SPELLING ENGLISH WORDS:

CONTRIBUTIONS OF PHONOLOGICAL, MORPHOLOGICAL AND ORTHOGRAPHIC PROCESSING SKILLS OF TURKISH EFL STUDENTS IN GRADES 6-8

A Dissertation

by

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ABSTRACT

The number of studies examining the simultaneous impact of multi-level metalinguistic skills influencing spelling in English is scarce. Spelling necessitates an integrated and simultaneous working of various linguistic, metalinguistic skills, and socio-cultural (SES) factors. The present study investigates the concurrent influence of multi-level metalinguistic skills including phonological, morphological, and orthographic knowledge in English as well as the impact of socio-cultural factors on EFL spelling of Turkish 6th, 7th, and 8th grade pupils (*N= 367)*. Measures tapping phonological, morphological, and orthographic skills in English (L2) and a background questionnaire were administered to Turkish 6th to 8th grade EFL children recruited in multiple school sites in a city of Turkey.

A robust configural baseline confirmatory factor analysis (CFA) model for all grades confirmed that the observed variables constructed a three-factor model (phono, morpho, ortho), as it was hypothesized. The second-order structural equation model (SEM) confirmed the three metalinguistic skills work simultaneously and they tap into the linguistic repertoire construct, which predicted EFL word-spelling of Turkish 6th, 7th, and 8th grade pupils. This provides converging results with linguistic repertoire theory, which suggests utilizing multiple metalinguistic skills when spelling words and teaching spelling. The final SEM model with the integrated SES factors (i.e., SES, home-literacy, and additional English exposure) also reported good model fit statistics where the English exposure factor had the highest regression coefficient on EFL word spelling outcomes.

The spelling error analyses showed parallel findings to the quantitative analyses, that phonology and orthography, but not morphology, were the two significant predictors of word spelling errors by Turkish 6th to 8th graders.

The key findings can inform foreign language teachers about the roles of phonological, morphological, and orthographic processing skills in English spelling. The pedagogical implications of the present study included the importance of directly teaching the three metalinguistic skills when EFL teachers are engaged in spelling instruction. The findings can also inform Turkey's foreign language education policy decision making by recommending the tailoring of policy and curriculum according to students' needs.

DEDICATION

I dedicate my work to my sons, Doğan Altay Gezer, my *muse* who helped me stay as focused, hopeful, strong and happy as I could be throughout the rough times, and to Şener Ataol Gezer , a new hope yet to be born.

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INTRODUCTION AND LITERATURE REVIEW

Spelling has a close relationship with reading (Perfetti, 1997). Despite the strong correlation between the two, spelling triggers linguistic and cognitive capacities differently than word reading does (Treiman, 1998a). Reading and spelling count on the same mental representation of a word; yet knowing how to spell a word makes the knowledge more robust for readers (Snow, Griffin, & Burns, 2005). Spelling, defined as "[the] encoding of linguistic forms into written forms" (Perfetti, 1997, p. 21), is a complex process that stimulates cognitive capacities and motor skills. It is a mode of production that utilizes various linguistic, cognitive, and literacy skills and awareness simultaneously; thus, it informs us beyond simple decoding or sounding out of words (Treiman, 1993). Compared to reading, spelling necessitates additional knowledge and finer-grained, more explicit vocabulary knowledge at both the spoken and written levels (Moats, 2005; Treiman, 1998b).

Word spelling also predicts writing practices. Writers generally choose the words that they know how to spell, which disrupts writing fluency by causing the writers to pause to spell an unfamiliar word or by leading to an unknown word to be replaced with a known-spelling word (Moats, 2005). These word substitutions also decrease the overall quality of the writing (Moats, 2005).

Word spelling in English has been accused of being irregular; however, it has been suggested that word spelling in English relies on the following five principles: a)

spelling speech sounds with single letters or letter combinations, b) sound spelling based on the position in a word, c) word meaning, d) word origin or history, and e) spelling of the sounds guided by letter pattern and sequence conventions (Moats, 2005). In essence, the roles of phonological, morphological and orthographic processing skills in spelling establish the tripod that spelling research is based on (Apel & Masterson, 2001; Moats, 1995; Perfetti, Reiben, & Fayol; 1997). Various developmental models of cognitive processes and component skills contributing to spelling performance have been proposed (Caravolas, 2006). A common theme that emerged from those theoretical propositions suggested that spelling in English is a multi-faceted process that is based on linguistic skills and knowledge at the phonemic level (Caravolas, Hulme, Snowling; 2001), morphological level (Bryant, Nunes, & Bindman, 1997; Treiman, Cassar, & Zukowski, 1994) and orthographic level (Cassar & Treiman, 1997). The tripartite metalinguistic skills at the phonological, morphological, and orthographic levels were found to determine the spelling outcomes of English and non-English speaking children; thus, they are the core of the present study.

According to Perfetti (1997), "…spelling, [which] may be seen less as a scientific problem of language use than as a literacy convention or school subject, has been rather neglected within mainstream psycholinguistics" (p. 21). The spelling performance of young learners commands the attention of researchers in various fields, such as psychology and linguistics, because children's spelling attempts and errors reveal many aspects of the nature of children's language and literacy acquisition, and development. These spelling patterns emerging in the early attempts of young learners provide

insightful information about each learner's understanding of the writing system. Learners' knowledge of the writing system is especially vital to identify children with spelling and reading disabilities and to help them become better spellers and readers (Treiman, 1993).

In this technology-oriented era, ideas are conveyed through typing at an increasing rate, and the writers' spelling is checked and corrected on word processors without the need for the speller's active attention. However, not all of the spelling errors are caught and corrected by spell checkers (e.g., *their-there*, *here-hear*). Even worse, poor spellers who mainly trust the magic of the spell checkers do not come up with close enough approximations in their spelling attempts for the spell checker to detect and correct automatically. Based on a study with 111 students with learning disabilities, it was reported that spell checkers could detect only 30% to 80% of the overall misspellings (Montgomery, Karlan, & Coutinho, 2001). The nature of literacy practices in this digital age contributes to the lack of spelling research and causes a modern dilemma. Despite the technological conveniences, it is essential to focus on spelling, especially at a young age, in order to sustain literacy and knowledge. Because spelling is a productive skill to express thoughts and messages, establishing a solid spelling foundation is imperative.

In literacy research, spelling is a field of study that has been under-examined. According to a search on the Social Sciences Index that focused on the last decade (2003-2014), spelling was found to be the least investigated literacy skill with 1,202 publications compared to 11,113 publications in reading and 8,554 publications in writing. Current knowledge on the development of spelling in English is more advanced

compared to the knowledge about spelling in other alphabetic languages (Caravolas, 2006). Spelling has been taking the attention of researchers from various languages and domains; however, the study of English spelling of English language learners (ELLs) with various linguistic backgrounds is rather understudied.

What we know regarding the spelling of children who are the speakers of other languages than English is not as advanced as studies conducted with English-speaking children (Arab-Moghaddam & Sénéchal, 2001). Thus, the need for further research on ELLs' writing skills development in English and the study of cross-linguistic effects in the acquisition of writing skills by ELLs is needed, especially when the insufficient literature in this field of literacy research is considered (Genesee, Lindholm-Leary, Saunders, & Christian, 2006).

Why Study the Turkish Context?

Globalization, a highly complex process, has notable impacts on societies at multiple levels including educational and literacy practices (Tsui & Tollefson, 2007). As well as the medium or the "driving force to strengthen the position of [itself] as a global language" (Chang, 2006, p. 515), English is an outcome of globalization (Crystal, 2003). The worldwide spread of English as a lingua franca has been influential on the education systems and literacy practices of people worldwide. According to Kachru's (1992) concentric language circles model, Turkey is an expanding circle country. As the classification of World Englishes model by Kachru suggested, the status of English in the expanding circle countries is regarded as a foreign language. In the English-as-a-foreign-language (EFL) context, English is typically learned at school and students with limited

motivation to improve their English skills also have little opportunity to use English outside the classroom (Kirkpatrick, 2007). Compared to ELLs in English speaking countries, EFL learners are at the other tail of the experiential continuum. The EFL learners mostly are exposed to English in English-based classrooms. According to Bear, Helman, Templeton, Invernizzi and Johnston (2007), EFL learners with a high L1 literacy could progress through the stages of orthographic development in English in a similar way, provided that sufficient amount of instructional English is practiced. Those whose native languages are similar to English may perform at a faster rate through the stages compared to those whose native languages differ from English typologically.

English as a lingua franca has such deep global effects on various societies that there is a serious need to further examine English language learners' literacy skills acquisition. Turkey, with Turkish as the medium of the national education system, attempted to meet the necessities of the globalized world by offering English as well as other foreign languages through the Turkish education system (Çetintaş & Genç, 2001). With no history of English colonization and a restricted use of the language without any nativization (Doğançay-Aktuna, 1998), Turkey presents an intriguing picture with its stance in terms of the global effects of English on the society, education system, and literacy practices. In the Turkish context, English has gained an increasingly crucial role in the education system, yet the opportunity to practice it is limited. Turkey has been switching gears in foreign language education, and in the education system, in general, to provide education at European Union (EU) nation standards. Those policy changes to the education system of Turkey include the change of perspectives toward foreign language

education and curriculum modifications to respond to the country's desire to be on the same educational level as the EU member countries. Turkey's success in implementing the new foreign language policy recommendations is uncertain, which may have negative consequences on the literacy skills acquisition outcomes in Turkish as a first and English as the foreign language (Ünal-Gezer & Dixon, unpublished manuscript).

Turkish and English: Two Alphabetic Orthographies with Varying Degrees of Alphabetic Principle

In order to understand the spelling issues related to English and other alphabetic orthographies, referring to the theoretical explanations that explicate the nature of those languages is vital. A cornerstone principle for alphabetic orthographies is the *alphabetic principle*, which postulates that graphemes (letters or groups of letters) represent phonemes (the smallest units of sound) in spoken language. An ideal alphabetic orthography follows one-to-one phoneme to grapheme correspondence, which consequently enables phonemic segmentation and letter knowledge as two core skills needed to spell any word. A handful of languages such as Finnish, Serbo-Croatian, and Turkish represent regular alphabetic orthographies with a very consistent letter-sound correspondence. A majority of the alphabetic orthographies, including English, do not strictly follow alphabetic principle by deviating with one phoneme represented by multiple graphemes or one grapheme representing different phonemes. There are various explanations of the reasons for these deviations from perfect alphabetic consistency, and one is the importance of the preservation of morphological information within words in exchange for grapheme-phoneme consistency (e.g., *heal-health*) (Caravolas, 2006). In

such cases where the derived word is spelled the same way as the base word, yet they are pronounced differently (as in *heal* and *health*), the phenomenon called *derivational constancy* is at play (Bryant, Deacon, & Nunes, 2006).

Child literacy acquisition has direct connections with the characteristics of the language to be acquired (Durgunoğlu & Öney, 1999; Öney & Durgunoğlu, 1997; Öney & Goldman, 1984). Several cross-linguistic spelling studies reported the cross effects of the first language to second language spelling outcomes across similar and different orthographies (Dixon, Zhao, & Joshi, 2010; Durgunoğlu, 1998; Sun-Alperin & Wang, 2011). These studies reported the cross effects of several types of native language skills including phonological, orthographic processing mechanisms on spelling outcomes of English language learners in various languages. Thus, the nature of Turkish is worth a brief explanation to have a better grasp of Turkish pupils' EFL spelling performance.

Linguistic Characteristics of Turkish

Turkish Phonology

Turkish is an alphabetic language that consists of eight vowels, 20 consonants, and one *silent g* written as "*ğ*", which can be in the middle or final position and it elongates the preceding vowel phoneme. The vowels (a, e, ı, i, o, ö, u and ü) conclude "all possible combinations of the distinct features *front/back, high/low*, and *rounded/unrounded*" (Durgunoğlu & Öney, 1999). Native Turkish vowels are phonemically short and, except for vowels in Arabic loan words and vowels that are followed by *silent g*, vowel elongation is not practiced (Kornfilt, 1997).

A unique phonology-driven characteristic of Turkish orthography is vowel harmony, which is a left to right parsing process affecting the vowel characteristics of the suffixes added to the end of the words (Durgunoğlu, 2006; Hankamer, 1992), "so that the following vowel assimilates to the preceding vowel in frontness and rounding" (Durgunoğlu & Öney, 1999, p. 286). As an illustration of the effects of vowel harmony in Turkish, the nominal suffix *-DIK* (as past tense, first person and plural marker) has 16 different forms (Underhill, 1976). In Turkish, each newly added iteration modifies the morphemes so to keep the vowels harmonious. To demonstrate vowel harmony in simple terms, the vowel characteristics of the inflectional morpheme to add plurality depends on the preceding vowel, for *araba* (car) it is *arabalar* (cars) and for *ev* (house) it is *evler* (houses).

Turkish consonant clusters, except for the loan words, do not exist at the initial position of a word; they are allowed in final position with a limited number of words such as *kürk (fur), kazanç (profit), çift (couple), aşk (love)* (Durgunoğlu, 2006; Kornfilt, 1997). The consonant cluster at the initial position is eliminated with the use of a buffer in spelling and pronunciation. The equivalent of the word *station* (as in *train station*) is *istasyon* in Turkish. As a borrowed word, *istasyon* has gone through orthographic mutation with the riddance of the consonant cluster at the initial position. This example illustrates the working mechanisms of Turkish that assist with loan words being assimilated according to the target language rules (Caravolas, 2006). In Turkish, a consonant cluster in the medial position is permitted only if each member of the cluster belongs to a different syllable (Kornfilt, 1997). In addition to vowel harmony, consonant

harmony is another phonotactic skill that Turkish students develop. Consonant harmony in Turkish requires the final consonant of words sending in p, ç, t, k as in *kitap* change the consonant of the suffix starting with *c* or , *d* to *ç*, and *t*, respectively, as in *kitapta* [kitap+da : in the book] or kitapçı [kitap+cı: book seller or bookshop].

Turkish Syllabication

Turkish has consistent grapheme-phoneme correspondence, which makes it easy to tap the phonemes and syllables. Syllables in Turkish determine the boundaries in the words, and there are four syllable structures (vowel, consonant+vowel, vowel+consonant, and consonant+vowel+consonant), which constitute 98% of all Turkish syllables (Durgunoğlu & Öney, 1999). According to Durgunoğlu (2006), CV is the most common syllable structure that exists in over 50% of syllables, and this syllable structure eases the syllabication task because of ending with a vowel. Established syllabication rules and grapheme-phoneme regularity facilitate directing Turkish learners' attention to phonemes and syllables and developing strong phonological awareness. The clear-cut syllable boundaries of Turkish help syllables manifest themselves more clearly compared to English (e.g., *ca-mel* or *cam-el*). Being a Turkish speaker necessitates continuous observation and processing of sub-lexical units, which eventually facilitates the development of strong phonological awareness in Turkish (Durgunoğlu & Öney, 1999). Therefore, beginning reading instruction in Turkish relies on the orthographic consistency and salient syllabic structures (Durgunoğlu, Nagy, & Hancin-Bhatt, 1993).

Turkish Morphology

Turkish, the largest member of the Turkic language group, belongs to the Ural-Altaic language family and, similar to Finnish, it is a morphologically-rich, agglutinative language which can produce new words and meanings by using iterative loops (Durgunoğlu, 2006; Kornfilt, 1997). Due to phonetic interactions, roots and suffixes can change to follow the rules of vowel and consonant harmony. Turkish is rich in derivational morphemes that derive nouns, verbs, and adjectives from each other (Kornfilt, 1997). Morphemes, which can be derivational or inflectional, are added to the end of the words due to post-positional nature of Turkish, and they add new meaning, such as tense, number, or negation or change the word class. Compounding is another productive word formation process in Turkish (Göksel & Kerslake 2005). A majority of Turkish compounds are formed based on nouns and they are right-headed (e.g., modifier+head noun). Compounds of Turkish are also observed at other levels including nominal (*para çantası- money bag*), adjectival (*darboğaz*-dar [narrow] *boğaz [*straight] meaning- *bottleneck*) and adverbial (*yaz kış*- yaz [summer], kış [winter] – meaning- *all year long*). The following comparison of Turkish and English morphology highlighted the noticeable differences between the two languages:

> Turkish is a good candidate for comparison with English because it differs markedly in some aspects of phonological, morphological, and syntactic structure. Turkish has a phonologically transparent orthography with very regular mappings between graphemes and

phonemes, but a relatively complicated morphological structure.

(Öney & Durgunoğlu, 1997, p. 2).

Unlike English, "words are formed by productive affixations of derivational and inflectional suffixes to roots or stems like beads on a string in agglutinative languages" (Oflazer & Güzey, 1994, p. 1.). Words that undergo phonological changes after taking inflectional and derivational morphemes commonly occur in Turkish. Morphological structures appended to the end of the word root are not clear due to sound changes (e.g., sound dropping, adding, or sound shift) when establishing new structures through inflection, derivation, and compounding; the transparency may be lost. The examples for the lack of transparency in inflected and derived Turkish words are abundant. Babayiğit and Stainthorp (2011), exemplified this point by stating that "…the effect of grammatical skills on spelling is most evident in the processing of complex words that cannot be spelled accurately by applying the phoneme-to-grapheme correspondence rules" (p. 542). When the Turkish pronoun *sen* (you-singular) takes dative case (*-e*), the result of the inflection yields *sana* (meaning: *to you*) instead of **sene* (meaning: *to you*), which is an example of the lack of transparency at the inflectional level. Derivational morphemes (e.g., *kurak* [meaning: *arid, barren] = kuru* [dry] + *ak* [suffix making adjectives from nouns]) and compounds (e.g., *kahvaltı* [meaning: breakfast] = *kahve* [coffee] + *altı* [under]) are examples for the lack of transparency in the morphemic structures. The morphology of Turkish is quite a productive mechanism; the role of morphological awareness in spelling in Turkish is undeniable. However, the relationship between the two is under-examined.

Turkish Orthography

Turkish is considered a shallow orthography due to its regular phoneme-to-grapheme correspondence (Durgunoğlu & Öney, 1999; Öney & Durgunoğlu, 1997; Öney & Goldman, 1984). Turkish is a left-branching language which means "governed elements precede their governors, objects precede verbs, postpositional objects precede the postposition and adjective modifiers precede the modified head" (Durgunoğlu, 2006, p. 220). Turkish is also a subject drop language because the subject marker could be attached to the verb and this allows the pronoun to be dropped. Turkish has flexible word order since the case markers can indicate the word function in the sentence. For instance, in the following sentences, the subject is unmarked and the object takes the case marker:

Turkish: Ali vazoyu kırdı [Ali vase+ accusative break+past]

English translation: Ali broke the vase.

Turkish: Vazoyu Ali kırdı [Vase+accusative Ali break+past]

English translation: Ali broke the vase.

The meaning is the same in both of these Turkish sentences except for the emphasis. The part of the sentence closer to the verb is always emphasized; therefore, in the first sentence the object is emphasized, whereas, in the second sentence the subject is emphasized. This flexibility of the word order suggests Turkish learners pay close attention to the word endings with case markers to interpret the meaning. Turkish has a well-defined syllabic structure and a regular orthography which facilitates the recognition, decoding and spelling of words. The regular phoneme to grapheme correspondence facilitates spelling and word decoding practices.

Spelling in English

Alphabetic writing systems, depending on the age of the adopted alphabet, follow three different routes when spelling words: 1) etymology-based spelling (i.e.,word origin), 2) traditional-spelling in languages with an old alphabet, and 3) phonetic-spelling of languages with more contemporary alphabets (i.e., following the pronunciation of words) (Ünal, 2011). Unlike Turkish which adopted the Latin alphabet in 1928, English, with a centuries-old alphabet, is a morpho-phonemic language with less transparent phoneme-grapheme correspondence to preserve the morphological information (i.e. *heal-health*) (Katz & Frost, 1992; Venezky, 1967).

Why the learners of a language make spelling mistakes has been the concern of the researchers. Spelling errors of young spellers may derive from the lack of linguistic mastery, literacy skills and cognitive capacities. Numerous research studies have focused on the characteristics of the English language and suggested the inconsistent phoneme-to-grapheme mapping of English orthography contributes to the misspelling of words (Caravolas, Volín, & Hulme, 2005; Kessler & Treiman, 2003). Treiman's (1993) research with native English-speaking first-graders provided important information about children's phonological, orthographic, and morphological processing skills when translating the oral language into a written form. Treiman (1993), for instance, found that English-speaking beginning spellers at first grade who had a strong grasp of English orthography utilized this knowledge in their spelling. The spelling errors of the first graders provided information about such tendencies in their spellings, as reliance on the phonological representations, and their application of this knowledge at the grapheme

level, which results in the non-possible but phonologically appropriate spelling outcomes such as *helpt* for *helped* (Treiman, 1993).

The basic nature of the English language needs to be understood to develop an overall understanding of why the language functions the way it does and why spelling errors occur. Kessler and Treiman (2003), for instance, suggested re-directing spellers' attention to two factors: the effects of position and environment that condition the way the words are spelled in English. English lacks consistency in both directions: phoneme-to-grapheme and grapheme-to-phoneme, which results in one-to-many and many-to-one phoneme-grapheme relations (Treiman, 1993). Such irregularities cause ambiguities which cannot be resolved based solely on the knowledge of phonological processes. Compelling evidence came from a study that concluded that almost half of English words could be spelled accurately on the sole basis of sound-letter correspondence (Hanna, Hanna, Hodges, & Rudorf, 1966). Children who start to develop knowledge and skills based on the inconsistent phoneme-to-grapheme relationships in English could detect common patterns in English by referring to semantics, syntax, morphology, and other orthographic characteristics of the language (Durgunoğlu, 2003; Fowler, Feldman, Andjelkovic, & Öney, 2003). *Bake,* for instance, which shares similar letter patterns with orthographic neighbors such as *cake, make, take,* and *fake,* was spelled more accurately compared to *ache* because of having commonly-used orthographic neighbors (Varnhagen, Boechler, & Steffler, 1999).

Multivariate Predictors of English Spelling

Spelling in English is a demanding task, especially when the multiple role of such metalinguistic skills as phonological, morphological, and orthographic processes are considered. Moats (1995) noted that a thorough spelling assessment includes the analysis of words based on phonology and morphology, and orthography. Whitehurst and Lonigan (1998) mentioned certain skills such as narrative, language, conventions of print, and phonological awareness as the "developmental precursors to conventional forms of reading and writing" (p. 849). Linguistic awareness, one of those precursors, is being able to discriminate the units of language such as phonemes, meaningful smallest units (morphemes) and sentence patterns. This linguistic awareness is also known as metalinguistic knowledge (Whitehurst & Lonigan, 1998), which has been conceptualized and tested for decades to understand how it affects reading and writing skills acquisition and rate of acquisition (Wagner & Torgesen, 1987). Over the past few decades, researchers studying literacy skills development compiled a substantial amount of evidence on the role of phonological, morphological, and orthographic processing skills in spelling development and those studies examined either unique or simultaneous effects of these metalinguistic skills on spelling.

Evidence of the effects of all three types of awareness on learning to read and spell words was reported (Berninger, Abbott, Nagy, & Carlisle, 2010). The morphophonemic nature of English, with an inconsistent phoneme-to-grapheme mapping, complicates spelling processes not only for native English speaking spellers but also for the speakers of other languages who are the learners of English. According to Treiman

(1993), learning to spell in English is complex due to multiple ways to spell the same sound (e.g., *maid, made*), and multiple ways to pronounce the same letter (e.g., *circus*) or letter combination (e.g., *chef, cheese*). Spelling outcomes have close connections with the phonological, morphological, and orthographic processing skills; therefore, each one of these metalinguistic skills deserves consideration for further research.

Phonological Processing Skills

Languages vary in terms of the complexity of the phonological structures, including the syllable types, the consistency of the sound-letter correspondence and the existence of morpho-phonemic alternations. Phonological processing skills refer to the awareness of sub-lexical speech segments at the level of syllables, onsets, rimes and phonemes. Such skills further include the ability to manipulate speech segments such as tapping out the number of phonemes and syllables, blending, segmenting the phonemes and identifying rhyme units, and phonemic similarity and differences at initial, middle and final positions in words.

The main focus of the previous cross-linguistic research was mostly on the effects of phonological processing skills on second language reading with less attention to second language spelling and writing (Sun-Alperin & Wang, 2011). The majority of the cross-language studies focusing on the possible effects of phonological processing skills found this variable to be contributing to literacy outcomes such as reading, spelling or word recognition (Apel, Wolter, & Masterson, 2006; Durgunoğlu & Öney, 1999; Öney & Durgunoğlu, 1997; Öney & Goldman, 1984; Rickard Liow & Lau, 2006, Sun-Alperin & Wang, 2011). Durgunoğlu and Öney (1999) acknowledged the bidirectional relationship

between phonological awareness and literacy development. The role of phonological awareness in reading success has been investigated (Durgunoğlu & Öney, 1999; Treiman, 1991; Yopp, 1988) and knowing "that graphemes map onto phonemes in alphabetic orthographies, it is hardly surprising that the acquisition of reading and spelling are closely related to a child's awareness of phonological units, especially phonemes" (Durgunoğlu & Öney, 1999, p. 281).

Spelling has proven to have strong ties with a variety of skills, such as "phonemic awareness, grapheme-phoneme correspondences and reading" (Caravolas, Hulme, & Snowling, 2001). Phonological knowledge emerges in the early spelling attempts where the most salient phonological representations of the words—initial and final phonemes—are spelled immaturely (Treiman, 1993). Knowing about the letters of the alphabet, manifested as the knowledge of letter names as well as letter sounds, is another crucial skill for strong spelling development in alphabetic writing systems (Caravolas, Hulme, & Snowling, 2001; McBride-Chang, 1999)

Phonology plays a crucial role in spelling from an early age (Goswami & Bryant, 1990; Read, 1975; Treiman, 1993) and it affects children's spelling performances at various grain-sizes (Ziegler & Goswami, 2005) such as syllables, onset-rime and phonemes (Kim, 2010). For instance, Jongejan, Verhoeven, and Siegel (2007) investigated the predictors of reading and spelling abilities in first and second language learners in grades 1, 2, 3, and 4 in Canada. They examined how several factors, such as phonological awareness, lexical access, syntactic awareness and verbal working memory, in native English-speaking children and ESL children affected their spelling. They found

a higher impact of phonological processing skills on reading for the native English group and increasing effects of phonological processing skills on the spelling performance of ESL children by grade level. Phonological processing skills were able to explain only 24% of the unique variance in spelling for ESL children at lower grades (1, 2) and this increased to 40% at higher grade levels (3 & 4).

In another study with an ESL context, Sun-Alperin and Wang (2011) studied the cross-linguistic effects of phonological and orthographic processing skills in Spanish (L1) and English (L2) with 89 2nd and 3rd grade Spanish-English bilinguals. They found cross-language phonological and orthographic transfer occurring from Spanish to English with Spanish phoneme deletion predicting English real and pseudoword spelling and Spanish homophone knowledge predicting English reading but not spelling. This study highlights the parallels between the phonological and orthographic processes of bilinguals and the importance of studying orthographic skills effects on spelling. The authors state, "there are shared phonological and orthographic processes in bilingual reading; however, orthographic patterns may be language specific, thereby not likely to transfer to spelling performance" (p. 591). Durgunoğlu (1998) investigated how language and literacy processes evolve in the context of a transitional bilingual education program. They examined how Spanish phonological awareness, syntactic awareness and letter knowledge predicted English and Spanish spelling among 46 Spanish-English bilingual students in the U.S. Durgunoğlu found a significant correlation between Spanish and English word recognition and spelling. She also reported strong cross-language transfer

based on the fact that Spanish letter identification and phonological awareness accounted for 84% of the variance in English spelling.

Phonological processing skills in the EFL context were studied by Kahn-Horwitz, Sparks, and Goldstein (2012). The researchers examined the influence of first language (Hebrew) literacy variables such as phonemic awareness and spelling on EFL spelling and word recognition longitudinally from Grade 4 to Grade 12. They found an interrelationship between first language literacy skills and EFL spelling at grades 4 and 9. English word recognition and letter-sound knowledge at earlier grades predicted EFL spelling at grades 4 and 9.

Phonological awareness is an umbrella term that embodies knowledge of the sounds at various grain sizes including phonemes and syllables. Examining an orthographically consistent language (Czech) and an inconsistent orthography (English), Caravolas, Volín, and Hulme (2005) reported phoneme awareness was a strong predictor of literacy development regardless of the orthographic consistency of the language. Kim (2010) focused on the phonological processing skills at different grain sizes such as syllable and onset-rime levels, criticizing the literature for having an overabundance of studies that tested phonological awareness at the phonemic level only. Kim examined unique contributions of orthographic, semantic (vocabulary and morphological awareness), phonological, and print-related variables to word reading and spelling by 4- to 5-year-old Korean-speaking children. The study found unique and robust contributions of phonological processing skills at the syllable level in spelling and reading practices, which confirms the cross-language effects of syllable salience in Korean. Further study

results revealed positive and statistically significant relationships between alphabetic knowledge, orthographic awareness, morphological knowledge, and Korean spelling measured based on a dictation task after controlling for vocabulary knowledge and phonological awareness. Kim's study adopted a comprehensive approach to understanding the spelling practices of Korean speakers by analyzing orthographic and morphologic processing skills. Her research did not find significant effects of morphological processing skills and the results of dominance analysis revealed the orthographic choice task was a strong predictor of spelling in Korean.

The ability of manipulating speech sounds has proven to have significant effects on the development of spelling abilities (Ehri, Nunes, Stahl, & Willows, 2001; Zhao, 2011) and it explains between 28 to 43% of the variance of children's word-level reading and spelling performances (Apel, Wilson-Fowler, Brimo, & Perrin, 2012). Phonemic awareness was also found to be a significant predictor of word and non-word spelling among Turkish first-graders (Öney & Durgunoğlu, 1997). These results suggested that Turkish children, unlike their English-speaking counterparts, develop such foundation skills early on and reach "mastery level in phonemic awareness tasks as well as in phonological spelling" (Caravolas, 2006, p. 503).

Spanish, a transparent and consistent orthography similar to Turkish, sets a good example to discuss the effects of phonology on cross-language literacy development. Durgunoğlu, Nagy, and Hancin-Bhatt (1993) tested the influence of several variables including letter naming and Spanish phonological awareness along with Spanish-English oral proficiency on Spanish-speaking first graders' English word identification

performance in the U.S. Durgunoğlu and colleagues (1993) found a strong correlation between Spanish phonological awareness and word recognition in English, suggesting a facilitative role of first language at emergent literacy stages (Durgunoğlu et al., 1993). This finding suggested the transfer of L1 phonemic awareness to L2 word recognition of bilingual readers.

