THE RELATIONSHIPS AMONG COGNITIVE PROCESSES, LANGUAGE EXPERIENCE AND ERRORS IN FARSI SPEAKING ESL ADULTS

by

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ABSTRACT

One of major goals of this study was to examine word reading, cognitive processes (syntactic, phonological, orthographic and memory processes) and errors (syntactic, phonological, and spelling) among bilingual speakers of Farsi and English and to compare their performance to native English speakers. The role of language experience (with L1 and L2) with respect to word reading performance and the making of errors was also examined. Participants were 60 bilingual Farsi speaking ESL students (age range19-35). A comparison group of 57 native English speakers was also examined. Language experience was estimated by measuring age on arrival to Canada, length of residence in Canada, and amount of Farsi materials read while residing presently in Canada. MANOVA and follow-up ANOVAs indicated that bilinguals did significantly better than native English speakers on a phonological awareness task. This may partly be attributed to early training in phonics instruction from pre-school in Iran. Bilingual students had significantly lower scores on an orthographic awareness task. This was explained by a group of bilinguals who were poor readers of English (n=16) and were not familiar with English Roman based script. There were multivariate main effects for English reading ability. Good readers of English had significantly higher scores on all English reading related cognitive processes. There were multivariate main effects for Farsi reading ability. Follow-up ANOVAs indicated that good Farsi readers had significantly higher scores than poor Farsi readers on all Farsi reading related cognitive processes except for Farsi long term memory. Pratt analyses indicated that variation in English word reading performance and phonological errors could be attributed differentially to cognitive processes and language experience. Correlation analyses found significant relationships for all cognitive processes in English and their counterparts in Farsi. The partialling of language experience had no significant influence on the aforementioned results. These results indicate that there is a common underlying proficiency with respect to cognitive processes across Farsi and English. Recommendations for future studies such as investigations with cognitive processes in other Iranian languages are suggested.

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CHAPTER I

Literature Review

Rationale

A fundamental objective of this study was to investigate word recognition processes in Farsi and English in Farsi speaking bilingual speakers. This study was of significant importance to psychologists studying bilingual cognitive processes, educators of English word reading as well as the general public. The main interest from a (cognitive) psychology perspective had to with the relationship of word reading to related cognitive processes in bilingual speakers. Specifically, no research studies have investigated the relationships of cognitive processes and language experience to word reading performance and related errors among adult Farsi speaking ESL (English as a second language) students. There were five related areas that required investigation. First, no studies had compared the relationships between Farsi and English word reading processes in Farsi and English among adult Farsi speaking bilingual students. Two studies have investigated these processes among bilingual Farsi speaking children (Arab-Moghaddam & Senechal, 2001; Gholamain & Geva, 1999), however the results of these studies may be limited in their generalizability to adult bilingual Farsi speakers because Bilingual children and adults are different with respect to cognitive development and background literacy. A second area of investigation was that of English phonological, syntactic and spelling errors. Although a number of excellent studies using contrastive analysis have been able to predict certain Farsi errors in phonology and syntax (e.g. Faghih, 1980), no studies had investigated the relative role of cognitive processes and language experience in the making of those errors. A third area of investigation was adult Farsi word reading. Results of studies that have investigated Farsi word reading among Farsi speaking adults (e.g. Baluch & Besner, 1991; Baluch, 2000) may be questioned since they relied exclusively on the paradigm that adult and skilled Farsi word reading is achieved entirely by orthographic processes. These studies did not take into account the possible role of other related processes in Farsi word reading performance (e.g. phonological processes, syntactic awareness). A fourth area of inquiry pertained to Farsi reading ability. Farsi reading ability had never been formally investigated. The Teacher Training University of Tehran (2000) has noted that a number of Iranian educators of English have asserted that good and poor readers of Farsi do not differ on reading related cognitive processes. However, these assertions had never been investigated. A final question related to that of a common underlying proficiency (Cummins & Swain, 1986) or the idea that reading related cognitive processes are consistent across languages with respect to Farsi speaking ESL adults. A key question was whether reading related cognitive processes were consistent across Farsi and English among Farsi speaking ESL adults.

The second possible benefit of this research was of potential relevance to educators of English as a second language. Specifically, the findings of this research had implications with respect to English reading programs designed for adults who read Farsi. A large proportion of students in English reading programs in British Columbia are now of Farsi speaking origin (Bahram-Nia, 1997). The results of this investigation were useful in suggesting more effective methods of English word reading instruction for Farsi speakers residing in British Columbia.

The third possible benefit of this study related to the general public, specifically, the Farsi speaking population of British Columbia. A large number of Farsi speaking immigrants in British Columbia are currently accessing the college and university systems (Amiri, 1992; Bahram-Nia, 1997). The numbers may as high as 50,000 or higher at the time of writing. The ability to read in English is an important factor for ESL (English as a second language) student success (August & Hakuta, 1997).

This study investigated those factors that affect competency in English word reading. There were three major factors that were to be investigated with respect to syntactic, phonological, and spelling skills in English:

1. Language experience and language effects. Language experience refers to the amount of exposure to one's first and second language in Canada. In this study, indicators of language experience were length of residence in Canada (Baluch, 1996; Cummins & Swain, 1986), age on arrival to Canada (Cummins & Swain, 1986), and amount of Farsi reading experience in Canada (Baluch, 1996). One important linguistic phenomenon that emerges as a result of the ESL student's language experience is language effects. Language effects refers to the idea that syntactic, semantic, morphological and phonological errors in the second language (L2) are the result of transfer of first language (L1) rules into L2 (Danesi & DiPietro, 1991; James, 1980; Lado, 1957). Contrastive analysis (e.g. Sridhar, 1981) can be used to investigate language effects by examining similarities and differences between L1 and L2 with respect to phonological, grammatical and semantic systems (Danesi & DiPietro, 1991; Fisiak, 1981).

2. Reading related cognitive processes. These are the reading related cognitive processes contributing to difficulties that are independent of language experience (e.g.,

Carlo & Sylvester, 1996). These difficulties are presumed to be inherent to individuals regardless of language(s) spoken (Mithen, 1996; Pinker, 1994, 1997). Reading related cognitive processes investigated in this study are syntactic awareness, phonological processes, and orthographic processes, as well as working memory and long-term memory.

3. Demographic variables. These are factors contributing to difficulties that are independent of language experience and reading related cognitive processes. Two examples are age (Keshavarz, 1994) and education level (Mokhtari & Sheorey, 1994). Jafarpur (1990) and Keshavarz (1994) note that these are demographic factors.

One of the primary goals of this study is to examine the relative roles of cognitive processes, language experience and effects, as well as educational history on the word reading performance of Farsi speaking immigrants to British Columbia. In addition, the relative influence of the aforementioned factors on the making of syntactic, phonological and spelling errors was also investigated.

The remainder of this chapter will outline the literature on (1) reading related cognitive processes and the pertinent ESL research (2) the linguistic interdependence hypothesis and (3) language experience and language effects among ESL students. Each of the three topics is followed by a summary of specific research questions related to this study.

Reading Related Cognitive Processes

It is noted that cognitive processes (such as language effects and demographic variables) are distinct from measures of reading competence. By cognitive processes we are referring to the idea of a common underlying (cognitive) proficiency (Cummins & Swain, 1986) that is consistent across languages. Specifically, the cognitive processes related to word reading are:

1. Syntactic awareness: Syntactic awareness refers to students' grammatical sensitivity or the ability to comprehend the basic syntactic aspects of language (Da Fontoura & Siegel, 1995; Willows & Ryan, 1986). In addition, syntactic awareness allows individuals to make use of context in reading by facilitating their sensitivity to the predictability of text (Carr, Brown, Vavrus & Evans, 1990). Syntactic awareness is important for the fluent and efficient reading of text that requires making predictions about the words that come next in a sentence (Siegel, 1993). Better readers may be more sensitive to syntactic information in text than less skilled readers (Bialystok & Ryan, 1985). In addition, children with reading problems in other languages do experience problems with syntax (Bentin, Deutsch, & Liberman, 1990; Da Fontoura & Siegel, 1995; So & Siegel, 1997). One way of examining syntactic awareness is by the oral cloze task (Siegel & Ryan, 1988) which requires the participant to supply the missing word in each of 20 sentences orally presented. Note that syntactic awareness is different and distinct from semantic processing (Carr, Brown, vavrus, & Evans, 1990; Siegel, 1993). Semantic awareness is assessed by tasks such as the word meaning task (Siegel & So, 1997).

2. Phonological processes: Phonological awareness is the metalinguistic awareness of the sound structure of language (Rohl & Pratt, 1995; Wagner & Torgesen, 1987) and refers to sensitivity or awareness of phonemes, syllables, and the phonological rules that operate them (Mann, 1998). Note that phonemic awareness is the sensitivity to the fact that words are divisible into phoneme-sized units (Mann, 1998; Troia, Roth, & Graham,

1998). Phonemic awareness is typically examined by blending and deletion tasks (Yopp, 1988, p.161). Note that there are different levels of difficulty associated with different kinds of phonological awareness tasks. Yopp (1988) notes that deletion tasks pose the greatest difficulty, whereas tasks examining awareness of rhymes and syllables are the least difficult tasks of phonological awareness (Yopp, 1988, p.169). A large amount of variance in word reading in English can be attributed to phonological awareness (Rohl & Pratt, 1995; Wagner, Torgesen, Laughon, Simmons, & Rashotte, 1993). Poor readers may have a core phonological deficit (Stanovich, 1988). In addition, there may be a strong genetic influence on deficits in phoneme awareness (Olson, Forsberg, & Wise, 1994). In addition to phonological awareness, phonological coding is also a key component in the word reading process (Carr, Brown, Vavrus & Evans, 1990). Phonological coding involves the decoding of written symbols or graphemes into a sound-based representational system or phonemes (Fox & Routh, 1976; Olson, Wise, Johnson, & Ring, 1997).

3. Orthographic awareness: This process involves knowledge of the spelling conventions of words, recognition of word properties, as well as the sequences and typical positions of letters in words (Olson et al., 1994; Siegel, Share, & Geva, 1995). There may be a relationship between poor orthographic skills and syntactic processing in reading (Smith, Macaruso, Shankweiler, & Crain, 1989). In addition, there may be a strong genetic influence on deficits in orthographic processes (Olson et al., 1997).

4. Working memory: The process of recoding written symbols into their sound based representations and holding them efficiently in working memory is important to reading (Torgesen, Wagner, & Rashotte, 1994; Wagner & Torgesen, 1987). Working memory is

important to reading because the reader must recognise words while remembering what has been read and retrieving information (i.e. grapheme-phoneme conversion rules) (Siegel, 1993). Carr, Brown, Vavrus and Evans (1990) and Siegel and Ryan (1989) note that disabled readers have significant difficulties with respect to working memory. In addition, Mann (1998) notes that poor readers do not perform as well as good readers on a wide variety of phonological short-term memory tasks. Specifically, " poor readers are less able to use phonetic structure as a means of holding material in short-term memory" (Mann, 1998, p.178). Deficits in phonological awareness may be associated with problems in phonetic recoding in working memory (Brady, 1991; Brady, Mann, & Schmidt, 1987; Mann, 1998; Mann & Liberman, 1984; Smith et al., 1989).

5. Long term memory: Information in long-term memory is typically stored in interconnected semantic networks (Rumelhart, 1989). In the context of reading, word meanings are coded in semantic networks and retrieved through these networks (Ausubel, 1963, 1968; Fisher, 1990; Kommers, Jonassen, & Mayes, 1992; Novak, 1992, 1998).

As noted previously, these reading related cognitive processes are considered to be part of an underlying cognitive proficiency that is consistent across languages (Cummins & Swain, 1986). By "languages" we are referring to (separate) language structures (e.g. Farsi language structure versus English language structure). In this study, these (phonological, syntactic and semantic) language structures are referred to as L1 (Farsi) and L2 (English). Although L1 and L2 have distinct language structures, both are related to a common underlying proficiency (Cummins & Swain, 1986). However, instruction or training in a specified reading related cognitive process (e.g. phonological awareness) in L1 can result in improved performance in that process. This improved performance may then manifest itself in better than expected performance with that same reading related cognitive process in L2. This phenomenon is referred to as "transfer of L1 training" (Selinker, 1972, p.216; Sridhar, 1981, p.220) to L2. The research discussed below will examine the relationship between reading related cognitive processes and word reading with respect to ESL students.

Research on Reading Related Cognitive Processes and Adult ESL Students

Cognitive Processes and ESL Reading

In general, a large number of studies examining English word reading in bilingual students have focused on text reading processes without accounting for word identification processes (Koda, 1987). However, text comprehension, as measured by reading comprehension tests, cannot occur without adequate knowledge of the spelling to sound correspondence rules of English reading (Carlo & Sylvester, 1996; Meara, 1984). In addition, standardized reading comprehension tests do not provide insight into the (cognitive) task demands that readers face (Tal, Siegel, & Maraun, 1994). The importance of word identification processes and strategies are "sometimes forgotten or ignored by ESL researchers" (Haynes & Carr, 1990, p. 377).

Researchers in ESL reading have begun to conceptualize the word reading process in terms of interacting cognitive components (August & Hakuta, 1997; Brown & Haynes, 1985; Carlo & Sylvester, 1996; Henderson, 1983; Royer, Cisero, & Carlo, 1993; Siegel, 1993; Walker, 1983). These consist of syntactic, phonological, orthographic and memory processes. Essentially, performance on all reading related cognitive processes are used by researchers such as Carlo and Sylvester (1996) and Siegel (1993) in the assessment of ESL reading ability. In addition, a single index (e.g., oral cloze tasks) cannot be used as the sole criterion of ESL English reading ability (Devine, 1987).

