presence of a sound shift because the sound shift items on the morphological awareness task were designed specifically to measure awareness of a change in sound without a corresponding change in spelling. The ability to isolate and identify morphemes which have been fused phonologically is honed by knowledge of a language with a high degree of fusion.

Over 90% of the languages represented in the sample possessed fusional morphological structures. According to the isomorphism principle, the spelling of a morpheme will remain as close to its initial form as possible, even after being bound to other morphemes. Therefore, while the phonetic structure of a morpheme may be altered by its phonetic context, the morpheme's spelling may remain unchanged, leading to incongruities between the word's sound and spelling. In a fusional language, phonetic alteration of words is grammatically necessary to convey information about verbs, nouns, or other word classes. Since phonetic and orthographic alteration

of base forms of words occurs regularly within fusional languages, familiarity with the morphological patterns of a fusional language increases an individual's experience with identifying and isolating highly fused morphemes. Therefore, familiarity with a fusional language contributes to the ability to identify English morphemes, specifically in the presence of sound and spelling incongruities.

Discussion of Findings for Research Question 5

When two morphemes are bound together, a shift in the word's sound may be accompanied by a corresponding shift in the word's orthography. While a sound shift alone may make a word more difficult to decode, a sound shift that is accompanied by a corresponding shift in spelling may make a word more transparent to decode, even though the constituent morphemes may become less recognizable resulting from the alteration in the word's spelling. A confluence of orthographic opacity, morphological fusion, and morphological synthesis explains 10.28% of the variance in performance on assessment items measuring awareness of morphemes in the presence of spelling shifts.

The degree of orthographic opacity and degree of morphological synthesis of the languages spoken by respondents are statistically significant predictors of English morphological awareness in the presence of a spelling shift. Of the two factors, inferential statistical methods revealed that knowledge of a language with a higher degree of morphological synthesis was related to a comparatively larger increase in morphological awareness in the presence of a spelling shift, while knowledge of a language with a higher degree of orthographic opacity was related to a lesser increase in morphological awareness.

Experience in a language is related to proficiency in a language. A person who has multiple opportunities to engage with a wide variety of texts written in an orthographically opaque language can draw from experiences when decoding unfamiliar words in an acquired language. Therefore, an individual is equipped with a stronger skillset for decoding spelling irregularities, including spelling shifts, through familiarity with the spelling patterns of an orthographically opaque language.

Likewise, experience in decoding words in a more morphologically synthetic language is associated with a higher level of morphological awareness in the presence of a spelling shift. When a spelling shift occurs, the boundary between two morphemes becomes more difficult to identify, thus, the word is more challenging to segment into separate morphemes. English is a morphologically analytic language; therefore, an individual who is proficient in a language which has a higher degree of morphological synthesis than the English language will likely have developed a more robust metalinguistic strategy for segmenting words into morphemes in the synthetic language, since the ability to segment words is a crucial prerequisite for understanding the semantic and syntactic information encoded within a word constructed through morphological synthesis.

Implications

In any language, readers must be able to decode words which are orthographically irregular and parse apart strings of morphemes to identify the semantic and syntactic information encoded within each morpheme. The development of metalinguistic frameworks for decoding words with challenging orthographic and morphological structures increases decoding accuracy and overall reading proficiency. A metalinguistic strategy is a mental framework which can be

applied consistently across languages as a method of isolating the morphemes of words, providing a source of semantic and syntactic information.

The ability to deconstruct morphologically synthetic words has a larger impact on morphological awareness than the ability to read orthographically opaque words. Previous experience with decoding morphologically synthetic words contributes to the development of a metalinguistic strategy for morphological decomposition which can be used by a reader when an unfamiliar multimorphemic word is read.

The study's findings suggest English metalinguistic skills may be enhanced in three ways. First, an ESOL program can enhance the ability of ELLs to decode irregular spellings by using explicit instructional methods to teach principles of phoneme-grapheme correspondence. Explicit instructional methods will demystify the illusory irregularities of English spelling by increasing awareness of the phonic principles of English. An individual who is already familiar with a language which has an opaque orthography will be better equipped to read English than an individual who is only familiar with languages which have transparent orthographies, since individuals who have experience decoding opaque languages are more familiar with decoding in a language where multiple phonemes correspond to one grapheme, and multiple graphemes correspond to one phoneme.