Children having difficulties in spelling phonemes of English that do not exist in the native languages is commonly observed across different languages and orthographies (Wang & Geva, 2003). Studying the influence of the Arabic phonological system on English word spelling of 4th and 6th grader Bahraini children, Allaith and Joshi (2011) found the sounds that exist in English but not in Arabic hindered children's English spelling. Children replaced certain English phonemes, such as /p/ with /b/ (e.g., pant *bant); however, English spelling was facilitated when phonemes common to Arabic and English were spelled. Allaith and Joshi (2011) noted that the spelling problems with such novel phonemes continued across grade levels and concluded this was mainly due to the lack of explicit phonological awareness instruction or lack of exposure to the English language.

Phonologically speaking, Turkish and English differ at various levels. At the phonemic level, Turkish is more consistent than English due to the regularity in phoneme to grapheme mapping. Although English and Turkish use generally the same Latin alphabetic system, they have uncommon letters and sounds represented by these characters such as *x*, *q*, *th* (voiceless as in *thin*) and *w* in English and *ğ*, *ı*, *ö*, and *ü* in Turkish. Turkish also has clear-cut syllabication rules that determine the syllable

boundaries, which is hypothesized to have a major role in Turkish children's English word spelling. The main rule of Turkish orthography is vowel harmony. Instead of being able to use the same suffix spelled the same way to indicate the aspects such as plurality or post-positions, students must spell these suffixes to match "the preceding vowel in [terms of] frontness and rounding" (Durgunoğlu & Öney, 1999, p. 286). When adding new iterations, the morphemes change the forms to meet the requirement of vowel harmony as in the examples of araba+lar (cars) and bebek+*ler* (babies). Lastly, English has a short-long vowel distinction as in *bin* and *bi:n* (e.g., *bean*, *been*) that Turkish does not have except for the loan words such as *saat* (*hour*, *clock*, *watch*) , *maaş* (*salary*) and the vowels followed by *soft g*. Based on the variations in the rules mediating the phonology of the two languages, it is hypothesized that Turkish students, with a strong familiarity with Turkish phonology, would succeed in the phonological processing tasks that measure sound knowledge of English at various levels such as phonemes at different positions in a word and syllables. Turkish 6^{th} to 8^{th} graders who are familiar with the phonetic nature of Turkish as L1 would show a tendency to spell the English words phonetically by sounding out the unknown or less-commonly known words (e.g., *tardi-tardy*).

Orthographic Processing Skills

Orthographic processing skills and knowledge were conceptualized differently by various researchers. Perfetti (1997) defined this term as "…children's understanding of the conventions used in the writing system of their language" (p. 70). Venezky's (1999) definition of orthographic knowledge is the ability to transcribe phonemes to graphemes.

Orthographic knowledge, in alphabetic writing systems, consists of "knowledge about the spacing of words, the orientation of writing, acceptable and unacceptable letter sequences, and the variety of ways in which certain phonemes may be represented, depending on such factors as their position in a word" (Treiman & Cassar, 1997, p. 70). To Ehri (2005), orthographic knowledge is a device establishing "connections between the graphemes and phonemes to bond spellings of the words to their pronunciations and meanings in memory [which is] enabled by phonemic awareness and by the knowledge of the alphabetic system, which functions as a powerful mnemonic to secure spellings in memory" (p. 167). Orthographic processing is translating sounds to letters (phonemes to graphemes) which entails a general knowledge of spelling rules and patterns. A further detailed analysis of the definition of this term provides "an implicit awareness and appreciation of orthotactic rules and phonotactic probabilities of word spellings" (Apel, Wolter, & Masterson, 2006, p. 25). Knowledge of orthotactic rules involves awareness of more or less plausible spellings (Apel et al., 2006), and phonotactic probabilities have to do with common occurrence of phonemes for example *it* in *sit, fit, kit.*

Orthographic processing skills "include overt knowledge of the rules and patterns that govern what letter or letters are used to represent speech sounds in print" (Masterson & Apel, 2010). An example for the orthographic knowledge represented in English spelling is spelling the pseudoword *sime* as *sighm* or *siem,* which are plausible spelling patterns in English for the long *i* sound.

What letter combinations such as grapheme distributions or string of graphemes are possible in a language, and what graphemes may occur in the final position are within

the scope of graphotactic patterns, a type of orthographic knowledge (Berkel, 2004). As determined by graphotactic patterns, *a, i, o* and *u* in the final position of a word as in *spa* or *ski* are rare. The possible effects of phonotactic and orthotactic probabilities on orthographic representation of novel words by 5-year-old preschoolers were examined by Apel, Wolter, and Masterson (2006). The novel words such as *hess, chan, sime* are conditioned based on phonotactic and orthotactic characteristics such as "high phonotactic/ high orthotactic", "high phonotactic/ low orthotactic", "low phonotactic/ high orthotactic", and " low phonotactic and low orthotactic". The findings revealed a successful fast mapping of new words after a minimal exposure to the language through literacy practices such as novel reading, which indicated parallel yet unique contribution of phonological and orthographic processing skills on spelling. Regarding the effects of orthographic processing, Apel, Wolter, and Masterson (2006) concluded " [while] phonological processing requires individuals to focus on the phonemes present in a word, orthographic processing requires them to determine which grapheme(s) best represent those sounds" (p. 22).

Spellers apply their phonological processing skills to the sounds in print, yet there are unique contributions of orthographic processing skills in spelling. Apel, Wolter, and Masterson (2006) made this distinction: "[while] phonological processing requires individuals to focus on the phonemes present in a word, orthographic processing requires them to determine which grapheme(s) best represent those sounds" (p. 22). Because English has many different ways to spell the same sound, depending on the orthographic

rules regarding legal letter strings for different parts of a word, orthographic knowledge is key to mastering conventional spelling.

Various studies provided empirical data to support the inevitable role of orthographic characteristics of the native and target language on spelling. Dixon, Zhao, and Joshi (2010) examined the impact of first language orthography on bilingual children's English as a second language spelling performance. This study, with 285 Singaporean 6-year-olds, examined whether English spelling varied across students from different orthographies co-existing in Singapore (Malay, Chinese and Tamil) and what kind of spelling errors children with a different linguistic background made. The error patterns seemed to be aligned with the orthographic characteristics of the mother tongues of these children. For instance, a commonly-occurring error among Malay speakers, who are accustomed to the shallow Malay orthography, was to represent the first phoneme only. This exemplified the adaptation of first language orthographic characteristics, phonemic approach, to English word spelling. The syllabic nature of the Tamil language necessitates a vowel /a/ with each consonant, which might explain why Tamil-speaking children mostly omitted consonants and substituted phonemes illegally. Chinese-speaking Singaporeans, who are exposed to a visual orthography with morphosyllabic characters, may have developed a stronger visual memory than phonological sensitivity compared to the other two groups. Thus, their English spelling errors included mainly real word substitution errors.

Fashola, Drum, Mayer, and Kang (1996) investigated how Spanish-speaking children spell English words with 72 Spanish speaking children attending an elementary

school in California, USA. The predictor variables, first language phonology and orthography effects, were tested based on a spelling dictation task in English, and it was hypothesized that Spanish-speaking children would produce errors that could be predicted on the basis of Spanish phonology and orthography. The findings revealed more predictable patterns made by younger children, which indicates a developmental pattern based on grade level and experience in L2. Fashola et al.'s (1996) study revealed children who come from a different linguistic background could systematically apply their L1 phonology and orthography knowledge to second language literacy practices. For instance, the letter *h* in English is equivalent to *j* in Spanish so a Spanish-speaking child is expected to spell *hero* as *jero* due to his phonological knowledge mediated by the characteristics of Spanish orthography. The findings of Fashola et al. study revealed how first language could affect second language literacy development and it validated studying the phonology knowledge in the current study.

Cross-language literacy studies are modeled after the studies conducted with native English speakers, the findings of which were used to understand English language learners' spelling attempts in English as a second or foreign language. The same factors, graphemic, phonemic, morphemic and orthographic knowledge, were examined and tested in various orthographies (Finnish by Lyytinen et al., 2006; Greek by Porpodas, 2006; multiple languages by Caravolas, 2006) and orthographies with varying levels of phoneme-grapheme consistency. The inconsistencies of phoneme-grapheme correspondences in the English language may challenge English language learners even more, because a deeper understanding of English requires an awareness of various

linguistic skills. The significance of orthographic processing skills as a variable emerges from the linguistic characteristics of the relevant orthographies. In deep orthographies such as English where phonological information is not enough to master spelling, there is a need to consider other variables such as orthographic awareness, which is the knowledge regarding typical and legal letter strings encountered in a language (Varnhagen, Boechler, & Staffler, 1999). A typical spelling for /eyk/ is represented with the letter string *–ake*, as in *bake, cake, take, make*. An atypical yet legal spelling on the same sound is *ache* as in *headache*. A non-typical and illegal spelling for this phoneme would be **-eyke*.

In alphabetic writing systems, orthography deals with the representations of the sounds by letters and the plausible letter combinations that are legal in a language. In Turkish, based on a regular orthography where a phoneme is represented by the same letter regardless of its position in the word, /s/, /e/, /l/ would be spelled as *sel* in Turkish not *sell* or *cell.* It is hypothesized that Turkish students, due to their familiarity with a consistent orthography, would misspell the English words by representing the unfamiliar sounds of English with a closest equivalent of Turkish. Another orthographic rule that is regarded as unacceptable in Turkish is the consonant cluster at initial position. It is hypothesized that Turkish 6th to 8th graders avoid consonant cluster by inserting a vowel buffer between the consonants of words.

Morphological Processing Skills

Phonologically complex languages represent either morphological or the grapheme to phoneme invariance during spelling processes (Katz &Frost, 1992). English,

with a complex phonology, refers to phonological coding which is not sufficient as a sole skill to explain spelling in English (Katz & Frost, 1992). Thus the examination of morpheme-level knowledge at the written level is necessary.

Morphological processing skills are conceptualized differently across various fields and among researchers. Durgunoğlu, Nagy, and Hancin-Bhatt (1993) categorized syntactic awareness under morphological awareness; Kim (2010) suggested morphological awareness is a type of semantic knowledge, along with vocabulary. According to Carlisle's (1995) definition, morphological awareness denotes "conscious awareness of the morphemic structure of words and their [students'] ability to reflect on and manipulate that structure" (p. 194). In English, word formation has associations with morphological structures added to word roots. Many words are produced in English using derivational and inflectional affixes; due to its morpho-phonological nature, English word spelling entails morphological awareness. Morphological processing skill is defined as the ability to recognize that words can be dissected into smaller segments that are functionally identifiable by "mapping these elements on graphic symbols and assembling, disassembling segmental intra-word information" (Koda, 2000, p. 299). Koda (2000) highlighted the need for the study of morphological awareness by stating that understanding the segmental nature of words promotes an analytical approach to word learning, and there is a need for mastery in not only phonemes but also in "dissecting the internal structures of words so as to identify the phonemic constituents" (Koda, 2000, p. 298).

Morphological knowledge and processing skill involves understanding the smaller meaningful units within words, recognizing the prefixes and suffixes, and compound word formations. This notion refers to "the ability to reflect on and manipulate morphemes and word formation rules" and it is associated with other metalinguistic skills (Kuo & Anderson, 2006, p.161). Acquisition of morphological structures include the acquisition of inflections (e.g., tense and number), derivatives (e.g., changing parts of speech), and compounds (e.g., cupcake). In terms of the acquisition of morphological structures in English, the inflections are found to be acquired before formal literacy instruction by English-speaking children (Berko, 1958) and children who are the speakers of such other languages as French (Casalis & Louis-Alexandre, 2000), Turkish (Fowler, Feldman, Andjelkovic, & Öney, 2003), and Serbo-Croatian (Feldman & Andjelkovic, 1992).

Inflectional morphemes typically mark syntactic or semantic relations between different words in a sentence without altering the meaning or the lexical category (e.g., verbs, nouns) of the stem. In English, for example, verbs may be marked by inflectional morphemes for tense. Nouns may be inflectionally marked for agreement in number with other words in the sentence. Derivation involves the addition of a morpheme to change the lexical category or the meaning of a base morpheme. For example, the verb *eat* becomes an adjective if attached with the suffix *–able (e.g., edible)*. Finally, compounding refers to the formation of new words by combining two or more independent words (e.g., pencil case, armchair). Languages differ in the extent to which each word formation process is used. In English, inflection is the most frequently used

word formation process and compounding is the most productive word formation process in Chinese (Packard, 2000). According to Goodwin, Lipsky, and Ahn (2012), morphological structures play a semantic role, communicating lexical meaning at the word base or affixes (e.g., *like* vs *dislike*), syntactic roles (e.g., *run* vs *ran*), grammatical categories (e.g., *health*, *health+y*), number (e.g., houses), and degree (e.g., *fast>faster>fastest*).

In English, morphological knowledge requires the addition of affixes (prefix and suffixes) in a systematic and linear fashion. Morphological mapping in English is more systematic in inflectional processes for instance *–tion*, *-ment*, and *–al* could convert verbs into nouns. The derivational morphemes vary in terms of their orthographic representation as in the case of *actor*, *dancer*, *announcer* where the *–er* suffix goes through several processes. Further issues concern morphological transparency. In regular formations, base morphemes retain their orthographic forms through affixation; therefore, they are structurally transparent (e.g., *–ed* past tense marker in *cleaned*, *studied, cooked*). In irregular formations, morphemes change and become visually opaque (e.g., *sang, drove, slept*). This variation affects the way morphologically complex words are processed. The opaqueness of English words exist at derived (*heal-health*) and compound (*smoke+fog = smog, or motel, brunch*) levels as well.

The writing system of English is not entirely alphabetic; "not only phonemes but also morphemes, word boundaries, intonation, and sentence boundaries" are represented (Nagy, Berninger, & Abbott, 2006, p. 135). The deviations from a consistent letter to sound mapping reflect the morpheme-level consistency (Venezky, 1999) and the

knowledge of morphology is essential for spelling accuracy (Bear, Invernizzi, Templeton, & Johnston, 2004). The morphophonemic nature of English is due to morphology compensating phonology in conventional spelling. For example, *electric* and *electricity* share a common meaningful unit (*electric*), which is preserved in the written form even though the pronunciation of the letter *c* changes from */k/* to */s/*. Muter and Snowling (1997) identified morphological awareness, independent from phonology, as a significant predictor of English spelling ability.

With the growth of literacy attainment, a shift from the knowledge of phonology to morphological processing skill attainment was reported (Carlisle, 2003). Morphological awareness has proved to be a strong predictor of the spelling skill development in English (Nunes, Bryant, & Bindman, 1997b). Several studies provided empirical evidence for the effects of morphological knowledge on spelling at various stages of literacy development. A longitudinal study by Nunes et al. (1997b) reported very low effects of morphological awareness in the early-stage spelling performances of English spelling (e.g., *sofed* for *soft*) , which later on, confined to grammatically appropriate patterns (e.g., *keped* for *kept*) and finally the spelling of right group of words. Another study by Nunes, Bryant, and Bindman (1997a) explored the acquisition of *-ed* regular past tense indicator and they found that although the acquisition of past tense in oral language is quite early, the same morphological structure is not properly used in spelling until third grade. This was also supported by the earlier spelling practices of young spellers that proved a heavy reliance on phoneme-grapheme correspondence with the predominance of phonetic spelling for the past tense endings (e.g., *opund* for *opened*,

hurd for *heard*) as found by Bryant, Deacon, and Nunes (2006). Children, in their early stages of literacy development, were found to rely on phonological and orthographic knowledge more than their morphological awareness skills for spelling (Treiman, Cassar, & Zukowski, 1994). Treiman and colleagues' (1994) study revealed native English-speaking young spellers were aware of meaning connections when learning to spell. They found even native English-speaking kindergarteners made fewer mistakes with the flap consonants that have semantic associations as in *dirty* (dirt-dirty) instead of the word *city*. The study findings concluded young spellers were not simply phonetic spellers as previously claimed. Instead, morphological processing skills were at work in spelling practices of native English speakers through meaning associations. The findings of these studies provided empirical evidence for Frith's stage theory that suggested a delayed role of morphological knowledge.

Native language morphological knowledge could transfer to the second language spelling performances. Dixon, Zhao, and Joshi (2012) studied the effects of dialectal influence of Singaporean Colloquial English on Singaporean kindergarteners' (Chinese:L1 background, *N*=168) English word spelling and they found that dropping the plural form was the most common error among Singaporean kindergarteners with Chinese linguistic background, suggesting the influence of Chinese L1 with no inflectional morpheme to indicate number.

Studies that examined the impact of morphological processing skills in English proved the intervening role of morphological awareness in spelling (Apel, Wilson-Fowler, Brimo, & Perrin, 2012; Nagy, Berninger, & Abbott, 2006; Nunes, Bryant, &

Bindman, 1997b) in an increasing level by age (Goodwin & Ahn, 2010). A longitudinal study conducted by Nunes, Bryant and Bindman (1997b) with native English speakers examined the effects of morphological knowledge in spelling development in English and the findings suggested a shift from reliance on phonology knowledge to utilizing morphological strategies for spelling. A more recent study reported native English-speaking 2nd and 3rd graders' morphological processing skills uniquely predicted their spelling outcomes (Apel, Wilson-Fowler, Brimo, & Perrin, 2012).

Morphology plays a major role in word formation in Turkish and this process follows a predictable pattern. Thus, it is hypothesized that morphological awareness in English contributes to English word spelling outcomes of 6th to 8th grade Turkish EFL pupils. It is, further, hypothesized that younger pupil's morphological processing skills are not as strong as a predictor of spelling as older pupils. It is hypothesized that morphological processing skills would develop with the growth of literacy skills and metalinguistic knowledge (Ehri, 1995; 2005).

In sum, spelling necessitates knowing what single-letter and letter combinations to choose to represent each phoneme and the intervening role of the phonology complicates this process by blurring the semantic connections within word stem and the derived forms as in *heal* and *health*. Thus, morphological processing skills need further investigation, first, to understand how young spellers process the unpronounced semantic relationships between the words and secondly to determine which one of the possible spellings of a sound should be used in a word (e.g., /ks/ represented by *x* or *cks*).

Correlations of Phonological, Morphological and Orthographic Processing Skills

Spelling in English necessitates multi-level skills such as mapping sounds (phonemes), letters (graphemes), mastering legal letter combinations (orthography), and developing awareness about word roots and affixation (morphemes) (Nagy, Berninger, & Abbot, 2006). Durgunoğlu, Nagy, and Hancin-Bhatt (1993), who identified the major components of cross-linguistic transfer in reading processes, concluded that orthographic and phonological knowledge are not two separate routes but, rather, they overlap and work in parallel. Therefore, the present cross-linguistic study investigated the possible effects of orthographic consistency variation on spelling practices with the mediating role of phonological, morphological, and orthographic processing skills across two alphabetic languages with varying degrees of orthographic depth. The deviations from the alphabetic principle in English spelling demonstrate maintaining the consistency of spelling of the morphemes (Chomsky & Halle, 1968; Venezky, 1999). English has a writing system that is not completely phonemic, it is rather morphophonemic, which suggests an inevitable relationship between the morphological and phonological processing skills. Nagy, Berninger, & Abbott (2006) speculated that the relationship between phonological and morphological processing skills might depend on several variables such as the age of the learner (e.g., higher impact of morphological awareness on decoding with older students) and the word types (e.g., words with less transparent morphological relationships as in sign-signature).

Neurocognitive studies provided insightful information about the relationship among the three metalinguistic skills. Brain imaging studies showed unique neural

images that are created for phonological, morphological, and orthographic word forms (Richards et al., 2005). The brain images further suggested cross-over effects between phonological and morphological treatment: those who received morphological treatment showed significant changes in phoneme mapping during brain scans and those who received phonological treatment showed significant changes in morpheme mapping.

Over the past few decades, researchers studying literacy development compiled a substantial amount of evidence on the role of phonological, morphological and orthographic processing skills in spelling development and those studies examined either unique or simultaneous effects of these metalinguistic skills on spelling in L1 and L2. The phonological awareness of learners from shallow languages showed influence on the second language spelling performance as seen by Rickard Liow and Lau (2006) and Sun-Alperin and Wang (2011). Rickard Liow and Lau (2006), who studied metalinguistic awareness of 6-year-old bilingual children with Malay (Malay L1, English L2), Mandarin (Mandarin L1, English L2) and English backgrounds (English L1, Mandarin L2), found Malay 6-year-olds relied on phonological processing skills more than the other two linguistic groups in their English spelling attempts. Dixon, Zhao, and Joshi (2010), who studied the spelling performances of Singaporean students with different linguistic backgrounds (e.g., Tamil, Malay and Chinese), found similar results and concluded "compared to Tamil and Mandarin Chinese, Malay is orthographically much closer to English, and procedures involved in phonological decoding and activation in Malay are more similar to those required in English" (p.214). Sun-Alperin and Wang (2011) also found cross-language effects of phonological and orthographic skills in Spanish to

English word and pseudoword spelling among Spanish L1 English learners. These findings suggested a shared phonological processing skill across languages that affects spelling outcomes. The cross-linguistic effect of a shallow native language orthography on second language spelling manifested itself based on phonetic approximations. These studies on the cross-language phonological processing skill effects on spelling demonstrated inseparable ties between phonology and orthography of a language, the two multivariate predictors of spelling outcomes.

The empirical study findings based on quantitative analyses made suggestions on the role of phonological and morphological processing skills. The hierarchical regression analyses that measured the impact of phonological and morphological processing skills on reading found when a measure of morphological awareness was entered after entering the measures of phonological awareness, the morphological processing measure only accounted for 5% of the unique variance, which was half of what the phonological processing skills accounted for in the same regression analysis (Shankweiler et al., 1995). However Nagy, Berninger, and Abbott (2006) argued, though it does not predict reading at vocabulary reading level as strongly as phonological skills do, morphological processing skills still played an important role in reading at decoding and comprehension levels.

Two other studies provided empirical data that supported the facilitative role of morphological awareness on spelling outcomes. First, one by Deacon, Kirby, and Cassellman-Bell (2009) examined the role of morphological processing skills along with several other confounding variables such as phonological processing, RAN, and short-

term memory of seven-year-old native English-speaking children (*n*= 115). Two years later, the spelling performance of these children was measured and morphological processing skill accounted for an additional 4-10% of unique variance on young learners' spelling. Morphological processing, in addition to the generally-accepted role of phonological processing on spelling outcomes, was concluded to be a significant, long-term contributor to spelling. Another study examined the relationship between spelling and morphological awareness of French-speaking 3rd and 4th graders based on the question whether phonemes with several possible spellings were spelled more accurately in derived words than non-derived French words (Casalis, Deacon, & Pacton, 2011). The findings showed a general relationship between word spelling and morphological awareness because morphological awareness had strong correlations with the general spelling outcomes, including the words that did not involve morphology. The researchers further demonstrated morphological awareness was dependent on the phonological structure of the items in the morphological task and the developmental level of the spellers. It is gaining increasing acceptance that morphological awareness helps to limit the range of possible spellings (e.g., ʃ is spelled as *–ss*, *–sh*, *-c*, or *–t* in the following words: *mission*, *fish*, *magician*, *connection*). The direction of future research, in the light of these studies, is to find out whether morphological processing skill, like general ability of manipulating the sound structure of words, has a general role in spelling development.

Multivariate Predictors of Turkish Speakers' Spelling

In Turkish, phonological processing skills were studied more comprehensively compared to the two other variables, morphological and orthographic processing skills.

Öney and Durgunoğlu (1997) examined how Turkish first graders' early literacy acquisition took place in Turkish, a transparent orthography, and how reading comprehension and spelling were influenced by several variables, including phonological processing, letter recognition, word and pseudoword recognition, syntactic awareness and listening comprehension. They tested these variables at three testing points (October, February, and May), and found results replicating previous research conducted with English-, Spanish- and Italian-speaking children that syllable manipulation was an easier task compared to phoneme manipulation. The findings revealed an exponential development in the identical tasks from October to February and a ceiling effect in May. All phonological processing skills including letter identification, blending, and phoneme segmentation and deletion, predicted 56% of the variance in spelling measured in October. The dramatic increase in performance of Turkish first graders implied the facilitative effects of consistent letter-sound correspondence which enabled Turkish students become efficient decoders and spellers quickly (Öney & Durgunoğlu, 1997).

Durgunoğlu and Öney (1999) compared the development of phonological awareness across Turkish and English, a relatively opaque language, with Turkish and English kindergarteners and first graders (*n*= 138). They found that Turkish pupils processed syllables and phonemes at final position more successfully than English speakers. This result was somewhat expected, due to the established knowledge on syllable salience and the continuous monitoring of suffixes in Turkish, in addition to the transparent orthography. Further analyses revealed that Turkish children (K-1), who outperformed American children (K-1), had a better grasp of syllables compared to

phonemes. In addition, Turkish children's phoneme knowledge at first grade exceeded their syllable knowledge at kindergarten and American counterparts' syllable and phoneme knowledge at first grade and kindergarten. The researchers related these findings to Turkish children's strong foundation of phoneme manipulation skills due to vowel harmony, which is a skill that American children did not excel in. The second linguistics-driven explanation to the findings was that Turkish students are used to adding suffixes because of the rich agglutinative characteristic of the language. This facilitates their performance on the tasks that dealt with the phonemes at final position, which is second nature to Turkish children.

Oktay and Aktan (2002) conducted cross-linguistic research to examine the role of phonological awareness and word recognition. The study shed light on the effects of children's phonological and orthographic knowledge of Turkish and English. A group of Turkish students (*n*= 94) at primary schools and kindergartens in Istanbul and a group of American students attending primary school and kindergarten in the U.S. (*n*= 44) participated in this study. Phonological processing and decoding skills were measured in both languages and the study found that, although the decoding skills of Turkish kindergarteners were lower compared to American counterparts (14% versus 22% of correct means, respectively), Turkish first graders outscored American first graders (100% versus 82% correct means on decoding, respectively). Phonological processing skills measured based on syllable and phoneme tapping and initial and final phoneme deletion revealed Turkish kindergarteners outscored their age-matched counterparts on the syllable tapping task but not the phoneme tapping. The Turkish kindergarteners were

more successful in final phoneme deletion compared to American kindergarteners. However, American kindergarteners performed similarly on the initial and final phoneme deletion tasks. The findings of this study were aligned with the empirical findings of the previous literature on Turkish (Durgunoğlu & Öney, 1999; Öney & Durgunoğlu, 1997).

Babayiğit and Stainthorp expanded on the current knowledge of native Turkish speakers' literacy development through several studies that modeled the relationships between cognitive-linguistic and literacy skills of Turkish students in northern Cyprus where the official language is Turkish (Babayiğit & Stainthorp, 2007; 2010; 2011). In their study with 57 Turkish speaking children at 1st and 2nd grades, Babayiğit and Stainthorp (2010) examined how phonological, grammatical and RAN skills influence composition writing in Turkish. They found significant contributions of phonological knowledge to spelling performance with the mediating effects of former spelling knowledge. Turkish word and sentence-level spelling measures of first and second graders were correlated significantly at $p < .05$ level. The observed spelling difficulties of native Turkish-speaking children, according to the authors, originated from the way words are pronounced which may deviate the consistency of spelling of the same words through assimilation based on the effects of neighboring sounds within words.

Babayiğit and Stainthorp (2010) emphasized the relationships between the phonological and morphological processing skills and highlighted the role of morphological awareness for agglutinative languages such as Turkish by stating: "…the effect of grammatical skills on spelling is most evident in the processing of complex words that cannot be spelled accurately by applying the phoneme-to-grapheme

correspondence rules" (p. 542). In agglutinative languages, suffixes are attached at the end of a noun or a verb which introduces complex multimorphemic words to young readers and spellers at earlier stages of their literacy development. For instance, words that undergo phonological changes after taking the suffixes change in the original form of the word. The sound quality change is not only limited to inflections, but derivational morphemes in Turkish could cause such changes too as in the case of *kurak* (meaning: *arid, barren*). This word lost a phoneme in the word root after receiving the suffix –ak as in *Kuru* (dry) + *ak* (suffix making adjectives from nouns) = *kurak* (barren).

Durgunoğlu (2003) examined the processing of morphologically complex words in Turkish with a group of second and fourth graders (n = 127). In her 2x2x3 design study (grade level x type of task [correction and completion] x levels of suffixation), Durgunoğlu (2003) found significant effects of grade level ($p < .05$) which means that fourth graders performed better than second graders on implicit morphology-based correction and completion tasks in Turkish. Further findings confirmed the correction task was easier compared to completing the sentence with a suffix. The level of suffixation did not reach significance which means students in either grade did not make fewer errors with morphologically simpler words than morphologically complex words. The nature of modifications displayed an intriguing pattern: both older and younger children modified Level 1 words more than Level 2 and Level 3 words. In other words, Turkish second and fourth graders were found to complicate the words instead of simplifying them. Durgunoğlu's (2003) study demonstrated that Turkish speakers processed morphologically complex words as accurately as morphologically simple

words. The words with complex morphological patterns have a lower number of probable suffixes, which facilitated Turkish students' performance on those words. Finally, Turkish students were found to have a tendency to change simpler forms to more complex ones.

Taken together, these studies conducted with Turkish speaking children emphasized an interwoven relationship among various types of metalinguistic abilities. Although studies in Turkish with a phonology-focus outnumbered the studies examining other predictor skills on spelling, the empirical evidence derived from these studies supported the combined and unique roles of various metalinguistic skills at the phonological, morphological and syntactic levels; thus, they established the solid basis for the present study.

The Socio-cultural Factors of Literacy Development

The autonomous theoretical models to explain literacy characterized literacy as a combination of cognitive skills that were isolated from the social contexts. In contrast, Street (1984) proposed literacy as a social practice and claimed that literacy acquired through formal schooling cannot be detached from social contexts. Thus, coupled with the linguistic and literacy skills of the spellers, the socio-cultural variables are important to consider. Genesee, Geva, Dressler, and Kamil (2006) claimed: "cross-language effects are not invariant and may be influenced by [not only] typological [but also] socio-cultural and instructional factors" (p. 164). As recommendations for further research, Genesee, Geva, Dressler, and Kamil (2006) suggested the need to provide information about "the

socio-economic status, schooling opportunities, language skills, and language and literacy background of English language learners at the time of testing" (p. 172).

Socio-economic Status (SES)

Membership in a socially defined group has an impact on behaviors, cognition, values and beliefs which possibly influences learning processes and outcomes (Goldenberg, Rueda, & August, 2006). SES, defined as "a cluster of variables [regarding] a person's or family's economic circumstances, level of formal schooling and occupational status" (Goldenberg, Rueda, & August, 2006, p. 251), has been a variable predicting cognitive and academic outcomes, especially when this variable is considered in aggregate with a consideration of the schools that students are attending and the neighborhoods in which they are residing (Goldenberg et al., 2006).