The model conceptualizing word reading (in terms of interacting components) holds that the process of word identification does not depend on higher-level processes such as text integration (Perfetti, 1988; Sinatra & Royer, 1993; Stanovich, 1990). In addition, Bernhardt (1991) makes a distinction between word recognition and lexicon (meaning) and notes that "second language readers may well be able to recognize words without knowing what they mean" (Bernhardt, 1991, p.79).

Arab-Moghaddam and Senechal (2001) as well as Gholamain and Geva (1999) are the only researchers to date who have investigated the reading processes of Iranian bilingual learners using the cognitive process paradigm. Arab-Moghaddam and Senechal (2001) investigated the relationship between word reading and phonological and orthographic processes in Farsi and English among bilingual Farsi speaking children enrolled in grades 2 and 3. It was found that phonological and orthographic processing skills each predicted unique variance in word reading in Farsi and English (Arab-Moghaddam & Senechal, 2001). Gholamain and Geva (1999) have found that the performance of Bilingual Farsi speaking children on word recognition has significant relationships with speed of letter naming and working memory cognitive processes.

The cognitive processes paradigm has been used in the investigation of the reading processes of various other (non-Farsi speaking) bilingual children. An example is a study of the reading processes of Portuguese Canadian children (Da Fontoura & Siegel, 1995). Da Fontoura and Siegel (1995) found that there was a significant relationship between the acquisition of word reading, pseudoword reading, syntactic awareness, as well as working memory processes in both English and Portuguese. A similar study of Arab Canadian children (Abu-Rabia & Siegel, 1997) also found a significant relationship between word reading, pseudoword reading, syntactic awareness as well as working memory processes in both English and Arabic.

However, Brown and Haynes (1985) note that the results of ESL studies dealing with children are limited in their generalization to adults since children and adult L2 readers have significant differences in cognitive development and background literacy. In addition, the relative relationship between specific cognitive processes and reading performance may not be exactly the same in ESL adults as it is in ESL children (Carlo & Sylvester, 1996). Henderson (1983) compared the Arabic word reading and English word reading performance of adult Arab ESL students. The method consisted of matching tasks involving two simultaneously presented items. The items (one set in Arabic and the other in English) were a mix of words, regular non-words, and irregular non words. Regular non-words orthographically resembled real Arabic words. Irregular non-words were those that had letters combined in such a way as to not orthographically resemble any real Arabic words (Henderson, 1983). Note that the irregular Arabic non-words were not pronounceable. The task was to decide whether two simultaneously presented items were the same or not (orthographically and phonologically). It was found that although both orthographic and phonological processes are important in both Arabic and English word reading, phonological processes were more significant (Henderson, 1983).

Jafarpur (1987) has questioned the validity of English oral cloze procedures as a measure related to the English reading ability of Farsi bilingual students. In a study of

110 university students, Jafarpur found insignificant correlations between a reading task and a cloze task. However, the conclusions of the Jafarpur study can be questioned. In relation to the Oral Cloze Task, it is only reported that the "the test was prepared after much refinement" (Jafarpur, 1987, p. 76). In addition, it must be noted that the procedure is not actually an oral cloze test, but a multiple choice grammar test. The testing procedure for Jafarpur's task is different from an oral cloze type of task. In oral cloze tasks (e.g., Siegel & Ryan, 1988), sentences are read aloud and then the participant has to supply the missing word. This is not what Jafarpur examined; the participants of his study read the sentence and then chose their response from four multiple-choice alternatives. Therefore, the results of Jafarpur's study cannot be generalized to oral cloze tasks in general.

Apart from a small number of studies (e.g. Jafarpur, 1987), no other studies have examined the relationship of various reading related cognitive processes (i.e., syntactic awareness) among adult Farsi speaking ESL students. The only studies that have examined this relationship are the aforementioned studies by Gholamain and Geva (1999) as well as Arab-Moghaddam and Senechal (2001) with bilingual Farsi speaking children.

Factors Accounting for Variance in L2 Word Reading

Carlo and Sylvester (1990) have noted the importance of investigating the variance in English word reading scores that can be attributed to various factors such as cognitive processes among ESL students. However, few ESL studies have investigated this question.

Haynes and Carr (1990) investigated the amount of variance in the reading scores of Taiwanese EFL (English as a foreign language) students accounted for by orthographic and phonological processing, vocabulary knowledge, and listening comprehension. They found that orthographic and phonological processes accounted for a significant proportion of the variance in reading scores. Brown (1990) investigated the amount of variance in reading scores of ESL students accounted for by phonological (decoding and awareness) and oral cloze tasks. In general, tasks measuring reading related cognitive processes accounted for over 49% of the variation in engineering reading performance. However, the design of the phonological tasks in the Brown study is unclear. The main issue is that of content validity - that is, whether the phonological tasks adequately represented the domain of phonological processes (Crocker & Algina, 1986). In addition, neither Brown (1990) nor Haynes and Carr (1990) attempted to explain the other sources of variation in ESL word reading such as language effects or past education level. Finally, it must be noted that no studies have investigated the proportion of variance in word reading scores accounted for by the reading related cognitive processes of adult Farsi ESL students.

Word Recognition Strategies in L2

There is broad agreement that readers of English use both phonological and orthographic processes in English reading (Olson et al., 1994; Seidenberg, Waters, & Barnes, 1984). A number of researchers maintain that ESL students transfer their L1 reading strategies to L2 (English) reading strategies (e.g., Brown & Haynes, 1985; Zuckernick, 1996), however, this assumption is challenged (e.g., Meara, Coltheart, & Masterson, 1985).

A factor that may influence word reading in English or other languages (e.g., Farsi) is the orthography of the script in question (Bentin, Bargai, & Katz, 1984). The orthography of a script is defined by the linguistics literature (Fromkin & Rodman, 1983; Jahani, 1989; Keshavarz, 1994) as the spelling conventions and rules of the written language. Koda (1987) and Carlo and Sylvester (1996) note that three major orthographic systems are presently used in the expression of written language. The first system is logography in which "one grapheme generally represents the meaning of one whole word or morpheme" (Koda, 1987, p. 128). This is typical of the Chinese script or the Japanese Kanji script (Carlo & Sylvester, 1996; Koda, 1987). The second system is syllabary in which "written characters represent speech syllables" (Carlo & Sylvester, 1996, p.6). Japanese Hiragana and Katakana are examples of syllabaries (Koda, 1987). The third system is alphabetic (Carlo & Sylvester, 1996; Fromkin & Rodman, 1983; Koda, 1987). Alphabetic writing systems are those in which "each symbol represents one phoneme" (Fromkin & Rodman, 1983, p.148). Examples of alphabetic writing systems are the English Roman based alphabet (Fromkin & Rodman, 1983) or the Farsi Arabic based alphabet (Baluch, 2000). Note that there is a distinction between scripts and writing systems. Although Farsi script is based on Arabic (different from the English Roman alphabet), its writing system is alphabetic (like English).

The origins of the Roman alphabet may be delineated as follows. Majority of linguistics scholars assert that the Roman alphabet is derived from the Greek alphabet (Fromkin & Rodman, 1983). The Greek alphabet was introduced to the pre-Latin people of Italy, known as the Etruscans, who in turn introduced it to the Romans (Fernandez-Armesto, 1994). The Greek alphabet began to be modified into the Roman alphabet by approximately 500 BC (Parker, 1993). The Roman Empire spread this script to the entire area of Western Europe up to and including Iberia (Spain), the British Isles, as well as

Dacia (present day Romania).

Although Farsi is an Indo-European language unrelated to Arabic (Mallory, 1989), written Farsi is based on a modified version of the Arabic script (Jahani, 1989; Lentz, 1937; Oranskij, 1975, 1977). The Arabic and Phoenician alphabets, along with several other alphabets such as Hebrew and Aramaic, are based on an early model called the North Semitic (McEvedy, 1967; Parker, 1993). Arabic belongs to the group of Semitic alphabetical scripts in which mainly the consonants are represented in writing, while the markings of vowels (using diacritics) is optional (Arberry, 1953; Parker, 1993; McEvedy, 1967). The North Arabic script was established in north-eastern Arabia and flourished in the 5th century among the Arabian tribes who inhabited Hirah and Anbar. It spread to Hijaz in western Arabia, and its use was popularized among the aristocracy of Quraysh, the tribe of the Prophet Mohammed (Arberry, 1953; Parker, 1993). From its early examples of the 5th and 6th century A.D., the Arabic alphabet developed rapidly after the rise and spread of Islam in the 7th century. Arabic script spread with the advance of Islam into non-Arab Sassanian Persia, Byzantine territories (Syria, Egypt, etc.) as well as Spain (Arberry, 1963; parker, 1993). Arabic script is used by many non-Arab countries such as Iran, Afghanistan and Pakistan (Jahani, 1989).

With the spread of Islam into non-Arab Persia, the Arabic alphabet was adapted by the Iranians for writing Farsi (Khanlari, 1979). The Arabic alphabet has twenty-eight letters, however Farsi has thirty-two (Baluch & Shahidi, 1991; Khanlari, 1979). This is because four letters were added to the original twenty-eight from Arabic. These were letters representing phonemes that do not exist in Arabic: /p/, /ch/, /zh/, and /g/. Another feature of Farsi script is that it has four graphemes representing /z/, three representing /s/, two representing /t/ and two representing /gh/ (Forozanfar, 1979). This is because many of the original Arabic letters corresponding to these sounds represent distinct sounds in Arabic, which do not exist in Farsi (Khanlari, 1979). These redundant graphemes have remained in the Farsi alphabet, partly due to theological and religious reasons (Forozanfar, 1979). The shape of Arabic based letters (Farsi script) change according to their position in the beginning, middle or end of the word (Forozanfar, 1979; Khanlari, 1979). Unlike the Roman alphabet, Arabic based Farsi script writing goes from right to left (Khanlari, 1979). Farsi script contains three long vowels, while diacritics can be added to indicate short vowels (Baluch & Besner, 1991). In written Farsi, the spelling to sound correspondences are always consistent, however, only some of the words include vowels as a fixed part of their spelling. These are transparent Farsi words (Baluch & Shahidi, 1991). In other Farsi words, vowels are not specified in the spelling. These are opaque Farsi words (Baluch & Besner, 1991). Vowels are represented by slashes (diacretics) for beginning readers only. Diacretics are eliminated from words in regular text. As a result, only consonants appear in opaque Farsi words.

An important distinction that can be made with respect to alphabetic writing systems (e.g. English Roman alphabet and Farsi Arabic based alphabet) is that between shallow and deep orthographic scripts. A shallow orthography is a spelling system in which the "phonemes (sounds) of a spoken word are represented by the graphemes (letters) in a direct and unequivocal manner" (Frost, Katz, & Bentin, 1987, p.104). In contrast, a deep orthography is a spelling system in which the "relation of spelling to sound is more opaque" (Frost, Katz, & Bentin, 1987, p.104). This means that the same letter may represent different phonemes in different contexts (Frost, Katz, & Bentin, 1987). In addition, different letters may represent the same phoneme (Baluch & Besner, 1991). The English Roman alphabet is considered to be a deep orthography (Arab-Moghaddam & Senechal, 2001; Fromkin & Rodman, 1983; Frost, Katz, & Bentin, 1987). More specifically, English is a script that is both polyphonic and polygraphic (Arab-Moghaddam & Senechal, 2001). It is polyphonic in that its graphemes can represent more than one phoneme (e.g. /i/ in m/i/nt vs. p/i/nt). The polygraphic nature of English is due to the fact that some phonemes can be represented by different phonemes (e.g. /f/ in /f/arm vs. /ph/armacy). These characteristics have led researchers such as Fromkin and Rodman (1983) to note that the Roman alphabet is not well suited to writing words in English. Fromkin and Rodman (1983) cite the movement of "spelling reformers" (Fromkin & Rodman, 1983, p. 52) such as George Bernard Shaw who have wanted to revise the alphabet so that one letter would correspond to one sound, and one sound to one letter, thus simplifying the spelling process.

An important study investigating the relationship between L1 script and patterns of English reading involved Spanish, Arabic, and Japanese ESL students (Brown & Haynes, 1985). Spanish and English share a common alphabet and similar orthographic systems. Arabic writing, like English, is alphabetic, but its grapheme system is different, short vowels are omitted, and it is read from right to left. Japanese script is composed of both logographic and syllabic characters. Different writing systems in L1 were hypothesized to be related to English word reading strategies in different ways. Two tasks were used. The first task enabled the researchers to observe the reaction times of the ESL students with respect to reading pairs of words and pseudowords shown on a computer screen. If performance on pseudowords was substantially slower than performance on words, it was inferred that spelling to sound translation skill was not fluent. Note that each member of a pseudoword-real word pair were the same length. The second task enabled the researchers to observe the reaction times of the ESL students with respect to reading pairs of pseudowords and non-alphabetic shapes. These non-alphabetic shapes were first taught to the participants before the study (Brown & Haynes, 1985). If performance on reading of the pairs was similar, then it was inferred that sight word knowledge was fluent and efficient.

In the first task (word – pseudoword), Japanese students performed more poorly than both Spanish and Arabic speaking students. Spanish students did better than Arabic students. In the second task (pseudoword – non alphabetic), Japanese students outperformed both Spanish and Arabic students. Spanish and Arabic students showed no significant differences in this task. The results of this study are interpreted as showing that Japanese students are more likely to use sight word knowledge, rather than spelling to sound knowledge, in their reading. In contrast, both Spanish and Arabic students seem to rely on spelling to sound correspondence rules in their reading. The relative superior performance of the Spanish ESL students in comparison to their Arabic counterparts is attributed to Spanish students' familiarity with Latin script (Brown & Haynes, 1985).