Second, an ESOL program can provide a forum for individuals to draw comparisons between the morphology of English and the other languages with which they are familiar. Morphological awareness encompasses the ability to decompose multimorphemic words, identify the meaning of individual morphemes, synthesize morphemes into words, and surmise the meaning of a word through observation of its constituent morphemes. Since languages vary

widely, both in degree of morphological fusion and in degree of morphological synthesis, it is beneficial for ESOL programs to provide opportunities to evaluate the similarities and differences between the degree of morphological fusion and synthesis found in English and the degree of morphological fusion and synthesis displayed by the other languages spoken by ELLs. A dialogic approach should be used to evaluate the structural similarities and differences between English and other languages, specifically on a morphological level. The program should provide opportunities for ELLs to analyze patterns of inflection and derivation within English and actively compare the patterns of English with the patterns of other languages.

Conclusion

Deep knowledge of morphology is a crucial skill which contributes to both decoding and comprehension, specifically for English language learners (ELLs). ELLs have different levels of experience with English; thus, ELLs vary in levels of perceived English literacy proficiency and oracy proficiency. Among study participants, individuals who were more familiar with English and who felt more proficient in the English language had higher levels of morphological awareness. Similarly, the structural features of the languages known by an ELL may impact English morphological awareness; therefore, study participants who were familiar with orthographically opaque or morphologically synthetic languages had higher levels of morphological awareness. For strong ESOL programming, curriculum designers should implement instructional methods which increase participants' perceptions of proficiency in English, prepare participants to decode orthographically irregular words, and equip participants with strategies for decomposing synthetically-bound morphemes.

Strengths of the Study

The global diversity of the participant pool, the use of a nuanced language coding system, and the development of a specific task to measure morphological awareness were the primary strengths of the study. First, the study was internationally distributed via Facebook Groups to language learners who originated from 40 different countries; consequently, the sample was extremely diverse and represented a wide array of languages. Due to the diversity of the languages represented in the sample, the findings may be generalizable to a wide array of languages. Second, the coding system used in the study aligned with the parameters developed by Sapir (1921) for the classification of languages' morphological patterns. Using Sapir's coding

system provided more nuanced information about each language's morphology, allowing the study to be more sensitive to the specific features of each language which might contribute to morphological awareness. Finally, the morphological awareness task was designed to mitigate the impacts of morpheme location (i.e., prefix, suffix, or base) upon morphological awareness, while still measuring morphological decomposition ability in the context of spelling and sound shifts. In addition, the task was developed using academic vocabulary words which aligned to the lexicons of adult language learners. The items of the study's tool were designed to provide a unique, accurate, and nuanced indication of the impact which knowledge of various other languages may have upon morphological awareness in English, filling in an important gap within the literature on morphological awareness.

Limitations of the Study

The primary limitation of the study was the high level of educational attainment of the participants in the sample. Of the participants, approximately two-thirds (67% of the participants) had attained either a bachelor's degree or a master's degree as their highest level of education at the time of participation, revealing the participants had a higher overall level of education than the general population. The Organisation for Economic Co-operation and Development (OECD), comprised of 38 countries across the globe, estimates the average international rate of post-secondary degree attainment is 39% (National Center, 2022). It can be assumed that a limitation of the study was the high level of educational attainment of the participants; therefore, a recommendation for further research could disaggregate results according to educational level.

Additionally, many of the participants were part of a self-described group of *polyglots*, individuals who know, learn, and use several languages (Dictionary.com, n.d.c). Polyglots bring language-learning bias to the sample because they know languages which display a variety of structural features. While, in some ways, the educational backgrounds and extensive language-learning experiences of the individuals in the sample may have limited the generalizability of the results. Further investigation would reveal whether similar results would be found among individuals who were bilingual or trilingual, as opposed to multilingual or polyglot.

Future Research Recommendations

Capturing the nuanced differences between languages with fusional morphological structures poses a challenge within the field of linguistics. Substantial variation may characterize the structure of fusional languages; however, within linguistic research, a functional system for classifying subtypes of fusional morphology has not yet been developed. A robust system for classifying subtypes of fusional languages would need to take into account factors such as morphological richness, defined as "the wealth of productive morphological patterns in a language," and morphological transparency, defined as the "ease with which the compositionality of a word form can be inferred from its sound shape" (Dressler et al., 2019, p. 87). While some fusional languages may be characterized by sparse instances of morphological inflection which fulfill syntactic functions, other fusional languages may have extensive systems of inflection and derivation, impacting the form of many words in the language. In the future, the morphological awareness task utilized within this study could be utilized in a different study eliciting data to describe the relationship between level of morphological awareness and the frequency and regularity of inflection and fusion across various parts of speech in a language.