The aforementioned synthesis was mostly based on immigrants and/or minority students learning English as a second language in the United States. The present study presents a different context with native Turkish-speaking children learning English as a foreign language. Erkan (2011), who investigated the role of various factors such as the family SES, children's pre-school education and parental educational status in the school readiness of Turkish children, concluded that family SES, children's preschool education and mother's education (but not father's education or child's gender) predicted Turkish first graders' school readiness. Similar to Erkan's findings, it is hypothesized that SES plays a role in EFL spelling outcomes by affecting the level of EFL knowledge, the familiarity with the language, and experience in the target language and culture. It is

hypothesized that the Turkish pupils with a higher SES would perform better in the spelling dictation tasks compared to the children of lower SES.

In summary, SES, along with several other socio-cultural variables, has been found to have an impact on academic achievement of school-age children. Because the data in the current study were collected in different cities and school sites with varying student characteristics including the levels of SES, it is important to incorporate this variable in the demographics and background questionnaire.

Literacy Background and Exposure to English

Knowing the language and literacy experiences of English language learners is an initial step to plan word study instruction because children's success in learning one language has close associations with their learning of another language (Bear, Helman, Templeton, Invernizzi and Johnston, 2007). In general, greater quantity of home literacy experiences and opportunities is related to better literacy outcomes (Goldenberg, Rueda, & August, 2006). Regardless of the language and ethnic background of the parents, the family literacy level anticipates the success of children (Reese, Garnier, Gallimore, & Goldenberg, 2000). Goldenberg, Reese, and Gallimore (1992), examining the role of school-based literacy materials entering homes of Spanish-speaking children, found story booklets and worksheets sent by teachers stimulated literacy experiences at home. Another study with Spanish-speaking children enrolled in bilingual education programs concluded that literacy experiences at home such as reading, being read to, and having books or other literacy materials in Spanish or English supported subsequent literacy development, regardless of language (Reese, Garnier, Gallimore, & Goldenberg, 2000).

Although family SES and home-based literacy activities could play a role in the first or second language development of children, the quantity and quality of exposure to the foreign language may impact literacy outcomes as well. For instance, children who have more books in English or those with an opportunity to be exposed to the target foreign language through media, the internet or tutoring services would have more advanced skills and knowledge of the target language. In the same vein, the present study examined the effects of literacy practices and English language exposure for a clearer understanding of the spelling performances of Turkish EFL students. It is hypothesized that the literacy background exposure to the target language would have positive effects on English as a foreign language spelling outcomes of Turkish students.

Instructor Effects

Second or foreign language learning is under the influence of many factors. Dörnyei (1994) claimed the learning environment influences students' learning outcomes, perhaps through intrinsic and extrinsic motivation. The learning environment is categorized in three different domains: lesson-related factors such as interest and expectations; class-based factors such as award system and collaboration; and finally, teacher-oriented variables such as teacher authority, personality, teaching style and motivation (Dörnyei, 1994).

A study by Dörnyei and Csizér (1998) with Hungarian English teachers reported that the English teachers perceived their in-class behaviors as the major factor influencing student motivation. Similarly, Chambers (1998), who collected data with secondary

school pupils learning German, found that the students' perception of the language teacher as the most significant factor impacting the foreign language learning outcomes.

The demand to learn English has been escalating in the world. The interest in English language learning is increasing at various levels of the education system in Turkey. Turkish public and private schools introduce this foreign language at early grades of primary education, yet EFL success level at public schools is not on par with the expected level (Atay, 2004). Teachers, due to background differences, may have teaching motivation at different levels and utilize different language teaching methods and strategies or use the same strategy differently (Good & Brophy, 1994). The native Turkish-speaking EFL instructor effect is hypothesized to have a significant impact on EFL spelling outcomes of Turkish students: teachers who are highly motivated, who use a variety of teaching methods and techniques and who integrate target language culture through authentic materials would affect Turkish spelling positively compared to the EFL instructors who do not demonstrate these factors in their classrooms. Thus, teacher effects are worth examining to have a better understanding of Turkish EFL students' English word spelling outcomes. This variable is crucial in the present study, considering the multiple data collection sites with different instructors.

Assessment of Spelling

People who experience spelling difficulty are said to be those with difficulties remembering the words that involve complicated relationships of phonology, morphology, and orthography (Moats, 1995). The phonological analysis of the spelling errors takes the degree to which a spelling attempt matches the spoken features of the

whole word into consideration. Omission, deletion, substitution of vowels and consonants, or at times, substitution of the whole word are types of phonology-related errors. The role of phonology is intertwined with the morphology. Having adopted this point of view, Carlisle (1987) categorized the types of derived words into four domains: no change of base form in the derived word (e.g., *enjoy-enjoyment*), orthographic change in the base form (e.g., *swim-swimming*), phonological change in the base form (e.g., *magic-magician*) and both phonological and orthographic change (e.g., *combine-combination*). Carlisle examined the spelling of the derived words by group of young spellers with and without learning disabilities and concluded that the words that challenged the young spellers most were the ones that went under phonological changes. Fischer, Shankweiler, and Liberman's (1985) study with adults provided converging findings that suggested that words with complicated morphophonemic structures were the ones that differentiated the disabled and non-disabled students. Lastly, orthographic processing errors occur more commonly with the spellers who are used to spell words phonetically (Moats, 1995). The orthographic errors may emerge from the attempts to delete, substitute, and add letters and syllable-level units to represent the phonetic equivalents (e.g., /k/ in canyon – kanyon).

The purpose of spelling assessment determines the approach toward the methods to analyze the performance. Spelling tests are given for evaluation, accountability, and placement purposes such as to determine the eligibility for special education, students' developmental level or the progress in response to instruction (Moats, 1995). Spelling is measured for the diagnosis of literacy skills of native speakers. In the present study, the

aim of spelling assessment is to understand the nature of word spelling attempts of English language learners who are familiar with a different orthography.

Direct analysis of spelling errors is a challenging business. As Moats (1995) indicated, the major problem with this is that many errors can have several plausible explanations, thus, a valid approach to understand the nature of spelling errors would be to relate the analysis to several variables such as "the inherent linguistic properties of words, principles of spelling, and language development" (Moats, 1995; p. 82), instead of simply forcing them into categories.

Relevant Conceptual Models

Theoretical explanations of spelling describe the cognitive processes involved in spelling and effective approaches to teach spelling (Moats, 1995). The theoretical framework of the present study is tri-fold: theoretical explanations on bilingualism, on orthographic variations, and on spelling development.

Conceptual Framework on Bilingualism

Bilingualism is an enriching experience for children both linguistically and cognitively. Cummins's (1978; 1979) Developmental Interdependence Hypothesis is an important theoretical explanation that facilitates the conceptual understanding of the spelling attempts of English as a foreign language students by providing psycholinguistic and cognitive explanations of the effects of bilingualism on children.

Developmental Interdependence Hypothesis

Bilingualism, which is defined as the state of having an access to more than one linguistic code, fosters the development of skills and awareness of language. The

developmental interdependence hypothesis suggests that level of L2 competence that a bilingual child acquires is a partial function of the type of competence the child has developed in L1 (Cummins, 1979). Children's first language skills and knowledge are instrumental in the optimal development of L2 abilities. This hypothesis proposed that L2 development is more easily built on a foundation of well-developed, age and grade-level appropriate L1 cognitive and linguistic capacities (Cummins, 1979).

The linguistic interdependence hypothesis, which is also conceptualized as a dual-iceberg, posits that each language in the mind contains separate surface structures (the tips of two icebergs); however, underlying those surface linguistic manifestations are one common cognitive operating system that functions across languages (the shared submerged portion of the dual iceberg). Cummins's developmental interdependence hypothesis establishes the theoretical background for the research in various fields including literacy studies. The basic tenet of Cummins's developmental interdependence hypothesis proposes that the language proficiency required for cognitively demanding tasks such as literacy practices is commonly used across languages; thus, once it is acquired in one language, it promotes literacy acquisition in another (Cummins, 1979). Supporting this theoretical explanation, Cenoz (2000) found that further development of students' linguistic knowledge in L1 benefited their foreign language learning. Based on an assumption that the native-Turkish 6^{th} to 8^{th} graders participated in this study with an already established first language literacy knowledge, the present study could utilize the theoretical explanations of Cummins's hypothesis when interpreting the spelling performance of Turkish EFL children.

Conceptual Framework on Orthographic Variation

Contrastive Analysis Hypothesis

The contrastive analysis hypothesis in second language acquisition identifies the linguistic differences and similarities between languages to pinpoint where language learning difficulties might arise (Lado, 1957). This hypothesis established the theoretical basis of the present study to examine the word spelling errors and to explain the cross-linguistic reasons behind these errors. Cross-language analyses between Turkish and English phonology, morphology, and orthography provided possible explanations regarding what linguistic characteristics of English and Turkish might cause the spelling errors attempted by native Turkish EFL students in 6^{th}, 7^{th}, and 8^{th} grades. For example, Turkish students may attempt to insert a vowel as a buffer sound between the consonant clusters of English words, following Turkish phonotactic rules. Durgunoğlu (1998) stated L2 literacy acquisition is not a replica of L1 and that there are various factors hampering this process.

Orthographic Depth Hypothesis (ODH)

All alphabetic writing systems are based on the principle that graphemes (letters or combinations of letters) represent phonemes (the smallest meaningful unit of sound in a language). In reality, the consistency of the phoneme-grapheme mappings vary from consistent mappings between phonemes and graphemes in shallow orthographies to inconsistent mappings in deep orthographies. Frost, Katz, and Bentin's (1987) orthographic depth model highlighted the orthographic differences of various degrees and the basic tenets of it are valid for various fields of linguistic research including literacy

acquisition research. Orthographic depth, defined by Katz and Frost (1992) as "…varying degrees of the dependence on the strict alphabetic principle: the range of correspondence between grapheme and phoneme varies both in consistency and completeness" (p. 67). Katz and Frost described this consistency as a person's ability to "…spell a word like it sounds and speak it the way it is spelled" (Katz & Frost, 1992, p. 69). Katz and Frost (1992) further explicated that "an orthography in which the letter-phoneme relation is equivocal [e.g., some letters have more than one sound] is said to be deep" (p. 71).

The amount of phoneme-grapheme variation defines the orthographic depth. Those orthographies that manifest the language's phonological constituents are considered to be shallow or transparent, and those that reflect more morphology (at the expense of phonology) are regarded as deep or opaque orthographies. In deeper orthographies, such as English and French, literacy acquisition is reported to be more challenging compared to shallow orthographies (Seymour, Aro, & Erskine, 2003).

The empirical findings support the theoretical explanations of the orthographic depth hypothesis. In a large-scale, longitudinal and cross-linguistic study, 90% and above mastery of word and non-word reading was reported in transparent orthographies after one year (Seymour, Aro, & Erskine, 2003). The same level of reading mastery was not reached even after two years of schooling by the students of deeper orthographies such as English or French. The slower reading skill development in deeper orthographies was interpreted as the result of a dual-foundation system where both logographic and alphabetic processing mechanisms are at play during reading, which takes twice as long

compared to the processing system based on a single foundation (Seymour, Aro, & Erskine, 2003). Bilingual spellers of English with a shallow Italian L1 orthography outperformed their age-matched, monolingual English counterparts in spelling and reading in English (D'Angiulli, Siegel, & Serra, 2001). Similar findings were observed in the English spelling attempts of a group of Portuguese-English bilingual children (Da Fontoura & Siegel, 1995). Bilingual spellers who are under the influence of their native language present an interesting picture in English word spelling. Turkish, a shallow orthography, is consistent in both reading and spelling words and English is less shallow with unsymmetrical sound-letter correspondence. Such orthographic depth variation between the two alphabetic languages facilitated the interpretation of Turkish EFL learners 'spelling outcomes in a deeper orthography by shedding light on the linguistic factors triggering the EFL spelling errors.

Conceptual Framework on Spelling in English

The theoretical explanations regarding spelling development in English provide guidance for instruction and the interpretation of spelling behavior (Moats, 1995). It should be noted that none of these theoretical explanations was proposed for Turkish spelling development and that the most recently proposed models were more comprehensive compared to those proposed earlier.

The Phase Model

The stage theory of Frith (1980; 1985) established the core of the phase model proposed a decade later (Ehri, 1995). Frith's stages suggested a transition from visual to alphabetic principles by following the logographic stage (visual processing), the

alphabetic stage (phoneme-grapheme correspondence), and lastly the orthographic stage with the application of larger spelling patterns and linguistic units to various word spelling attempts (Ehri, 2005).

Ehri (1995) modified the stage theory and proposed her phase theory on the grounds that stage theory was too ambiguous. The phases in Ehri's model characterized the *dominant* type of alphabetic knowledge utilized. Ehri (2005) differentiated between *phase* and *stage* by refuting Frith's (1985) theory's assumption that the previous stage of spelling is a prerequisite for the succeeding one. Instead, she claimed "phase theory provides a looser view of the properties that portray the course of acquisition" (Ehri, 2005, p. 176). Along the same vein, Treiman and Bourassa (2000) criticized the stage theory for not being comprehensive enough to represent the complexities of phonological, morphological and orthographic manifestation in spelling. Ehri's model consisted of four phases: pre-alphabetic, partial alphabetic, full alphabetic, and consolidated alphabetic phases.

During *pre-alphabetic phase*, which is also known as logographic or pre-communicative phase, spellers have limited knowledge of the alphabetic system. Spellers at pre-alphabetic phase could read labels and signs in the environment but their spelling and reading skills are limited to the small number of words that they can spell and read. At *partial (semi-phonetic) alphabetic phase*, children's spelling is restricted to basic level skills such as naming the letters and sounding them out because of an incomplete alphabet knowledge. At this phase, children either rely on the context or they make analogies to known words when spelling words. The phonemic representations are

utilized partially because of the incomplete phoneme-grapheme knowledge. At the *full alphabetic phase*, a stronger grasp of the conventional spellings and the grapheme-phoneme correspondence are observed. As children become more competent in the language, they develop awareness of "recurring blends of grapho-phonemic units" (Ehri, 2000, p. 29) at the *consolidated alphabetic phase*. Those linguistic units establish larger linguistic units that can be applied to different literacy contexts. In conclusion, the phase model characterizes the initial phases of children's early literacy skills acquisition based on the phonological and orthographic skills, which are later followed by morphological processing skills that emerge during the consolidated alphabetic phase.

Dual-route Model (DRM)

Another influential model of spelling and reading is the Dual-Route Model (DRM), which suggests different aspects of word knowledge are stored in different independent modules that are linked to each other by neural network (Stuart & Coltheart, 1988). According to dual route model, the sound structures of words are stored in the phonological (sub-lexical) module and the information related to letters in the printed words are stored in the orthographic (lexical) module. In this model, the semantic processor functions as the facilitator of the retrieval of the words through visual/orthographic processing or via the phonological route.

The dual route was proposed to explain how words are spelled based on the orthographic module in response to a semantic and/or a phonological cue. The orthographic spelling based on a meaning cue only (without a phonological cue) would be spelling *little* for *small* (or vice versa), and an example of orthographic spelling based

on phonological cue would be spelling *too* for *two* when the phonological, but not the semantic, cue is present. If the orthographic memory is triggered with the phonological cue, words with similar but slightly different phonemic structure might be spelled (e.g., *ate*, *eight*). If the sequence of the letters in the word is not known, letter omissions or sequence reversal is observed in spelling attempts (e.g., *lost*, *lots*). These examples of spelling attempt errors show the dual-route model is capable of providing explanations to different kinds of spelling errors through the lenses of orthography, phonology, and semantics (Moats, 1995).

Psycholinguistic Grain Size (PGS)

The psycholinguistic grain size hypothesis suggests that differences in reading accuracy and speed depend on orthographic differences which align with different phonological recoding and reading strategies (Goswami, Ziegler, Dalton, & Schneider, 2003; Ziegler, Perry, Jacobs, & Braun, 2001). As suggested by Ziegler and Goswami (2006), children who start to read in orthographically transparent languages use small grain-size processing by developing phoneme-grapheme recoding strategies. Readers of orthographically deep languages are not as inclined to use small grain-sizes as the readers of shallow languages.

Psycholinguistic grain size theory, proposed by Ziegler and Goswami (2005), hypothesized that literacy acquisition differs due to the varying levels of orthographic and phonological consistency within and across languages. Ziegler and Goswami's (2005) cross-linguistic theory suggested the influence of three core mechanisms on reading development: availability, consistency and granularity. The nature of the orthographic

code stored in the mind enables different types of pre-lexical orthographic codes at various grain sizes (e.g., coarse-grained, fine-grained code). The coarse-grained route, according to Grainger and Ziegler (2011), provides fast access to semantics by increasing the role of word identity. The fine-grained route, on the other hand, pays attention to the order of letters and letter combinations, which enables sublexical access to word spelling by emphasizing morpho-orthographic processing such as prefixes and suffixes (Grainger & Ziegler, 2011). In inconsistent languages such as English, larger units such as words or syllables are more consistent compared to smaller units such as phonemes; therefore, children learning to read in English refer to not only smaller units such as phonemes but also larger ones such as rimes. Children learning to read Turkish, on the other hand, rely on the consistencies in the small grain size such as phonemes because of the consistent orthography which manifests itself as regular and predictable, one-to-one phoneme to grapheme correspondence (Durgunoğlu & Öney, 2002).

Linguistic Repertoire Theory

Apel and Masterson (2001) posited that children's knowledge and awareness of the linguistic rules governing phonology, morphology, orthography, and semantics facilitate the development of their spelling abilities. As opposed to stage and phase theories, linguistic repertoire theory stems from an assumption that spelling is a linguistic event which utilizes the multi-level linguistic resources derived from phonology, morphology, orthography and semantics (Apel & Masterson, 2001; Masterson & Apel, 2010). A newly-emerging, multi-linguistic theoretical explanation on spelling development, the linguistic repertoire theory explained that young spellers exert various

linguistic resources including morphological awareness in their spelling (Apel, Masterson, & Hart, 2004), and that young spellers actively consider linguistic patterns when spelling (Masterson & Apel, 2010). As a reaction to the traditional methods of assessing spelling acquisition, repertoire theory aimed to provide a more extensive explanation of spelling and spelling assessment. Masterson and Apel's (2010) linguistic repertoire theory adopted a comprehensive approach to spelling by considering the role of learners' phonemic, orthographic, morphological and semantic processing skills; thus, it established the essence of the present dissertation research.

Based on the repertoire theory, Zhao (2011) studied the contributions of morphological, phonological and orthographic knowledge to the English spelling attempts of monolingual English and Chinese-English bilinguals and found support for repertoire theory. The simultaneous influence of phonological, morphological and orthographic knowledge on English word spelling by Chinese EFL students in Grade 8 (n= 339) and native English speakers in Grade 3 (n= 166) was examined. Zhao (2011) found similar metalinguistic skills predicted spelling outcomes across the groups; in addition, a high correlation among the metalinguistic skills suggested that the students were drawing on their linguistic repertoire. Morphological awareness was the major component for both the Chinese and English groups; however, the contribution of phonological awareness was greater for the native English-speakers and orthographic awareness was a greater contributor to the spelling performance of the Chinese EFL group.

Even at an early age, children have been found to utilize multiple linguistic resources including phonology, orthography, and morphology in spelling (Masterson & Apel, 2010; Wolter, Wood, & D'zatko, 2009), and this established the core of linguistic repertoire theory. The early influence of morphological processing skills is considered as a linguistic component in this theoretical explanation on spelling and this point distinguishes linguistic repertoire theory from the previous models. Linguistic repertoire theory established the theoretical framework of the present study because it established a theoretical basis for the collective contributions of phonological, morphological, and orthographic processing skills, and it provided a more comprehensive approach to spelling. In Turkish students' cognitive capacities, the first and second language spelling outcomes are facilitated by the linguistic interactions among the systems of phonology, morphology, and orthography; with its comprehensive scope to include all these systems in spelling development, the linguistic repertoire theory benefited the present study by providing a detailed theoretical foundation.

Gap in the Literature

Bilingualism is influential on the literacy performance and the development of metalinguistic awareness of language learners (Bhatia, Ritchie, & Bialystok, 2012; Cummins, 1978; Cummins, 1979; Dufresne & Masny, 2006; Wang, Perfetti & Liu, 2005). How young minds work bilingually and the effects of bilingualism on bilingual literacy development have been researched with different methodologies with various samples representing diverse linguistic groups, with conflicting results (Fashola, Drum,

Mayer, & Kang, 1996; Figueredo, 2006; Öney & Durgunoğlu, 1997; Rickard-Liow & Lau, 2006).

What we know regarding the spelling of children who are the speakers of other languages than English is not as advanced as studies conducted with English-speaking children (Arab-Moghaddam & Sénéchal, 2001). Spelling is a complicated, multi-level skill to develop, especially the acquisition of spelling in a language other than the mother tongue. In various parts of the world, children learn to read and write in other alphabetic languages, and understanding the acquisition of those literacy skills enables researchers to understand how generalizable literacy acquisition patterns observed in English are to other languages and writing systems (Arab-Moghaddam & Sénéchal, 2001).

Research that focuses on the cross-linguistic effects of metalinguistic processing skills on spelling varies in terms of the languages studied and the linguistic context (*English* Treiman, Cassar, Zukowski, 1994; *Mandarin Chinese, Malay and English* Rickard-Liow & Lau, 2006; *Spanish* Sun-Alperin & Wang, 2008, *Cantonese, Tagalog* Marinova-Todd & Hall, 2013). Although some cross-linguistic studies have been conducted, many of these studies focused on spelling outcomes only indirectly; there is also a dearth of studies that follow a more comprehensive approach to examine both the unique and simultaneous roles of multiple metalinguistic skills in spelling outcomes.

The Present Study

The present study was designed to investigate to what extent Turkish 6th, 7th, and 8th grade pupils' English word spelling is influenced by their phonological, morphological, and orthographic knowledge in English. English (L2) measures tapping

phonological, morphological and orthographic processing skills at various levels were administered to Turkish middle-school children at grades 6 to 8 in Turkey. With a more comprehensive approach to the examination of the unique and simultaneous roles of the three metalinguistic skills in EFL and EFL spelling outcomes, the present study aimed to inform the literacy researchers and foreign language educators about the nature of the cross-linguistic literacy practices and the possible role of several metalinguistic skills such as phonological, morphological and orthographic processing skills in the foreign language spelling outcomes.

Considering the lack of literature that has examined the simultaneous effects of multi-level metalinguistic skills, the question of how the metalinguistic skills work together and separately for the Turkish-speaking EFL learners deserves serious consideration. Therefore, the present study investigated the influence of first language (L1) orthography on Turkish 6th, 7th, and 8th graders' EFL spelling outcomes. In general, the present research aimed to examine the relative power of different predictors of the spelling outcomes of native Turkish children. The study is framed through the following research questions:

Research Questions

RQ1) What are the inter-correlations among the English (L2) phonological, morphological and orthographic processing skills of native Turkish children at grade levels 6 to 8?

RQ2) What are the unique and shared contributions of English (L2) phonological, morphological, and orthographic processing skills to Turkish speaking 6th, 7th, and 8th

grade EFL students' English (L2) spelling performance, measured by real word spelling dictation task, after accounting for Turkish children's literacy practices and exposure to English, family SES and instructor effects?

RQ3) To what extent do English (L2) phonological, morphological and orthographic processing skills explain the errors Turkish 6th, 7th, and 8th graders make in spelling English words?

RQ4a) What are the common English as an L2 spelling error types among Turkish 6th, 7th, and 8th graders?

RQ4b) Is there a trend for errors emerging within each grade level and across different grade levels?

RQ5) How do family socio-economic status, native Turkish children's literacy practices and exposure to English, and instructor effects influence Turkish 6th-8th graders' EFL spelling outcomes?

Studies that focused on one literacy skill to predict spelling, such as phonological processing skill, are plentiful in the literature. However, spelling proved to be a multi-level literacy skill outcome that is based on mapping sounds to letters, mastering legal letter combinations, and word roots and affixation (Nagy, Berninger & Abbot, 2006). Therefore, the present study aimed to examine the concurrent role of various literacy skills in the spelling of English words.

CHAPTER II

METHOD

Participants

Several studies conducted to understand Turkish-English literacy outcomes of Turkish students at earlier grade levels included studies that focused on how the effects of phonological processing skills, listening comprehension, and letter and word recognition predicted early Turkish spelling of first graders (Öney & Durgunoğlu, 1997); how cross-linguistic phonological awareness skills were processed by kindergarteners and first graders (Durgunoğlu & Öney, 1999); and how Turkish phonological processing skills influenced Turkish spelling and reading outcomes (Erdoğan, 2011). This snapshot of the literature revealed the domination of phonological knowledge as the theme of the literacy research with young readers or spellers; thus, it is necessary to pursue further research with a more comprehensive approach to literacy practices.

In addition to the review of the literature to find the gaps in the research on spelling, an extensive analysis of the English and Turkish teaching curriculum materials, such as textbooks, downloaded from the Ministry of National Education in Turkey website (MEBSIS, 2013) and education enactments by Turkish Education Board (Talim Terbiye Kurulu) established the basis of the present study. The EFL curricula of various grade levels were examined to determine the predictor variables and the pedagogical approaches adopted to teach word-level spelling.

Native Turkish speaking students at 6^{th}, 7^{th}, and 8^{th} grades learning English as a foreign language in Turkey were chosen for the following reasons:

1) Effective starting in the academic year of 2012-2013, the Ministry of Education in Turkey commenced a new system called 4+4+4 on a national basis, which means the first four years of education including the Grade levels 1 through 4 is mandatory primary education (Ünal-Gezer & Dixon, unpublished manuscript). The mandatory, middle-school education starts with Grade 5 through Grade 8, and it continues with high school education, which is mandatory. During the first five years of education, basic literacy skills are emphasized in Turkish and in English. After consulting with experts in the literacy research field and instructors teaching Turkish and English courses, it was decided that some of the measures would not be appropriate for the age and grade level of this study, when they were designed for students who were below grade 6.
2) A further analysis of the English textbooks used for teaching pupils at different grade levels of middle school in Turkey provided us with the information that Grade 5 English curriculum targets certain skills such as listening, reading and speaking and leave spelling and writing skills unattended. Due to this finding of the English teaching curricula and material analyses, fifth grade was not included in the present study, and the sample was confined to 6^{th}, 7^{th}, and 8^{th} grades only.
3) Students in the middle school (Grades 5-8) receive 2 hours of mandatory and 2 hours of elective English instruction on a weekly basis. Turkish EFL students have limited exposure to the English language. The use of mother tongue by the student and the instructors is acknowledged as a common practice in the classrooms (Ministry of Education Website, 2014), and this factor limits the use of the target language by EFL

students. The EFL instructors, mostly, hold a bachelor's degree in English language teaching or they have teaching certificates that qualify them to work as EFL instructors. The EFL teachers who had received their education in the same education system of Turkey, typically, do not speak English well. Many Turkish EFL children employ tutoring services to improve their foreign language knowledge.

The native Turkish-speaking EFL students attending three grade levels (6^{th}, 7^{th}, and 8^{th} grades) at two schools in a city of Turkey were recruited. The total sample size including all grade levels was three hundred sixty-seven middle-schoolers (*N*= 367), these students' parents, and five EFL instructors who taught EFL at 6^{th}, 7^{th}, and 8^{th} grades. Participants' consent was granted with a signed consent form that had been approved by the Human Subjects Protection Program at Texas A&M University (IRB Reference Number IRB2013-0887). The criteria for inclusion of the participating students consisted of being a native Turkish speaker and attending one of the stated grade levels at a public school in Turkey. The 6^{th} graders (*N*= 142) were sampled from seven intact classes, the 7^{th} graders (*N*= 121) were sampled from six intact classes, and the 8^{th} graders (*N*= 104) were sampled from five intact classes at two public middle schools located in the same city of Turkey. Both male and female pupils participated in the study. The female participating students represented the 48.2% (*N*= 177), and the male students represented 51.8 % (*N*= 190) of the total sample. Based on the data gathered from the classroom teachers, the participants were screened for a history of special education services, and none of the participating children were reported to be receiving special education services. Poor spelling has close associations with hearing difficulties, and

cognition and language impairment (Montgomery, 2007); thus, the participating children were screened for any physical, cognitive or linguistic impairment. As parental background survey informed, none of the participating students reported having speech, hearing or vision impairment that was major enough to interfere with their literacy activities.

Years of education completed by parents ranged from 5 (primary education) to 18 years (up to a master's degree). Mean years of education for mothers (*M*= 7.9, *SD*= 5.6) was less than for fathers (*M*= 9.3, *SD*= 6.4). For mothers, 35.9% had completed elementary school, 53.6% had completed middle and high school, and 10.5% had earned a baccalaureate degree or higher. Only one mother was reported to have earned a master's degree. For participating fathers, 17.3% had completed elementary school; 58.3% had completed middle and high school; and 24.4% had earned a baccalaureate degree or higher. Only two fathers were reported to have a degree above bachelor's degree. The parental education level data were aligned with a statistical report on Turkish population. The 2011-2012 population report informed majority of Turkish male and females have completed primary school (98%), junior high school that includes the middle school and high school education (68% to 66% for males and females respectively), but only a third have earned higher education degrees (35%) (TUIK, 2012).

The parental occupation data were coded based on the International Standard Classification of Occupations (ISCO-88), a system of classifying and aggregating the occupation information for censuses or statistical surveys. Also, approved by International Labour Organization this classification was based on a framework with two

concepts: work performed and skill. Several categories of ISCO-88 were legislators (1), professionals (2), technicians (3), clerks (4), service workers (5), agriculture workers (6), trades workers (7), elementary occupations (9), and armed forces (0). The subcategories helps refine the parental occupation data in further detail (See Appendix B. 10 for ISCO classification rubric).

The majority of the participating mothers were reported to be housewives (83.4%) so they were coded as service workers, following the ISCO-88 classification system. Paternal occupation data showed that almost half of the fathers (49%) were doing elementary jobs that only require basic skills and knowledge (e.g., construction worker, bus driver, street vendor etc.). Of the participating fathers, 23.2% reported themselves to be professionals, especially in the field of education.

Family income ranged from less than 12,000 New Turkish Liras per year (approximately USD 5,751) to over 24,000 New Turkish Liras per year (approximately USD 11,502). The number of families that reported monthly earning of less than 1,000 New Turkish Liras (approximately 500 USD) was 22.9% (N = 84) of the total sample. Those that reported the monthly income of 1,000- 1,500 (500 USD to 750 USD) New Turkish Liras was 33% (N = 121) of the sample; those who reported earning 1,500- 2,000 (750 USD to 1,500 USD) New Turkish Liras per month consisted of 20.2% (N = 74) of the family sample, and those who reported the monthly earning of 2,000 New Turkish Liras and above (1,500 USD and over) was 24% (N = 88) of the participating families.