Zuckernick (1996) compared the English word decoding strategies of native English speakers and Finnish ESL speakers. Both groups were highly proficient in spoken and written English[1]. Finnish, like Spanish (Suarez & Meara, 1989), Serbo-Croatian (Feldman, 1987), many Farsi words (Baluch, 1993), and many English words (Baluch & Besner, 1991) has a highly regular, orthographically shallow alphabetic

[1] The Finns of this study were advanced EFL (English as a foreign language) speakers. Most of the Finns taught English at universities in Finland.

system. Finns recognize and read the majority of Finnish words by spelling to sound correspondence rules (Zuckernick, 1996). It was hypothesized that the Finns would transfer their L1 decoding strategies when reading English pseudowords. Native English speakers were expected to use phonological processes in pseudoword reading. Finns' and native English speakers' performance was compared on the reading of real words and pseudowords.

The results indicated that native English speakers mainly use spelling to sound correspondence rules in the reading of pseudowords. These results are in concordance with the research literature indicating a significant role for phonological processes in word reading of adult native English speakers (Frost, Katz, & Bentin, 1987). However, many native English speakers reported that they simultaneously tried to find real English words that had orthographic similarity with the pseudoword and unfamiliar word items. For example, the pseudoword item "vove" would be associated with "drove." The Finns also used spelling to sound correspondence rules in English word decoding, but they used the orthographic strategy differently. The orthographic strategy would be used only when words and pseudowords were difficult to decode. There were also differences in the way the orthographic strategy was applied. Native English speakers tended to focus on the last segment of each pseudoword whereas bilingual Finns would focus on the initial segment. Zuckernick (1996) attributes this finding to differences in processing strategies between Finns and native English speakers and offers the following explanations. Finns would focus on the initial segment of the word in order to first attempt to phonologically decode it; if this proved to be difficult (as with difficult words or pseudowords), then that (initial) segment would be used to find analogous real words

(Zuckernick, 1996). In response to difficult words and pseudowords, native English speakers would first attempt to find analogous real words, and this may explain why they focused on the last segment (Zuckernick, 1996). In summary, Zuckernick hypothesizes that since Finns always use phonological decoding strategies, they always focus on the initial segment of the word; in the case of difficult words and pseudowords, native English speakers focus on the last segment because they are attempting to find an analogous real word.

A significant aspect of this study is that EFL students with above average English skills may use different processing strategies than proficient native English speakers. Zuckernick's findings indicate that Finnish students seem to adapt their existing skills to that of English reading. It may be that the Finns recognized that English has an irregular orthography, and recognized the need to use orthographic strategies as well as spelling to sound correspondence rules to read pseudowords.

Researchers in ESL word identification processes are interested in whether or not ESL readers apply the reading strategies of L1 (e.g., Farsi) to L2 (e.g., English) reading (Carlo & Sylvester, 1996). It is not clear whether ESL students would use the same reading strategies in L1 and L2. There are two possibilities. First, ESL students (i.e., Farsi speakers) may transfer their Farsi word identification strategies to English. Koda (1987) has hypothesized that "strategies developed in L1 reading are transferred to L2 reading " (p. 134). This would imply that Farsi word reading strategy has an influence on English word reading strategy.

A second possibility is that all ESL students will adopt a new reading strategy in English because of the demands of English script (Meara et al., 1985). This would mean that reading skills do not simply transfer from L1 (i.e., Farsi) to L2 (i.e., English). ESL students would adapt to the new script and develop strategies to deal with the way print to sound is processed in English (Besner, 1987).

Word Recognition Strategies in L1

One of the most important aspects of research in ESL English word reading processes is the awareness of how ESL students read words in their native language. Koda (1987) has proposed that different cognitive strategies are involved in the word recognition processes of different orthographic systems. A number of studies have attempted to investigate the relationship of phonological and orthographic processes to word reading in Farsi, Hebrew, and Serbo-Croatian. Hebrew script shares characteristics with Farsi and Arabic based script by its use of diacretics to represent vowels (Baluch & Besner, 1991). Serbo-Croatian shares many linguistic (e.g., phonology) features with Farsi (Gamkrelidze & Ivanov, 1990; Mallory, 1989).

The orthographic depth hypothesis maintains that scripts in which the spelling to sound correspondences are consistent (transparent) are recognized by using a phonological code prior to access (Baluch, 1993; Besner, 1987). It must be noted however, that this is also true for scripts in which spelling to sound correspondences are inconsistent. Essentially, the orthographic depth hypothesis states the importance of using spelling to sound rules for word decoding. The universal hypothesis is the theory that all scripts are recognized by using visual orthographic information in order to access the mental lexicon (Baluch, 2000; Besner, 1987). The dual route theory is the hypothesis that both phonological and orthographic routes are involved in word recognition (Baron & Strawson, 1976; Coltheart, 1978; Forster & Chambers, 1973; Meyer, Schvanevelt, &

Ruddy, 1975). In this theory, two independent routes of word recognition are available; a phonological route and an orthographic route. There are a number of important studies that have attempted to investigate the relative roles of orthographic and phonological processes in L1 word reading.

Baluch (1993), Baluch and Besner (1991) and Baluch and Shahidi (1991) have investigated the processes of Farsi word reading. All of these studies (e.g., Baluch & Besner, 1991) used the technique of measuring the speed and accuracy of Farsi word and pseudoword naming. The words appeared in the center of a computer screen. The recording devices measured the time elapsed between the moment the word or pseudoword appeared and the moment it was named.

Baluch (1993) claims that since Farsi contains both opaque and transparent words, one is able to test the validity of the orthographic depth versus the universal hypothesis by reaction time studies. The basis of this claim is not conceptually clear; Baluch (1993) and Baluch and Besner (1991) base this reasoning on the premise that "Persian (Farsi) script allows us to assess the effects of phonological transparency within a script" (Baluch & Besner, 1991, p. 645). As a result, one does not have to compare different languages with different scripts in order to examine the validity of the orthographic depth hypothesis (Baluch, 1993, 2000). Baluch (1993) notes that a major problem with the aforementioned procedure is that "inferences concerning psychological processes of visual word recognition are drawn by data across orthographies" (Baluch, 1993, p. 22). Therefore, it would be difficult to tell whether differences in visual word recognition across orthographies are truly the result of orthographic transparency or from a host of other differences that may exist between different orthographic scripts (Baluch, 1993, 2000).

The results of the Farsi word reading studies (e.g., Baluch, 1993) indicate that for higher frequency words, the reaction times were as fast for both opaque and transparent Farsi words. However, reaction times to lower frequency transparent words were faster than matched opaque words. Baluch (1993) states that this difference in reaction times is an indication that Farsi word reading is achieved entirely by orthographic recognition, without the implication of any phonological processes. Baluch (2000) claims that the universal hypothesis is supported at the expense of the orthographic depth hypothesis since "transparency of a (Farsi) word's spelling is not crucial in a lexical decision task..." (Baluch, 1993, p. 26). The conclusions of these studies also lead to the claim that English word reading (both native speakers and all bilingual ESL students) is also achieved primarily by the orthographic route (Baluch & Besner, 1991). It is interesting to note that a very similar study by Mason (1978) investigating the reading processes of college level native English speakers also concluded that only orthographic processes were relevant to English word reading.

The conclusions of the Farsi reaction time studies (e.g., Baluch & Shahidi, 1991) may not be warranted for the following reasons. The delay in reaction times between low frequency transparent and opaque words may have as much to do with phonological decoding processes as they do with orthographic matching. No methodology, instruments or statistical analyses in any of these studies (e.g., Baluch & Besner, 1991) investigated the differential role of phonological and orthographic processes in Farsi reading performance. Another important point is that there is evidence that reaction time studies to words can be manipulated to reveal orthographic effects only, by using word frequency as a factor (Hudson & Bergman, 1985). This was found in a study with Dutch college students who read Dutch words (Hudson & Bergman, 1985). Note that Dutch is a language in which there is a high degree of correspondence between letters and sounds (Hudson & Bergman, 1985). In addition, the findings of the aforementioned Henderson study (1983) with Arab ESL students have found both phonological and orthographic processes to be important to Arabic word reading. Arabic and Farsi use similar scripts. Baluch (personal communication, January 22, 2000) dismisses the Henderson (1983) findings on the basis that no timing mechanisms were used to measure reaction times in lexical decision making tasks.

Word and pseudoword reading has been investigated and compared across languages (English, Serbo-Croatian and Hebrew) by using reaction time methods (Frost et al., 1987). The reaction time results of these studies support the orthographic depth hypothesis. Hebrew seems to require the greatest amount of orthographic processing. One reason for this may be that vowels are not represented in regular Hebrew text (Frost et al., 1987). Note that all Hebrew vowels are represented by dots (diacretics) for beginning readers only (Bentin et al., 1984). Diacretics are eliminated from words in regular text (Bentin et al., 1984). As a result, only consonants appear in Hebrew words (Bentin et al., 1984). In Hebrew (like Farsi), consonants are always pronounced the same (Baluch & Shahidi, 1991). Serbo-Croat, with a very shallow orthographic system, seems to use orthographic processes least, by relying mainly on phonological processes. English seems to lie in between Hebrew and Serbo-Croat; although orthographic processes are important, phonological processes play an important part in English word reading. In essence, English reading may be using a dual route model of processing, with less emphasis on orthographic processes than Hebrew (Frost et al., 1987). In conclusion, different writing systems may result in different strategies of reading (Koda, 1987). However, the notion of orthographic depth determining the amount of phonological usage may not be as clear cut as indicated by the orthographic depth hypothesis. So and Siegel (1997) have found word recognition in Chinese to be highly correlated with phonological processes. This suggests that even readers of non-alphabetic languages such as Chinese seem to use phonological encoding for word recognition. This finding is particularly interesting since the participants of this study were grade 1-4 children from Hong Kong. Hong Kong children do not receive any formal training in Chinese with respect to any type of phonemic analysis. Specifically, the Pinyin system, which is a Romanized alphabetic form of Chinese characters (Hudson-Ross & Dong, 1990) is not taught in Hong Kong as it is in mainland China (Killingley, 1998). Essentially, the findings of So and Siegel (1997) cannot be attributed to any practice effects with a formal alphabetic system of instruction.

It is evident that the cited studies in L1 reading have provided conflicting results. Farsi word reading is said to be achieved mainly by orthographic processes (e.g., Baluch, 1993), whereas a number of other studies cite the importance of orthographic depth (i.e., amount of spelling to sound correspondence) (e.g., Frost et al. 1987) and phonological processes (e.g., Henderson, 1983).

Reading Ability Comparisons

Conner (1987) has suggested a relationship between reading ability of ESL students and their proficiency in reading related cognitive processes. Specifically, reading ability comparisons (i.e., good versus poor readers) can help identify between group differences with respect to reading related cognitive processes (Anderson, 1991; Henderson, 1983). Devine (1987) hypothesizes that the English reading ability of ESL students is related to their overall cognitive and language proficiency.

A limited number of studies with adult ESL students have compared good and poor readers. Henderson (1983) compared Arab ESL university students with respect to English reading ability (good versus poor). The data indicated that "more effective readers use a phonological coding strategy" (Henderson, 1983, p. 118). It was concluded that greater use of phonological coding was associated with superior word reading performance (Henderson, 1983). Mokhtari and Sheorey (1994) examined the differences between good and poor adult ESL readers of English with respect to their perceptions of reading problems in English (reading speed, vocabulary, cognitive processes). They did not specify the first language of the students, who were only identified as "international students" (Mokhtari & Sheorey, 1994, p. 50). Two groups of students (graduate and undergraduate) were examined. Low English proficiency ESL students (poor readers of English) reported that a lack of adequate vocabulary was the main weakness in their reading skills. High proficiency students (good readers of English) reported no consistent weakness. There were differences between graduate and undergraduate students. Graduate students (high or low proficiency) reported that a lack of adequate reading speed was their main source of difficulty. Undergraduate students did not report reading speed as being relevant to their reading performance. However, the most interesting finding was that "students in both the high and low proficiency groups indicated that they would like to improve their word reading skills" (Mokhtari & Sheorey, 1994, p. 58).

Although Mokhtari and Sheorey (1994) do not further elaborate this finding, it may be assumed that the "skill" implicates both phonological coding and orthographic awareness in English.

No studies have investigated the relationship between reading ability and reading related cognitive processes among Farsi ESL students. However, as noted by the Teacher Training University of Tehran (2000), the assertion has been made by a small number of researchers that Farsi reading ability is unrelated to Farsi reading related cognitive processes. By implication, Farsi speaking students' English reading ability would be unrelated to their reading related cognitive processes. Specifically, good and poor readers of Farsi would not differ on cognitive tasks measuring skills such as syntactic, phonological or orthographic processes. This assumption has neither been investigated nor challenged in the ESL literature. Carr (1981) and Carr and Levy (1990) have noted that differences in reading ability can be linked to working memory, orthographic awareness, syntactic processes, and phonological processes. Differences have been found between good and poor readers on various cognitive processing tasks examining phonological processes (Mann, 1998; Olson, Kliegl, Davidson, & Foltz, 1984; Wagner & Torgesen, 1987), syntactic awareness (Carr & Levy, 1990; Siegel, 1993), orthographic awareness (Olson et al., 1984; Siegel, Share and Geva, 1985), and phonological recoding in working memory (Rapala & Brady, 1990). Reading ability differences have been found to be related to cognitive processes across languages as diverse and different as Portuguese (Da Fontoura & Siegel, 1995), Arabic (Henderson, 1983), and Chinese (So & Siegel, 1997).