An additional recommendation for future research is to conduct a randomized controlled trial with a population of adult ELLs who are enrolled in ESOL programs to evaluate the effects of ESOL program design upon English morphological awareness and spoken and written English proficiency. The results of the study could inform future practices for TESOL programs. A similar design could also be utilized to evaluate K-12 ESOL programming models.

Conclusion

English language learners are a growing population within the United States and on a global scale. For ELLs who are learning to read in English, morphological awareness is a powerful skill. ELLs who are more familiar with English and who feel more proficient in the English language have higher levels of morphological awareness. Individuals who are proficient users of orthographically opaque or morphologically synthetic languages also have higher levels of morphological awareness. ESOL programs can help participants develop the skills and strategies necessary to successfully decode orthographically irregular words and separate morphemes which have been bound together synthetically. By using instructional methods which provide a scaffold to support the acquisition of higher levels of morphological awareness among program participants, ESOL programs will increase the confidence of the ELLs in the program, enhance the quality of the participants' language output, and equip ELLs with skills to promote increased fluency during reading the English language.

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Appendices

Appendix A

Survey Instrument

Study Title: “From Language to Literacy: First Language Structure as a Facilitator of English Language Learner Morphological Awareness and Word Decoding Skill”

Part 1 – Morphological Awareness Task:

***Instructions*:**

The task below contains 30 questions. Each question consists of a set of 3 uncommon words which look similar. Please select the 2 words that share a word part with the same meaning. Do not choose words simply because they have similar spellings or sound similar when read aloud. It is acceptable to answer the question even if you do not know the meaning of all three words. Please answer the questions to the best of your ability. Guessing on questions is acceptable.

Example 1:

a. Sentimental

b. Sensation

c. Sectioned

Answers A. (sentimental) and B. (sensation) are the correct words, because “sentimental” and “sensation” each have the word part “senti-/sens-,” which means “to feel.”

Example 2:

a. Envision

b. Victory

c. Revise

Answers A. (envision) and C. (revise) are the correct words, because “envision” and “revise” both contain the word part “vis,” which means “to see.” Even though the letter “i” sounds different in “envision” and “revise,” the words are related in meaning.

Question 1). Correct answers: ascending, crescendo (shared root; sound shift)

- ascending
- crescendo
- concerned

Question 2). Correct answers: inclination, declining (shared root; sound shift)

- inclination
- declining
- unclipped

Question 3). Correct answers: innovate, novelties (shared root; sound shift)

- innovate
- novelties
- knowing

Question 4). Correct answers: antecedent, exceeding (shared root; spelling shift)

- antecedent
- exceeding

- ceremonial

Question 5). Correct answers: inclusion, secluded (shared root; spelling shift)

- inclusion
- secluded
- clumsiest

Question 6). Correct answers: inscription, subscribed (shared root; spelling shift)

- inscription
- subscribed
- scrimping

Question 7). Correct answers: recognize, repurpose (shared prefix; sound shift)

- recognize
- repurpose
- reddening

Question 8). Correct answers: anteriorly, antecedent (shared prefix; sound shift)

- anteriorly
- antecedent
- arthropods

Question 9). Correct answers: proceeding, progressed (shared prefix; sound shift)

- proceeding

- progressed
- practicality

Question 10). Correct answers: envelops, ingested (shared prefix; spelling shift)

- envelops
- ingested
- unending

Question 11). Correct answers: illogical, irregular (shared prefix; spelling shift)

- illogical
- irregular
- ailments

Question 12). Correct answers: astronaut, asterisks (shared prefix; spelling shift)

- astronaut
- asterisks
- attract

Question 13). Correct answers: depression, confusion (shared suffix; sound shift)

- depression
- confusion
- uncommon

Question 14). Correct answers: outages, sabotage (shared suffix; sound shift)

- outages
- sabotage
- agencies

Question 15). Correct answers: ambitious, tumultuous (shared suffix; sound shift)

- ambitious
- tumultuous
- tornadoes

Question 16). Correct answers: difference, guidance (shared suffix; spelling shift)

- difference
- guidance
- glancing

Question 17). Correct answers: inaction, coercion (shared suffix; spelling shift)

- inaction
- coercion
- adjoined

Question 18). Correct answers: coercible, advisable (shared suffix; spelling shift)

- coercible
- advisable
- particles

Part 2 – Language History Questionnaire:

1. Please type your age:

   _____

2. Please type your country of origin:

   _____

3. Rate your current English language ability in terms of literacy (reading/writing).

Very Low	Low	Moderate	High	Very High
○	○	○	○	○

4. Rate your current English language ability in terms of oracy (listening/speaking).

Very Low	Low	Moderate	High	Very High
○	○	○	○	○

FIRST LANGUAGE:

5. Please type the name of the language you learned first (i.e., your home/native/family language)

   _____

6. If you have stopped using the language, please type the age at which you stopped using the language. If you still use the language, please type “N/A.”