Among the participating Turkish pupils, 52% of the sample reported they almost never sought extra English tutoring/classes in addition to the English (EFL) instruction at

school. The remaining 48% of the student sample took extracurricular English at various frequency ranges: 28.3% of the students took extracurricular English once a week, 10.4% took additional English classes once a month, 6% took on a daily basis and 3.3% of the pupils took extracurricular English 2-3 times per month. The total percentage of the students who frequently watched English television (TV) shows was 49.9% (includes sum of those who viewed English TV every day or at least once a week). Most of the students had never been to any English-speaking countries; only 6.5% had been to an English-speaking country. The majority of the participating students could not speak a second foreign language; those who could speak a second foreign language consisted of 4.6% of the sample. None of the students had vision, hearing or speech impairment.

All of the participating teachers (N = 5) showed high motivation as EFL teachers. The survey completed by the teachers instructed the teachers to report how often they utilize certain strategies in their classrooms and the items listed were hypothesized to tap into different scales such as teacher's ways to boost student self-confidence and, to integrate the target language culture to their teaching.

Based on the teachers' reporting of how frequently they implement these strategies, all of the teachers were found to utilize certain core items such as 'being a good role model', 'creating a safe environment for learners', and 'preparing for teaching' quite often. The teacher data displayed low teacher motivation to integrate the target language culture in their classrooms (Items # 14-17). The low implementation of the culture-based items was reasonable when the context each teacher works in is considered.

Variation of student motivation and capacity to learn a foreign language, the school management and the regulations affecting teachers' freedom of choices in teaching materials and strategies, and numerous other factors might play a role in the teacher responses. Because all participating teachers reported they utilized various types of strategies, they were regarded to be highly motivated. As a result, the instructor motivation as a predictor variable of spelling was not integrated in the statistical analyses.

Data Collection

Data collection took place during the spring semester of 2014, from February to April 2014. Testing was carried out in classrooms during the times designated by the English instructors as available time blocks. The test stimuli were pre-recorded and played to the students. Tests were administered by the research affiliate who received training for conducting human-subjects research and for the assessment procedures involved in the present research. The background surveys were taken to parents to solicit their participation by providing family background information such as literacy practices or family SES.

Students were informed prior to the testing that these tests would not affect their academic standing or their relationship with the teachers and their school. Parent consent forms and student assent forms were obtained prior to data collection (See Appendix B. 11). The entire testing session lasted about 3-4 class hours (45-50 minutes per class hour). The testing time, the order in which the tests were given, and the instructions provided were the same for all three groups in order to ensure consistency across grade levels and student groups.

Instruments

All three grade levels were tested with the following measures in English, and the reliability coefficients of the test scores of each test were calculated based on the Cronbach's alpha method. The calculated Cronbach's alpha scores varied across tasks. Table 1 displayed the data collection tasks utilized. The predictor measurement tools were tasks that measured the phonological, morphological, and orthographic processing skills as well as the socio-economic factors such as family SES, home literacy practices, and participating children's extracurricular English practices. The outcome variable was 6^{th}-8^{th} graders' spelling performances based on the real-word and pseudoword spelling tasks.

Table 1

Chronological Order of Tasks

English Tasks Table		
		SES Surveys
English Predictors	English Outcomes	
Phonological Processing Phoneme Oddity Rhyming Speech Sound and Syllable Count (Zhao, 2011)	English Real Word Spelling (Test of Written Spelling-4 by Larsen, Hammill & Moats, 1999)	Family Background Questionnaire SES Home Literacy Extracurricular English
Morphological Processing Morphological Signals (Receptive by Berninger & Nagy, 2003) "Comes From" Receptive Task (Berninger & Nagy, 2003)	English Pseudoword Spelling (Woodcock Johnson III Form A-Spelling of Sound Subset	Teacher Motivation Survey (Dörnyei & Csizér, 1998)
Orthographic Processing Homophone Choice Task (Aaron, Joshi, Williams, 1999) Orthographic Constraint Test (Wang, Perfetti, Liu, 2005)		

Word Spelling

English Real Word Spelling

Test of Written Spelling (TWS) – IV Form A (Larsen, Hammill, & Moats, 1999) was administered to test real word spelling. TWS-IV is a normed task based on a sample of 4,952 students from 23 states who were demographically consistent with the regions in which they lived. The test-retest reliability for Form A ranged from .94-.97. The word dictation task, originally, consisted of 50 real words that varied in word length, and they were sequenced based on difficulty levels (e.g., Item 1: yes, Item 45: zealous). Only the first 35 vocabulary words of the TWS were given in the spelling dictation task to Turkish EFL students, on the grounds that the time and the English word spelling capacities of the EFL students were limited. The pilot testing with a small group of EFL students indicated most Turkish EFL students could not spell past item 30 (Agriculture), which also suggested the use of the abbreviated version of the spelling task was appropriate. Before taking this spelling dictation task, the examinees were provided with sample items to help them understand the nature of the task.

Testing Procedures

During testing, students received a blank assessment sheet with the relevant instructions provided in Turkish. The words of this task had been recorded by a native-English speaking, middle-aged, female voice by using a voice recorder application, and this was played in the classrooms by using a CD player. The students first heard the target words in isolation followed by the words contextualized within sentences. Then the participants listened to the words individually again and they were asked to spell these

words on the sheets within the given time frame. Contextualization of the words within sentences were to prevent spelling errors for homophones (e.g., *eight* vs *ate*).

The analyses of the TWS-IV were two-fold. First, students' spelling outcomes were scored for correct spelling by using the scoring rubric provided in the battery kit. The student responses were scored as correct and incorrect. Only the raw scores were calculated in the analyses because there was no standard spelling score for Turkish EFL pupils. The Cronbach's alpha reliability coefficient was reported as α= .88 (N= 35) for the Turkish EFL 6^{th} to 8^{th} grade sample of the current study.

Secondly, an error analysis on the incorrect spelling attempts by the participating students established the basis of the second round of real word spelling analyses. The spelling errors of Turkish EFL students were analyzed based on a rubric designed by Moats (1995) which categorized the errors into three themes: a) orthographic (phonologically accurate), b) phonological (phonologically inaccurate), and c) morphological errors. The first round of spelling error analyses revealed that Moats's spelling error rubric failed to capture all kinds of spelling errors made by native Turkish speakers. Thus, this rubric was expanded further to capture all of the errors. The types of spelling errors that could be observed were broken down into further categories under each theme and this provided the most comprehensive rubric to analyze the spelling errors made by learners of English.

Pseudoword Spelling

English Pseudoword Spelling

Woodcock Johnson III Form A- Test 20 Spelling of Sounds (Woodcock, McGrew, & Mather, 2001) was administered to measure the participants' ability to

translate the spoken elements of non-words into graphemic units and phonologically mediated mapping of orthography. WJ-III is a norm-referenced test that is widely used for diagnostic purposes in the U.S., and most of the WJ-III tests have high reliability coefficients of .80-.90 or higher. This test was used to parse out the lexicality effect (e.g., sight word knowledge) because it entailed the ability to segment novel speech sound strings into component parts and to represent each phoneme segment orthographically, either by strict one-to-one phoneme-to-grapheme conversion or by use of an analogy strategy.

The pseudoword dictation task consisted of 23 pseudowords with varying lengths and difficulty levels (e.g., *gat* versus *automotous*). Before taking the actual pseudoword spelling dictation task, the examinees were provided with sample tests to help with the grasp of the nature of the task. The curricular area of this task was phonetic coding based on the auditory stimuli. The test required the participants to spell the letter combinations that were regular patterns in written English. The testing procedure involved the participants' listening to the audio recording and then spelling the letter combinations that were regular patterns in English spelling. The pseudoword spelling test, for the sample group, had a high Cronbach's alpha coefficient of .88 (N= 23).

Testing Procedures

During testing, students received a blank assessment sheet with the relevant instructions provided in Turkish to prepare the participants for this task. The pseudowords had been recorded by a native-English speaking, middle-aged, female voice by using a voice recorder application and this was played in the classrooms by using a

CD player. The participants were instructed to write only the target word and they were encouraged to make attempts even when they were not sure how to spell the target word in English. The dictation procedures described in the battery were followed carefully to keep the instruction consistent across different grade levels and classrooms. As instructed in the tester's manual, the items 1 through 5 were presented orally as practice items. The remaining items (e.g., Items 6-23), presented from the audio recording constituted the pseudoword task. The participants were instructed that the audio recording would provide adequate time between items for the subjects to respond and the research associate could pause the recording if additional time was needed.

The student responses to the pseudoword task were scored based on the scoring directions provided in the sub-test. Per the instructions in the tester's manual, test items 6-12 were scored with multiple points ranging from 3 to 0 points (e.g., 3, 2, 1, or 0). All other items were scored as correct or incorrect. The responses listed in the test book were the only acceptable correct answers. For items 6 through 12, points for each grapheme, or word part, that was in proper sequence and the words that were correctly spelled were given points. Points were deducted if the subject gave sounds that were not present, sounds that were altered by extra letters, or sounds out of sequence. Reversed letters, as long as they did not form different letters, were acceptable. For instance, a reversed "b" becoming a "d" was regarded as incorrect; however, a reversed *a* was accepted.

Phonological Processing Skills

English phonological processing skills were measured with three tasks: first with a sound oddity task, second with a rhyming task, and third with a speech sound and syllable counting task.

English Phonological Processing: Sound Oddity Task

The Sound Oddity Task, "Circle the Odd One", was an adaptation from James (1996), and it was the first phonological processing task that was given to the students to measure receptive phonological processing skills in English. The test originally consisted of three sub-tests: initial, middle, and final phoneme judgment with ten test items for each sub-test. Due to the time limitation, six items per sub-test were given in the present study. In this task, the participants saw a set of picture prompts on the test paper and they heard the words in the audio recording. Then, they were provided with instructions in Turkish to choose which one of the words represented by the pictures had a different initial, middle or final sound. The participants circled the picture that had a different initial, medial or final sound.

Practice Set 1:[picture of robe], [picture of rod], [picture of rock],[picture of box] (what participants were given as the visual prompt on the paper). The audio input intoned 'robe', 'rod', 'rock' and 'box'. Then participants were given five seconds to circle the word that has a different initial phoneme

(robe, rod, rock, **box**).

Practice Set 2: [picture of lick], [picture of lid], [picture representing a missing piece of puzzle-miss], [picture lip]

The Cronbach's alpha reliability coefficient, for this sample, was .78 (N= 18).

English Phonological Processing: Rhyming Task

This test was a pencil-paper adaptation of Woodcock Johnson III Form B Subtest 21A-- Sound Awareness and Rhyming subtest (Woodcock, McGrew, & Mather, 2001). The task was, originally, designed for assessing the phonological knowledge of individuals, and it was modified for a group administration.

In this task measuring receptive English sound awareness, participants listened to the word from a CD player and simultaneously looked at the three pictures of words, two of which rhymed. For instance, for the picture set of *eye, pie* and *spoon,* students saw the pictures and listened to the audio prompt. Then they were asked to circle which two words represented by the pictures were rhyming words. The sound awareness and rhyming sub-test consisted of three items and one practice item. Three additional items were added. The Cronbach's alpha reliability coefficient, for the present study sample, was calculated as α= .70 (N= 6).

Look at the picture and listen to the audio sound and find out which two of the following three words end alike.

Practice item:

[picture of cat] [picture of sun] [picture of hat]

A B C Correct answer: A and C

English Phonological Processing: Speech Sound and Syllable Count Task

Speech Sound and Syllable Count Task was adopted from Zhao (2011) to measure the English phonological processing skills at sound and syllable levels. This task

was developed by Zhao (2011) and it was composed of two parts: speech sound and syllable counting. In the first part, participants were expected to count the number of speech sounds; for example, there were three speech sounds in the word 'cat': */k/, /æ/, /t/*. The participant heard the target word twice and then wrote the number 3 (indicating that the word has three phonemes). In the second part, the participants counted the number of syllables in the words. In word *perfect* there were two syllables: 'per' and 'fect.' For Turkish speakers, syllabication is a straightforward process due to the clear rules that determine syllable boundaries; however, syllabication is not as clear in English. Additionally, this task aimed to measure English phonological processing skills at a coarser grain size. The previous two tasks were based on phonemes and this task tapped into syllable level manipulation. The Cronbach's alpha for this task, based on the present study sample, was α= .78 (N= 20). A full list of words of the sound and syllable counting task were listed in the Appendix B.5.

Morphological Processing Skills

Two of the subtests of University of Washington Language Battery (Berninger & Nagy, 2003) were used to measure receptive morphological processing skills in English. Turkish students' English morphology knowledge was tested using derivational affixes.

English Morphological Processing Skills: Morphological Signals

"Morphological Signals" a sub-test from the University of Washington Language Battery (Berninger & Nagy, 2003) was adapted for the present study to measure receptive morphological knowledge. This multiple-choice test had an incomplete sentence which was completed with one of the provided options. The goal of this task was to test the

participants' word structure knowledge depending on the semantic relationship it had within the sentence. The participants were expected to complete the sentence with the best choice provided from the choices. Practice items were provided to help the participants understand the nature of the test. The Cronbach's alpha coefficient for the current sample was α= .48 (N= 10). Several steps were taken to find ways to improve the poor reliability coefficient of this task. The item total statistics indicated the correlation and covariances and the suggested step was to remove Item 7. With the removal of this item, the reliability alpha went up to .55 (*N*= 9); however, since this step did not improve the reliability alpha to an acceptable level, the process was abandoned.

Practice Item: Amanda is ……

a) happiness b) **happy** c) unhappily d) unhappiness

Practice Item: This is Uncle Brandon. He is a …….

a) law b) lawly c) **lawyer** d) lawful

English Morphological Processing Skills: Comes From Task

"Comes From Task," a sub-test from the University of Washington Language Battery (Berninger & Nagy, 2003), was administered to measure explicit derivational morpheme and word stem knowledge of English words receptively. The original task consisted of 80 items. A representative sample of 20 items, determined based on an analysis of English textbooks used for grades 6 to 8 in Turkey, were included in this task. The participating students were asked to read two provided words and decide if the second word was the stem of the first word. If it was, the participants were instructed to circle YES; if the second word did not come from the first one, they circled NO. This

task was administered to groups of students in the pencil-paper format and the reported Cronbach's alpha reliability coefficient, based on the sample, was α= .82 (N= 20).

Practice Item: teacher teach **YES** NO (teach is the word stem for teacher)

Practice Item: single sing YES **NO** (single and sing are not semantically related)

Orthographic Processing Skills

Two tasks Homophone Choice Task (Aaron, Joshi, &Williams, 1999) and Orthographic Constraint Tasks (Wang, Perfetti, & Liu, 2005) were used to measure receptive orthographic processing skills in English.

English Orthographic Processing Skills: Homophone Choice Task

A homophone choice task (Aaron, Joshi, &Williams, 1999) consisted of 45 target words and 45 pairs of homophones of the target words (e.g., target word=hear, the homophones= heer, here), and the present study included 20 test items. The participants were asked to identify among three words that were pronounced the same with an exception that one word in the set was a made-up word. The participants were expected to find this non-English word and circle it. For example, in this row, circle the word that is NOT an English word: *see, sea*, *cee*. *Cee* is the non-English word in this set.

Aaron, Joshi, and Williams (1999) reported the limitations of this orthographic processing task; however, as a recognition task, it was less demanding on the memory compared to recall tasks. The Cronbach's alpha reliability coefficient for this task, based on the present sample, was computed to be α=.88 (N= 20).

English Orthographic Processing Skills: Orthographic Constraint Task

The Orthographic Constraint Test, which was a pseudoword based task that measured the orthographic processing skills receptively, was administered in small groups. This task was originally created by Cassar and Treiman (1997) and was modified by Wang, Perfetti, and Liu (2005). The task consisted of 18 items tapping into the knowledge of various orthographic patterns in English (e.g., permissible position). The justification of the task was that if students made their judgment based on phonological processing skills only, both non-words had equal chances. However, if they considered orthographic acceptability, then they utilized their orthographic knowledge and processing skills. The Cronbach's alpha reliability coefficient of the orthographic constraint test, based on the present study sample, was α= .83 (N= 18).

Practice item: Circle the one that does not look like an English word

1. ffeb beff (first word, because double f at the initial position does not exist in English)

Family Background Questionnaire

Demographic data were gathered using the Background Questionnaire. The questionnaire consisted of demographic information related to students' EFL background, including English TV viewing, English book reading, English abroad, and extracurricular English. The socio-economic status of the participating families was based on family income, maternal and paternal education, and occupation, and general literacy practices was based on the items asking the number of books at home, the frequency of parent-child reading, library visits and book check-outs. In the structural equation models, each

of these observed variables were fitted under a latent construct to measure the relationship and correlations between these latent constructs with the literacy variables.

Teacher Motivation Survey

The teacher motivation data were collected from multiple school sites and grade levels. The instructor effect was considered to have potential influence on the EFL-related literacy and metalinguistic skills of Turkish 6th to 8th graders. An adaptation of Dörnyei and Csizér's (1998) teacher motivation survey was utilized to measure the teacher motivation. The survey was adapted to the scope of the present research and the EFL teaching context in Turkey. The items in this survey (N = 30) were filled out by five EFL instructors who taught English as a foreign language at two different schools and at various grade levels. The survey asked the teachers how frequently they utilized the strategies listed in the questionnaire. Dörnyei and Csizér (1998) reported that the items of the questionnaire formed various scales (e.g., factors) such as *teacher*, *climate, task, rapport, self-confidence, interest,* and *autonomy.* The adapted version of the questionnaire included several items regarding various factors such as the instructor, climate, culture, rewarding students, and interest (Appendix B.8).

Data Analysis

Reliability Coefficient Calculation

The Cronbach's alpha reliability coefficient is a measure of item homogeneity, where large alpha scores indicate the items tapped into the same common domain; it can be affected by various factors such as the item quality and the test length. For instance, the length of the test has a major role in alpha calculations, as increasing the test length by five items may increase the reliability substantially, depending on the quality of the items. The role of reliability in estimation of correlations is often misunderstood by educational researchers. The reporting of reliability coefficients needs a brief discussion, because the concept of what is an acceptable reliability is based on an inadequate understanding of the role of reliability in estimation of effects. As Reynolds, Livingston, Willson (2008) explicated, a reliability coefficient is the proportion of test score variance attributable to true score variance, not due to measurement error, so for complex measurements a perfectly reliable measurement will not exist.

The question of *how large do reliability coefficients need to be* has been a matter of discussion and Reynolds, Livingston, Willson (2008) concluded that there was no single and simple answer to this question. In educational research, some researchers state that reliability coefficients over .7 are regarded as *acceptable* for research relating two variables *x* and *y*. When correlation coefficients are estimated, it needs to be noted that the true correlation value could be attenuated (i.e. lowered) due to various reasons such as measurement error or the dichotomization of continuous data. Attenuation-corrected correlation- disattenuated correlation- is expected to be higher than the original

correlation estimate based on the assumption that if the error of measurement of either measure could be reduced, the correlation value would increase. Measurement error could be removed from a correlaiton coefficient, r_{xyx} to estimate the disattenuated reliability of measurement error, r_{xx}^{*}, by the formula

$$r_{xx}^{*} = r_{xy} / [\text{SQRT} \{r_{xx} r_{yy}\}]$$

The Spearman correction for attenuation of a correlation is a function of the reliabilities of the two variables, r_{xx}, r_{yy} and it sets the upper boundary for estimation of the correlation with another measure. When this formula is applied to the low reporting of the reliability of the first morphological processing skill task (MA1), the maximum effect found could be as high as .70. Jöreskog (1971) noted that "the correlation coefficient corrected for attenuation between two tests is the correlation between their true scores. If, on the basis of a sample of examinees, the corrected coefficient is near unity, the experimenter concludes that the two tests are measuring the same trait." (p. 117). In most research the actual correlation will fall below the theoretical limit, indicating the observed correlation is not an underestimate of the true correlation. Thus, even for fairly low reliability of one or two measures, the typical correlation among social science indicators is unlikely to approach the limit. This is the functional basis for interpreting reliability of measures for research.

Missing Data Procedures

Before planned analyses could be conducted, several procedures needed to be followed to prepare the data set for the quantitative analyses. The collected data included the test performance and the demographic data of participating children and their

families, which had missing values. Ideally, researchers would analyze the complete data sets, with no missing value points. In reality, missing values occur in data sets due to various factors that could be based on the participants (e.g., attrition), the survey items (e.g., difficulty level, ambiguity), or technology-related issues (e.g., software problems, hardware failure) in spite of efforts to prevent them (Kline, 2011).

The proper number of sample size for the SEM research has been a matter of discussion and the missing values in the present data made this topic essential to be discussed. When determining the right sample size for the SEM research, Kline (2011) advised to remember the $N{:}q$ rule of 20:1 which was originally claimed by Jackson (2003). This was the preferable ratio of sample cases (N) to the number of model parameters that required statistical estimates (q). In other words, for each path in a confirmatory factor or structural equation model analysis, a minimum of 20 participants would be needed. A less ideal yet statistically-acceptable ratio would be 10:1. The suggested CFA and SEM models made the representation of each case in the data set essential for the quantitative analysis purposes. This proportion ratio made the missing data handling an inevitable procedure for the present study because the untreated missing values would lower the $N{:}q$ ratio and the interpretations of the findings would be made ambiguous by the missingness. A few missing values, such as less than 5% on a single variable in a large sample could be of little concern to the researchers, mostly such small-scale missingness is ignorable.

The first step to handle missing data is to explore the amount of missingness. The suggested procedure was to find out the percentage of missingness per variable and per

grade level. The instructor data did not have any missing values, so it was excluded in the calculation of missingness and the multiple imputation procedures. If the missingness level was below 5% per variable used in an analysis, the original data would be used without much concern for distorted results. The second question to be answered, based on the findings of percentage of missingness, was to determine the type of missingness: missing at random, missing completely at random, and not missing at random.

According to Kline (2011), most methods that deal with missing observations function based on the assumption that data loss pattern is ignorable. In other words, the missing observations on some variable *X* differ from other observed scores on that variable only by chance, meaning the data loss pattern is missing at random (MAR). Missing at random suggests missingness can be a function of observed covariates and observed outcomes. By referring to the Table 2 that summarizes the percentage of missingness per grade level and variable, it was concluded that the data loss pattern in the present research data set is ignorable. Two of the observed, categorical variables, *father's education* and *father's occupation* were likely to be missing at random, simply because of the careless reporting of the 8th graders on these variables, rather than a systematic reason.

Each type of missingness (missing at random, missing completely at random, and not missing at random) has a different statistical assumption and suggestions on data handling procedures (Enders, 2010). There are various methods to handle the missing data and several of the traditional methods, such as pairwise and listwise deletion (e.g., case methods), are prone to bias and they reduce power (Enders, 2010). The second

category, single imputation methods, replace the missing scores with a calculated score based on mean substitution or regression-based substitution. As Enders (2010) reported, this second category that substitutes the missing values with the group mean scores could distort the distribution of the data by reducing the variability because the scores are lumped together in the center. The third method is called multiple imputation, a procedure that is more advantageous compared to the initial two missing data handling methods and it was the missing data handling method adopted in the present study.

Multiple Imputation

The method used to handle missing data for the current study was multiple imputation, which was originally proposed by Rubin (1987). Yuan (2007) described multiple imputation as a procedure that "replace[s] each missing value with a set of plausible values that represent the uncertainty about the right value to impute" (p.1). Due to the statistical power of this data handling procedure, compared to case methods or single imputation, multiple imputation was determined to be the most suitable procedure to handle the missing data in the present study data set. It was computed by using the Mplus 7.2, a latent variable modeling statistics software (Muthén & Muthén, 2012).

As Table 2 displays, the percentage of missigness of 8th graders exceeded most missing percentages of lower grade levels. Similarly, the missingness was significantly more on the SES variables (e.g., family income, mother-father education and occupation, book reading etc.) than the measured literacy and metalinguistic skill variables. It was concluded that although the missingness may not be at random for Grade 8, the general pattern was missing at random. The appropriate procedure to handle the missing data, in

this case, was multiple imputation. This procedure was followed by using Mplus 7.2, a latent variable modeling statistics software (Muthén & Muthén, 2012).

Multiple imputation, as the title implies, can generate multiple iterations of each missing observation. In technical terms, this method replaces a missing value with an imputed value that was calculated based on a predictive distribution that models the underlying data loss mechanisms. In non-technical terms, a model for a complete and incomplete data is defined. Then, the means and variances of the whole sample is estimated by complying with a statistical criterion. The model, which is based on expectation-maximization (EM) algorithm, functions based on two steps: first, the missing observations are imputed by predicted scores in a series of regression in which each incomplete data value point is regressed on the remaining variables; then, the whole imputed data set is submitted for an ML estimation.

Mplus 7.2 provides multiple imputation of missing data using Bayesian analysis (Rubin, 1987). Using multiple imputation, multiple data sets are generated. Parameter estimates are averaged over the set of analyses, and standard errors are computed by using the average of the standard errors based on a set of analyses and the between analysis parameter estimate variation (Muthén & Muthén, 2012). Procedure 11.5 in the Mplus user guide was followed to compute multiple imputation for a set of variables with missing values.

Table 2

Percentage of Missingness per Variable (Dependent vs Independent) and Grade Level

Variables Grades	**All Grades**	**6th Grade**	**7th Grade**	**8th Grade**
TWS (Spelling-DV)	**6%**	4%	**6%**	**17%**
WJ(Pseudo-spell-DV)	**5**	4	3	**15**
Sound Oddity (PHO1-IV)	4	2	**6**	**15**
Rhyme (PHO2-IV)	3	3	4	**6**
SSSC (PHO3-IV)	4	4	**9**	4
Morphology (MOR1-IV)	2	2	3	4
Morphology (MOR2-IV)	3	2	5	4
Orthography (ORT1-IV)	**7**	5	**10**	4
Orthography (ORT2-IV)	**17**	**6**	**22**	**27**
Family Income (SES1-IV)	**20**	**13**	**16**	**34**
Mother Ed (SES2-IV)	**21**	**18**	**14**	**35**
Mother Occ (SES3-IV)	**18**	**13**	**10**	**33**
Father Ed. (SES4-IV)	**24**	**20**	**14**	**39**
Father Occ. (SES5-IV)	**20**	**14**	**10**	**40**
English Abroad (EnEx1-IV)	**10**	**6**	4	**18**
Eng.TV (En.Ex.2-IV)	**8**	**6**	**5**	**16**
Extra.Eng. (Eng.Ex.3-IV)	**8**	**6**	4	**17**
Eng.Book.Read (Eng.Ex.4-IV)	**9**	**6**	**9**	**15**
#of Eng.Book (Eng. Ex.5-IV)	**13**	**6**	4	**31**
Freq.Libr.Visit (Lit.1-IV)	**8**	**6**	4	**16**
Fre.Book.Out (Lit.2-IV)	**9**	**6**	**6**	**17**
#of Home Books (Lit.3-IV)	**13**	**6**	4	**31**

Data Analysis Procedures

The data analysis procedures followed in the present study are tri-fold. First, the analysis of measures with robust psychometric characteristics, such as good reliability, needed to be validated. Otherwise, as Kline (2011) noted, the analysis of constructs with deficient psychometric characteristics could bias the results.

Secondly, a preliminary exploratory data analysis was carried out before testing the SEM models. Frequency distributions were generated for individual variables and box and whisker plots were created to identify outliers. Once data were prepared, descriptive statistics such as means and standard deviations, and zero order correlations were calculated. The outcome results were tested to see if they were normally distributed. The preliminary data analyses included the calculation of means, standard deviations on several variables, and grade levels. The correlation matrix displayed the relationships among the variables. Analysis of variance (ANOVA) was computed to test the statistical significance of student performances on the metalinguistic processing tasks or the spelling tasks based on words and non-words. Cross-grade level comparisons provided insightful information about student performance. On the findings that proved a significant omnibus *F*-test with a factor that consists of three or more means, a post hoc analysis based on Scheffé's test was computed to explore whether the differences were significantly different from each other. Scheffé's test was the suggested post hoc procedure for unequal sample sizes. Scheffé's test is commonly known and utilized for educational statistics and it is regarded to be the most conservative of the post hoc procedures.

Structural Equation Modeling and Confirmatory Factor Analysis

The third round of analyses consisted of the latent variable modeling. Structural equation modeling, a single statistical technique for testing and estimating the causal relations using statistical data and causal assumptions, embodies a family of related statistical procedures such as path analysis, factor analysis, and regression. In SEM, the parameters which denote the factor loading or the regression coefficient between the indicator and the factor, are estimated based on the covariance matrices. These matrices capture the relationship between the variables and the estimated covariance matrices of the best-fitted model. Maximum likelihood estimation or weighted least squares are the methods to determine the model fit. The model fit is evaluated based on various types of approaches and because different measures of fit capture different aspects of the model fit, the appropriate way is to report a selection of different fit measures. This is also a frequently used approach when reporting SEM models because of the chi-square statistics limitations. One of the model fit index, The Comparative Fit Index (CFI) is an incremental index to indicate the relative improvement in fit of the tested model to the statistical baseline model and has a benchmark value of 0.95 (Hu & Bentler, 1999). The CFI ranges from zero to one and the CFI value closer to one indicates a better model fit. Kline (2011) indicated that the CFI value larger than 0.95 indicates an acceptable model fit. The Root Mean Square Error of Approximation (RMSEA), a badness of fit index, indicates the best fit when the RMSEA value approaches to zero. An RMSEA value less than .08 indicates an acceptable fit. The confidence interval is also reported for this model fit. The Standard Root Mean Square Residual (SRMR) is a statistics related to the

correlation residuals and the SRMR value smaller than .08 is an acceptable fit indicator (Kline, 2011).

One of the biggest strengths of SEM is the ability to construct latent variables, the variables that are not directly measured but instead are estimated based on several measured variables in a model. In this sense, SEM could be exploratory or confirmatory, and it could be utilized for model generation. According to Muthén and Muthén (2012), structural equation modeling (SEM) is a two-fold process with a measurement model and a structural model. The measurement model is a multivariate regression model that describes the relationships between a set of observed dependent variables and a set of continuous latent variables.

Structural equation modeling could serve two different purposes: theory development and theory testing. In SEM, exploratory factor analysis (EFA) is often used when the researcher has no a priori hypothesis about the factors or the observed variables. As the name suggests, EFA uncovers the underlying structure of a large set of variables. On the other hand, confirmatory factor analysis (CFA) is used to examine the relationships between a set of observed variables and a set of continuous latent variables. CFA is a special type of factor analysis that measures a theory-driven or data-driven model that is hypothesized based on the theoretical explanations provided in the field and/or the directions provided by the empirical findings of the previous studies. The general intention of the CFA is to test whether the data fit a hypothesized measurement model. Thus, CFA is regarded as a measurement model. This is determined based on the calculation of observed data fit under a latent construct to confirm that these factors form

an unobserved theoretical construct. Confirmatory factor analysis is especially useful for the researcher who intend to test whether certain items in a measure or survey measure the same construct. Maximum likelihood analysis is the generally-utilized testing to evaluate the model fit estimation procedure of CFA.