Language Category Comparisons

Another type of between group comparisons in ESL studies is that between bilingual and native English speakers (e.g., Frost et al., 1987). With respect to bilingualism studies, Douglas (1981) has noted that a useful measure is the comparison of bilingual students' proficiency with that of their native speaking counterparts. Huestis and Fagan (1992) have noted that the main value of comparing the performance of ESL students to that of a "benchmark native English speaking group" (Huestis & Fagan, 1992, p. 230) is that it allows for comparisons with respect to reading related cognitive processes.

Many of these between language comparisons have been made with respect to performance variables such as reading scores and /or errors (e.g., Zuckernick, 1996). However, it must be noted no studies have compared the reading related cognitive processes of Farsi adult ESL students with native English speakers.

Suggestions and Predictions for Research on the Reading Related Cognitive Processes of Farsi Adult ESL Students

The suggestions and predictions of this section form the basis of a number of the research questions of this study. With respect to the reading related cognitive processes of Farsi Adult ESL students, four areas were investigated.

Variance in English Word Reading

A large proportion of the variance in English word reading by bilingual students may be attributed to reading related cognitive processes. However, other factors such as language experience and demographic factors (e.g., education level) may also attribute for a proportion of the variance in English word reading. One prediction with Farsi speaking ESL students was that the major source of variation in English word reading would be accounted for by reading related cognitive processes. However, past research (e.g., Brown, 1990) has failed to take into account the role of language experience. For example, length of residence has been found to account for a significant proportion of variance in ESL students (Cummins, Swain, Nakajima, Handscombe, Green, & Tran, 1984). It was predicted that a significant proportion of the variance in English word reading could also be attributed to language experience.

Relationship of Cognitive Processes to Word Reading Performance

The question asked here is how important are syntactic, phonological, orthographic and memory processes to word reading in both English and Farsi. There is lack of agreement in the literature as to which of these processes are important in Farsi and English word reading with respect to Farsi ESL students. Baluch and Besner (1991) claim that no significant relationship exists between phonological processes in general and reading in Farsi or English. In addition, it has been claimed that Farsi speakers rely exclusively on orthographic routes of processing when reading Farsi or English words (Baluch, 2000). It was predicted that significant relationships would be found between phonological processes (awareness and coding) and reading (in Farsi and English). Many studies have found a significant relationship between reading and phonological processes in English speakers (e.g., Olson et al., 1984) and bilingual speakers (e.g., Da Fontoura & Siegel, 1995; Henderson, 1983). In relation to this area of investigation, we were also interested in knowing whether the pattern of relationships between reading and reading related cognitive processes were the same in both Farsi and English. Essentially, we were interested in knowing whether processing strategies were similar across L1 (Farsi) and L2 (English).

Reading Ability and ESL Students

A fundamental question was whether the defining characteristic difference between good and poor readers of English was due to differences in performance on reading related cognitive processes. The same question could apply to Farsi reading: is the major characteristic difference between good and poor readers of Farsi defined by performance on tasks that measure Farsi reading related cognitive processes?

It was predicted that good Farsi readers would outperform poor Farsi readers in all categories of Farsi reading related cognitive tasks. The same relationship was expected for Farsi students' English reading ability and reading related cognitive processes. This was based on the aforementioned literature indicating that reading ability differences are related to (reading related) cognitive processing differences within languages.

Language Category Comparisons

A fourth area of investigation was to examine reading related cognitive processes among bilingual adult speakers of both Farsi and English and to compare their performance to that of native English speakers. Between language comparisons however, were not expected to show any differences with respect to reading related cognitive processes. This is because these processes are consistent across languages (Mithen, 1996; Pinker, 1994, 1997). In his argument for a universal "language instinct" (Pinker, 1994, p. 19), Pinker examines neurological research with respect to the linguistic processes of children and adult stroke victims, and concludes that "I would expect the basic design of language, from syntax to phonological rules and vocabulary structure, to be uniform across the (human) species" (Pinker, 1994, p. 328-329).

Linguistic Interdependence Hypothesis

An important area of ESL research has to do with the interrelationship of cognitive skills across L1 and L2. The linguistic interdependence hypothesis states that individuals use the same set of processing strengths and weaknesses in both their first language (L1) and second language (L2) (Cummins, 1979; Cummins et al., 1984; Cummins & Swain, 1986; Royer & Carlo, 1991). In word reading, this would involve cognitive processes that would be "relatively immune to language shape or structure" (Hodes, 1981, p. 27). As a result, a deficit in L1 would be the same deficit in L2 (Cummins & Swain, 1986). For example, poor reading performance in L1 would be matched by poor reading performance in L2 (Devine, 1987; Haddad, 1981). Pinker (1994, 1997) and Mithen (1996) have noted that general cognitive processes (such as phonological or memory processes) involved in reading and writing are consistent across languages for all age groups.

Cummins and Swain (1986) note that two models of ESL proficiency have been proposed. The first model known as SUP (Separate Underlying Proficiency) states that L1 proficiency is separate from L2 (e.g., Clarke, 1980). Performance in L1 and L2 are due to separate (cognitive) processes. The second model known as CUP (Common Underlying Proficiency) states that aspects of bilingual proficiency in L1 and L2 are common or interdependent across L1 and L2. Experience with either L1 and L2 can help promote the development of proficiency underlying both languages. Surface features of L1 and L2 are those that have become relatively automated (less cognitively demanding). In essence, L1 and L2 cognitive proficiency are interdependent as a result of the fact that both are manifestations of the same underlying cognitive proficiency (Cummins, et al., 1984; Cummins & Swain, 1986).

Finally, Cummins (1984) makes a distinction between basic interpersonal communicative skills (BICS) and cognitive academic language proficiency (CALP). This theoretical framework is based on the findings of studies by Cummins (1979, 1981), and Skutnabb-Kangas and Toukomaa (1976). Essentially, younger immigrant students have been found to converse in peer-appropriate ways in everyday face to face situations (in both L1 and L2) despite literacy skills that were significantly below age-appropriate levels (Cummins, 1978, 1979, 1981; Skutnabb-Kangas & Toukomaa, 1976). The literacy skills measured were primarily reading skills (e.g., Cummins, 1979, p. 233). The reading skills of immigrant children were compared to similarly aged native English speaking children. Skutnabb-Kangas and Toukomaa (1976) did the same with respect to Finnish immigrant children attending Swedish mainstream schools. However, the Finnish students were also investigated with respect to their grade and age level achievement in "conceptual operations connected with mathematics ... biology, chemistry, and physics" (Skutnabb-Kangas & Toukomaa, 1976, p. 69).

Essentially, a distinction has been made between the elements of "surface fluency" (Cummins, 1984, p. 25) and more cognitively-related aspects of language proficiency. Basic interpersonal communicative skills (BICS) refers to the notion of surface fluency, or the superficially fluent communication skills required for L2 face to face communication (Cummins & Swain, 1986; Royer & Carlo, 1991). This is not be categorized with L2 (English) cognitive academic skills (Cummins, 1984). The language skills needed for L2 face-to-face communication (BICS) are different than performance required for L2 cognitive and academic tasks (CALP). Cummins and Swain (1986) note that English communicative skills are considerably better developed than academic language skills among many ESL students. For younger students (e.g., age on arrival being below 11 years of age), elements such as pronunciation are one of the least cognitively demanding aspects of L1 and L2 proficiency. Educators have often assumed that ESL students' L2 face to face communication is no different than their performance on an L2 cognitive/academic task (Cummins, 1984). Cognitive academic language proficiency (CALP) refers to the ESL student's conceptual and linguistic knowledge. Cognitive academic language proficiency in L1 and L2 is seen as a manifestation of one common underlying proficiency (Cummins & Swain, 1986; Royer & Carlo, 1991).

Research on the Linguistic Interdependence Hypothesis

Common Underlying Proficiency

Gholamain and Geva's study (1999) of reading in bilingual Farsi speaking children seems to provide support for the linguistic interdependence hypothesis. Gholamain and Geva (1999) investigated the basic cognitive skills in Farsi and English reading skills among bilingual Farsi ESL children. A significant relationship between students' language and cognitive skills was found in both Farsi and English (Gholamain & Geva, 1999). The skills examined were pseudoword decoding, working memory, and speed of letter naming tasks (Gholamain & Geva, 1999). No studies have investigated the role of reading related cognitive processes in English language acquisition among adult Farsi speaking ESL students.

In addition to the study of Gholamain and Geva (1999), studies lending support for the linguistic interdependence hypothesis have also been conducted with bilingual children in various other languages. One example is a study on Arab-Canadian children (Abu-Rabia & Siegel, 1997), which examined the relationship between reading, phonological, syntactic, and working memory processes in Arabic and English among Arab-Canadian children. There were significant relationships between English and Arabic phonological, orthographic, and working memory skills (Abu-Rabia & Siegel, 1997). Similar results were found with Berber and Arabic speaking children in Morocco (Wagner, Spratt, & Ezzaki, 1989), bilingual Portuguese Canadian children (Da Fontoura & Siegel, 1995), sixth grade Hispanic students in the US (Royer & Carlo, 1991), sixth through eighth grade level Polish and other ESL students in Canada (Huestis & Fagan, 1992). These studies suggest that there is a relationship between the reading skills in both the first and second languages. In essence, bilingual children with reading problems in their first language are more likely to exhibit difficulties in their second language.

In addition to bilingual Arab children, a study with adult university level Arabic ESL students (Henderson, 1983) has found tentative support for the interdependence of reading related cognitive skills across languages. Henderson found strong positive correlations in English and Arabic on cloze and pseudoword reading tasks. In addition, he found a strong positive correlation between an index termed as "reading rate" (Henderson, 1983, p. 94) in English and Arabic. The index of reading rate was calculated by recording the number of words read per minute in a passage. Henderson concludes that "a high level of proficiency in reading one's own native language can be a valuable asset in developing reading skills in a new language" (p. 120). However, no studies have examined the interdependence hypothesis among adult Farsi speaking ESL students or other adult ESL students in general.

Bilingual Education Programs

Cummins and Swain (1986) report on a number of bilingual education programs dealing with bilingual Ukrainian, Punjabi, and Spanish children. In general, these children were significantly better at identifying ambiguities in English sentence structure than their counterparts who only spoke English. What is interesting is that these "bilingual children" also develop an appreciation for and knowledge about their own (e.g., Ukrainian) culture. Note that in these programs, the pre-dominant language of instruction is initially in the first language (e.g., Spanish), however English language instruction is gradually increased (Cummins & Swain, 1986). However, some programs may introduce English at an earlier stage (e.g., an English-Ukrainian program in Edmonton, Alberta introduced English after Kindergarten) and some programs at a later stage (e.g., San Diego City School Spanish-English program introduced English from grade three). In addition, using the first language (e.g., Punjabi) as an initial medium of instruction has no detrimental consequences for English language development. For example, Hispanic children's achievement in English ultimately met and exceeded English-language norms at grade levels according to the 1982 San Diego City School's Spanish-English program (as cited by Cummins & Swain, 1986). This project observed two groups of students from Kindergarten to grade six; bilingual instruction Hispanic children and English-instruction only Hispanic children (Cummins and Swain, 1986). Three major findings were reported in the 1982 San Diego City School evaluation (as cited in Cummins & Swain, 1986) for the Spanish-English program. First, although the bilingual-instruction Hispanic children were only exposed to English reading and writing in the third grade, by fifth grade many had met or exceeded English language norms for their grade levels. Second, by sixth grade, the acquired English language skills were above the norm with respect to both their English-instruction only Hispanic peers as well as native English speakers in the San Diego School district. Third, the bilingual instruction Hispanic students also developed native language skills (Spanish reading and writing) that were above grade norms.

In essence, the data indicates that bilingual programs have been very successful in developing English academic skills despite the fact that students receive less exposure to English than in mainstream English programs. Barik and Swain (1978) for example, have found that early French immersion program students were performing better than control (English speaking only) students by grade five.

The major implication of the findings with bilingual program studies is that there exists a common underlying proficiency that underlies the development of academic skills in both L1 and L2. Although these programs have focused mainly on children, it may be safe to conclude from the results that there exists a set of underlying cognitive processes common to both English and Farsi proficiency among Farsi speaking adult ESL students.

Length of Residence and Age on Arrival in Canada

Two factors that have been investigated in relation to cognitive academic proficiency are age on arrival (AOA) and length of residence (LOR) (e.g., Cummins et al., 1984). In general, it has been found, with respect to age on arrival, that people who arrive in Canada at age 6 or later take between 5-7 years on average to approach grade norms in English vocabulary knowledge (Cummins & Swain, 1986; Huestis & Fagan, 1992). The findings with length of residence suggest that as LOR increases, academic performance begins to approach grade norms. In general, older students perform better than younger students on English cognitive/academic measures (Cummins et al., 1984). In addition, older immigrant students (10-12 years) achieve L2 cognitive/academic proficiency more rapidly than younger immigrant students (Cummins & Swain, 1986). Data supporting this observation is based on studies comparing the performance of immigrant ESL students at different ages of arrival to Canada. In general, it was found that older learners (i.e., age on arrival at 10-12 years) made more rapid progress over time in measures such as reading, vocabulary, and grammatical tasks, in comparison to children who arrived at earlier ages (e.g., age on arrival at 6-7). This may be due to the fact that older students have already developed advanced cognitive proficiency in their L1. This proficiency is seen as a major factor in the rapid acquisition of English academic skills. This would imply that cognitive academic proficiency is interdependent across languages.