_____

7. Describe the method by which you learned your first language. Please select all choices that apply:

    - Immersion (Learning by being surrounded by family or friends who are native speakers of the language, studying abroad, etc.)
    - Self-learning (e.g., Duolingo, Rosetta Stone, etc.)
    - Language used by teachers in most school classrooms [e.g., all classes (math, history, science) besides foreign language classes were taught in this language]
    - Bilingual school (e.g., classes were taught equally in two languages – a native language and another language.)
    - Foreign language classroom (A foreign language class is a class for a language, such as French, at a school which teaches all other classes in a different language, such as English)

8. What is the highest educational level at which you have used your first language?

    - Elementary School
    - Middle School
    - High School
    - College
    - Graduate School
    - I have not used the language in any educational setting.

SECOND LANGUAGE: If you only know one language, please scroll to the bottom of the screen and click "Next."

9. Please type the name of the language you learned second.

   _____

10. Please type the age you began learning the language.

    _____

11. If you have stopped using the language, please type the age at which you stopped using the language. If you still use the language, please type "N/A."

    _____

12. Describe the method by which you learned your second language. Please select all choices that apply:

    - Immersion (Learning by being surrounded by family or friends who are native speakers of the language, studying abroad, etc.)
    - Self-learning (e.g., Duolingo, Rosetta Stone, etc.)
    - Language used by teachers in most school classrooms [e.g., all classes (math, history, science) besides foreign language classes were taught in this language]
    - Bilingual school (e.g., classes were taught equally in two languages – a native language and another language.)
    - Foreign language classroom (A foreign language class is a class for a language, such as French, at a school which teaches all other classes in a different language, such as English)

13. What is the highest educational level at which you have used your second language?

- Elementary School
- Middle School
- High School
- College
- Graduate School
- I have not used the language in any educational setting.

THIRD LANGUAGE: If you do not know a third language, please scroll to the bottom of the screen and click "Next."

14. Please type the name of the third language you learned.

    _____

15. Please type the approximate age you began learning the language.

    _____

16. If you have stopped using the language, please type the age at which you stopped using the language. If you still use the language, please type "N/A."

    _____

17. Describe the method by which you learned your third language. Please select all choices that apply:

    - Immersion (Learning by being surrounded by family or friends who are native speakers of the language, studying abroad, etc.)
    - Self-learning (e.g., Duolingo, Rosetta Stone, etc.)

- Language used by teachers in most school classrooms [e.g., all classes (math, history, science) besides foreign language classes were taught in this language]
- Bilingual school (e.g., classes were taught equally in two languages – a native language and another language.)
- Foreign language classroom (A foreign language class is a class for a language, such as French, at a school which teaches all other classes in a different language, such as English)

18. What is the highest educational level at which you have used your third language?
    - o Elementary School
    - o Middle School
    - o High School
    - o College
    - o Graduate School
    - o I have not used the language in any educational setting.
19. Please list any additional languages you have learned that were not mentioned in the previous three sets of questions.

    _____

Appendix B

Table B

Descriptive Statistics Summary Table: Number of Speakers of Each Language Represented in the Response Set as a First, Second, or Third Language

Language Category	*n*	%	Cumulative %
Number of L1 Speakers of Each Language			
English	27	29.67	29.67
Spanish	17	18.68	48.35
Arabic	5	5.49	53.85
Polish	4	4.40	58.24
Russian	4	4.40	62.64
Czech	3	3.30	65.93
Croatian	3	3.30	69.23
Dutch	3	3.30	72.53
French	3	3.30	75.82
Greek	3	3.30	79.12
Italian	3	3.30	82.42
Romanian	3	3.30	85.71
German	2	2.20	87.91
Afrikaans	1	1.10	89.01
Bulgarian	1	1.10	90.11
Cantonese	1	1.10	91.21
Haitian creole	1	1.10	92.31
Hungarian	1	1.10	93.41
Portuguese	1	1.10	94.51
Slovak	1	1.10	95.60
Slovenian	1	1.10	96.70
Swedish	1	1.10	97.80
Vietnamese	1	1.10	98.90
Yezidi	1	1.10	100.00
Missing	0	0.00	100.00
Number of L2 Speakers of Each Language			
English	51	56.04	56.04
French	16	17.58	73.63
Spanish	8	8.79	82.42
German	7	7.69	90.11
Korean	2	2.20	92.31

Table B (continued).