In the present study, the Structural Equation Modeling analyses for model testing established the third level of analyses in the present research. The CFA models tested were theory-driven based on the theoretical and empirical knowledge that had accumulated in literacy research. A type of SEM, Confirmatory Factor Analysis, was computed to see how well the observed variables fit in the factors and establish the latent constructs. For the grade-level analyses where the CFA model tests did not yield reasonable results, exploratory factor analyses were run to identify the relationships among the measured variables. All of the SEM models were tested by using AMOS (Arbuckle, 2006) and Mplus (Muthén & Muthén, 2012), two commonly used latent variable modeling software programs, to confirm the findings of the model testing and to modify the models. AMOS was used to draw the models. In summary, SEM was used to answer research questions 1, 2, and 5 to show the intercorrelations among the predictor variables and the contribution of the latent variables (phonological, morphological and orthographic processing skills) to EFL spelling outcomes (RQ1 and RQ2), and the contribution of socio-cultural variables (literacy background, exposure to L2, and teacher effects as RQ5 asked) to EFL word spelling.

Error Analysis Plan

Probably, the simplest method of spelling assessment is to regard the attempts as correct or incorrect. Coding the spelling attempts as correct or incorrect was the adopted method for the statistical analysis purposes. The analysis of the spelling errors provides further information about the linguistic knowledge of the spellers; thus, the spelling error analysis is an integral part of the present research. The goal of spelling assessment, in this study, is to understand the nature of word spelling attempts of English language learners who are familiar with a different orthography. Two research questions (RQs 3 & 4) were related to the errors in EFL spelling attempts of Turkish students. An error analysis rubric was adopted to answer RQ3 asking how phonological, morphological, and orthographic processing skills explain Turkish 6th to 8th graders' EFL spelling attempts. To categorize the spelling errors based on the three metalinguistic processing skills, phonological, morphological, and orthographic skills, would be a coarse analysis without referring to the finer-grained information about the spelling. Previous research recommended that spelling error analyses should be as coarse and as fine-grained as possible. When analyzing spelling errors, Treiman's (1993) suggestion that "any study of children's spelling that is confined to the level of whole words is incomplete" (p. 66) was adopted in the present research.

Turkish 6th, 7th, and 8th graders' EFL spelling errors, excluding the sight words listed in the word spelling task, were hypothesized to originate from the shallow native language orthography. In other words, most EFL spelling errors would be consistent with the shallow nature of Turkish language. It is hypothesized that Turkish students would

spell the English words as they hear them, imitating their spelling practices in Turkish when they spell words in English.

With these points in mind, an error analysis rubric by Moats (2005) was adopted (Appendix B.2). Depending on the nature of the misspelling of English words, the types of spelling error were put into three main categories: phonological, morphological, and orthographic errors. After coding the errors based on this rubric, the coding was re-analyzed by a person who was trained based on the pilot study data. Approximately one-third of the present data set with a representative sample of 100 participants and 1,400 word spelling errors were analyzed and coded by two raters. The inter-rater reliability for the raters was calculated by using SPSS and the Kappa = .70 ($p < .0.001$) with a 95% confidence interval of (0.50, 0.85) reported substantial amount of agreement between the raters.

CHAPTER III

RESULTS

Descriptive Statistics

Table 3 shows the means, standard deviations, skewness, kurtosis, and standard errors associated with skewness and kurtosis for literacy measures for all grades.

Table 3

Means, Standard Deviations, Skewness and Kurtosis for All Grades

Measure	Min.	Max.	M	SD	Skewness	S.E.	Kurtosis	S.E.
TWS	0	25	14.94	5.45	-0.62	0.12	-0.58	0.25
WJ	0	37	13.10	8.30	-0.54	0.12	-0.37	0.25
SO	3	18	14.86	3.00	-1.70	0.12	2.92	0.25
Rhyme	0	6	4.61	1.48	-1.17	0.12	0.72	0.25
SOC	0	10	3.31	2.23	0.12	0.12	-1.02	0.25
SYC	0	10	5.75	2.79	-0.72	0.12	0.06	0.25
SSSC	0	20	9.07	4.07	-0.23	0.12	0.26	0.25
MA1	0	9	4.28	1.94	0.20	0.12	0.10	0.25
MA2	0	20	13.45	3.99	-0.55	0.12	0.74	0.25
OA1	0	20	12.56	4.86	-0.44	0.12	-0.68	0.25
OA2	0	18	9.35	4.46	-0.78	0.12	0.42	0.25

Note: TWS-Word spelling; WJ- pseudoword spelling; SO-sound oddity; Rhyme-rhyming; SOC-sound counting; SYC-syllable counting; SSSC- speech sound and syllable counting; MA1- morphology task one; MA2- morphology task two; OA1- orthography task one; OA2- orthography task two.

Grade Level Comparisons on the Test Measures

Table 4 shows the means, standard deviations, skewness, kurtosis, and standard errors associated with skewness and kurtosis for literacy measures for individual grade level.

Table 4

Means, Standard Deviations, Skewness and Kurtosis for Each Grade

Measures	Grade 6 (*N* = 142)							
	Min.	Max.	M	S.D.	Skewness	S.E.	Kurtosis	S.E.
TWS	0	23	13.51	6.30	-0.48	0.20	-1.01	0.40
WJ	0	22	12.51	5.33	-0.44	0.20	-0.48	0.40
SO	0	18	13.96	2.86	-1.70	0.20	3.99	0.40
Rhyme	0	6	4.12	1.52	-1.11	0.20	0.69	0.40
SOC	0	7	3.20	2.53	-0.05	0.20	-1.57	0.40
SYC	0	10	5.30	3.40	-0.36	0.20	-1.23	0.40
SSSC	0	17	8.51	4.96	-0.19	0.20	-0.92	0.40
MA1	0	9	4.57	1.68	-0.43	0.20	0.21	0.40
MA2	0	20	13.95	4.77	-1.31	0.20	1.44	0.40
OA1	0	20	11.55	4.82	-0.29	0.20	-0.63	0.40
OA2	0	18	9.48	5.62	-0.51	0.20	-1.09	0.40

Table 4 continued

Measures	Grade 7 (N = 121)							
	Min.	Max.	M	S.D.	Skewness	S.E.	Kurtosis	S.E.
TWS	2	25	15.12	5.81	-0.56	0.22	-0.85	0.44
WJ	0	22	14.37	6.31	-0.71	0.22	-0.83	0.44
SO	3	18	16.09	1.84	-3.13	0.22	12.23	0.44
Rhyme	0	6	4.61	1.81	-0.85	0.22	-0.79	0.44
SOC	0	8	2.89	1.96	0.66	0.22	-0.10	0.44
SYC	0	9	5.85	2.46	-1.43	0.22	0.91	0.44
SSSC	0	16	8.75	3.45	-0.86	0.22	0.97	0.44
MA1	0	9	3.50	2.05	0.70	0.22	0.61	0.44
MA2	0	19	11.71	3.18	-0.18	0.22	1.80	0.44
OA1	0	20	12.04	5.16	-0.63	0.22	-0.47	0.44
OA2	0	17	9.09	5.31	-0.65	0.22	-0.81	0.44
Measures	Grade 8 (N = 104)							
	Min.	Max.	M	S.D.	Skewness	S.E.	Kurtosis	S.E.
TWS	3	25	16.21	4.18	-0.70	0.23	0.72	0.47
WJ	0	37	12.42	5.63	-0.27	0.23	-0.99	0.47
SO	0	18	14.55	4.60	-1.41	0.23	1.11	0.47
Rhyme	0	6	5.11	1.07	-2.01	0.23	6.02	0.47
SOC	0	10	3.84	2.07	0.03	0.23	-1.07	0.47
SYC	0	9	6.12	2.35	-0.93	0.23	-0.19	0.47
SSSC	0	20	9.97	3.67	-0.31	0.23	-0.51	0.47
MA1	0	9	4.77	2.01	0.25	0.23	0.23	0.47
MA2	0	20	14.70	4.40	-0.75	0.23	0.85	0.47
OA1	0	20	14.10	5.24	-0.78	0.23	-0.23	0.47
OA2	0	17	11.78	3.36	-0.75	0.23	-0.56	0.47

Because descriptive statistics on the total sample are not adequate to provide finer-grained information about grade-level performance on the spelling tasks and metalinguistic processing skills outcomes, comparisons across grades were computed. These analyses revealed intriguing patterns of the Turkish 6th, 7th, and 8th graders' word spelling, pseudoword spelling, phonological, morphological, and orthographic processing skills in English. While the performance of the students across grade levels showed a linear growth pattern in the TWS word spelling, this linearity was not observed in pseudoword spelling performance across grade levels. Similarly, performance on the metalinguistic processing skills revealed significant effects of the grade on student performance on several tasks only. The following tasks were the only ones that showed a linear growth pattern across grades: word spelling (TWS), rhyming (Rhyme), syllable counting (SYC), and the first and second orthography tasks (OA1, OA2). This provides an answer to the question whether literacy skills show a linear growth across grade levels; some of the outcome and predictor literacy variables such as pseudoword spelling (WJ), morphology tasks (MA1, MA2), sound counting (SOC), and sound oddity (SO) did not show a linear pattern across grades.

Spelling Measure Comparisons across Grades

Test of Written Spelling

The one-way ANOVA computed for the total TWS spelling task scores of each grade level showed that the mean of the TWS increased by grade level. The null hypothesis states that there is no difference of the mean of the TWS scores across grade levels and the null is rejected at $p < .001$ level. One way ANOVA tested the statistical

significance of the TWS scores among the grade levels and there was a statistically significant effect of grade on TWS mean scores at the $p < .001$ level for the three conditions F (2, 364)= 7.143, $p < 0.001$.

Due to the unequal sample sizes across grade levels, a post hoc analysis based on Scheffé test was computed. Post hoc comparisons using the Scheffé's test indicated that the mean of the TWS score for Grade 6 (M = 13.51, *SD* = 6.30) was statistically significantly lower compared to the mean of the TWS score of 8th graders (M= 16.21, *SD* = 4.18) at $p< .05$ level. Although the mean of the 6th grade TWS score was lower compared to the 7th grade score, post hoc analyses did not yield a statistically significant difference between the mean of 7th grade TWS (M= 15.12, *SD*= 5.81) and the mean of the TWS of the 6th or 8th grade.

Woodcock Johnson Pseudoword Spelling

Although pseudoword spelling outcomes did not show a pattern parallel to the grade level increase, the average of the WJ scores of 6th, 7th and 8th grades changed by grade level. A one-way ANOVA was computed to test the statistically significant difference in the mean scores of Woodcock Johnson (WJ) pseudoword spelling task by grade level. The one-way ANOVA provided a statistically significant difference of the mean of the WJ scores by grade level for the following three conditions, F (2,364)= 3.98, $p < .05$.

The post hoc comparisons on the WJ using the Scheffé's test indicated that the mean of WJ score for Grade 6 (M= 12.51, *SD*= 5.33) was statistically significantly lower than the mean of the WJ score of 7th graders (M= 14.37, *SD* = 6.31) at $p < .05$ level;

however, 6th grade average WJ score was not statistically significantly different from the mean of the WJ score of 8th grade (M= 12.42, *SD*= 5.63). The one-way ANOVA computed for the total WJ pseudoword spelling task scores of each grade level showed that the mean of the WJ did not increase by grade level. Based on these statistical findings, the null hypothesis that states that there is no difference of the mean of the WJ by grades is rejected at $p < .05$ level.

Phonological Measure Comparisons across Grades

Sound Oddity

The one-way ANOVA computed for the sound oddity (SO) phonological processing task scores of each grade level showed that the mean of the SO did not increase by grade level. The null hypothesis states that there is no difference of the mean of the SO scores across grade levels, and the null is rejected at $p < .001$ level. One way ANOVA tested the statistical significance of the SO scores among the grade levels and there was a statistically significant effect of grade on SO mean scores at the $p < .001$ level for the three conditions $F(2, 364)= 17.72$, $p < 0.001$.

Due to the unequal sample sizes across grade levels, a post hoc analysis based on Scheffé's test was computed. Post hoc comparisons using the Scheffé's test indicated that the mean of the SO score for Grade 6 (M = 13.96, *SD* = 2.86) was statistically significantly lower than the mean of the SO score of 7th graders (M= 16.09, *SD* = 1.84) at $p< .05$ level. No statistically significant difference was found between the mean of 6th and 8th grade SO scores (M= 14.55, *SD*= 4.60). There was a statistically significant difference between the SO scores of 7th and 8th grades at $p < .05$ level.

Rhyme

The second phonological processing skill, Rhyme, was tested based on a one-way ANOVA to compare grade level performance on this task. The mean of the Rhyme increased by grade level. The null hypothesis states that there is no difference of the mean of the Rhyme scores across grade levels and the null is rejected at $p < .001$ level. One way ANOVA tested the statistical significance of the Rhyme scores among the grade levels and there was a statistically significant effect of grade on Rhyme mean scores at the $p < .001$ level for the three conditions $F(2, 364) = 16.85$, $p < 0.001$.

Due to the unequal sample sizes across grade levels, a post hoc analysis based on Scheffé's test was computed. Post hoc comparisons using the Scheffé's test indicated that the mean difference of the Rhyme score for Grade 6 ($M = 4.12$, $SD = 1.52$) was statistically significantly lower than the mean difference of the Rhyme score of 7th graders ($M = 4.61$, $SD = 1.81$) and the mean difference of the Rhyme score of 8th graders ($M = 5.11$, $SD = 1.07$) at $p < .05$ level.

Speech Sound and Syllable Count

The third phonological processing skill measured based on the Speech Sound and Syllable Count (SSSC) task was tested based on a one-way ANOVA to compare grade level performance. The mean of the SSSC did not show a linear growth through each grade level. The null hypothesis states that there is no difference of the mean of the SSSC scores across grade levels and the null could not be rejected at $p < .05$ level.

Further descriptive analyses on the two sub-tests of SSSC task, the sound counting ($N = 10$) and syllable counting ($N = 10$) provided evidence on English

phonological processing abilities of native Turkish 6^{th}-8^{th} graders at various levels. The mean of the sound counting total scores (SOC) for grades 6, 7, and 8 (M =3.20, *SD*=2.53; M = 2.89, *SD*= 1.96; and M = 3.84, *SD*= 2.07 respectively) were lower compared to the mean of the syllable counting total (SYC) scores for all grade levels (M =5.30, *SD*=3.40; M = 5.85, *SD*= 2.46; and M = 6.12, *SD* = 2.35) respectively. While the one-way ANOVA results did not show any statistically significant difference among the three grade levels on SYC scores, there was a statistically significant effect of grade on SOC scores for the three conditions $F(2, 364)= 5.35$, $p < 0.05$. The multiple comparisons across grade levels revealed a statistically significant mean difference on the SOC scores of Grades 7 and 8 only at $p < .05$ level. The higher syllable counting performance across all three grade levels converged with the previously proposed theoretical explanations that claimed that children who process less-consistent orthographies such as English may need to resort to coarser units such as syllables when they experience inconsistencies at the phoneme level (Ziegler & Goswami, 2005). Durgunoğlu and colleagues reported syllables as salient units of written and spoken Turkish; similarly, Kim (2011) noted that the syllable is a salient unit in spoken Korean. Durgunoğlu and Öney (1999) and Kim (2011) analyzed the unique componential language and literacy related skills that are critical for word spelling in Turkish and Korean, respectively, and they found that syllable was a unique salient unit that predicted spelling performance of Turkish and Korean students in the relative languages. Turkish EFL learners performed better on the syllable sub-section of the SSSC task compared to the sound counting task across all grades. This finding provided

empirical support to the hypothesis that the salient syllable structure of Turkish would affect Turkish EFL students' EFL spelling performance.

Multiple regression analysis was used to test if the sound counting and syllable counting predicted the participant's English word spelling outcomes. The results of regression indicated that these two variables explained approximately 11% of the variance in the TWS $R^2 = .111$, F (2,364) = 22.825, $p < .001$. The syllable counting predicted the TWS word spelling scores more $\beta = .342$, t (367) = 6.589, $p < .001$ compared to sound counting $\beta = -.180$, t (367) = -3.457, $p < .001$. The syllable count performance of 6th graders also predicted the 6th grade English word spelling outcomes more $\beta = .317$, t (142) = 3.613, $p < .001$ than the performance of the same group of students on the sound performance. Similarly, 7th grade syllable counting predicted 7th grade TWS word spelling scores more $\beta = .567$, t (121) = 7.348, $p < .001$. However, for 8th grade, sound count had a higher and statistically significant contribution on 8th grade TWS spelling outcomes. The overall analysis including all of the grade levels confirmed the hypothesized higher effects of Turkish EFL students' English syllable knowledge on their EFL spelling outcomes.

Morphological Measure Comparisons across Grades

Morphological Awareness One (MA1)

The first morphological processing skill was tested based on a one-way ANOVA to compare grade level performance on this task. The mean of the MA1 did not show a linear growth per grade level. The null hypothesis states that there is no difference of the mean of the MA1 scores across grade levels and the null is rejected at $p < .001$ level. One

way ANOVA tested the statistical significance of the MA1 scores among the grade levels and there was a statistically significant effect of grade on MA1 mean scores at the $p < .001$ level for the three conditions $F (2, 364)= 15.93$, $p < 0.001$.

Post hoc comparisons using the Scheffé's test indicated that the mean of the MA1 score for Grade 6 ($M = 4.57$, $SD = 1.68$) was statistically significantly higher than the mean of the MA1 score of 7th graders ($M= 3.50$, $SD = 2.05$) at $p < .05$ level. The mean of MA1 score of 7th graders was statistically significantly lower compared to the MA1 score for 8th graders ($M= 4.77$, $SD= 2.01$) at $p < .05$ level. No statistically significant difference on the MA1 scores between 6th and 8th grades was found.

Morphological Awareness Two (MA2)

The second morphological processing skill was tested based on a one-way ANOVA to compare grade level performance on this task. The mean of the MA2 did not show a linear growth per grade level. The null hypothesis states that there is no difference of the mean of the MA2 scores across grade levels and the null is rejected at $p < .001$ level. One way ANOVA tested the statistical significance of the MA2 scores among the grade levels and there was a statistically significant effect of grade on MA2 mean scores at the $p < .001$ level for the three conditions $F (2, 364)= 19.26$, $p < 0.001$.

Post hoc comparisons using the Scheffé's test indicated that the mean of the MA2 score for Grade 7 ($M = 11.71$, $SD = 3.18$) was statistically significantly lower than the mean of the MA2 score of 6th graders ($M= 13.95$, $SD = 4.77$), and lower than the mean of the MA2 score of the 8th graders ($M = 14.70$, $SD= 4.40$) at $p < .05$ level.

It was hypothesized that morphological awareness in English contributes to English word spelling outcomes of 6^{th}-8^{th} grade Turkish EFL pupils, and that younger pupils' morphological processing skills would not be as strong a predictor of spelling as the morphological processing knowledge of older pupils. The study findings suggested that the English morphological processing skills of Turkish EFL learners did not develop with the growth of literacy skills and metalinguistic knowledge as they progressed into higher grade levels. In fact, the 6^{th} graders' morphological processing skills as measured by the two morphology tasks were statistically significantly higher than the morphological processing skills of 7^{th} graders. This finding, by itself, suggested the hypothesized linear growth in the EFL morphological processing skills of Turkish pupils was not observed within the existing data set.

A multiple regression was used to test if the morphological processing skill tasks significantly predicted Turkish students' EFL word spelling outcomes. The results of the regression indicated the two predictors explained less than 10% of the variance in the TWS $R^2 = .097$, $F\ (2,364) = 19.498$, $p < .001$.

Orthographic Measure Comparisons across Grades

Orthographic Awareness One (OA1)

The first orthographic processing skill was tested based on a one-way ANOVA to compare grade level performance on this task. The mean of the OA1 showed a linear growth per grade level. The null hypothesis states that there is no difference of the mean of the OA1 scores across grade levels and the null is rejected at $p < .001$ level. One way ANOVA tested the statistical significance of the OA1 scores among the grade levels and

there was a statistically significant effect of grade on OA1 mean scores at the $p < .001$ level for the three conditions $F (2, 364)= 10.47$, $p < 0.001$. Post hoc comparisons using the Scheffé's test indicated that the mean of the OA1 score for Grade 8 ($M = 14.10$, *SD* = 5.24) was statistically significantly higher than the mean of the OA1 score of 7th graders ($M= 12.04$, *SD* = 5.16), and the mean of the OA1 score of the 6th graders ($M = 11.55$, *SD*= 4.82) at $p < .05$ level.

Orthographic Awareness Two (OA2)

The second orthographic processing skill was tested based on a one-way ANOVA to compare grade level performance on this task. The mean of the OA2 showed a linear growth per grade level. The null hypothesis states that there is no difference of the mean of the OA2 scores across grade levels and the null is rejected at $p < .05$ level. One way ANOVA tested the statistical significance of the OA2 scores among the grade levels and there was a statistically significant effect of grade on OA2 mean scores at the $p < .05$ level for the three conditions $F (2, 364)= 4.86$, $p < 0.05$. Post hoc comparisons using the Scheffé's test indicated that the mean of the OA2 score for Grade 6 ($M = 9.48$, *SD* = 5.62) was statistically significantly lower than the mean of the OA2 score of 8th graders only ($M= 11.78$, *SD* = 3.36) at $p < .05$ level. No statistically significant difference was found between OA2 scores of 6th and 7th grades ($M= 9.09$, *SD*= 5.31).

Correlation Matrix

The first research question asked what the inter-correlations among the English (L2) phonological, morphological and orthographic processing skills of native Turkish children at grade levels 6 to 8 would be. Table 5 shows the zero-order correlations among

the literacy outcome variables (word and pseudoword spelling) and the three types of metalinguistic skill variables for all grade levels. A closer examination of the table revealed that both the word spelling task and pseudoword spelling task were highly and positively correlated with the three level metalinguistic processing skills ($p < .01$ level), except for the MA2 with no statistically significant correlation with pseudoword spelling. The TWS had the highest correlation with the Rhyme ($r = .63$, $p < .01$ level) and WJ scores ($r = .56$, $p < .01$ level). One phonological processing skill task, Sound Oddity, had negative correlations with the tasks tapping into phonological processing (SSSC, $r = -0.03$) and other metalinguistic skills (MA2, $r = -.04$). Rhyme, one phonological processing task, had positive and high correlations ($p < .01$ level) across all literacy tasks. Two morphology and two orthography tasks were positively correlated with one another at $p < .01$ levels. The correlation matrix provided an answer to the first research question regarding the correlations among the observed variables.

Table 5

Intercorrelations among Literacy Variables

Measures	1	2	3	4	5	6	7	8	9
1. TWS	—								
2. WJ	.56**	—							
3. SO	.48**	.47**	—						
4. Rhyme	.63**	.56**	.35**	—					
5. SSSC	.16**	.24**	-.03	.26**	—				
6. MA1	.26**	.14**	.04	.30**	.10	—			
7. MA2	.25**	.08	-.04	.26**	.44**	.33**	—		
8. OA1	.47**	.20**	.02	.34**	.28**	.24**	.51**	—	
9. OA2	.21**	.17**	.07	.17**	.17**	.12*	.29**	.26**	—

*p < .05, **p < .01.

Model Testing

The missing value points were imputed by using Mplus (Muthén & Muthén, 2012) multiple imputation method. All of the participants were included in the subsequent CFA model testing procedure to measure the three factor (Phono, Morpho, Ortho) CFA model first. The second model that was tested for a good model fit had an endogenous variable, word spelling (measured by TWS). The initial model was computed based on all grade levels; subsequently, the data were analyzed using multiple group structural equation modeling. This procedure was followed to understand whether the factorial structures and the causal relationships among the observed variables vary across different grade levels. Two SEM software programs, Mplus (Muthén & Muthén, 2012) and AMOS (Arbuckle, 2006), were used for model testing and model modification purposes.

First, the equality of covariance matrices across the groups, based on the null hypothesis (H_0), stated as $\sum Grade6 = \sum Grade7 = \sum Grade8$. In this hypothesis, $\sum$ denotes the population variance-covariance matrix. Rejecting the null hypothesis means that the groups may not be equivalent; however, failing to reject the null hypothesis suggests that the variance-covariance matrices of the grade levels may not vary. The rejection of the null is based on the chi-square ($\chi 2$), which is sample size sensitive. SEM is a large sample method and with a large sample, the p-value of the chi-square is small and the null is always rejected (Thompson, 2000).

The Baseline CFA Model

The initial baseline model was hypothesized for the whole sample that included all three grades. Then the same model was then computed for each grade level separately to test the model fit for different grades.

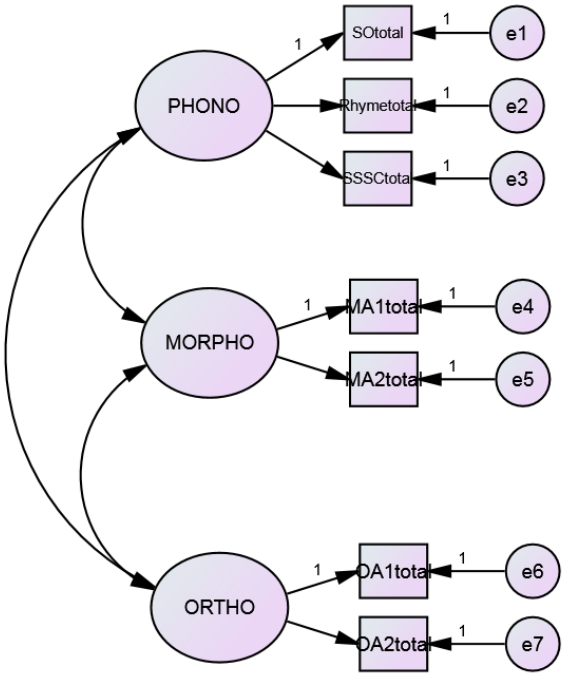

Figure 1

Baseline CFA Model with Three Factors (Phono, Morpho, Ortho)

In this model, the oval shapes represent a latent construct, also known as a factor. There are also rectangular shapes that indicate the observed variables based on the

measures administered. The seven rectangular shapes tap into the three factors: Sound Oddity (indicated as SO in the model), Rhyme (Rhyme), and Speech Sound and Syllable Counting (SSSC) to Phonology, Morphology One (MA1) and Morphology Two (MA2) to Morphology factorial structure, Orthography One (OA1) and Orthography Two (OA2) tapping into Orthography factor. The measurement errors associated with each observed variable were numbered as e1-e7.

Due to the limitations with the chi-square lack of fit statistics that is sample dependent, other model fit indices are reported to indicate the overall model fit to the existing data. In addition to reporting the chi-square (to indicate goodness of fit), Akaike information criterion (AIC), root mean square error of approximation (RMSEA), comparative fit index (CFI), and standard root mean residual (SRMR) are some of the measures to report the model fit.

When this baseline model in Figure 1 was computed for all grades, the values of selected indices did not indicate a good model fit of the three-factor CFA model: $\chi 2_{(7)} = 93.633$. The chi-square value was 93.633, $p < .01$, CFI = 0.794, RMSEA = 0.143 with the 90% confidence interval 0.117- 0.170, SRMR = 0.066. Overall, these model fit indices did not show a good model fit of the baseline CFA model. The basis of structural equation modeling, including the CFA, is constructing models based on the covariances among the variables and the population parameters. Thus, a hierarchical model with the addition of a second order was computed to increase the number of covariation among the variables to find if this hierarchical model proves a better model fit. The hierarchical CFA model with

the second order did not yield a better model fit when the hierarchical model was computed for all grade levels; therefore, this procedure was aborted.

The next step for model improvement was to look at the model modification index. The modification indices suggested correlating the two phonological processing tasks, sound oddity and rhyme tasks, with an M.I. of 54.472, EPC =1.641 (Figure 2). Because this model modification suggestion was theoretically appropriate and reasonable, the modification was implemented. This resulted in a converged, admissible solution for all grades and the values of the selected indices indicated a good model fit: $\chi 2_{(7)} = 36.426$, $p < .01$, CFI = 0.934, RMSEA = 0.085 with a 90% confidence interval 0.056 - 0.115, and SRMR = 0.039. A robust CFA model for all grades was obtained, and this finding was interpreted as the result of the good amount of variance-covariance of the measurement model across different grades and age groups. The variability in the age and the exposure to the foreign language across grade levels yielded a good model fit.

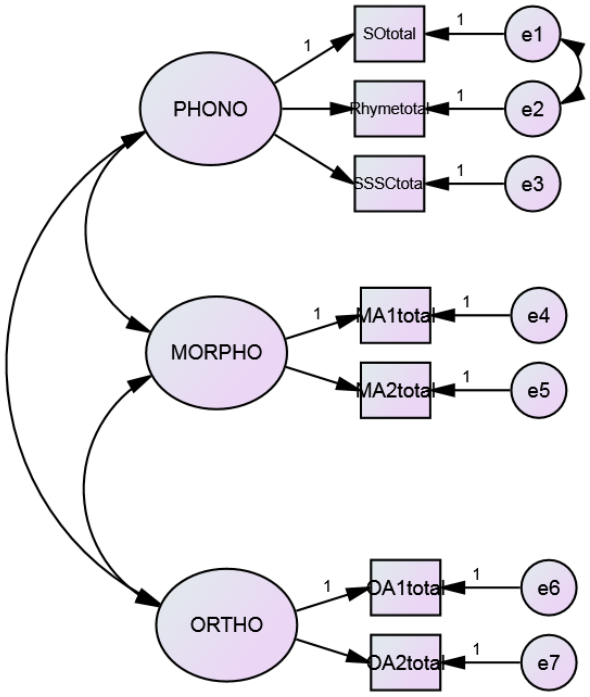

Figure 2

Configural Baseline CFA Model

Testing the Configural CFA Baseline Model for Separate Grades

Because a good model fit was confirmed after correlating the two observed variables, this was taken as the new baseline model and re-tested for individual grade levels. The model tested for Grade 6 and Grade 7 separately on Mplus and the output reported an error that indicated "the latent variable covariance matrix (PSI) is not positive definite." When all of the eigenvalues are positive, the PSI cannot be negative and this may indicate a negative variance/residual variance for a latent variable or a correlation

that is greater or equal to one between two latent variables. The standardized model results confirmed this interpretation on the non-positive definite covariance matrix. The three factor structures showed very high correlations among the latent variables of Grade 6 (Morpho with Phono = 1.075, Ortho with Morpho 1.089). An exploratory factor analysis (EFA), a statistical technique for evaluating the measurement models, was computed.