Finally, length of residence has been found to be strongly (negatively) related to L1 (Japanese) academic proficiency (Cummins et al., 1984). Therefore, the longer the student has been outside of Japan and in Canada, the less proficient she/he will become in L1 (Japanese) academic skills. Baluch (1996) has found the same to be true with the Farsi academic reading skills of Iranians who have lived in the west for at least five years.

Suggestions and Predictions for Research on the Linguistic Interdependence Hypothesis.

The suggestions and predictions of this section formed the basis of a number of the research questions of this study with respect to Farsi Adult ESL students.

Cognitive Processing Consistencies across Languages

The question was whether specific reading related processes in English showed significant relationships with their Farsi counterparts. For example, would phonological awareness in English have a strong relationship to its counterpart in Farsi? It was predicted that the present study would confirm the linguistic interdependence hypothesis by finding significant correlations between Farsi and English reading related cognitive processing scores. The main reason for this prediction was that a number of previous studies have found reading related cognitive processes to be significantly related in other languages. For example, Da Fontoura and Siegel (1995) have found statistically significant correlations among English and Portuguese tasks measuring the same process (e.g., English and Portuguese pseudoword, English and Portuguese oral cloze). Since reading related cognitive processes are considered to be independent of the language structures of L1 (Farsi) and L2 (English), it was considered likely that this study would find that reading related cognitive processes were parallel across English and Farsi. This would provide support for the notion of a common underlying (cognitive) proficiency among Farsi ESL students. Significant correlations would imply that cognitive processes are intrinsic to the individual and are independent of language category (Pinker, 1994, 1997).

Influences of Length of Residence and Age on arrival to Canada

Length of residence and age on arrival to Canada have been shown to be related to the reading performance of ESL students (Cummins & Swain, 1986). However, the relationship of these factors to reading related cognitive processes among Farsi ESL students had not been addressed in past research. One possible prediction was that neither length of residence or age on arrival would affect the significance of the relationships between L1 and L2 reading related cognitive processes.

Language Effects and Language Experience

Before discussing the notions of language effects and language experience, it will first be necessary to outline the background literature of the field; idiosyncratic dialects, approximative systems, interlanguage hypothesis, contrastive analysis and error analysis. These are discussed below.

The notion of idiosyncratic dialects (Corder, 1971, 1973, 1975) notes that the person's grammar and language are unique to that individual. This idiosyncratic dialect (Corder, 1971, p. 148) has shared features with both the native (L1) and target language (L2). Nemser's concept of approximative systems (1971) emphasizes the developmental nature of second language acquisition. There is a constant process of change; the student is consistently taking in new phonological and syntactic elements from L2. There are three general features of approximative systems: (a) they are internally structured, (b) they are independent of L1 and L2, and (c) they are transient, in that they change as they evolve from one system (or stage) to the next. Selinker (1972) notes that a person's interlanguage has shared features with both L1 and L2, yet is also distinct from both of them. In addition, Selinker (1972) asserts that L2 learners can have persistent syntactic, phonological and morphological errors despite years of ESL instruction. In summary, when observing bilinguals' competency in L2, we are really examining the "intermediate space" (James, 1980, p. 4) between L1 and L2. This involves contrastive analysis as the main tool of investigation.

One of the main objectives of contrastive analysis is the recognition of "interference errors" (Danesi & DiPietro & 1991, p. 29) of L1 to L2. The repetition of an error in L2 is indicative of a source of difficulty (Danesi & DiPietro, 1991). That source of difficulty is investigated by comparing the English error to its equivalent in L1. Each specified category of English error is viewed as an "imitation" (Danesi & DiPietro, 1991, p. 32) of its equivalent in Farsi.

Contrastive analysis is the comparison and determination of similarities and differences between two, or more, languages with respect to phonological, grammatical and semantic systems (Danesi & DiPietro, 1991; Fisiak, 1981, 1990; James, 1980; Odlin, 1989; Sridhar, 1981). There are three steps to contrastive analysis (Krezezowski, 1967, 1974, 1981): (a) separate descriptions provided for L1 and L2, (b) grammatical elements to be compared between L1 and L2 are determined, and (c) native (L1) and second language (L2) are compared. As a result, contrastive analysis can not only assist in explaining so called "interference errors" from L1 to L2, it can also help in (theoretically) predicting L2 errors.

There are two fundamental assumptions in contrastive analysis. The first assumption is that the effect of L1 onto L2 is the major source of errors (Krezezowski, 1967, 1974). The second assumption is that the greater the difference between L1 and L2, the greater the difficulty in learning L2 (Krezezowski, 1967, 1974).

However, contrary to assumption one, many empirical studies have failed to substantiate native language interference as the main (or sole) cause of errors (August & Hakuta, 1997; Keshavarz, 1994; Sajavaara, 1981; Wolfe, 1967). Other factors may also contribute to errors, such as cognitive processes (Carlo & Sylvester, 1996), and education level (Mokhtari & Sheorey, 1994). By strictly adhering to assumption 1 (native language effect), we may lose sight of the various sources of error (e.g., cognitive processes) committed by Farsi-ESL students. In addition, contrastive analysis has also been criticized for ignoring the factor of overgeneralization of target language rules (James, 1981; Keshavarz, 1994) as well as other processes that take place as result of the language experience of the ESL student (Sajavaara, 1981; Sridhar, 1981).

Due to the above mentioned shortcomings in the contrastive analysis approach, researchers such as Arani (1985), Ghadessy (1980), Keshavarz (1994), and Mirhosseini (1986) have also turned to the techniques provided by error analysis. Error analysis involves the collection of samples of the ESL learner's performance on specified tasks (Corder, 1973, 1975; Ghadessy, 1980; Keshavarz, 1994). In error analysis, errors are identified, described and classified (Keshavarz, 1994).

However, a much more important issue related to contrastive analysis is that of language effects. Language effects is the process in which specific linguistic elements from one's L1 interfere or transfer to their counterparts in L2 structure (Jackson, 1981; Sajavaara, 1981; James, 1981; Krezezowski, 1967, 1981). These specified linguistic structures can be composed of syntactic, semantic and/or phonological elements. Jackson (1981) notes that the process of transfer and/or interference is a dynamic one (Jackson, 1981). This means that there is "movement from a specific element in L1 to a specific element in L2" (Krezezowski, 1981, p. 71).

However, despite general agreement as to the overall definition of language effects as defined above, the theoretical basis of the field is very complex and has been fraught with controversy. As noted by Sajavaara (1981), there is a "confusion of the relationship between the (psycholinguistic theory) of interference and errors, and the theory of second language learning" (p. 87). One major issue is whether language effects or interference possess some kind of "psychological reality" (James, 1980, p. 178). This pertains to the question of how the actual "psychological process" of effect or interference actually takes place and whether this phenomenon can be statistically measured and/or quantified. The only agreed upon tool for examining language effects is the qualitative technique of contrastive analysis, which compares the phonological, syntactic and semantic systems of L1 and L2. As noted above, contrastive analysis views L2 errors as being due to interference from L1. This is viewed as being caused by a contrast between L1 and L2 linguistic structures (Jackson, 1981; Keshavarz, 1994; Krezezowski, 1981). As noted by Krezezowski (1981), contrastive analysis is "limited to explaining phenomena which seem to occupy one portion in the linguistic behavior of foreign-language learners " (p. 77). In essence, second language learning is a complex process which includes a number of linguistic processes such as language effects (Krezezowski, 1981; Sajavaara, 1981). Most researchers agree that an important factor that may encapsulate the linguistic aspects of ESL learning as a whole, is exposure or experience with one's first and second languages. This "language experience" is characterized by the interlanguage hypothesis of Selinker as well as Corder's idiosyncratic dialect hypothesis as discussed earlier. The "experience" with L1 and L2 leads to at least five linguistic processes within the ESL learner (Krezezowski, 1981; Selinker, 1972): (a) strategies of L2 communication, (b) overgeneralization of L2 materials, (c) transfer of L1 training, (d) strategies of L2 learning, and (e) the transfer of syntactic, phonological and semantic elements from L1 to L2. Note that the final category is the linguistic process of language effects defined earlier.

In contrast to language effects, the quantification and statistical measurement of language experience variables are more consistently defined and agreed upon in the literature. Language experience is the amount of exposure one has had to one's first and second language in a non-Farsi speaking country (Canada) (Jafarpur, 1987, 1990). The variables of length of residence in Canada (Baluch, 1996; Cummins & Swain, 1986) and age on arrival to Canada (Cummins & Swain, 1986) pertain to language experience with English. Language experience with Farsi is investigated by examining amount of Farsi reading experience while residing in a non-Farsi speaking country (Canada) (Baluch, 1996). Note that Baluch's factor of length of residence (Baluch, 1996) in a non-Farsi speaking country is analogous to the notion of length of residence as defined by the literature in the linguistic interdependence hypothesis (Cummins & Swain, 1986). Factors such as length of residence and age on arrival can be used in multiple regression analysis as predictor variables to account for the variance on specified criterion variables (i.e., errors or reading scores) (Cummins et al, 1986).

In general, the longer a person has resided in Canada and the younger she/he was when she arrived to Canada, the more language experience she/he has likely had with English (Baluch, 1996; Cummins & Swain, 1986). Similarly, quantity of exposure to Farsi reading materials is one way of determining the amount of language experience with Farsi while residing in a non-Farsi speaking country (Canada) (Baluch, 1996).

Finally, it must be noted that many studies have compared groups of students (i.e., bilingual versus English speakers) and interpreted differences between them as showing language effects. A typical example is that of Zuckernick's Finnish ESL study (1996). Between group differences on ANOVA comparisons between Finnish (residing in

Finland) and US students are interpreted as showing "significant language effects" (Zuckernick, 1996, p. 88). However, differences between groups in ESL studies only show that the groups have shown a statistical difference on some dependent variable (Tabachnik & Fidell, 1996). It is not clear whether that difference can be entirely attributed to language effects (Jafarpur, 1990). The differences may be attributed to a number of other factors such as individual differences in reading related cognitive processes.

Research on Language effects and Language Experience

The research that is relevant to the language effects of adult Farsi ESL students can be summarized into the following categories: (a) the investigation of phonological, syntactic, and spelling miscues or errors, (b) transfer of L1 word identification strategies to L2, and (c) cultural factors.

Phonological, Syntactic, and Spelling Miscues or Errors

Goodman (1981) rejects the use of the term "error" on the premise that it implies an undesirable occurrence. He uses the term "miscue" instead, which is defined as any observed oral response to print that does not match the expected response (Goodman, 1976a, 1976b). Miscues are viewed as by-products of the reading process (Goodman & Burke, 1972; Goodman, 1976a, 1976b). The analysis of miscues reveals a reader's strengths and weaknesses (Tatlanghori, 1984). However, the main theoretical strength of the term "miscue" lies in the fact that it allows for "a means of studying not only oral reading, but all cognitive and linguistic processes" (Goodman, 1981, p. ix) implicated in the making of a so-called "error". This definition is important to this study because it allows for the implication of both cognitive and linguistic processes in the making of errors by Farsi speaking ESL students.

There have been a limited number of studies and categorisations of Farsi ESL errors in English phonology, syntax and spelling. Many of these studies also investigated the role of L1 language effects on L2 (English) acquisition of syntactic and phonological skills. However, unlike other ESL studies of errors (e.g., Tatlanghori, 1984), many of these studies (e.g., Shajari, 1983) have failed to acknowledge the role of both cognitive and linguistic processes in the making of errors (i.e., Goodman's (1981) "miscues").

Wilson and Wilson (1987), Keshavarz (1994), Mirhassani (1983), and Shajari (1983) note the following ESL phonological errors as being due to L1 (Farsi) language effects. The first type of error is due to a lack of certain English phonemes (vowels and consonants) in Farsi phonology. This is the case in which Farsi speakers try to use the closest sound in their Farsi language structure that approximates the closest (equivalent) English sound. Examples of this are using /t/ instead of /th/ (e.g. saying "tink" instead of "think") and /v/ instead of /w/ (e.g. saying "voman" instead of "woman"). The second type is due to difficulties with consonant clusters in English. An example is "small" pronounced as "e-small." This is mainly due to the fact that initial consonant clusters are not phonologically legal in Farsi; each consonant in the initial position is either preceded or followed by a vowel (Baker & Goldstein, 1990; Keshavarz, 1994; Wilson & Wilson, 1987). The third type of error is due to the confusion of when and how to stress vowels in English words. An example of this is "ship" pronounced as "sheep." The fourth type is due to English consonant errors. An example is "light"; /g/ is pronounced fully as in "get." "Light" in this case would be pronounced as a word resembling "liked" with the "k" resembling a hard "g" sound. The final type of error has to do with the /w/ sounds of English. An example is "water" pronounced as "vater."

Wilson and Wilson (1987), Faghih (1980), Ghadessy (1980), Keshavarz (1994), Sadighi (1990), and Yarmohammadi (1980) have identified the following three broad grammatical categories of errors as being due to Farsi language effects. The first category of grammatical errors is very large and includes syntactic elements such as prepositions, adjectives, adverbs, nouns, verbs, and conjunctions. Examples include using wrong prepositions in sentences (e.g., please answer <u>to</u> my letter soon). The second category of lexico-semantic errors include the interchangeability of similar measurement terms such as "tall-taller" or "big-bigger." Errors of omission are the third most common type of error. These include the tendency to delete certain function words (i.e., definite and indefinite articles) from spoken sentences (e.g., my father is __ doctor). This is because Farsi syntax is void of certain grammatical forms such as definite and indefinite articles (Wilson & Wilson, 1987).