Language Category	*n*	%	Cumulative %
Arabic	1	1.10	93.41
Hebrew (Ivrit)	1	1.10	94.51
Filipino	1	1.10	95.60
Hindi	1	1.10	96.70
Italian	1	1.10	97.80
Koine Greek	1	1.10	98.90
Ukrainian	1	1.10	100.00
Missing	0	0.00	100.00
Number of L3 Speakers of Each Language			
French	19	20.88	20.88
German	12	13.19	34.07
Spanish	11	12.09	46.15
English	10	10.99	57.14
Italian	6	6.59	63.74
Mandarin Chinese	4	4.40	68.13
Dutch	2	2.20	70.33
Japanese	2	2.20	72.53
Swedish	2	2.20	74.73
Arabic	1	1.10	75.82
Hebrew	1	1.10	76.92
Latin	1	1.10	78.02
Portuguese	1	1.10	79.12
Russian	1	1.10	80.22
Scottish Gaelic	1	1.10	81.32
Sinhala	1	1.10	82.42
South African Sign Language	1	1.10	83.52
Swahili	1	1.10	84.62
Urdu	1	1.10	85.71
Vietnamese	1	1.10	86.81
Missing	12	13.19	100.00

Appendix C

Table C

Descriptive Statistics Summary Table: Total Number of Speakers of Each Language Represented in the Response Set

Language Category	*n*	*%*
Total Number of Speakers of Each Language		
English	88	96.70
French	38	41.76
Spanish	36	39.56
German	21	23.08
Italian	10	10.99
Arabic	7	7.69
Dutch	5	5.49
Russian	5	5.49
Mandarin Chinese	4	4.40
Polish	4	4.40
Croatian	3	3.30
Czech	3	3.30
Greek	3	3.30
Romanian	3	3.30
Swedish	3	3.30
Hebrew (Ivrit)	2	2.20
Japanese	2	2.20
Korean	2	2.20
Portuguese	2	2.20
Vietnamese	2	2.20
Afrikaans	1	1.10
Bulgarian	1	1.10
Cantonese	1	1.10
Filipino	1	1.10
Haitian creole	1	1.10
Hindi	1	1.10
Hungarian	1	1.10
Koine Greek	1	1.10
Latin	1	1.10
Scottish Gaelic	1	1.10
Sinhala	1	1.10

Table C (continued).

Language Category	*n*	*%*
Slovak	1	1.10
Slovenian	1	1.10
South African Sign Language	1	1.10
Swahili	1	1.10
Ukrainian	1	1.10
Urdu	1	1.10
Yezidi	1	1.10

Appendix D

Table D

Categorization of Languages Represented in Response Set by Orthographic Opacity, Morphological Fusion, and Morphological Synthesis

Language Name	Orthographic Opacity	Morphological Fusion	Morphological Synthesis
Afrikaans	2	3	1
Arabic	3	4	2
Bulgarian	2	3	1
Cantonese	5	1	1
Croatian	2	3	2
Czech	1	3	2
Dutch	3	3	2
English	4	3	1
Filipino (Tagalog)	1	2	2
French	4	3	2
German	4	3	2
Greek	2	3	2
Haitian creole	2	3	1
Hebrew (Ivrit)	3	4	2
Hindi	1	3	2
Hungarian	1	2	2
Italian	1	3	2
Japanese	5	2	2
Koine Greek	2	3	2
Korean	1	2	2
Latin	2	3	2
Mandarin Chinese	5	1	1
Polish	2	3	2
Portuguese	2	3	2
Romanian	1	3	2
Russian	2	3	2
Scottish Gaelic	3	3	2

Table D (continued).

Language Name	Orthographic Opacity	Morphological Fusion	Morphological Synthesis
Sinhala	4	3	2
Slovak	2	3	2
Slovenian	1	3	2
South African Sign Language	3	3	2
Spanish	1	3	2
Swahili	2	2	2
Swedish	3	3	1
Ukrainian	2	3	2
Urdu	4	3	2
Vietnamese	1	1	1
Yezidi	1	3	2