Exploratory Factor Analysis

Kline (2011) indicated "EFA does not require a priori hypotheses about factor-indicator correspondence or even the number of factors" (p.116), and it allows all indicators to load on every factor without restricting the factor models. In simple terms, this procedure was followed to take a step back in the model testing to have background information about the observed variables prior to the enforcement of a factor model.

The EFA was computed for Grades 6 and 7 by using Mplus 7.2 (Muthen & Muthen, 2012). Maximum likelihood was the estimator and Geomin was the rotation procedure for the exploratory factor analysis. The output could not yield a three factor structure for Grade 6. The two-factor model with a $\chi 2_{(7)}$ value of 6.680 $p > .05$, CFI = 1.000, RMSEA = 0.000 with a 90% confidence interval 0.000- 0.087, SRMR = 0.023 suggested a better model fit for the data compared to a one-factor model with a $\chi 2_{(7)}$ = 31.623 $p < .05$, CFI = 0.923, RMSEA = 0.094 with the 90% confidence interval 0.050-0.138, and SRMR = 0.056.

The two-factor model for Grade 6 suggested the first factor defined by a combination of two observed variables measuring phonological processing skills, Sound

Oddity and Speech Sound and Syllable Counting, with a Geomin rotated loadings 0.427*, 0.451* (* denotes the significance at 5% level) respectively; two observed variables of orthographic processing OA1 = 0.723*, OA2 = 0.358, and one morphological processing task MA2 = 0.899*. The observed variables tapping into the second factor structure were Rhyme = 0.515* (a phonological processing variable) and MA1 = 0.589*. The two factor model suggested for Grade 6, although showed a statistically acceptable model fit, did not have a theoretical ground, thus, it was not implemented.

The EFA computed for Grade 7 based on the maximum likelihood estimation and Geomin rotation procedure did not yield a three factor structure. The two-factor model with a $\chi 2_{(7)}$ value of 7.230, $p > .05$, CFI = 1.000, RMSEA = 0.000 with a 90% confidence interval 0.000- 0.100, SRMR = 0.033 suggested a better model fit for the data compared to a one-factor model with a $\chi 2_{(7)} = 34.001$ $p < .05$, CFI = 0.844, RMSEA = 0.109 with the 90% confidence interval 0.062-0.156, and SRMR = 0.062.

The two-factor model for Grade 7 suggested the first factor defined by a combination of all observed variables of phonological processing. The Geomin rotated factor loadings of Sound Oddity was 0.559* (* denotes the significance at 5% level), the Rhyme task loaded under the first factor with a factor loading of 0.900* and Speech Sound and Syllable Counting 0.207* along with MA1 = 0.409* and OA1 = 0.442*. The variables tapping into the second factor were MA2 = 0.947* and OA2 = 0.258. The two factor model suggested for Grade 7, although showed a statistically acceptable model fit, did not have a theoretical ground, thus, it was not implemented. The lack of model fit of a three factor design for Grades 6 and 7 was most likely due to the restricted range groups.

Within each grade level, individual variations such as age could play a role in the model fit results. Because the age range is somewhat homogeneous within each grade level, it was concluded that the school-level information for Grades 6 and 7 did not show enough variation for a good model fit.

The baseline CFA model testing for Grade 8 yielded a good model fit for a three factor structure with the $\chi 2_{(7)} = 17.641$ $p > .05$, CFI = 0.962, RMSEA = 0.086 with the 90% confidence interval 0.000-0.150, and SRMR = 0.052. This intriguing finding suggested that the modified three factor baseline model showed a good model fit for Grade 8. It was concluded that the variability of the measurement variables across the participants and schools within this grade level was higher compared to the other two grades, thus, a good model fit was obtained.

The CFA model was tested for all grades and each grade level. Table 6 provides a summary of the parameters for the Baseline CFA Model for all grades and for individual grades. The regression weights of the observed variables on the factors, the correlations among three factors, and the coefficients of determination (R^2) that indicated the fit of the data to the statistical model were presented on Table 6.

Table 6

Summary of Parameters in the Configural Baseline CFA Model

Parameter	All Grades		6th grade only		7th grade only		8th grade only	
	Standardized	S.E.	Standardized	S.E.	Standardized	S.E.	Standardized	S.E.
Regression weights								
Phono BY SO	-0.024	0.066	0.624***	0.072	0.704***	0.179	0.776***	0.061
Phono BY Rhyme	0.465***	0.060	0.675***	0.068	0.664***	0.181	0.072	0.115
Phono BY SSSC	0.578***	0.061	0.585***	0.068	0.276**	0.107	-0.774***	0.061
Morpho BY MA1	0.396***	0.053	0.326***	0.084	0.518***	0.110	0.339***	0.094
Morpho BY MA2	0.827***	0.064	0.774***	0.094	0.493***	0.108	0.968***	0.121
Ortho BY OA1	0.682***	0.066	0.605***	0.104	0.600***	0.167	0.901***	0.104
Ortho BY OA2	0.377***	0.056	0.394***	0.092	.246	0.107	0.393***	0.094
Correlations								
Phono ∪ Morpho	0.837***	0.095	1.075***	0.141	0.781***	0.222	-0.753***	0.098
Phono ∪ Ortho	0.833***	0.112	0.711***	0.153	0.959**	0.354	-0.667***	0.103
Morpho ∪ Ortho	0.911***	0.102	1.089***	0.191	1.156***	0.358	0.786***	0.151
R-square								
SO	0.001	0.003	0.390***	0.090	0.495**	0.252	0.602***	0.095
Rhyme	0.216***	0.055	0.456***	0.092	0.441**	0.241	0.005	0.017
SSSC	0.335***	0.070	0.343***	0.079	0.076	0.059	0.599***	0.094
MA1	0.157***	0.042	0.106	0.054	0.269	0.114	0.115	0.065
MA2	0.685***	0.106	0.599***	0.145	0.243	0.107	0.938***	0.235
OA1	0.465***	0.089	0.365**	0.125	0.360	0.200	0.812***	0.188
OA2	0.142***	0.042	0.156	0.072	0.060	0.053	0.154	0.074

As shown in Table 6, the standardized regression weight of phonology factor was best defined by SSSC for all grades; however, Rhyme and Sound Oddity were the best phonology indicators for Grade 6 and 7 subsequently. Similarly, while MA2 task was the best indicator of morphology factor in the analyses on all grades together and Grades 6 and 8, MA1 task was found to have a heavier factor loading on the morphology factor for Grade 7. The first orthography task (OA1) had a higher factor loading under the orthography factor for all grades together, and Grades 6, 7, and 8 analyses. In sum, while the morphology and orthography latent variables were better defined by MA2 and OA1 observed variables compared to the other tasks loading on to these factors, the tasks that defined the phonology factor the most for different grades varied across grades. The comparison of R-square statistics for all of the analyses on each grade level confirmed that the phonology factor was better manifested through SSSC, Rhyme and Sound Oddity for all grades, Grade 6, and Grade 7 and 8 respectively. The morphology factor was better manifested through MA2 compared to the other morphology task in all grade level analyses, and the orthography factor was best manifested through OA1 compared to OA2 in all grade level analyses. This overall finding suggested that the factorial structures across different grades showed variation, especially on the phonology factor.

Baseline SEM Model

The second research question inquired what the unique and shared contributions of English (L2) phonological, morphological, and orthographic processing skills to Turkish speaking 6^{th}, 7^{th}, and 8^{th} grade EFL students' English (L2) spelling performance, measured by real word spelling dictation task, would be. In order to test the simultaneous

contributions of the phonological, morphological, and orthographic factors on the Test of Written Spelling (TWS) scores, a latent variable structural equation model was designed. The hypothesized baseline structural equation model, presented in Figure 8 (See Appendix A), was tested, but the model testing did not provide converging results on Mplus. The same model was tested by using AMOS and the following parameters yielded: $\chi 2 = 139.531$ df= 10, $p > .001$, CFI = 0.822, RMSEA = 0.157 with the 90% confidence interval 0.134-0.181. Overall, this did not show a good model fit of the hypothesized baseline structural equation model. As the Figure 3 displayed, the correlated three factors, Phono, Morpho and Ortho predicted TWS spelling exogenous variable individually. The regression weights between the three factors and the exogenous variable were not statistically significant. These observations suggested that the first-order factors might be explained by a higher order structure and this led the way to the next step, designing a hierarchical factorial structure. The basis of the structural equation model is constructing models based on the covariances among the variables and the population parameters. Therefore, a hierarchical model with the addition of the second order factor increased the number of covariation among the variables. Zhao (2011), who also designed a second-order factor structure in the baseline SEM model, hypothesized this second-order factor based on the linguistic repertoire theory. This emerging theory takes its premises from Masterson and Apel (2010).

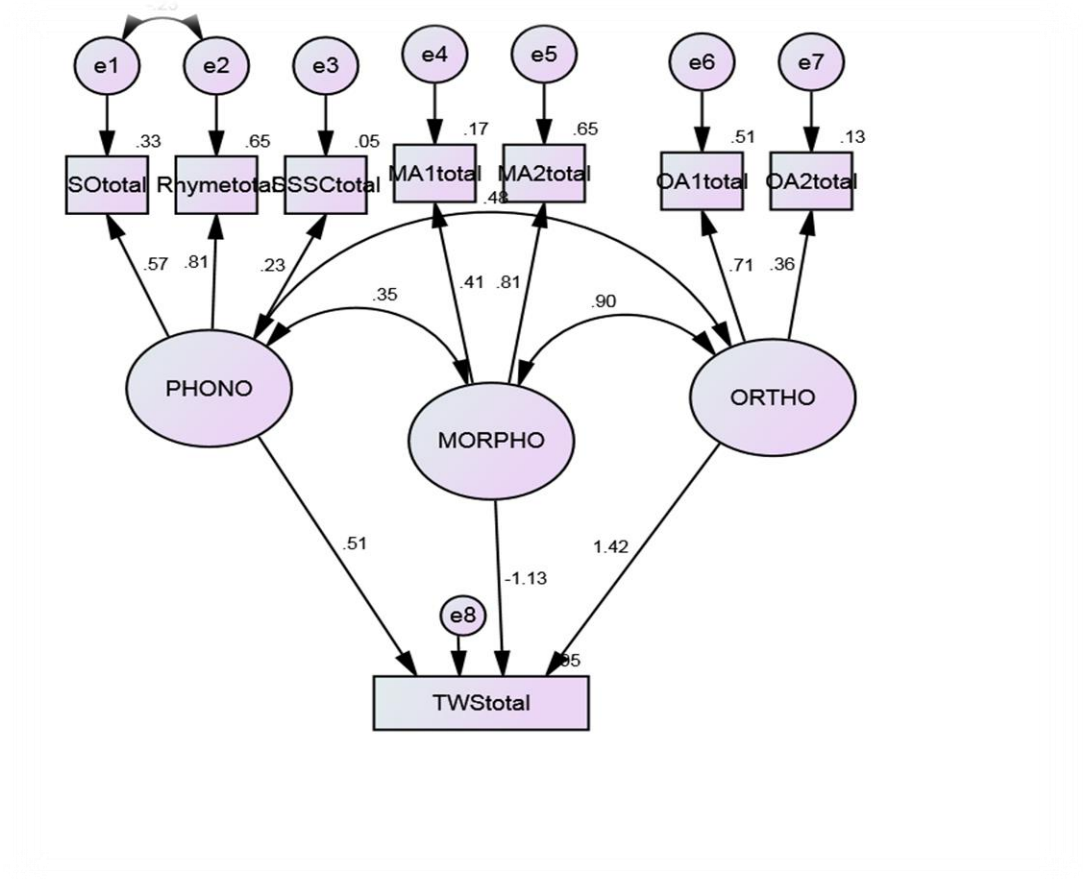

Figure 3

Standardized Regression Coefficients of the Baseline SEM Model

Second-Order Factorial Design and the Structural Equation Model

In the second-order factor structural equation model the following assumptions suggested by Byrne (2010) were met: 1) the first-order factors (Phono, Morpho and Ortho) and the second-order factor (LING) explained the observed variables represented with rectangular shapes, 2) observed variables had a non-zero loading on the first-order factor, 3) error variances of the observed variables were uncorrelated, and 4) the

covariation among the first-order factors were accounted for by the second-order factor. The graphic representation of the second-order factor is presented in Figure 4.

The second-order factor structure improved the model fit significantly and results indicated the second-order factor was explained by the three first-order factors, phonology, morphology and orthography, statistically significantly at $p < .001$ level. The factor loadings of the first-order factors were statistically significant at $p < .001$ level and Phono had 0.875 regression weight with S.E. 0.079, Morpho had 0.957 regression weight with a S.E. 0.080, and Ortho had a 0.952 factor loading with a S.E. 0.091. The following statistical model fit indices $\chi 2 = 36.426$, df= 10, $p > .0001$, CFI = 0.934, RMSEA = 0.085 with the 90% confidence interval 0.056 - 0.115 and SRMR= 0.039 suggested an overall very good model fit of the second-order factor structural equation model, and it was tested to measure the simultaneous impact of the phonological, morphological and orthographic processing skills on the word spelling outcomes.

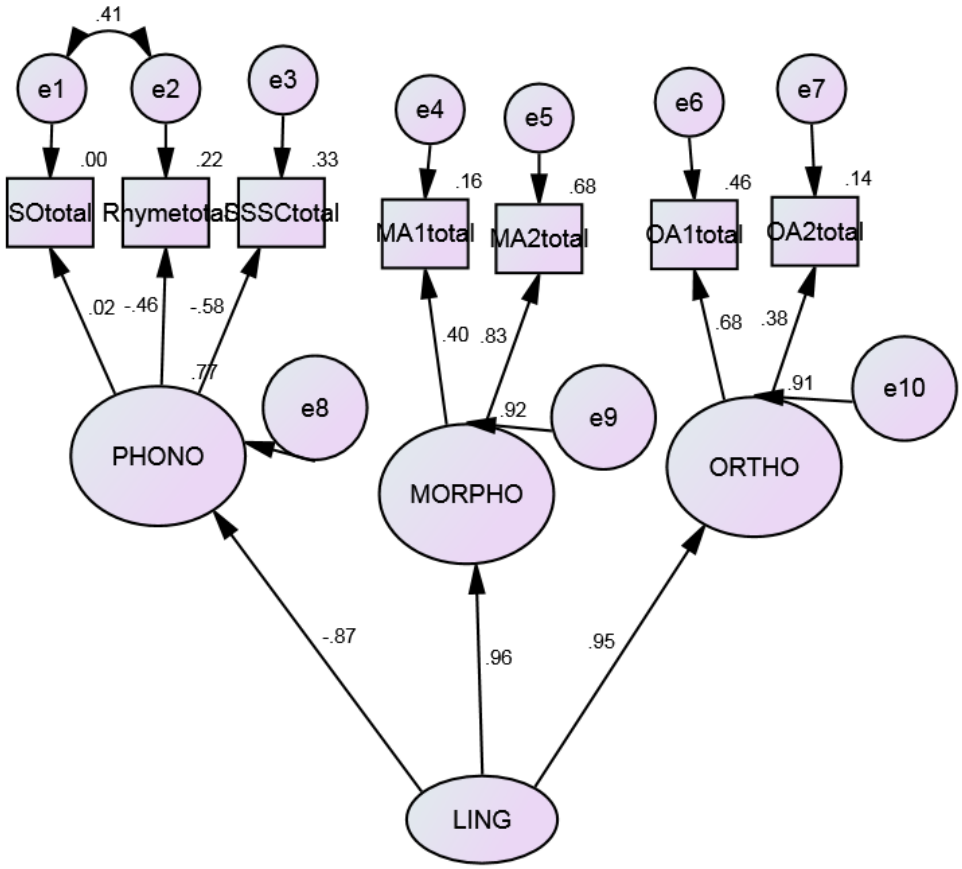

Figure 4

Standardized Factor Loadings of the Second-order Factor SEM Model

In the next model testing, the exogenous variable TWS was added to the second-order factor model and this model was tested for all grades. The tested SEM model yielded the following fit-indicator parameters $\chi 2 = 227.726$, df= 16, $p > .001$, CFI = 0.702, RMSEA = 0.184 with the 90% confidence interval 0.163 - 0.206, which did not indicate a good model fit. After the testing of the configural SEM model, I found the data

did not fit the model. The chi-square was significant; however, other model fit indicators such as CFI or RMSEA were poor. The factor coefficients from the first-order factors on the second-order factor were reasonably good (Phono on Ling= .96, Morpho on Ling = .60, and Ortho on Ling = .73), as Figure 5 displayed. The factor coefficient of the second-order factor on the exogenous variable also seemed fine (Ling on TWS = .87). The modification indices for this model testing were examined for model improvement. Only the model modification indices that would not make dramatic changes on the model (e.g., deleting an observed variable) were followed. The first step taken to improve the model was to covary the error terms. It has been suggested that if the correlated variables are *not* logically causally correlated, but merely statistically correlated, then covarying the error terms in order to account for the systematic statistical correlations without implying a causal relationship is possible.

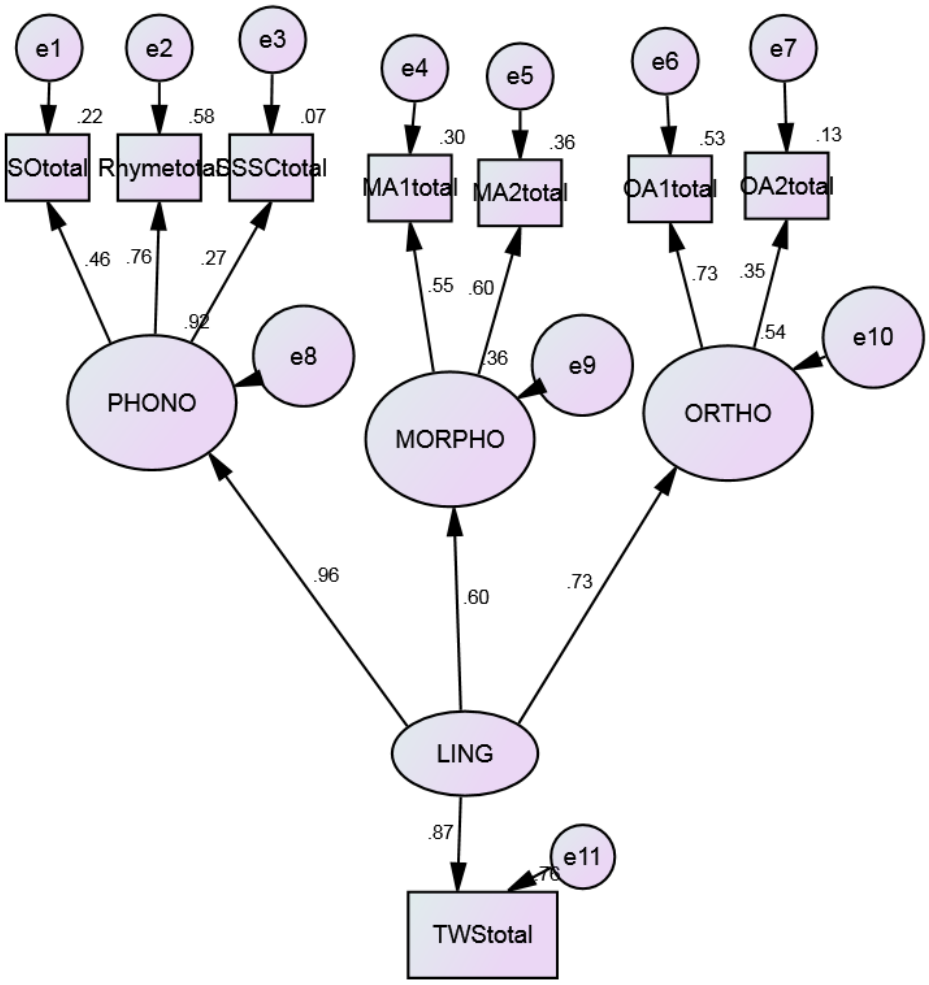

Figure 5

Configural SEM Model with Regression Coefficients

Following the modification indices, the error terms of several observed variables were correlated with one another to improve the model fit. Correlating the e2-e3, e3-e5, e3-e6, e3-e7, e5-e6 (See Figure 6) yielded the following fit-indicator parameters $\chi 2$ = 58.144, df= 11, p > .001, CFI = 0.933, RMSEA = 0.108 with the 90% confidence interval

0.082 – 0.136, and SRMR = 0.059. This suggested an acceptable model fit compared to the baseline two-factor SEM model on the exogenous spelling factor. The RMSEA did not indicate a good fit; however, other model fit indices suggested an overall good model fit and the model improvement procedures ended.

The model fit indices reported were based on the analyses on Mplus because the data set was imputed by using the same statistical analysis software. The model which initially did not have any correlations among the error terms associated with the observed variables and the final configural SEM model with the covaried variables both showed that the three factors were significantly loading onto the second order factor that predicted the word spelling outcome. The factor loadings of the observed variables onto the factors and the factors onto the second order factor and the exogenous variable changed when the model was changed from the baseline to configural final model; however, both models showed a pattern that supported the theoretical model suggested by the Linguistic Repertoire Theory. The configural model, by associating the error terms associated with the observed variables, accounted for some other constructs that the observed variables could measure.

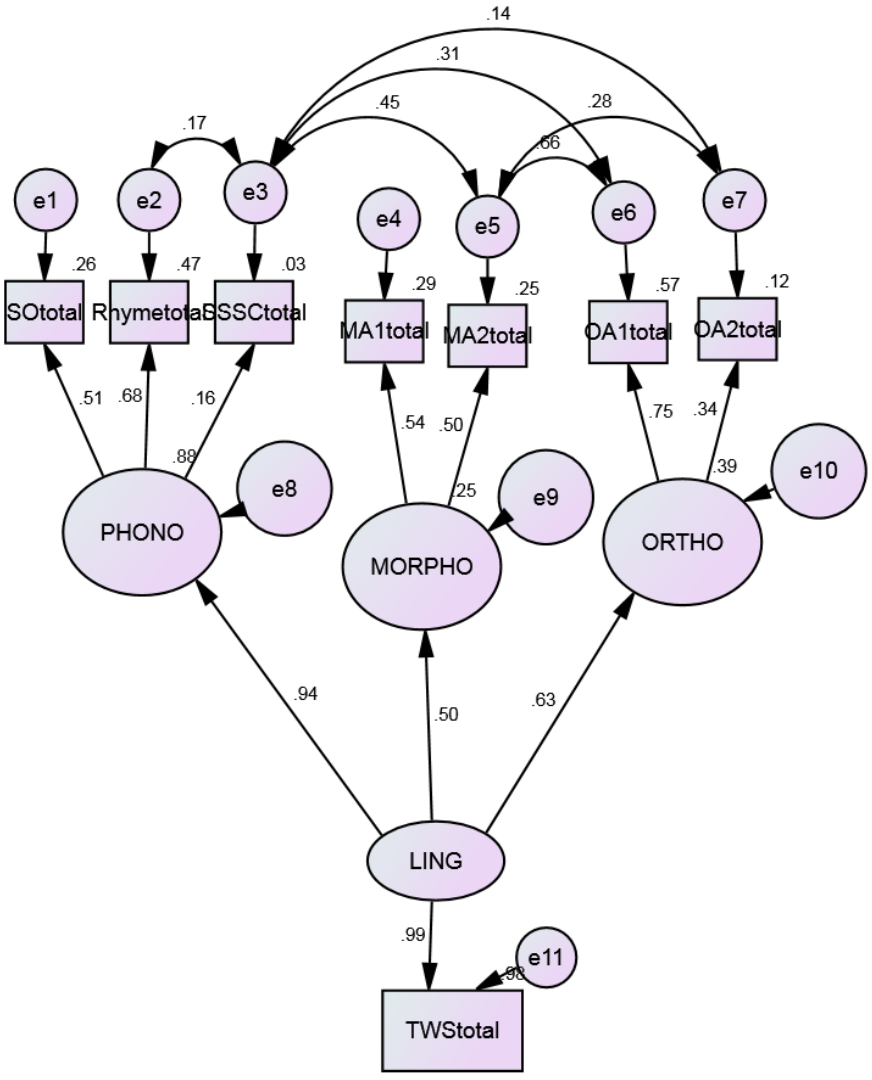

Figure 6

Final Configural SEM Model Standardized Estimates

The fifth research question investigated how family socio-economic status, native Turkish children's literacy practices and exposure to English, and instructor effects

influence Turkish 6th-8th graders' EFL spelling outcomes. To test the impact of the socio-cultural components, the SES variables were integrated into the SEM model which was represented by the graphic Figure 9 (See Appendix A). This overall model showed a good model fit with a CFI .917, RMSEA .047 with the 90% confidence interval between .039 and .056. The standardized regression coefficients of the three socio-cultural variables showed that the EFL factor had a higher regression coefficient on TWS score. This means the extracurricular activities of Turkish EFL children at grades 6-8 (number of English books, English book reading, taking extracurricular English lessons, and viewing English programs on TV etc.) had a positive and significantly higher effect on their EFL spelling outcomes. It was hypothesized that Turkish pupils with a higher SES would perform better in the spelling dictation tasks compared to the children of lower SES. The findings, based on the SEM model with the integrated SES variables, revealed that socio-economic status factor defined by several observed variables such as father's education, father's occupation, and family income did not predict the EFL spelling outcomes of Turkish EFL students at Grades 6 through 8. It was also hypothesized that the literacy background exposure to the target language (represented by the EFL factor structure in Figure 9) would have positive effects on English as a foreign language spelling outcomes of Turkish students. This hypothesis was confirmed because observed variables such as English-abroad, English TV, Number of English Books, English Book Reading and Extracurricular English had positive coefficients under the EFL factor and the EFL factor positively and significantly predicted the TWS spelling outcomes of Turkish EFL 6th to 8th graders. In sum, among the three SES factors, the EFL factor with the observed

variables tapping into various types of EFL exposure was the strongest predictor of the TWS spelling outcomes of the participating Turkish pupils (RQ5 answer).

EFL Word Spelling Error Analysis

Two of the research questions (Question 3 and 4a and 4b) considered the word spelling errors of Turkish 6^{th} to 8^{th} graders based on TWS word spelling performance. The abbreviated version of the word spelling task, TWS, included thirty-five items. When the number of items in this test is multiplied by the current study sample size, this would give a total of 12,845 word spelling attempts. There were 400 cases that were not attempted; they were simply left blank. Approximately 5,500 cases represented correct spelling and this have left an approximate 7,000 cases of spelling errors that needed to be analyzed and coded. A good number of the existing word spelling attempts were more closely analyzed and these errors were found to be undecipherable spelling attempts, or simple scribbling. After taking the scribbling out, approximately 5,000 word spelling attempts were left for coding and analyzing.

Moats (1995) designed a spelling error rubric to categorize the spelling errors occurring during spontaneous writing of adolescents with dyslexia. This error categorization rubric was not designed for the target population (EFL) of the present study; thus, many of the categories were not able to explain the current data set. Due to the EFL nature of it, the present spelling error data set presented some other types of errors, such as the native language effect, syllable omission, sounding out and the like. This resulted in the use of a modified spelling error categorization rubric.

The spelling error coding rubric was based on three major categories: phonologically incorrect attempts, phonologically accurate but orthographically unacceptable spelling attempts, and morphologically inaccurate spelling. The phonological error category represented those words that were misspelled due to changing the phonetic nature of the word (e.g., *went-wnet*; *shake-sheak*). A more-detailed categorization of the phonologically inaccurate errors yielded eleven sub-categories (See Table 7). The first sub-category, whole-word substitution, is based on the premise that the target word is replaced by another meaningful word, as in the case of *unify-uniform, fountain-fourteen, and nucleus-nuclear*. The second sub-category, multiple (undecipherable) errors, represented those misspelled words that violated the phonetic nature of the target word multiple times as in the case of *went-wit* or *went-vet.* The third sub-category, omission of the consonants, included errors such as *went-wet, next-nex.* In the analyses of the present study, one error was categorized into one main category and one sub-category. This aspect of the spelling error categorization made the process challenging because the first example of the consonant omission, went-wet could be categorized as a whole-word substitution as well. For instance, words such as *wit* and *vet* are real words in English and therefore could have been coded as whole word substitutions; however, these words are unlikely to be in an EFL learner's vocabulary. As for the consonant omission, a word that misses a consonant was categorized as consonant omission even if the resulting spelling was a different real word.

The second major error category, orthographically inaccurate errors, represented those words that were misspelled due to misrepresentation of the sounds of the words

such as representing the /k/ sound in the target word *canyon* with *k* instead of *c* (i.e., kanyon). The most commonly occurring orthographic error in the present data set was sounding out of the target words without following the plausible letters or letter combinations. Spelling the target word *eight* as *eyt* or *nucleus* as *nuklius* are some examples for this sub-category of orthographically inaccurate word spelling.

The last major error category, morphological errors, included those misspelled words that included a misrepresented meaningful unit (morpheme) within the word. The morphologically inaccurate spelling attempts had semantic relationships with the target words (e.g., sign-signal). This aspect of the morphologically inaccurate spelling attempts differentiate this main category from the first two main error categories.

In order to answer the third research question "To what extent do English (L2) phonological, morphological and orthographic processing skills explain the errors Turkish 6th, 7th, and 8th graders make in spelling English words?", a representative sample of 100 participants that represented both school sites, three grade levels, and genders were randomly chosen. A total of 1,400 spelling errors of these participants were coded to categorize the types of errors based on the three metalinguistic skills (i.e. phonological, morphological, and orthographic). As shown in Table 7, when the categories were further broken down, a total of twelve types of phonological errors, four types of orthographic errors, and four types of morphological errors were found in the existing data set. In the analyses, the individual variations were excluded and only the spelling errors that occurred consistently across grade levels and individual participants were included.

The word spelling error analyses showed all three metalinguistic skills explained, at least, some of the word spelling errors of Turkish EFL students at grades 6 to 8. With more types of categories, such as whole word substitution, multiple/undecipherable errors, consonant and vowel insertion, substitution, and omission, phonological processing mechanisms constituted a major portion of the existing spelling errors of Turkish EFL students (*N*= 1163). Almost half of the phonological processing type of errors was whole word substitution which replaced the target word with a known word. Several items on the TWS task were commonly rendered by whole word substitution. For instance, out of a total of 71 spelling attempts on the word *pile*, 67 were whole word substitution (e.g., *pail, nail, fail, play, life, oil*); out of a total of 79 word spelling attempts on the word *fountain,* 26 were spelled as *fourteen,* 19 were spelled as *found.* Other target words that were substituted by meaningful words were *unify* (substituted by *uniform* 48 times), *collar* (substituted by *color/colour* 38 times and *cover* 26 times), *nucleus* (substituted by *nuclear* 42 times) and *tranquil* (substituted by *triangle* 24 times and *tongue* 22 times).