The domain of English spelling errors made by Farsi speaking ESL students has not been investigated to the same extent as phonological and syntactic errors. It must be noted that the language effect literature pertaining to Farsi speakers (e.g., Wilson & Wilson, 1987) defines any type of spelling error as an orthographic error. However this definition may not be conceptually accurate in that it is really only pertaining to one of the cognitive processes involved in spelling. Specifically, spelling ability involves the translation of oral language into written symbols (Lennox & Siegel, 1993, 1996). The process of spelling involves both phonological and orthographic processes (Bruck & Waters, 1988, 1990). The phonological process in which spelling is based upon rests on the relationship between letters and sounds in English. Two types of phonological skills are needed in this case. The first is the ability to recognize the sounds of single letters (grapheme - phoneme conversion rules). The second is the ability to recognize the sounds of combinations of letters in which some sounds may change according to position and letter order rules (Lennox & Siegel, 1993, 1996). Bruck and Waters (1990) note that "the accurate knowledge of these (sound-spelling) correspondences differentiates the more skilled from the less skilled speller " (Bruck & Waters, 1990, p. 165-166)..

The orthographic aspect of spelling can be used in which the form of a word can be replicated using orthographic memory skills, without intermediate phonological skills; a process known as lexical access (Lennox & Siegel, 1998). It is important to note that the "memory skills" in this case are pertaining exclusively to skills and processes of written language. In their comparison of children (ages 6 -16) with average and poor spelling ability, Lennox & Siegel (1996) found that average spellers tended to use a phonological approach more frequently (as opposed to a visual approach); the reverse was found for poor spellers.

With respect to English spelling errors, it is not possible to speak of "language effects" in the same sense as phonological and syntactic errors. This is because the script system in Farsi is based on Arabic and has no effect on English Latin based script (Jahani, 1989). The only possible source of language effect error is the fact that Farsi script is read from right to left, in contrast to English. However, Wilson and Wilson (1987) have noted that this does not cause any serious problems with the acquisition of English reading. It must be noted that Wilson and Wilson base their assertions about reading direction on their teaching experience of English in Iran and have not formally investigated that process. There are no studies to date that have investigated the effect of reading direction of Farsi script on the acquisition of English reading and spelling skills.

Wilson and Wilson (1987) note that the only case in which definite language effects may exist in spelling is in that of capitalization. Farsi does not contain capital letters in the English sense, and Farsi speakers find them difficult to master in English (Wilson & Wilson, 1987). However no research has investigated this assertion and no evidence supporting this supposition exists in the literature. It is likely however, that Farsi speakers may make a certain "language effect" type of error (Teacher Training University of Tehran, 2000), especially with consonant clusters starting with the letter "s". For example, "small" may be written as "e-small" by Farsi speakers. This type of error has been observed among EFL students in Tehran (Teacher Training University of Tehran, 2000). This may indicate that as the EFL student hears the dictated word "small", she/he is phonologically processing the word as "e-small" and then writing the word as such.

In addition to the above observation, Wilson and Wilson (1987), Keshavarz (1994), and Arani (1985) have identified the following categories of spelling errors common among Farsi speaking ESL students. It is not clear whether these errors can be solely attributed to language effects (Wilson & Wilson, 1987). The first has to do with the tendency to confuse letters with mirror images (e.g., b and d; p and q). The second category has to do with homonyms such as deer-dear, or in-inn. The third has to do with confusion with English spelling rules. In general, there seem to be six areas of confusion among Iranian EFL (English as a foreign language) students in Iran (Teacher Training

University of Tehran, 2000) with respect to English spelling rules. Four of these are related to confusion as to which letters to write in response to the following families of sounds (1) s, z, soft c sounds, (2) q, hard ch, and hard c sounds, (3) t, d, and th sounds, and (4) ph, f, and v sounds. The fifth category is similar in that it has to do with confusion with respect to which vowel letters (a, e, i, o and u) to write with respect to English vowel sounds. The sixth and last category has to do with the doubling of final consonants in monosyllabic words before a suffix beginning with a vowel (e.g., clapping, hitting).

However, the studies of Arani (1985), Faghih (1980), Ghadessy (1980), Mirhassani (1983), Sadighi (1990), Shajari (1983), and Yarmohammadi (1980), have significant problems with methodology as well as instrument validity and reliability, especially with respect to face, content and construct validity (Cone & Foster, 1996). Content validity of the tasks is a major concern. Essentially, the tasks may not be representing the performance domain they purport to measure (Crocker & Algina, 1986). For example, it is unclear what phenomenon Shajari's (1983) miscues or errors are actually measuring with respect to reading. Specifically, no clear distinction seems to be made between phonological miscues or errors with respect to single word reading and syntactic errors with respect to text reading. Another serious confound with a number of the aforementioned studies (e.g., Ghadessy, 1981) is that they have relied on tasks that had not adequately addressed reliability concerns.

The methodology of the above mentioned studies (e.g., Arani, 1985) is also unclear. For example, Mirhassani (1983) does not provide any description about the number of participants involved, sample selection, or procedure. In addition, many of the aforementioned studies fail to provide information on the data analysis procedures of their studies (e.g., Ghadessy, 1980). In some cases, assertions about errors are made without any reference to previous research or relevant literature (e.g., Yarmohammadi, 1980). The element of length of residence in an English speaking environment and its relationship to English performance is not addressed (e.g., Faghih, 1980).

The most serious confound however is the assumption about the actual sources of errors. The majority of researchers of Iranian ESL students (e.g., Cowan & Sarmed, 1976; Shajari, 1983) subscribe to Krezezowski's assumption (1967, 1974) that language effects are the major source of errors and attribute for the greatest variation in word reading. However, it is not clear in any of the above studies whether the errors are due exclusively to language effects. Errors in syntax, phonology, and spelling may also be attributed to individual differences, especially with respect to cognitive processes. In addition, a major question that has not been addressed is how much of the variation in errors are due to language experience and separate reading related cognitive processes. Finally, education level may also influence error scores.

L1 to L2 Transfer of Word Identification Strategies

Language experience results in a number of processes (e.g. language effects) one of which is the transfer of the individual's L1 learning strategy to L2 (Danesi & DiPietro, 1991). The question here is whether L1 (Farsi) reading strategies transfer to L2 (English) reading strategies. As noted in the literature on ESL cognitive processes, two theories exist: (a) L1 reading strategies are influenced by the script of that language and transfer to L2 (Koda, 1987), and (b) ESL students adapt to the cognitive demands of English reading regardless of their original L1 script (Meara et al., 1985).

Cultural Factors

Cultural factors may be one of the elements influencing the English language acquisition of Farsi speaking ESL students (Wilson & Wilson, 1987). Anderson and Gunderson (1997) have noted that "for many immigrants learning represents the acquisition of a large number of facts through rote memorization" (p. 112). Since the 1970s, a number of studies have investigated the relationship of cultural background knowledge with respect to long term memory recall of texts (Royer, Carlo, Carlisle, & Furman, 1991; Steffensen, 1987). It has been asserted that ESL students who come from cultures with a strong oral tradition (e.g., Morocco) tend to have superior recall of verbal information (Field & Aebersold, 1990). This learning process (i.e., memorization) has been investigated in the Morrocan educational system (Wagner, Spratt, & Ezzaki, 1989). Citing Wagner, Messick and Spratt's study of the acquisition of literacy in Morroco, Wagner, Spratt and Ezzaki (1989) note that rote memorization was a fundamental medium of instruction at all levels of education. It is further observed that "memorization has been witnessed throughout the higher levels of modern Morrocan school systems extending into the university, to be a central pedagogical principle and acquisition strategy (Wagner et al., 1986; p. 253 as cited in Wagner, Spratt and Ezzaki, 1989).

It has further been claimed that these ESL students can do better than native English speaking students on tests that examine rote recall of facts (Field & Aebersold, 1990). Hall (1977) has asserted that Iranian culture as a whole is based on a strong oral tradition in which the ability to recall long verses of poetry or facts is highly valued socially. In addition, it has been noted that the school and university systems in Iran tend to emphasize the value of rote recall (Hall, 1977). It must be noted that Hall's assertions (1977) are not based on any empirical research; his conclusions are based on observations and interviews made in Iran in the late 1970s.

Two studies have investigated the long-term memory performance of adult Farsi ESL students. Johnson (1981) investigated the long-term memory processes of Farsi ESL students. She was interested in knowing whether (a) syntactic and semantic complexity or (b) the cultural familiarity of a text had a greater relationship to long-term recall. Iranians only did better on recall tasks that contained Iranian cultural content. However, syntactic and semantic complexity was the major predictor of long-term memory performance. Malik (1990) had Farsi ESL students read aloud encyclopedia descriptions of an Iranian or Japanese myth and were later tested for long-term recall of facts. The results indicated that both poor and good English readers had much better recall for the Iranian myth. In summary, recall for (previously) unknown content was not shown to be superior in any of the aforementioned studies. Although Iranians may emphasize the role of rote recall culturally and educationally, it is not predicted that this cultural factor will result in superior performance with respect to long memory tasks containing unfamiliar (i.e., non-Iranian) content.

Suggestions and Predictions for Research Related to Language Effects and Language Experience

The suggestions and predictions of this section formed the basis of a number of the research questions of this study. Specifically, the following areas were investigated with respect to reading related syntactic, phonological, and spelling errors.

The Study of Language Experience and Language Effects

In this study, language experience was measured by length of residence, Farsi reading experience in Canada as well as age on arrival. It was expected that language experience would explain a portion of the variation with respect to certain identified errors in which bilingual students may have had significantly more errors than their native English speaking counterparts (e.g., decoding the letter "w"). The contrastive analysis technique was used to help explain the specific phenomenon of language effects inherent in the overall language experience of the bilingual learner.

Error analysis and Contrastive Analysis

Error analysis involved the collection of samples of the ESL learner's performance on specified tasks (Corder, 1973; James, 1980). By having described and classified the types of errors, contrastive analysis was used to locate the sources of English reading difficulty in Farsi speaking ESL students.

Variance in Errors

It was predicted that syntactic, phonological and spelling errors could be partially attributed to language experience variables (Danesi & DiPietro, 1991; Fisiak, 1990), reading related cognitive processes (Carlo & Sylvester, 1996), as well as education level (demographic variables) (Mokhtari & Sheorey, 1994). No previous studies had investigated the relative amounts of variance in errors due to language experience, cognitive processes and educational level among Farsi ESL students. A general prediction was that none of the errors could be purely attributed to language experience or cognitive processes. The amount of variance accounted for by each predictor variable would probably vary with each category of error. For example, certain errors such as difficulties with the /w/ sound could be partially due to language experience; however, cognitive processes (e.g., phonological awareness) could also account for a proportion of the variance. The question here was which processes (language experience and cognitive processes) were most implicated in each type of error.

Word Reading Strategies in L1 and L2

The inquiry was whether word reading strategy in L1 (Farsi) was similar to word reading strategy in L2 (English). This question compared relationships between cognitive processes and reading in L1 and L2. Would the relationship between cognitive processes to Farsi reading be similar to that of cognitive processes to English reading? Perhaps Farsi students could have used the same processing strategies in both Farsi and English reading, since both languages use alphabetic scripts.

Cultural Factors and Memory Performance

Although assertions have been made about Iranian students being able to do better than native English speakers on memory tasks due to cultural factors (Hall, 1977), previous research (e.g., Malik, 1990) has found no supporting evidence. No significant differences were expected to be found in the comparison of ESL Farsi speakers and native English speakers with respect to performance on memory (short term or long term) as well as other reading related cognitive processes (e.g., syntactic awareness).

Research Questions

Having outlined the literature and suggested areas of investigation, we now address the research questions of this study. Each research question (along with statistical method) is outlined and discussed below.

1. What is the relationship between language category and English reading ability to scores attained in English reading related cognitive tasks?

We were interested in comparing Farsi speakers of good and poor English reading ability to their native English speaking counterparts with respect to their scores on English reading related cognitive tasks. This was analyzed by the 2-Way MANOVA procedure. The first factor was language category, which consisted of two levels (Farsi and English). The second factor was English reading ability, which consisted of two levels (good versus poor). The dependent variables were the scores on the English reading related cognitive tasks. The reading subtest of the standardized WRAT 3 (Jastak & Wilkinson, 1984) was used to assess reading level in English[2].

A main effect with respect to reading ability was expected. It was expected for good and poor readers to differ in their performance on various reading related cognitive processing tasks (e.g., Mann, 1998). No main effects were expected for language category. This was based on the premise that cognitive processes are consistent across languages and that there is a common underlying proficiency across languages (Cummins & Swain, 1986). No interactions between language category and English reading ability

[2] The analytical details of this procedure are discussed in the Method section.

were expected. Essentially, we expected that changes of the criterion variable (the cognitive scores) over levels of language category would not depend on the level of English reading ability. Also, changes of the criterion variable (the cognitive scores) were not expected to depend on levels of language category.

2. How much of the variance in word reading is accounted for by cognitive processes and language experience?

We were investigating the variation in reading scores due to English reading related cognitive processes and language experience among Farsi speaking ESL students. The variation due to education level (non-native language factors) was also investigated, since it could account for a proportion of variance in word reading performance of ESL students as well (Mokhtari & Sheorey, 1994). Sequential multiple regression was the tool of analysis, a model that has been proposed as effective in helping to account for the variation in reading scores due to factors such as cognitive processes (Singer & Crouse, 1981). The criterion variable was word reading performance. Specifically, separate sequential multiple regression analyses were conducted on the Woodcock Word Identification Task and the WRAT Reading Task.

The first predictor variable was a block variable defined as "cognitive processes factor." All of the scores on the reading related cognitive processes were entered as a set in order to form this single predictor variable. Specifically, these were the scores for the Oral Cloze Task, Rosner Auditory Analysis Task, Woodcock Word Attack, Orthographic Task, Working Memory Task, and Long-term Memory Task. The second predictor variable was a block variable defined as "language experience factor". This was composed of the following factors: (a) length of residence in Canada (Baluch, 1996;

Cummins & Swain, 1986), (b) age on arrival to Canada (Cummins & Swain, 1986), and (c) Farsi reading experience in Canada (Baluch, 1996). The third predictor variable was education level in Canada (ELC).

One prediction was that the majority of the variance in word reading scores would be due to reading related cognitive processes (i.e., Brown, 1990). However language experience could also have accounted for a significant proportion of the variance. Jafarpur (1990) has noted that a significant proportion of variance in the word reading performance of Farsi ESL students may be attributed to language experience. Education level in Canada was predicted as accounting for the least amount of variance in word reading scores.

3. Are there significant differences between bilinguals and native English speakers with respect to syntactic error scores?

We were comparing error scores between bilinguals and native English speakers in the syntactic category. Error analysis was used to identify, describe, and classify every item of error for each participant (e.g., Danesi & DiPietro, 1991). An important note must be made with respect to the issue of language effects. Differences between Farsi speaking ESL students and native English speakers with respect to error scores did not imply that a language effect had been identified. As noted in the literature review, a number of ESL researchers (e.g., Zuckernick, 1996) interpret between group differences (ESL students and native English speakers) on performance (criterion) variables as identifying language effects (Jafarpur, 1990). The tool of analysis of these investigations are usually ANOVA or MANOVA methods (e.g., Zuckernick, 1996). However, ANOVA or MANOVA only detects differences between groups. One cannot (statistically) account for the factors resulting in the variance in the dependent variable(s). This particular question only examined where significant differences (in particular errors) between bilingual and native English speaking students had been identified.

Finally, the predictor variable was language category (there were two levels, bilingual and native English speakers). The criterion variables were the syntactic error scores.

4. How much of the variance in each category of syntactic errors is accounted for by cognitive processes and language experience?

We were investigating the syntactic error categories in which significant between group were found (previous question). The main objective of this question was to investigate the amount of variance in each item of syntactic error among bilinguals (in which between group differences were found) accounted for by cognitive processes and language experience respectively. The variation due to education level (non-native language factors) was also investigated, since it could have accounted for a proportion of variance in errors (Keshavarz, 1994). Sequential multiple regression was the tool of analysis. Specifically, the regression analyses endeavored to account for the amount of variance in syntactic error categories that were due to language experience and cognitive processes respectively. The criterion variable in each case was the specific item of syntactic error in which bilinguals had significantly more errors than native English speakers (previous question). The three block variables (cognitive processes factor, language experience factor, and demographic factor) were entered into the regression model as defined in question two above. However, the Oral Cloze Task was not used as a predictor within the cognitive processes factor, since the same variable cannot be used as both a predictor and criterion variable in the same equation.

It was predicted that cognitive processes and language experience would account for the major proportion of the variance in errors, with education level in Canada accounting for a lesser proportion of the variance. Language experience could have accounted for the majority of the variance with certain types of errors, and cognitive processes with other types of errors. For example, language experience may have accounted for the major source of variation in verb errors. The specific role of language effects within language experience was then be explained by the contrastive analysis technique. Contrastive analysis could have revealed that Farsi speakers' verb errors in English were due to the fact that in Farsi (in contrast to English), verbs occur at the end of sentences (Wilson & Wilson, 1987).

5. Are there significant differences between bilinguals and native English speakers with respect to phonological error scores?

We were comparing error scores between bilinguals and native English speakers in the phonological category. Error analysis was used to identify, describe, and classify every item of error for each participant (e.g., Danesi & DiPietro, 1991). The predictor variable was language category (there were two levels, bilingual and native English speakers). The criterion variables were the phonological error scores. MANOVA was the statistical tool of analysis.

6. How much of the variance in each category of phonological errors is accounted for by cognitive processes and language experience?

We investigated the phonological error categories in which significant between group differences were found (previous question). Multiple regression analyses were used to account for the variation due to language experience or other processes.

The main objective of this question was to investigate the amount of variance in each item of phonological error (in which between group differences were found) accounted for by cognitive processes and language experience respectively. The variation due to education level (non-native language factors) was also investigated, since it could have accounted for a proportion of variance in errors (Keshavarz, 1994). Sequential multiple regression was the tool of analysis. Specifically, the regression analyses endeavored to account for the amount of variance in phonological error categories that were due to language experience and cognitive processes respectively. The criterion variable in each case was the specific item of phonological error in which significant between group differences were found (previous question). The three block variables (cognitive processes factor, language experience factor, and demographic factor) were entered into the regression model as defined in question two above.

It was predicted that cognitive processes and language experience would account for the major proportion of the variance in errors, with education level in Canada accounting for a lesser proportion of the variance. Language experience could have accounted for the majority of the variance with certain types of errors, and cognitive processes with other types of errors. For example, language experience could have accounted for the major proportion of variance with respect to the phonological error of pronouncing "w" as /v/. Follow-up contrastive analysis examining the role of language effects could have revealed that a language effect occurs due to the fact that no /w/ sound exists in Farsi (Wilson & Wilson, 1987). Cognitive processes however, could have accounted for the major proportion of variance with respect to sight-substitution errors (e.g., reading "benign" as "begin" on WRAT Reading Task or "historical" as "hysterical" on Word Identification Task of Woodcock).

7. Are there significant differences between bilinguals and native English speakers with respect to spelling error scores?

We were comparing error scores between bilinguals and native English speakers in the spelling category. Error analysis was used to identify, describe, and classify every item of error for each participant (e.g., Danesi & DiPietro, 1991). Finally, the predictor variable was language category (there were two levels, bilingual and native English speakers). The criterion variables were the spelling errors. MANOVA was the statistical tool of analysis.

8. How much of the variance in each category of spelling errors is accounted for by cognitive processes and language experience?

We were investigating the spelling error categories in which significant between group were found (previous question). Multiple regression analyses were used to account for the variation due to language experience or other processes.

The main objective of this question was to investigate the amount of variance in each item of spelling error (in which between group differences were found) accounted for by cognitive processes and language experience respectively. The variation due to education level (non-native language factors) was also investigated, since it could also have accounted for a proportion of variance in errors (Keshavarz, 1994). Sequential multiple regression was the tool of analysis. Specifically, the regression analyses endeavored to account for the amount of variance in spelling error categories that were due to language experience and cognitive processes respectively. The criterion variable in each case was the specific item of spelling error in which significant between group differences were found (previous question). The three block variables (cognitive processes factor, language experience factor, and demographic factor) were entered into the regression model as defined in question two above.

It was difficult to predict how much of the variance in spelling errors would be due to language experience, because Farsi and English use different scripts. It was possible that the majority of the variance in spelling errors would be due to cognitive processes, especially with the process of being able to conceive dictated words as sequences of phonemes. Specifically, an important (cognitive) process in this case could have been the awareness of phonological segments in English words or phonological analysis skills in English.

9. What is the relationship between reading ability in Farsi and attained scores in Farsi reading related cognitive tasks?

Our main interest was in investigating the relationship between Farsi reading ability and performance on Farsi reading related cognitive tasks (defined in Methods section). This was analyzed by the MANOVA procedure. The predictor variable was Farsi reading ability, which consisted of two levels (good versus poor). The criterion variables were the Farsi reading related cognitive processing tasks (defined in Method section). The Farsi Reading Task (Farrokh & Chalashgar, 1999) was used to assess reading level in Farsi speakers. A main effect with respect to Farsi reading ability was expected. This prediction was expected because good and poor readers have been shown to differ in their performance on various reading related cognitive processing tasks across a number of languages such as Chinese (e.g., So & Siegel, 1997).

10. What is the relationship between scores in English reading related cognitive tasks and their Farsi counterparts?

We were examining the relationships between word reading and reading related cognitive processes in both English and Farsi. This was analyzed by a correlation matrix consisting of correlations between all of the reading related cognitive Farsi tasks, their English counterparts, Farsi reading, and English reading tasks. We then partialled out language experience variables (length of residence, age on arrival, and Farsi reading experience in Canada). This was done in order to see whether language experience affected the relationships observed. Two general areas were examined.

We first investigated the notion of cognitive processes being consistent across languages (linguistic interdependence hypothesis). It was predicted that significant relationships would be found between specific reading related cognitive processes (e.g., phonological awareness) in Farsi and English. Our second area of investigation concerned the correlations between cognitive processes and word reading in both English and Farsi (discussed in ESL cognitive processes). It was predicted that significant relationships would be found between reading related cognitive processes and word reading in both Farsi (i.e., Gholamain & Geva, 1999) and English (i.e., Mann, 1998). In relation to this area, we also compared the magnitude of the (significant) correlations between cognitive processes and word reading in Farsi and in English. For example, we compared the size of the correlation between the Woodcock Word Identification and Oral Cloze Task to that of Farsi Word Identification and Farsi Oral Cloze. Essentially, we were asking whether processing strategies were similar or not across L1 (Farsi) and L2 (English) (discussed in ESL cognitive processes and language experience and effects).

Predictions were difficult to make, however one possibility was that Farsi students' processing strategies would be similar across both Farsi and English reading.

CHAPTER II

Methods

Participants

One of major goals of this study was to examine reading related cognitive processes and errors among bilingual speakers of both Farsi and English and to compare their performance to that of native English speakers. The recruitment of the Farsi speaking bilingual students proceeded as follows. A total of 60 Farsi speaking ESL participants ($\underline{n}$ = 30 female; $\underline{n}$ = 30 male) ranging between 19-35 years of age were recruited from the following sources: Multilingual Orientation Services Association for Immigrant Community (known as MOSAIC), and the Persian student associations of the various colleges and universities were also contacted for Farsi speaking volunteers. The Afghan community centres were also canvassed for potential volunteers.

The 60 native English speakers ($\underline{n}$ = 30 female; $\underline{n}$ = 30 male) were recruited from the metropolitan and North Vancouver Community Centers as well as through the various student associations of the colleges and universities of British Columbia. The native English speakers were matched to their bilingual counterparts with respect to education level in Canada. There were four distinct categories of education level in Canada; (1) below grade 12, (2) grade 12 complete, (3) college or university incomplete, and (4) university degree.

Procedures

Each bilingual participant was given an initial interview that ascertained the age, first language, ethnic origin, education level (in Iran and Canada), amount of daily or weekly Farsi reading, and length of residence in Canada. The ethnic origin and first language categories were used to screen out those volunteers who came from non-Farsi speaking ancestry. Specifically, these would be people whose first language was either a non-Farsi Iranian language (e.g. Kurdish) or Turkish. The participants of this study came from families who have spoken Farsi as their first language for at least two generations.

In one session, the Farsi-ESL participants were given Farsi reading, grammatical sensitivity, phonological awareness and decoding, orthographic, spelling, working memory and long term memory tasks (tasks described below). In another session, the equivalent English tasks were administered in same order (tasks described below). The order of language presentation was randomly assigned to either Farsi or English first. The comparison group was also given the English versions of all the tests.

Description of Tasks

Below is a description of the tasks used in the assessment of English and Farsi reading, spelling, syntactic awareness, phonological awareness, phonological coding, orthographic awareness, working memory and long term memory.

English reading

The Word Identification subtest of the Woodcock Reading Mastery Test-Revised (Woodcock, 1987) (Appendix A) had 106 items. Students read aloud words that increased in difficulty. Examples included "woman" and "zeitgeist". Note that the items of the Woodcock Word Identification Task were designed to measure the domain of word recognition as defined in the literature review. This was an important basis for the measure's construct and content validity; as noted by Woodcock (1987), items "were developed by contributions by outside experts" (Woodcock, 1987, p.97). Concurrent validity correlations between the Word Identification Task of the WRMT-R (Woodcock Reading Mastery Tests-Revised) and the Letter-Word Identification Task of the Woodcock-Johnson Reading Tests for grade levels 1, 3, 5, and 8 were .69, .82, .83, and .72 respectively (Woodcock, 1987). The split-half reliabilities (Spearman-Brown corrected) reported in the test manual were .86, .94, and .97 for grade 11, college and adult levels, respectively (Woodcock, 1987).

Another task used in the assessment of English reading was the reading task of the Wide Range Achievement Test (WRAT 3) (Wilkinson, 1993) (Appendix B). The word reading task of the WRAT3 contained 42 pronounceable words (Wilkinson, 1993). Participants read aloud an increasingly difficult set of words. Examples included "cat" and "terpsichorean". Note that like the Woodcock Word Identification task (Woodcock, 1987), the items of the WRAT Reading Task were designed to examine word recognition as defined in the literature review. This was an important basis for the measure's construct and content validity, and as noted by Wilkinson (1993), "domains being measured are all words in the English language for … reading" (Wilkinson, 1993, p.176). The reliability scores (coefficient alpha) reported in the test manual were .92, .92, .90, and .92 for age ranges 17 - 19, 20 - 24, 25 - 34, and 35- 44, respectively (Wilkinson, 1993).