The second most commonly occurring spelling error category was orthographic errors. Some of the sub-categories representing orthographic errors were sounding out (spelling the words as they were heard—*payl* for *pile*), homophones, native language effect, and surface phonetic errors. Sounding out represented the majority of orthographic errors in the existing data set and homophones (e.g., *new-knew*) represented almost one-fourth of the existing orthographic errors. Native language effect where the attempts such as consonant cluster avoidance (e.g., *kinife*) or insertion of native language letters

(e.g., *sekşin*, *üniforma*), and lastly surface phonetic errors such as *kanyon* for *canyon* were some other commonly observed orthographic errors. A total of 230 cases constituted orthographic errors where the attempted words were phonetically accurate but orthographically inaccurate.

The third category, which least occurred in the existing data set, was morphological errors. Morphological errors mostly occurred in certain words such as target word *spend* where the past tense indicator was added nine times, *knew* where past tense indicator was omitted twice, and addition of prefix (*illegal-legal*) and omission of suffix (*sign-signal*) that each occurred once. Because of the low occurrence rate, the last two categories could be random errors with no systematic nature. In order to explore the role of morphological processing skills in EFL 6th to 8th graders' EFL word spelling attempts, more data are needed to be analyzed and coded.

The fourth research question inquired what would be the most common English as an L2 spelling error types among Turkish 6th, 7th, and 8th graders. Based on the information from the word spelling error analyses, it was concluded that the most commonly-occurring error types in the existing data set were phonological and orthographic errors, which constituted 83% and 16%, respectively, of the overall word spelling errors that existed in the analyzed data set. This pattern was observed in all grade levels and it did not show variation by grade. This finding provided an answer to the second part of the fourth research question: "Is there a trend for errors emerging within each grade level and across different grade levels?" The errors did not show a pattern or trend based on the grade level differences. Whole word substitution was the most

common type of spelling error, constituting 48% of the total spelling errors of all grades and 58% of the phonological errors. Multiple/undecipherable errors constituted 18% of the total spelling errors and 22% of the phonological errors, and sounding out constituted less than 1% of all of the word spelling errors and 56% of the orthographic errors.

The analyses of the word spelling attempts of Turkish EFL students at grades 6 to 8 shed light on the nature of the metalinguistic processing skills that played a significant role in the EFL word spelling attempts. It was hypothesized that Turkish 6th to 8th graders, with a strong familiarity with the Turkish phonology, would show tendency to spell the English words phonetically by sounding out the unknown or less-commonly known words (e.g., *tardi-tardy*). The examples of the sound out attempts (*N*= 128) in the existing data suggested support for this hypothesis. The second hypothesis that predicted Turkish students would spell the English words based on Turkish orthography by representing the unfamiliar sounds of English with a closest equivalent of Turkish also found supporting evidence based on the EFL spelling errors of Turkish students. Another orthographic rule that is regarded as unacceptable in Turkish is the consonant cluster at initial position. It was hypothesized that Turkish 6th to 8th graders would avoid consonant clusters by inserting a vowel buffer between the consonants of words and existing examples supported this hypothesis as well.

Table 7

Spelling Error Categorization Rubric

Phonological Errors	***N***	**Sample Errors**	**Orthographic Errors**	***N***	**Sample Errors**	**Morphological Errors**	***N***	**Sample Errors**
Whole-word substitution	677	*went: with, what; much: match, many; unify: uniform*	Sounding out	128	*eight: eyt; pile: payl; nucleaus: nuklius*	Adding past tense	10	*spend: spent*
Multiple error (undecipherable)	256	*went: vet, vit, spend: speen, spet*	Homophones	51	*knew: new*	Omitting past tense	2	*knew: know*
Consonant omission	51	*went: wet; next:nex*	Native language effect	46	*knife: kinife*	Omitting suffix	2	*signal: sign*
Vowel substitution	48	*legal:legel; went: wint*	Surface phonetic	5	*canyon: kanyon*	Adding prefix	1	*legal: illegal*
Syllable omission	45	*institution: instution, institu*						
Vowel insertion	24	*spend: sopend; terrible: terribil*						
Vowel omission	21	*shake: shak; fountain: fountin*						
Consonant substitution	21	*let: led; district:district*						
Consonant insertion	13	*next: nexst*						

Table 7 continued

Phonological Errors	***N***	**Sample Errors**	**Orthographic Errors**	***N***	**Sample Errors**	**Morphological Errors**	***N***	**Sample Errors**
Consonant/letter order reversal	6	*went: wnet*						
Vowel order reversal	1	*shake: sheak*						
	Total: 1163			Total: 230			Total: 15	

CHAPTER IV

DICUSSION and CONCLUSIONS

Discussion

The present study examined the concurrent contribution of phonological, morphological, and orthographic processing skills to English-as-a-foreign language word spelling of Turkish 6th to 8th graders. Because the present literature highlighted the multi-dimensionality of the metalinguistic skills affecting spelling outcomes, each metalinguistic processing skill established a construct (a factor) that was assessed by multiple measures. Phonological processing skill was measured by three different tasks that assessed Turkish EFL learners' phoneme knowledge with a sound oddity task, rhyming task and both phoneme and syllable level knowledge with a speech sound and syllable counting task. Morphological processing skill was measured by two different tasks that assessed receptive morpheme knowledge based on identifying the root. The third metalinguistic skill, orthographic processing, was assessed by two separate tasks that measured Turkish EFL learners' English orthography knowledge based on a homophone choice task and an orthographic constraint task. The outcome variable, spelling knowledge, was tested based on a word spelling and a pseudoword spelling task.

The current study resulted in three major findings. Analysis of the first factor, phonological processing skills, confirmed that Turkish EFL learners' English syllable manipulation was stronger compared to their phoneme manipulation abilities. The regression analysis provided additional evidence that Turkish students' English syllable manipulation was a stronger predictor of their EFL spelling outcomes compared to their

phoneme manipulation abilities. Together, these findings aligned with the previous research that showed that English-, Italian-, and Spanish-speaking children manipulated syllables more easily than phonemes (Cossu, Shankweiler, Liberman, Katz, & Tola, 1988; Liberman, Shankweiler, Fishcher, & Carter, 1974). Öney and Durgunoğlu (1997) also examined Turkish phonological awareness skills of native Turkish students at the phoneme and grapheme levels and concluded that syllable manipulation was an easier task for Turkish first graders' compared to a sound manipulation task. The present study not only found converging results with the literature on other transparent languages that found children were capable of manipulating syllables more successfully than manipulating the sounds, it also contributed to the current knowledge by providing parallel findings based on an older age group of children.

The second major finding of the current study was the strong correlations among the three metalinguistic processing skills: phonological and morphological processing skills with a strong correlation of .84, phonological and orthographic processing skills of .83 and morphological and orthographic processing skills of .91 for the analysis of all grade level together. These correlations implied strong relationships among these processing skills that share a common feature; and yet each also demonstrated a unique contribution to spelling performance. The unique contribution was confirmed by significant factor loading of each first-level factor on to the second-order factor, linguistic repertoire.

This study is, perhaps, the first to examine Turkish EFL learners' multi-level metalinguistic knowledge effects onto their EFL word spelling outcomes. Previous

research included numerous studies that focused on native Turkish speakers' phonological processing skills and reading in Turkish as a native language and in English as a foreign or second language (Durgunoğlu, 2003; Durgunoğlu & Öney, 1999; Öney & Goldman, 1984); the relationship between spelling and metalinguistic processing skills had not been investigated. Because it is the first to examine the multi-level metalinguistic skills, the present research study was not comparable to any other studies conducted to measure the effects of multiple metalinguistic awareness skills on spelling performance. The results of this study provided converging results with the current body of correlational studies that examined the relationship between one or multiple metalinguistic skills and spelling outcomes with native English speakers. In the closest comparable study of native English speakers, Berninger, Abbott, Nagy, and Carlisle (2010) conducted a longitudinal study to examine the phonological, morphological, and orthographic processing skills growth of first to sixth graders who were native English speakers. Berninger et al. found the greatest growth in phonological and orthographic processing skills during the primary grades and a substantial morphological processing skill growth at later grades (e.g., derivational morphology growth after 4th grade). This finding provided directions to interpret the results of the present dissertation study that morphological processing skills that may emerge at later stages could become influential on the EFL literacy outcomes of Turkish students at a later stage of their L2 development.

In the current study, all three types of metalinguistic skills showed statistically significant and positive impacts on the English word spelling outcomes of Turkish students at grades 6, 7, and 8. Although the phonological and orthographic processing

skills had higher impacts on English word spelling outcomes of Turkish students, the morphological processing construct had a lower but still significant impact. The second-order factorial design revealed that two metalinguistic skills, phonology and orthography, had high factor loadings on the second-order factor, linguistic repertoire, with factor loadings of .84 and .64 respectively. Morphology loaded onto the linguistic repertoire with a lower regression coefficient of .49. The second-order factor, linguistic repertoire, predicted over 60% of the variance of TWS English word spelling performance of Turkish EFL students with a factor loading coefficient of .98. The final configural SEM model with the second-order factor predicted the spelling performance of all grades statistically significantly.

These findings support the emerging linguistic repertoire theory. Apel and Masterson (2001) proposed the linguistic repertoire theory, based on the assumption that spelling was a linguistic skill that actively utilized multiple linguistic resources. In a later study, Apel, Masterson, and Hart (2004) tested the role of multi-linguistic spelling instruction in the classroom setting. Apel, Masterson, and Hart (2004) introduced multi-linguistic spelling instruction in one third-grade class while the other class, which matched the linguistic and ethnic profile of the experimental class, adopted the traditional methods of spelling instruction. In the traditional spelling instruction class, a list of vocabulary words were given to students on a certain school day and the students' spelling knowledge was tested on a later day. By contrast, the multi-linguistic spelling instruction approach consisted of several units that focused on each type of metalinguistic skill. After nine weeks of instruction, students in both classrooms were given the same

word spelling test. While the ones in the traditional spelling classroom did not show any improvement (*d*= -.07), the ones who were taught based on multi-linguistic approach showed a major improvement in their spelling with a medium effect size of *d*= .65.

In one of the few SEM studies to examine all three metalinguistic skills together, Zhao (2011) confirmed the role of linguistic repertoire based on the combined contributions of morphological, phonological, and orthographic knowledge to the English spelling attempts of monolingual English 3rd-grade students and Chinese 8th-grade EFL. All three metalinguistic skills combined together predicted English word spelling outcomes of English and Chinese EFL speakers better than the three skills separately. Similar to Zhao, the present study found a second-order factor of "linguistic repertoire" better predicted Turkish EFL students' spelling outcomes than the three meta-linguistic skills separately.

The present study is the first to measure the simultaneous effects of three metalinguistic skills to predict the English word spelling outcomes of Turkish students; it also contributes converging findings supporting the emergence of linguistic repertoire theory that claims that phonological, morphological, and orthographic processing skills develop together and are influential on literacy practices. Although the current study cannot support or refute linguistic repertoire theory among monolingual English speakers, the findings, with Zhao's, provide additional evidence that EFL learners may use all three skills simultaneously in their attempts to spell English words. Considering Turkish is a language with a highly transparent orthography, whereas Chinese has

arguably the most opaque orthography, these two studies' findings provide highly suggestive evidence of the importance of all three metalinguistic skills in EFL spelling.

The qualitative analyses of the spelling errors also provided converging results with the findings of the quantitative analyses. The English word spelling error analyses of Turkish 6^{th}– 8^{th} graders showed that phonological, orthographic, and morphological processing skills all explained the errors Turkish 6^{th}, 7^{th}, and 8^{th} graders made in spelling English words, with phonological and orthographic processing skills predominating. For instance, the word *knew* was mostly spelled as *new* instead of *know*. This, by itself, indicated that phonological processing skills were playing a more major role compared to morphological skills. It had been hypothesized that the phonetic nature of Turkish would affect the EFL word spelling attempts and would cause phonetically-plausible and orthographically incorrect word spelling attempts (e.g., kanyon-canyon; payl-pile); this hypothesis was confirmed.

Dixon, Zhao, and Joshi (2010) compared the English word spelling outcomes of Singaporean children with different linguistic and ethnic backgrounds: Malay, Tamil and Chinese. Dixon and colleagues found the two groups that were exposed to alphabetic (Malay) or syllabic (Tamil) orthographies had higher rates of phonological errors such as consonant or vowel omission, whereas the Chinese group, with a more visually-learned orthography, made more real-word substitution errors rather than phonetic approximations. The present study did not support this finding because the spellers with a strong native language phonology knowledge had a significant amount of word spelling errors that were categorized as whole-word substitution. There are two plausible ways to

explain this finding. First, Turkish EFL students with limited English word spelling knowledge attempted to spell unknown words simply by substituting them with a word they already knew. The item *nucleus* exemplified this point. Out of 66 spelling attempts on the word *nucleus*, 42 were whole word substitution. The word *nuclear* is a more widely-known word among native Turkish speakers compared to the word nucleus, which students might possibly come across in a science class. The substitution, *nuclear*, was also adopted into Turkish (i.e, *nükleer*, e.g., *nükleer santral*) and is commonly used. Another example would be substituting the word *uniform* for *unify. Uniform* is another commonly known word in Turkish (e.g., okul üniforması—*school uniform*) and out of 83 word spelling attempts on the item *unify*, 48 were whole word substitution with the word *uniform*. In both cases, there were also phonetic approximations (e.g., *nougless-nucleus*; *unifay-unify*); however, these attempts were not as many as the whole word substitution types of errors. To sum up, it seems likely that Turkish students substituted the words with the closest variations with which they were more familiar and comfortable spelling.

A second finding from the error analysis was that Turkish EFL students, who were familiar with their native language phonology and orthography with a consistent letter-sound correspondence, treated English as their foreign language the same way. Two examples, item 15 (*knew*), and item 32 (*baste*) that were highly substituted with other meaningful words (e.g., *new- knew*= 50 times; *best- baste*= 34 times and *based-baste*= 26 times) could explain this second point. In Turkish, silent letters at initial position (e.g., *k*nee, *h*our) or silent e (e.g., baste, plane) are not allowed. Turkish students who were not familiar with the phonological and orthographic characteristics of the

English language might have disregarded such grammatical structures of English and not incorporated them in their English word spelling attempts.

The last structural equation model suggested the integration of the socio-cultural factors such as SES, home-based literacy, and extracurricular English practices to examine the role of these factors, in addition to the three metalinguistic skills in Turkish 6^{th} to 8^{th} graders' EFL word spelling outcomes. The SES, home-based literacy practices, and EFL-related activities were hypothesized to predict the EFL word spelling performance of native Turkish students. Three factor constructs were established based on several items in the demographic background survey. The first factor, socio-economic status, included a question on family income, maternal and paternal education level and occupation. The second factor was home-literacy activities and it was constructed based on the items that tapped into parent-child reading, library visits, library book check-out habits and the number of books at home. The third factor was called EFL and it included several items from the background survey that asked the number of English books at home, and EFL-related habits such as extracurricular English lesson taking, English TV viewing, English book reading, and English experience abroad.

The standardized regression coefficients of the three socio-cultural variables showed the highest regression coefficient of EFL factor on EFL word spelling performance of native Turkish speakers. In other words, the extracurricular activities of Turkish EFL children at grades 6 to 8 had a positive and significantly higher effect on their EFL spelling outcomes compared to the other two factor constructs. It was hypothesized that Turkish pupils with a higher SES would perform better in the spelling

dictation tasks compared to the children of lower SES. The findings, based on the SEM model with the integrated SES variables, indicated that socio-economic status factor, defined by several observed variables such as father's education, father's occupation, and income, and literacy activities, did not predict the EFL spelling outcomes of Turkish EFL students at Grades 6 to 8. Interestingly, the native language literacy practices done at home or outside of school context did not predict Turkish EFL students' EFL spelling outcomes.

Together, these findings showed the EFL factor positively and significantly predicted the English word spelling outcomes of Turkish EFL 6th to 8th graders. Among the three SES factors, the EFL factor with the observed variables tapping into various types of EFL exposure was the strongest predictor of the EFL spelling outcomes of the participating Turkish pupils. This meant that those students who spent more time to familiarize themselves with English language through English book reading, English television viewing, and taking extra English lessons, were the ones who did better on the English word spelling test compared to those who were not as involved in adding to their classroom exposure to English.

The current study examined the role of three metalinguistic skills and the socio-cultural variables in English word spelling outcomes of native Turkish 6th to 8th graders and a robust model fit that represented all grade levels was obtained. The directions for future research include identifying the role of other types of metalinguistic processing skills in English, such as English syntax knowledge, to word spelling and its relationship with the other types of metalinguistic awareness such as phonological, morphological,

and orthographic processing skills. Secondly, the present study was cross-sectional with the integration of three grade levels. In other words, the students were not followed longitudinally to examine the growth of the simultaneous roles of the three metalinguistic skills. A longitudinal study that observes the literacy attainment of Turkish EFL students in L1 and English as an L2, and the development of the L1 and EFL metalinguistic skills over several years would provide literacy researchers and educators with valuable information.

Pedagogical Implications

In old-school spelling instruction in an EFL context, spelling in English has been regarded as a skill that is based on rote memorization. The emerging linguistic repertoire theory that predicted the EFL spelling outcomes of Turkish 6th to 8th graders confirmed that multiple resources were actively involved in the spelling process. This provides pedagogical implications on the ways to teach spelling. Masterson and Apel (2010) suggested abandoning the traditional spelling instruction that de-emphasized the linguistic knowledge that supported word spellings and to replace this old-school system with a multilinguistic spelling approach that highlights the role of phonological, morphological and orthographic information in English word spelling. Effective instructional methods to teach EFL word spelling could include adopting a contrastive approach to compare the phonological, morphological, and orthographic structures of Turkish and English and to teach these metalinguistic awareness skills explicitly by highlighting their role in English spelling system. For instance, the nature of English phonology that includes unstressed sounds or letters, vowel and consonant digraphs;

explicit rules on orthographic mapping that puts constraints in acceptable spelling patterns (e.g., ff at initial position is not allowed) and morpheme-grapheme mapping could enhance English language learners' overall linguistic knowledge. Improving these types of metalinguistic awareness would boost their English word spelling performance.

The English word spelling errors also provided evidence for the effects of native language. Durgunoğlu (2002) compiled a literature review to highlight the importance of focusing on cross-language effects when making judgments on the reading and spelling outcomes. A cross-linguistic approach to take the attention of learners to the linguistic characteristics of English and Turkish is crucial to assist learners understand the underlying linguistic mechanisms that influenced literacy skills outcomes.

Limitations of the Study

The present study included several limitations. First, the limitations related to the nature of the data collection are listed. Because the study research sites were not randomly chosen, the generalizability of the findings is limited and the study findings should be interpreted with caution. Secondly, the tasks were administered in small groups, which did not allow the research affiliates pay attention to individual effort or need to complete the tasks. This resulted in the loss of data, especially at Grade 8 and in the second school data set.

The second type of limitations is related to data collection triangulation for both student spelling data and the socio-cultural background data. Research supports assessment of word spelling based on a multiple data collection methods (Moats, 1995). English word spelling data collection could have provided more comprehensive

information on Turkish students' EFL word spelling performance had it included spontaneously occurring words in addition to word dictation. This is a major limitation when the restrictive nature of word dictation procedures, with the negative influence of time limitation and lack of instruction provided during testing, is considered. These factors could negatively influence EFL learners' English word spelling performance and this could yield misleading information on the word spelling performance of EFL students. Spontaneously occurring word spelling data could provide more in-depth information on the spelling outcomes because the spellers were not limited in timing, and more importantly, they are free to choose which word to spell.

Secondly, the family background survey and the teacher motivation survey provided information about the socio-cultural background of the families with literacy practices, family SES, student EFL exposure, and the strategies frequently used by the EFL teachers based on the responses from the instructors. Subjectivity of the participating parents and teachers could distort the findings. Data triangulation by interviewing the family members and the instructors to validate their responses could be one method to eliminate the bias in the teacher data; however, this was not possible due to time limitation. Some of the items in the teacher motivation survey, for instance, included words that could change the direction of the responses. In the teacher survey, in Item 28- the word '*constantly*' could be the reason why several teachers reported a lower frequency of implementation of this item. The interview with the instructors could have confirmed this point; however, an interview was not performed. Another teacher data triangulation method would be classroom observation by using the same rubric as an

observation checklist to cross-validate the frequency reporting by the instructors. Both of these methods were the suggested procedures to prevent subjective, biased data. Due to the time limitation, neither of these data triangulation methods were adopted.

The present study included three grade levels and the cross-grade level nature of the study prevented the observation of change over time. A longitudinal study that follows students over several years would provide valuable data on how the phonological, morphological and orthographic processing skills develop over time and whether such developmental growth would play a role in students' English word spelling outcomes.

Limitations exist in spelling error analysis because some of the errors were not easy to put in one category only. Spelling attempts such as *new* for *knew* could be categorized in different ways depending on the nature of the languages involved. Silent letters such as *k* in *knew* is not allowed in Turkish. If we consider this perspective, we could say this is an L1 type of error. The second plausible interpretation of this type of error would be the omission of a consonant by disregarding the silent letter. The third possibility is that Turkish EFL learners who were not familiar with the past tense form of verb *know* substituted a more familiar word *new* for this word. Due to this type of uncertainty when categorizing the word spelling errors, validation of the student spellings was necessary. An interview with the participating students to understand the nature of their English word spelling choices was not possible; therefore, the categorization of the spelling errors was not validated.

Conclusions

The present study is unique with its multi-dimensional factor constructs to represent three meta-linguistic skills and its comprehensive nature to examine the simultaneous role of multiple types of metalinguistic skills in English word spelling of a group of non-native English speaking children. Although it had certain limitations, the present study provided theoretical and empirical evidence for the simultaneous role several metalinguistic awareness skills, phonology, morphology, and orthography, play in Turkish EFL learners' English word spelling performance. The strong correlations among the observed variables, three factor constructs, and the impact of the three factors on English word spelling performance of EFL learners were noteworthy. The word spelling error analyses that showed a major role of phonological and orthographic processing skills in word errors were in parallel with the quantitative, statistical data analysis results. The present study incorporated the socio-cultural variables to assess the impact of them on EFL word spelling performance. One socio-cultural factor construct called EFL included items that tapped into different sorts of English exposure and habits, and this factor was found to have a strong impact on English word spelling outcomes of Turkish speakers.

From a pedagogical perspective, the present study provides useful information to the educational researchers and educators to explore the unique and joint contributions of phonological, morphological, and orthographic processing skills to the English word spelling outcomes of native Turkish students who come from a transparent L1 background and are the learners of English in a foreign language context.

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APPENDIX A

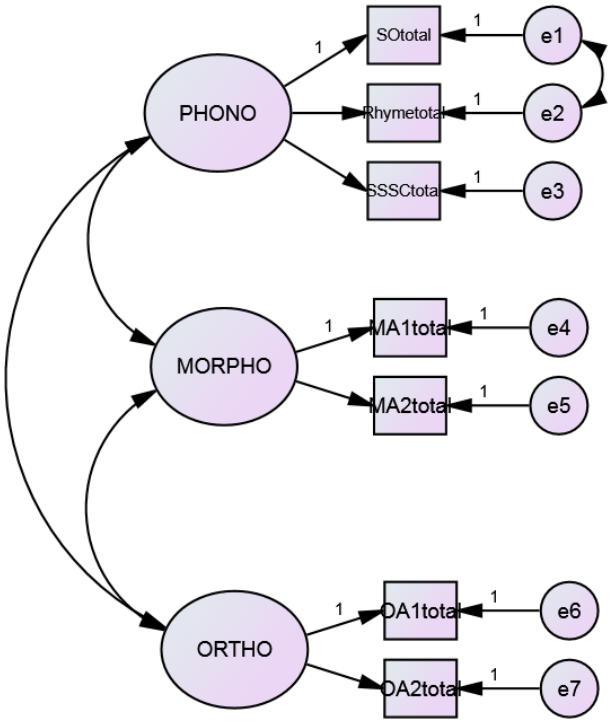


Figure 7

Modified Baseline CFA Model

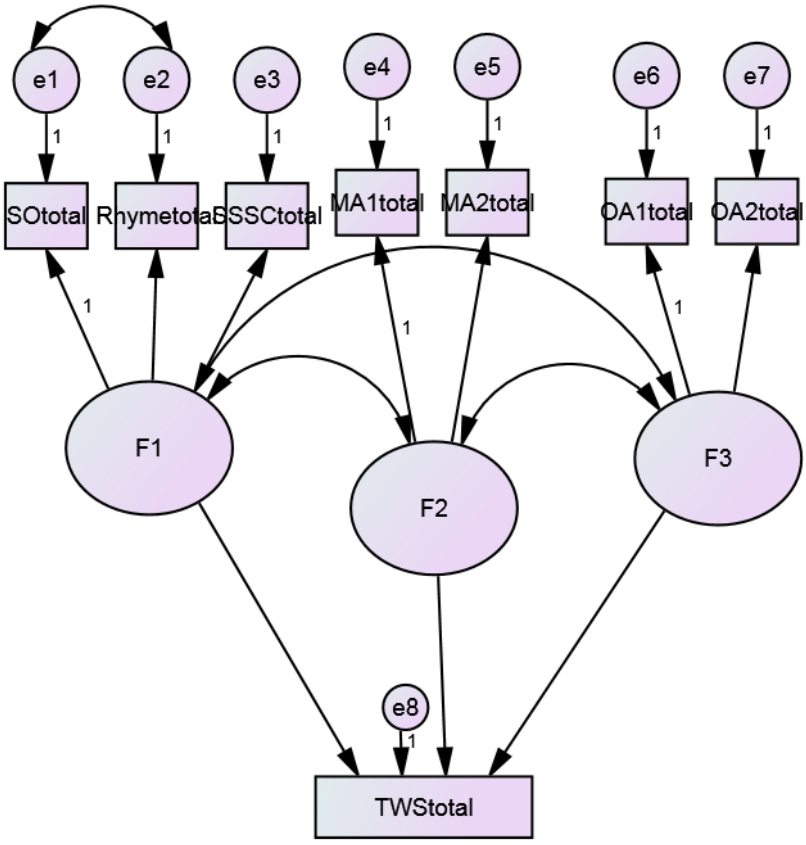


Figure 8

Hypothesized Baseline Structural Equation Model

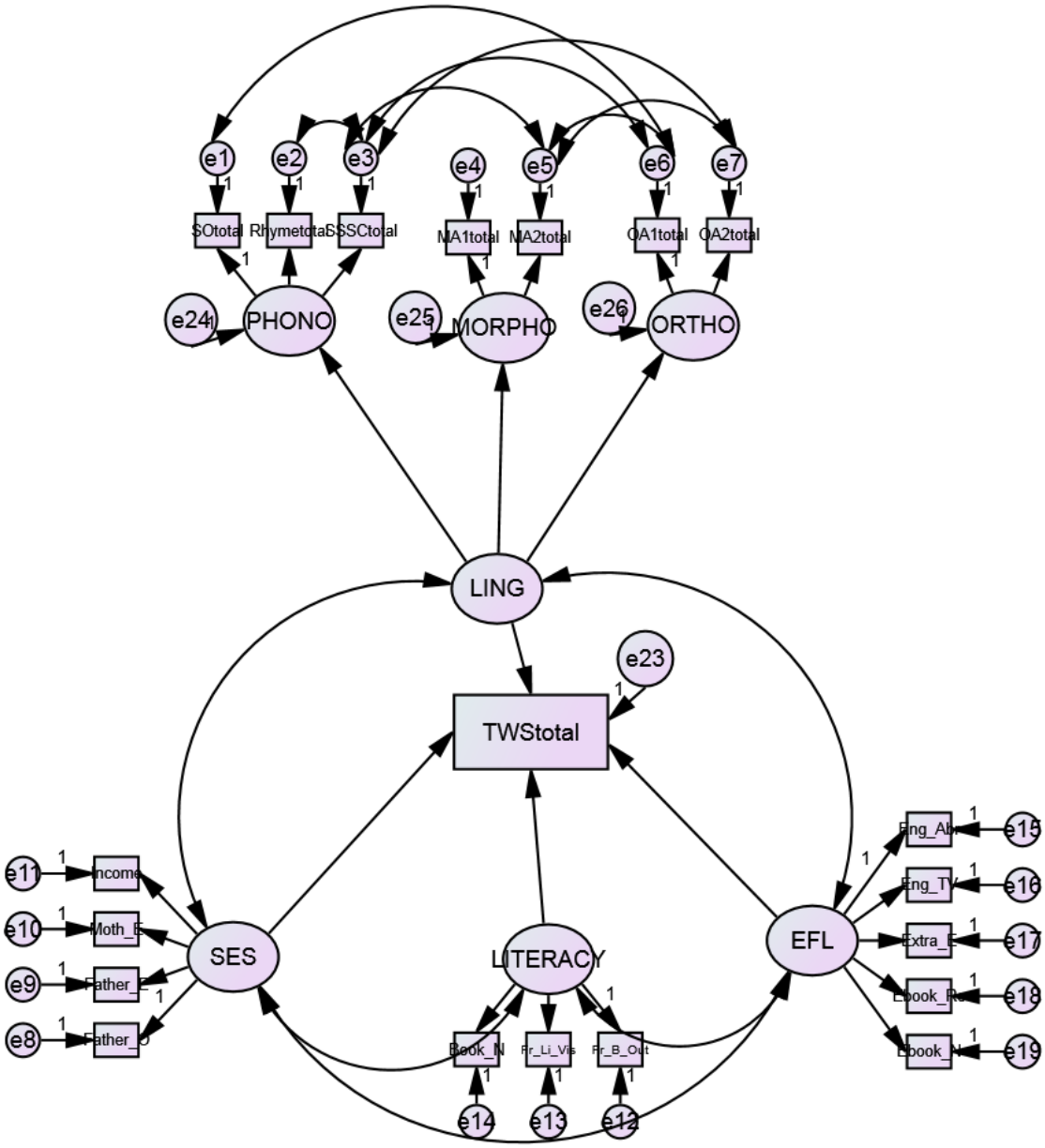


Figure 9

SEM Model with SES Variables

APPENDIX B

B. 1. ENG SPELL 1-Test of Written Spelling 4 (Larsen & Hammill, 1999) Form A
You will hear a number which is followed by an English word. Please write down the words you will hear on the answer sheet.
Task: 20 minutes

#	Word	Sentence	Word
1	Yes	Yes, I am going to Maria's house today	Yes
2	Bed	She slept on a bed.	Bed
3	Let	Please let me go.	Let
4	Us	Please come with us to the puppet show.	Us
5	Went	Jim went to the store.	Went
6	much	You didn't eat much of your breakfast.	much
7	Next	She is next in line.	Next
8	Spend	Did you spend the money?	Spend
9	Who	Who did you see?	Who
10	Shake	Did the baby shake the rattle?	Shake
11	Eight	The boy had eight books.	Eight
12	Strong	The woman was strong.	Strong
13	Pile	The boys played on a pile of dirt.	Pile
14	Knife	The knife was sharp	Knife
15	Knew	Kathy knew the right answer.	Knew
16	Tardy	Alan was tardy for school.	Tardy
17	Nineteen	My brother is nineteen years old.	Nineteen
18	Section	The children read the first section of the book.	Section
19	Signal	The cars stopped at the traffic signal	Signal
20	Expect	We expect them to be on time.	Expect
21	Canyon	The canyon is very deep.	Canyon
22	District	The congressman campaigned in his district.	District
23	Fountain	There was water in the fountain.	Fountain
24	Legal	The judge has legal authority	Legal
25	Terrible	Paul saw the terrible storm.	Terrible
26	Unify	Being angry does not help unify a group.	Unify
27	Bicycle	Paul received a bicycle for his birthday.	Bicycle
28	Institution	The school is called an institution of learning.	Institution
29	Collar	She buttoned her collar	Collar
30	Agriculture	Agriculture is an important part of the economy.	Agriculture
31	Visualize	It is not always possible to visualize a dream.	Visualize
32	Baste	It's time to baste the turkey.	Baste
33	Nucleus	The cell has a nucleus.	Nucleus
34	Tangible	A dream is not tangible.	Tangible
35	Tranquil	The tranquil scene helped calm her thoughts.	Tranquil

36	Continuity	There is little continuity in the stock	Continuity
37	Luminous	The luminous sign was an effective advertising tool	Luminous
38	Laborious	The laborious task took four hours.	Laborious
39	Linguistic	John's linguistic competence was well recognized	Linguistic
40	Opaque	The new fingernail polish was opaque.	Opaque
41	Gauntlet	The group had its new members run the gauntlet	Gauntlet
42	Panorama	The wall contained a panorama of the Grand Canyon.	Panorama
43	Finesse	The game of bridge requires finesse.	Finesse
44	Gregarious	Sheep are gregarious creatures	Gregarious
45	Zealous	Jose was zealous in his beliefs.	Zealous
46	Requisite	The student did not have the requisite skills for the course.	Requisite
47	Champagne	Champagne was used to toast the bride and groom.	Champagne
48	Cyst	A cyst was found in the dog's leg.	Cyst
49	Versatile	Susan was very versatile dancer	Versatile
50	Liaison	The company's liaison spoke to the general.	Liaison

B.2. TWS Spelling Error Analysis Rubric

I. Orthographic (phononologically accurate) errors:

homophones	by/buy to/two
letter name	opning, reflexs
surface phonetic	one/own, tipe/type cind/kind
letter reversal	emdarase
schwa misspelling	attatude
silent e overgeneral	plane/plan, hotele/hotel
sounding out	payl/pile
L1 effect	

II. Phonological errors (phonologically inaccurate):

consonant substitution	
consonant addition	
consonant omission	
whole word substitution	close/cost
schwa deletion	
vowel substitution	werey/worry
consonant blend	

schwa insertion
syllable omission
consonant order reversal
multiple errors/undecipherable
vowel insertion

III. Morphological errors
Omission of ed
addition of ed
addition of prefix
addition of suffix
omission of prefix
omission of suffix
misspelling of prefix
misspelling of suffix

B.3. Pseudoword Spelling Task Woodcock Johnson III Form A- Spelling of Sound Subset (Woodcock, McGrew, & Mather, 2001)
Sample Items
Starting With Sample Item C
The research associate will say: " I am going to ask you to spell some words that are not real words—they are nonsense words. Nonsense words may sound like "bip", "ost", "mib". Try to spell the nonsense word the way you think it would be spelled if it were a real word. Listen carefully. I will say the nonsense word twice and then you write it".
C. "Ut", "ut" (pronounced as in cut.)
D. "Ab", "ab" (pronounced as in cab.)
Spelling of Sounds Test Begins
The research associate will say: "Now you will hear the nonsense words from the audio. After you hear the word twice, you will hear two beeps. Then I want you to spell the word. Begin with number six."

#	Nonsense words	Correct Answer
6	gat	g-a-t (3 pts)
7	ift	i-f-t, i-ff-ed (3 pts)
8	pag	p-a-g (3 pts)
9	glay	g-la-y (3 pts)
10	pash	p-a-sh (3 pts)
11	foy	f-oy, ph-oy (2 pts)
12	jong	j-o-ng (3 pts)
13	splunted	splunted
14	grunches	grunches
15	quib	quib
16	glounder	glounder
17	stribbles	stribbles

18	toping	toping, toaping
19	scritch	scritch
20	glinful	glinful
21	flidge	fledge, phlidge
22	stenerous	stenerous, stenorous
23	briff	briff
24	gaw	gaw
25	tranning	tranning
26	automitous	automatous, automatous, automatous, automotous
27	ket	ket
28	stawn	stawn

B. 4. Scoring Rubric for WJ-III Pseudoword Spelling Task: The scoring directions provided in the test kit will be followed closely. As instructed in the tester's manual, test items 6-12 will be scored with multiple points (3, 2, 1, or 0). All other items will be scored 1 or 0. The responses listed in the test book are the only acceptable correct answers. For items 6 through 12, points for each grapheme, or word part, that is in proper sequence and the words that are correctly spelled will be given points. Points will be deducted if the subject gives sounds that are not present, sounds that have been altered by extra letters, or sounds out of sequence. Reversed letters, as long as they do not form different letters, will be accepted. For instance, a reversed "b" becomes a "d" would be incorrect.

B. 5. Phonological Processing Tasks

Sound Oddity Task (Adopted from James, 1996)

Direction: You will have a set of four pictures representing a set of words on the test paper. You will listen to the audio prompt and choose which word has a different initial, middle and final sound. Please listen to the audio sound to find out which word has a different initial sound. First Section A: Initial Sound Different

Instruction: Please listen to the audio sound to find out which word represented by the picture has a different initial sound.

(Practice Items were already shared in text. **The following items with missing sounds will be replaced with picture prompts.**)

1.	__ud	__un	__us	__ug
2.	__ip	__in	__ill	__ig
3.	__am	__ap	__ad	__at
4.	__eg	__en	__ell	__et
5.	__id	__ick	__iss	__ill
6.	__ot	__op	__ock	__og
7.	__eap	__ean	__eal	__eat
8.	__ack	__ab	__ag	__ap
9.	__im	__ip	__ick	__ip
10.	__oof	__oom	__ood	__oot

Section B: End Sound Different
Instruction: Please listen to the audio sound to find out which word represented by the picture has a different final sound.
Practice Item: fan, cat, hat, mat
Practice Item 2: leg, peg, hen, beg

1.	pi__	wi__	si__	fi__
2.	do__	ho__	to__	po__
3.	bu__	hu__	gu__	su__
4.	ma__	ca__	ga__	pa__
5.	me__	re__	be__	fe__
6.	wi__	fi__	pi__	di__
7.	wee__	pee__	nee__	dee__
8.	pa__	la__	sa__	ba__
9.	san__	han__	lan__	ban__
10.	sin__	min__	pin__	win__

Section C: Middle Sound Different
Please listen to the audio sound to find out which word has a different middle sound.
Practice Item: mop, hop, tap, lop
Practice Item 2: pat, bat, fit, cat

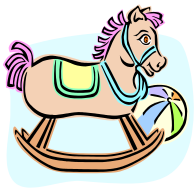
1.	l__t	c__t	p__t	h__t
2.	f__n	p__n	b__n	g__n
3.	h__g	d__g	p__g	w__g
4.	r__d	f__d	l__d	b__d
5.	w__g	r__g	b__g	l__g
6.	f__ll	d__ll	w__ll	b__ll
7.	m__n	b__n	p__n	t__n
8.	f__g	d__g	m__g	l__g
9.	f__d	n__d	w__d	s__d
10.	f__sh	d__sh	w__sh	m__sh

Scoring:
1= Correct answer
0= Incorrect answer

Paper and Pencil adaption from Woodcock Johnson III Form B Subtest 21A (Sound Awareness-Rhyming)
Sample item:
Instructions: The research associate will say: “Look at these pictures – cat, sun, hat. Circle the two that end alike or rhyme.
[picture of cat] [picture of sun] [picture of hat]
A B C Correct answer: A and C

Test Items

Instructions: Look at the pictures and listen to the audio sound and find out which two of the following three words end alike or rhyme.

1.	 A  B  C	Answer _A_ and B__
2.	 A  B  C	Answer _A_ and C__
3.	 A  B  C	Answer _A_ and _C_
4.	 A  B  C	Answer _A_ and _B_
5.	 A  B  C	Answer A__ and _C_

6.	 A  B  C	Answer _B_ and _C_

Scoring
1 = Correct response
0 = Incorrect response
Speech Sound and Syllable Counting Task
Part A
Directions: Please listen to the words in the audio and write down how many speech sounds you heard.
How many speech sounds are in the following words?
Practice Item: the word “cat” has speech sounds ‘k’-‘a’-‘t’.
Analysis of the speech sounds

Item	Word		# of Speech Sounds	Item	Word		# of Speech Sounds
1	add	‘a’-‘d’	2	10	Tuesday	t-u-z-d-a-i	5
2	ship	‘sh’-‘i’-‘p’	3	11	making	m-a-k-i-ŋ	5
3	grass	g-r-a-s	4	12	sale	s-ey-l	3
4	box	b-o-k-s	4	13	basket	b-a-s-k-e-t	6
5	moon	m-u-n	3	14	market	m-a-r-k-t	5
6	brush	b-r-u-sh	4	15	cooked	k-u-k-t	4
7	knee	n-i	2				
8	through	th-r-u	3				
9	whether	wh-e-th-e	4				

Part B
Directions: Please listen to the words in the audio and write down how many speech sounds you heard.
How many syllables are in the following words?
Practice Item: the word “perfect” has 2 syllables, “per”-“fect”.
Analysis of syllables

Item	Word	# of Speech Sounds	Item	Word	# of Speech Sounds
1	together	3	10	treat	1
2	drink	1	11	question	2

3	bookkeeper	3	12	strangely	2
4	frogs	1	13	watermelon	4
5	pocket	2	14	political	4
6	achieve	2	15	university	5
7	composition	4			
8	beautiful	3			
9	unhappy	3			

B. 6. Morphological Processing Skills Tasks

Morphological Signals (Washington Language Battery Subtest A—Berninger& Nagy, 2003).

"Morphological Signals" measures implicit derivational morphological knowledge receptively. The participants will be asked to choose the best option in each multiple choice items. Items in this test are exact ones from the subtest.

Instruction: Choose the best option to complete sentence. (Correct answers are in bold)

1. He listened carefully to the _____.
   a) **directions** b) directs c) directing d) directed
2. It was the _____ sky of the winter.
   a) darkful b) darkless c) **darkest** d) darkly
3. Did you hear the _____?
   a) announce b) announcing c) announced d) **announcement**
4. His _____ saved the dog.
   a) quicker b) quickly c) quickest d) **quickness**
5. Her imagination led to a wonderful _____ .
   a) creative b) **creation** c) creator d) create
6. The lost dog was _____.
   a) **homeless** b) homeish c) homeful d) homeness
7. It is _____ not to lock your bike in the rack.
   a) foolness b) fooless c) **foolish** d) foolful
8. She hoped to make a good _____.
   a) impressive b) impressionable c) **impression** d) impressively
9. A famous doctor performed the _____.
   a) **operation** b) operational c) operative d) operationalize
10. Watch carefully. I will _____.
    a) demonstration b) demonstrative c) demonstrable d) **demonstrate**

'Comes From' Task

(Washington Language Battery Subtest B—Berninger& Nagy, 2003).

This task measures explicit derivational morpheme and word stem knowledge of English words receptively. The original task consisted of 80 items. A sample of 20 items are included based on an analysis of English textbooks used for grades 6, 7, and 8.

Comes From Test-Receptive Version

If the first word comes from the second, circle YES
If the first word does not come from the first, circle NO (Correct answers are in bold)
Sample 1- teacher teach **YES** NO
Sample 2- Single sing YES **NO**

1.	winter	win	YES	**NO**
2.	sunny	sun	**YES**	NO
3.	flight	fly	**YES**	NO
4.	message	mess	**YES**	NO
5.	climber	climb	**YES**	NO
6.	personal	person	**YES**	NO
7.	butter	but	YES	**NO**
8.	dollar	doll	YES	**NO**
9.	center	cent	YES	NO
10.	needle	need	YES	**NO**
11.	mother	moth	YES	**NO**
12.	forty	four	**YES**	NO
13.	summer	sum	YES	**NO**
14.	shoulder	should	YES	**NO**
15.	carpet	car	YES	**NO**
16.	rainy	rain	**YES**	NO
17.	cotton	cot	YES	**NO**
18.	global	globe	**YES**	NO
19.	market	mark	YES	**NO**
20.	thinker	think	**YES**	NO

B. 7. Orthographic Processing Skills Tasks

Homophone Choice Task (Aaron, Joshi &Williams, 1999)

In each of the following rows, circle the one that is NOT an English word.
Practice Item: Which one is not an English word? see sea **cee**
Practice Item 2: Now you try these: to **tou** too buy bye **bie**

1.	Hear	here	heer
2.	Knew	new	knwe
3.	No	know	knoe
4.	There	their	their
5.	Hole	hoale	whole
6.	Blew	blue	bloo
7.	Throu	threw	through
8.	Summ	sum	some
9.	Waigh	weigh	way
10.	Scent	cent	sent
11.	Sell	cell	scell
12.	Brake	braek	break

13. Waek weak week
14. Woode wood would
15. Rose rows rwos
16. Meet meat meate
17. Bred braed bread
18. Wone one won
19. Plain plane plaine
20. Reede reed read
21. Pleas please plees
22. Soe sow so
23. Bete beet beat
24. Rode roade road
25. Peek peak peeck
26. Roal roll role
27. Nihgt knight night
28. Wrote rote roat
29. Steel stael steal
30. Seen scene sceen
31. Faire fare fair
32. Rain rayn rein
33. Peace piece peice
34. Creack creek creak
35. Root route ruote
36. Haerd herd heard
37. Wait waite weight
38. Sole soul soal
39. Syte sight site
40. Idle idel idol

Orthographic Constraint Task
In each of the following word pairs, circle the one that DOES look like an English word.
Practice Item: neff nnef (second word since double n at the initial position does not exist in English)
1. ffeb beff
2. dalled ddaled
3. yikk yinn
4. vayying vadding
5. dacker ckader
6. vaad vadd
7. munt muun
8. moyl moil
9. bei bey
10. daw dau
11. gri gry

12. chym chim
13. milg miln
14. vism visn
15. vosst vost
16. skap sckap
17. qoast quoast
18. phim ffim
Note: Correct choices are underlined.

B. 8. Literacy Background Questionnaire (English)
Your child's information
1. First Name_____ Last Name_____
2. Gender ( ) Male ( ) Female
3. Date of birth _____ (MM/DD/YYYY)
4. Class/Grade Level _____
5. School _____
---
6. Mother's education:
a. Highest degree obtained_____
b. Total years of education completed_____
7. Mother's occupation_____
8. Father's education:
a. Highest degree obtained_____
b. Total years of education completed_____
9. Father's occupation_____
10. What is your family income?
O Less than 1,000 Turkish Liras O 1,000 to 1,500 TL O 1,500 to 2,000 TL O 2,000 and above TL
11. How many books for children are there in your home?
O Fewer than 10 O 11-25 O More than 25
12. How many books other than textbooks are there in your house?
O Fewer than 10 O 11-25 O More than 25
13. How many English books are there in your home?
O Fewer than 10 O 11-25 O More than 25
14. How many English books other than textbooks are there in your home?
O Fewer than 10 O 11-25 O More than 25
15. How often does an adult/older sibling read or look at books with (child) *IN ENGLISH*?
O Daily O 1-2 times a week O 2-3 times a month O Once a month O Almost never
16. How often does someone take (child) to the library?
O Daily O 1-2 times a week O 2-3 times a month O Once a month O Almost never

17. How often does (child) check out books from the library?
O Daily O 1-2 times a week O 2-3 times a month O Once a month O Almost never
18. How often does your child take private tutoring to learn English?
O Daily O 1-2 times a week O 2-3 times a month O Once a month O Almost never
19. How often does your child watch TV programs in English?
O Daily O 1-2 times a week O 2-3 times a month O Once a month O Almost never
20. What is the main language of television for your child?
_____
21. When does your child start taking English classes? (state grade level and age)
_____
22. Has your child been to another English-speaking country?
_____
23. If you have a child who has been to an English-speaking country, please state how long s//he stayed.
_____
24. Does your child know other languages besides English?
O Yes. Please specify_____
O No.
25. Is there documented impairment in visual, speech and language for your child?
O Yes. Please specify_____
O No.

B. 9. Teacher Survey **(**adaptation from Dörnyei & Csizér, 1998)
Read the statements numbered 1-30. Choose a number on the side depending on how frequently you adopt those strategies or use them in your classrooms.
Key to 5-point Likert Scale of Frequency:
1- never
2- rarely, hardly-ever
3- sometimes
4- often, frequently
5- always, every time

#	Strategy	1	2	3	4	5
1	Prepare for the class properly.					
2	Show a good example by being committed and motivated.					
3	Create a pleasant atmosphere in the classroom.					
4	Bring in humor, laughter and smile.					
5	Give clear instructions.					
6	State the purpose and utility of every task.					
7	Develop good relationship with your students.					
8	Give positive feedback and appraisal.					

9 Offer a variety of materials.
10 Vary the activities.
11 Make tasks challenging to involve your students.
12 Encourage creative and imaginative ideas.
13 Encourage questions and other contributions from the students.
14 Familiarize the learners with the cultural background of the language they are learning.
15 Use authentic materials.
16 Find penfriends for your learners.
17 Invite native speakers to some classes.
18 Include regular groupwork in your class.
19 Organize extracurricular (out-of-class) activities.
20 Help students develop realistic expectations about their learning.
21 Set up specific learning goals for the learners.
22 Emphasize the usefulness of the languages.
23 Besides grades, give the learners other rewards.
24 Help maintain the set of classroom rules that students accepted.
25 Regularly review the classroom rules with your students.
26 Allow students to create products that they can display or perform.
27 Avoid any comparison of students to one another.
28 Constantly encourage your students.
29 Demystify mistakes: they are a natural part of learning.
30 Select tasks that do not exceed the learners' competence.

B. 10. ISCO-88 International Standard Classification of Occupations (2004, Retrieved from http://www.ilo.org/public/english/bureau/stat/isco/isco88/.)

Code	Main Category	Occupation
0	Armed Forces	army, navy, air force, police officer, custom inspector
1	Legislators, Senior Officers, and Managers	Legislators, senior officials, corporate managers, general managers
2	Professionals	physical, mathematical, and engineering science professionals, health professionals, teaching professionals
3	Technicians and Associate Professionals	Physical and Engineering science associate professionals, life science and health associate professionals teaching associate professionals
4	Clerks	Office clerks, customer services clerks
5	Service workers, shop and market sales workers	personal and protective services workers, salesperson
6	Skilled Agricultural and Fishery Workers	skilled agricultural and fishery workers
7	Craft Etc. Trades Workers	Extraction and building trades workers Metal and machinery trades workers handicraft trades workers
8	Plant & Machine Operators	machine, stationary-plant operators, drivers and mobile-plant operators, semi-skilled workers
9	Elementary Occupations	Sales and elementary occupations, laborers in mining, construction, manufacturing, transport

B. 11. Child Assent and Parental Consent Forms in Turkish

B. 11. 1. Child Assent Form in Turkish

TEKSAS A&M ÜNİVERSİTESİ İNSAN DENEKLERİN HAKLARINI KORUMA PROGRAMI

GÖNÜLLÜ KATILIMCI FORMU

PROJENİN BAŞLIĞI: 6.,7., ve 8. SINIF TÜRK ÖĞRENCİLERİNİN İNGİLİZCE KELİMELERİ YAZMA PERFORMANSLARI VE FONOLOJİK, MORFOLOJİK VE ORTOGRAFİK FAKTÖRLERİN ETKİSİ

Sn. Prof. Quentin Dixon'ın danışmanlığında Melike Ünal tarafından hazırlanan araştırma projesine katılımcı olarak davet edilmiş bulunmaktasınız. Bu form sizi bu çalışma hakkında bilgilendirmek ve çalışmayla ilgili sorularınızı cevaplamak amacıyla hazırlanmıştır. Çalışmaya katılmaya karar verdiğiniz takdirde bu form sizin gönüllü katılım formunuz olarak kullanılacaktır. Katılmamaya karar verirseniz kaybedeceğiniz hiçbir şey olmadığı gibi herhangi bir ceza da söz konusu değildir.

Bu Çalışma Neden Yapılıyor?

Bu çalışmanın amacı dille ilgili fonolojik, morfolojik ve ortografik faktörlerin 6.,7., ve 8. sınıf öğrencilerinin İngilizce kelimeleri yazma performanslarına etkisini ölçmesi amacıyla tasarlanmıştır.

Neden Bu Çalışmaya Katılım İçin Davet Ediliyorum?

Bu çalışmaya gönüllü katılımcı olarak davet ediliyorsunuz çünkü Türkçe konuşuyor ve İngilizceyi yabancı dil olarak 6.,7., ve 8. sınıflarda alıyorsunuz.

Bu Çalışmaya Kaç Kişi Davet Edildi?

Bu çalışmaya yaklaşık 600 6.,7., ve 8. sınıf öğrencisi davet edildi.

Çalışmaya Katılmamanın Alternatifi Nedir?

Gönüllü katılım esas olduğundan çalışmaya katılımın alternatifi katılmamaktır.

Bu Çalışmada Ne Yapmam Bekleniyor?

Çalışmaya gönüllü katılımcı olarak anketi doldurmanız ve sınıfta grup halinde verilecek bazı testlere katılmanız beklenmektedir. Katılımınız yalnızca yaklaşık bir ders saatinizi alacaktır ve bu süre zarfında kağıt-kalem bazlı testlere katılacaksınız.

Çalışmaya Bağlı Riskler Nelerdir?

Bu çalışma günlük hayatta başınıza gelebilecek herhangi bir riskten daha büyük bir risk içermez.

Çalışmanın Bana Faydaları Nelerdir?

Çalışmanın size direk faydaları İngilizce kelime yazma kapasitenizi ölçmek ve bu konuda uzmanlardan bilgi edinmek.

Çalışmanın Bana Masrafı Olacak Mı?

Zamanınız dışında çalışmanın size bir masrafı yoktur.

Çalışmaya Katılım İçin Ücret Alacak Mıyım?

Bu çalışma gönüllü katılıma dayalı olup katılımı ücretlendirme söz konusu değildir.

Benim Katılımcı Bilgilerim Gizli Tutulacak Mı?

Çalışmaya katılımınız gizli tutulacaktır. İsminiz çalışmaya bağlı hiçbir yerde ya da makalede yer almayacaktır. Katılımcı anketleri yalnızca Melike Ünal'ın ve Dr. Quentin Dixon'un ulaşabileceği bir yerde saklanacaktır. Kağıt üzerindeki bilgiler kilitli bir kasada

ve bilgisayardan erişilebilecek bilgilerse şifreli bilgisayarlarda saklanacak ve yalnızca araştırmacılar bu bilgilere erişebilecektir.

Daha Fazla Bilgi İçin Kime Ulaşabilirim?

Çalışma hakkında dilek ve şikayetlerinizi çalışmadaki danışman hoca Dr. Quentin Dixon'a 281-210-8688 nolu telefonu arayarak ya da qdixon@tamu.edu adresinden email atarak ya da Melike Ünal'a 979-997-3088 nolu telefondan ya da melikeunal@tamu.edu adresinden email atarak ulaşabilirsiniz. Bu çalışmaya gönüllü katılımcı olarak sorularınızı, şikayetlerinizi ya da endişelerinizi Teksas A&M Üniversitesi İnsan Denekleri Koruma Programı Ofisini 979-458-4067 nolu telefonu arayarak ya da irb@tamu.edu adresine email atarak ulaşabilirsiniz.

Katılım Konusunda Fikrimi Değiştirirsem Ne Olacak?

Bu çalışmada tamamiyle gönüllülük esas olduğundan çalışmaya katılıp katılmama kararı size aittir. Çalışmaya en başından katılmamayı ya da ortasında bırakmayı isteyebilirsiniz. Çalışmaya katılmamak işinizde, derslerinizde ya da ders notlarınızda herhangi bir değişikliğe neden olmayacaktır.

Bu anketi tamamlayarak araştırmacıya bilgilerinizi kullanabilme hakkını vermiş bulunuyorsunuz.

GÖNÜLLÜ OLMA İBARESİ

Çalışmayla ilgili tüm prosedürler, riskler ve faydalar bana açıklanmakla birlikte gönüllü katıldığımı bildiririm. Sorularım cevaplanmıştır ve istediğim an soru sorabilme hakkım olduğunu biliyorum. Bu formu imzaladığım takdirde yasal hiçbir hakkımdan vazgeçmediğimi ve bu formun bir kopyasını alacağımı biliyorum.

Katılan Öğrencinin İsmi

Ebeveyn İmzası

Tarih

ARAŞTIRMACININ YEMİNLİ İFADESİ

Ben ya da bu projede ortak çalıştığım kişiler ebeveyne çalışmanın detaylarını açıklamıştır. Bu formu imzalayan kişinin çalışmanın getirdiği gereklilikler, fayda ya da riskler hakkında bilgilendirildiğini taahhüd ederim.

Araştırmacının İsmi Soyismi

Araştırmacının İmzası

Tarih

B. 11. 2. Parent Consent Form in Turkish

TEKSAS A&M ÜNİVERSİTESİ İNSAN DENEKLERİN HAKLARINI KORUMA PROGRAMI
EBEVEYN İZİN FORMU
PROJENİN BAŞLIĞI: 6.,7., ve 8. SINIF TÜRK ÖĞRENCİLERİNİN İNGİLİZCE KELİMELERİ YAZMA PERFORMANSLARI VE FONOLOJİK, MORFOLOJİK VE ORTOGRAFİK FAKTÖRLERİN ETKİSİ

Sn. Prof. Quentin Dixon'ın danışmanlığında Melike Ünal tarafından hazırlanan araştırma projesine siz ve öğrencileriniz katılımcı olarak davet edilmiş bulunmaktasınız. Bu form sizi bu çalışma hakkında bilgilendirmek ve çalışmayla ilgili sorularınızı cevaplamak amacıyla hazırlanmıştır. Çalışmaya katılmaya karar verdiğiniz takdirde bu form sizin gönüllü katılım formunuz olarak kullanılacaktır. Katılmamaya karar verirseniz kaybedeceğiniz hiçbir şey olmadığı gibi herhangi bir ceza da söz konusu değildir.

Bu Çalışma Neden Yapılıyor?

Bu çalışmanın amacı dille ilgili fonolojik, morfolojik ve ortografik faktörlerin 6.,7., ve 8. sınıf öğrencilerinin İngilizce kelimeleri yazma performanslarına etkisini ölçmesi amacıyla tasarlanmıştır.

Çocuğum Bu Çalışmaya Katılım İçin Neden Davet Ediliyor?

Çocuğunuz bu çalışmaya gönüllü katılımcı olarak davet ediliyor çünkü 6.,7., veya 8. sınıfa gidiyor ve İngilizceyi yabancı dil olarak okul ortamında öğreniyor

Bu Çalışmaya Kaç Kişi Davet Edildi?

Bu çalışmaya yaklaşık 600 6.,7., ve 8. sınıf öğrencisi ve bu sınıflarda İngilizce öğreten öğretmenler davet edildi.

Çalışmaya Katılmamanın Alternatifi Nedir?

Gönüllü katılım esas olduğundan çalışmaya katılımın alternatifi katılmamaktır.

Bu Çalışmada Çocuğumdan Ne Yapması Bekleniyor?

Çalışmaya gönüllü katılımcı olarak sizin için düzenlenmiş bu formu bilgilerinizle doldurmanız ve imzalamanız beklenmektedir. Çocuğunuz ise sınıf ortamında kağıt-kalem bazlı verilecek bazı testlere katılacaktır ve çalışmaya gönüllü katılımcı formunu doldurup imzalayacaktır.

Bahar 2014 Dönemi İçin Önerilen Çalışma Tablosu

Ziyaret 1 (Birinci Haftada)

Bu ziyaret bir ders saatinden daha az bir süreyi alacaktır. Bu ziyarette gönüllü katılımcı formları katılan öğrenciler tarafından tamamlanacak ve öğrenciler fonoloji ve morfoloji testlerini alacaklardır.

Ziyaret 2 (İkinci Haftada)

Bu ziyaret bir ders saatinden daha az bir süreyi alacaktır. Bu ziyarette önceki haftada gönüllü katılan öğrenciler kağıt-kalem bazlı bazı testler alıp (ortografi ve kelime yazma testleri) çalışmayı sonlandıracaktır.

Çalışmaya Bağlı Riskler Nelerdir?

Bu çalışma günlük hayatta başınıza gelebilecek herhangi bir riskten daha büyük bir risk içermez.

Çalışmanın Bana Faydaları Nelerdir?
Çalışmanın size direk faydaları öğrenci ya da çocuklarınızın İngilizce kelime yazma kapasitesini ölçmek ve bu konuda uzmanlardan bilgi edinmek olacaktır.
Çalışmanın Bana Masrafı Olacak Mı?
Zamanınız dışında çalışmanın size bir masrafı yoktur.
Çalışmaya Katılım İçin Ücret Alacak Mıyım?
Bu çalışma gönüllü katılıma dayalı olup katılımı ücretlendirme söz konusu değildir.
Benim Katılımcı Bilgilerim Gizli Tutulacak Mı?
Sizin ve çocuğunuzun çalışmaya katılımınız gizli tutulacaktır. İsminiz çalışmaya bağlı hiçbir yerde ya da makalede yer almayacaktır. Katılımcı anketleri yalnızca Melike Ünal'ın ve Dr. Quentin Dixon'un ulaşabileceği bir yerde saklanacaktır. Kağıt üzerindeki bilgiler kilitli bir kasada ve bilgisayardan erişilebilecek bilgilerse şifreli bilgisayarlarda saklanacak ve yalnızca araştırmacılar bu bilgilere erişebilecektir.
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Katılım Konusunda Fikrimi Değiştirirsem Ne Olacak?
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GÖNÜLLÜ OLMA İBARESİ
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Gönüllü Katılım İçin İzin Veren Ebeveynin İsmi

Ebevenynin İmzası

Tarih

ARAŞTIRMACININ YEMİNLİ İFADESİ
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Araştırmacının İsmi Soyismi

Araştırmacının İmzası

Tarih