Farsi Reading

Farsi word reading was composed of 148 items. Farsi word reading was originally designed as separate tests: the Farsi Reading Task (Farrokh & Chalashgar, 1999; 42 items, Appendix C) and the Farsi Word Identification Task (Farrokh & Chalashgar, 1999; 106 items, Appendix D). In this study both tasks were used in order to have a total of 148 items (to match the total number of words in the Woodcock Word Identification and the Reading subtest of the WRAT3), however they were treated as one singular task (Farsi word reading) since both tasks only assessed word-decoding in Farsi. In Farsi word reading, the participant read aloud an increasingly difficult set of words. Examples included "parvaz" (flight) and "motejanes" (homogeneous). Reliability for all of the Farsi tasks constructed for this study was established in a pilot study (i.e., Farrokh & Chalashgar, 1999; see below).

English Spelling

The Word Spelling Subtest of the WRAT3 (Wilkinson, 1993) (Appendix E) involved asking an individual to write words to dictation. The task was composed of 40 items arranged in increasing order of difficulty. Examples included "cook" and "pusillanimous". Note that the items of the WRAT Spelling Task were designed to examine English spelling errors as defined in the literature review. This was an important basis for the measure's construct and content validity, and as noted by Wilkinson (1993), "domains being measured are all words in the English language for … spelling" (Wilkinson, 1993, p.176). The reliability scores (coefficient alpha) reported in the test manual were .92, .93 and .93 for age ranges 17 - 19, 20 - 24, 25 - 34, and 35- 44 respectively (Wilkinson, 1993).

Farsi Spelling

The Farsi Spelling Task (Farrokh & Chalashgar, 1999) (Appendix F) involved asking an individual to write Farsi words to dictation. The Farsi Spelling Task (Farrokh & Chalashgar, 1999), Appendix F) involved the individual writing words to dictation. The task was composed of 40 items arranged in increasing order of difficulty. Examples included "dast" (hand) and "ezmehlal" (deconstruction).

English Syntactic Awareness

This task was a revision of the oral cloze task originally developed by Siegel and Ryan (1988) to examine syntactic awareness. One half of the sentences were revised to examine syntactic errors most common among bilingual Farsi speakers (Swan & Smith, 1987; Yarmohammadi, 1980). In the Revised Oral Cloze task task (Farrokh, Vahabzadeh, & Otton, 1998) (Appendix G) examiners asked participants to fill in the blank spaces of sentences that were presented to them orally. The participant's task was to supply a word that was syntactically appropriate. An example of this would be a sentence such as "The girl_____ is tall plays basketball well". This task had a total of 20 items. Note that the items of the Revised Oral Cloze Task were "selected to accurately measure the domain of syntactic awareness in order to provide the basis for the measure's construct and content validity" (Farrokh, Vahabzadeh, & Otton, 1998, p.2). The split-half reliability of this task was .81 (Farrokh, Vahabzadeh, & Otton, 1998).

Farsi Syntactic Awareness

In the Farsi Oral Cloze Task (Farrokh, Vahabzadeh, & Faizabadi, 1999) (Appendix H) examiners asked participants to fill in the blank spaces of sentences with syntactically appropriate words that were presented to them orally. An example of such a sentence was "Havapeyma ____ meeyane abraha parvaz meekonad" (The plane flies___ the clouds[1]). Possible prepositions were "dar" (in) or "az" (through). This task had a total of 20 items.

English Phonological Awareness

The Rosner Auditory Analysis Task (Rosner & Simon, 1971) (Appendix I) was used to assess phonological awareness in English. The participant was instructed to take a part of the sound off a meaningful word, and to say what was left. One example was "belt" and "bel(t)". The portion left off was "t". The correct response was "bell"[2]. This task had a total of 40 items. With respect to construct and content validity, Rosner and Simon (1971), note that items were designed to examine the domain of phonological analysis or the ability "to repeat a word without certain specified phonemic elements" (Rosner & Simon, 1971, p.384). The concurrent validity of this task with the Stanford Achievement Test Reading scores ranged from .53 - .84 (Rosner & Simon, 1971). The split-half reliability reported for this task was .95 (Gottardo, Stanovich, & Siegel, 1996).

Farsi Phonological Awareness

In the Farsi Auditory Analysis Task (Farrokh & Vahabzadeh, 1999, Appendix J) the participant was instructed by the tester to take a part of the sound off a meaningful word and then to say what was left. Similar to the English Rosner Auditory Analysis Task, subjects were first orally given an actual word such as kafsh (shoe) and then told to repeat it. Next, they were to repeat the word "kafsh" without sounding out /sh/. The correct response was "kaf" (surface). This task had a total of 40 items.

[1] Note that the word to word translation from Farsi is "The plane___ the clouds fly does". In the majority of cases, verbs come at the end of sentences in Farsi (Khanlari, 1979).
[2] It is not always actual words that are left (e.g. "philosophy" with /lo/ removed, resulting in "phisophy").

English Phonological Coding

The Word Attack subtest of the Woodcock Reading Mastery Test-Revised (Woodcock, 1987) (Appendix K) required the participant to read aloud an increasingly difficult set of pseudowords (Woodcock, 1987). Examples of these included fay, cigbet, and monglustamer. The Word Attack had a total of 45 items. Note that the items of the Woodcock Word Attack Task were designed to examine the domain of phonological coding as defined in the literature review. This was an important basis for the measure's construct and content validity; as noted by Woodcock (1987), items "were developed by contributions by outside experts" (Woodcock, 1987, p.97). Concurrent validity correlations between the Word Attack Task of the WRMT-R (Woodcock Reading Mastery Tests-Revised) and the Word Attack Task of the Woodcock-Johnson Reading Tests for grade levels 1, 3, 5, and 8 were .64, .74, .90, and .64 respectively (Woodcock, 1987). The split-half reliabilities (Spearman-Brown) reported in the test manual were .84, .81, and .87 for grade 11, college and adult levels, respectively (Woodcock, 1987).

Farsi Phonological Coding

The Farsi Pseudoword Task (Farrokh & Chalashgar, 1999, Appendix L) required participants to read an increasingly difficult set of Farsi pseudowords. Examples of these included geem, seeklokeh, and shakmojhke. The Farsi Pseudoword Task had 45 items.

English Orthographic Awareness

The Orthographic Task (Siegel, Share, & Geva, 1995) (Appendix M) contained 17 pairs of pronounceable pseudowords. Only one member of every pair contained a bigram that did not occur in English in the relevant position (e.g. filk-filv). Although "filv" was pronounceable, "lv" never occurs without an "e" at the end of an English word such as halve. The task was to select the member of each pair that "could be a word" or "looks like a word". Note that the items of the Orthographic Task were designed to examine orthographic awareness as defined in the literature review. This was an important basis for the measure's construct and content validity, and as noted by Siegel, Share, and Geva (1995), the main objective of the task was to examine participants' ability with respect to "recognition of the orthographic characteristics of the English language" (Siegel, Share, & Geva, 1995, p.250). The split-half reliability (Spearman-Brown corrected) of this task was .70 (Stanovich & Siegel, 1994).

Farsi Orthographic Awareness

The Farsi Orthographic Task (Farrokh, Chalashgar & Faizabadi, 1999, Appendix N) contained 17 pairs of pronounceable Farsi pseudowords. Only one member of every pair contained a bigram that did not occur in Farsi in the position shown (initial or final). Similar to the English Orthographic Task, the task was to select the member of each pair that could be a word or looks like a word. As an example, one of the pairs was palam-fakam. The Farsi pseudoword "fakam" is pronounceable, but is not a typical written Farsi word.

English Working Memory

In the Working Memory Task (Siegel, 1993; Siegel & Ryan, 1989) (Appendix O), sentences with the final word missing were read to participants. The participant was to supply the missing word at the end of each sentence, and repeat all the missing words at the end of the set. Sentences were selected so that the final word was predetermined. This was done to reduce difficulties in word retrieval. The maximum score was 12 points. A score was given when all the correct missing words were recalled in the correct order. An example were the sentences "In a baseball game, the pitcher throws the____ " (participant says "ball") and "On my two hands, I have ten____ " (participant says "fingers"). Participants had to be able to repeat the two words in the correct order (ball – fingers). With respect to construct and content validity, items were designed to examine the domain of working memory as defined in the literature review. No index of split half-reliability has been reported for this task.

Farsi Working Memory

In the Farsi Working Memory Task (Farrokh & Vahabzadeh, 1999, Appendix P) sentences with the final word missing were read to participants. The task was to supply the missing word at the end of each sentence and to repeat all the missing words from the set. This was done to reduce difficulties in word retrieval. Note that sentences were selected such that the final word was predetermined. In Farsi, sentences ending with verbs are such that the verbs are pre-determined (Khanlari, 1979). Specifically, the tense of the sentence (e.g. past tense, future tense, etc.) predetermines the verb that comes at the end of the sentence (Khanlari, 1979). The maximum score was 12 points. A score was given when all the correct missing words were recalled in the correct order. Examples include the sentences "Darejeye havaye imrooze Toronto chand (How much (is) today's temperature in Toronto[3]) _____(participant says /ast/ "is") and "dar kheeyaban haer rooze hadese-ee rokh (On the street every day an incident)____" (participant says /meedahad/ "occurs"). Participants had to be able to repeat the two words in the correct order (mikonaam – meedahad).

[3] In Farsi, verbs come at the end of sentences in the majority of cases (Khanlari, 1979).

English Long-term Memory

The design of this task was based on previous ESL long term memory tasks (e.g. Richardson-Klavehn & Bjork, 1988). All participants were first presented with a one page historical passage about German secret weapons of the Second World War (Appendix Q). A survey of 120 Farsi speakers indicated that this topic is unfamiliar to the majority of Iranians. A similar survey of 26 high school teachers from Vancouver indicated that this topic is not currently taught in secondary schools and is unfamiliar to the majority of native English speakers. The English Long Term Memory Task (Farrokh, 1999) (Appendix R) was a 10 item multiple choice quiz (each question has 4 response choices). The quiz was given to the participant one week after having read the passage. This was done to ensure that the quiz only tested long term retention of facts (Daneman & Carpenter, 1980). To ensure construct validity, the items of the task were designed to examine "conscious recollection of (previously) studied material" (Heredia & McLaughlin, 1992, p. 92) or "recall of previously read material in order to effectively examine long term (semantic) memory for that material" (Farrokh, 1999, p.3). The split-half reliability (Spearman-Brown corrected) of this task was .83.

Farsi Long-term Memory

Participants were first presented with a historical narrative of the Celts, a topic unfamiliar with the majority of Iranians (Farrokh & Vahabzadeh, 1999, Appendix S). A survey of 120 Farsi speakers indicated that this topic is unfamiliar to the majority of Iranians. The Farsi Long-term Memory Task (Farrokh & Vahabzadeh, 1999) was a 10 item multiple choice quiz (each question has 4 response choices, Appendix T). The quiz was given to the participant one week after having read the passage.

Task Design

Most previous studies of Farsi ESL learning have relied on English tasks that were simple translations of typical Farsi items into English (Ghadessy, 1980). The instruments used in previous Farsi ESL studies (e.g. Fallahi, 1978) may not have been measuring the reading related cognitive processes relevant to English language acquisition. The design of the Farsi tasks in this study were done in consideration of the following issues: construct validity, the difficulty level of the Farsi instruments, and the reliability of the Farsi instruments. Each of these issues are discussed in detail below.

Content and Construct Validity

Each of the English tasks (e.g., Rosner Auditory Analysis Task) had an underlying conceptual basis. That conceptual basis lead to the selection of certain words, sentences or items appropriate to the domain being measured. The same conceptual basis was used in designing each of the equivalent Farsi tasks. As a result, the words and sentences used in the Farsi versions of the tasks were selected in accordance with the demands of the conceptual basis of the tasks. In essence, Farsi items were not simple translations of English items. This was done to make the Farsi version of the tasks as parallel as possible to their English counterparts in purpose and difficulty.

Task Difficulty

This was done by pre-testing the Farsi instruments with 30 volunteers[4]. These participants were then interviewed about their perceptions regarding the difficulty level and appropriateness of the test items.

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[4] These were separate from the main body of research participants

The next step was to analyze the statistical distribution of scores to ensure that the range of scores was sufficient for a proper correlation analysis. This would suggest that the instruments had the means to distinguish more finely the various levels of performance. The aim of pre-testing was to adjust the level of difficulty of the items of all the Farsi tasks.

Reliability of Tasks

Reliability is defined as the desired consistency (or reproducibility) of test scores (Crocker & Algina, 1986). To ensure the reliability of the Farsi tasks, the following steps were taken. The pilot sample of n=30 volunteers were given all of the tests. Split half reliability was calculated and are as follows:

1. Farsi Word Identification Task (Farrokh & Chalashgar, 1999) = .92
2. Farsi Reading Task (Farrokh & Chalashgar, 1999) = .91
3. Farsi Oral Cloze Task (Farrokh et al., 1999) = .83
4. Farsi Auditory Analysis Task (Farrokh & Vahabzadeh, 1999) = .85
5. Farsi Pseudoword Task (Farrokh & Chalashgar, 1999) = .88
6. Farsi Orthographic Task (Farrokh et al., 1999) = .82
7. Farsi Spelling Task (Farrokh & Chalashgar, 1999) = .86
8. Farsi Working Memory Task (Farrokh & Vahabzadeh, 1999) = .79
9. Farsi Long-term Memory Task (Farrokh & Vahabzadeh, 1999) = .81

Error Analysis and Contrastive Analysis

The error analysis procedure was designed to identify, describe, and classify every error for each participant (Corder, 1975; Danesi & DiPietro, 1991; Ghadessy, 1980; Keshavarz, 1994) in phonology (based on the WRAT Reading and Woodcock Word Identification tasks), spelling (based on the WRAT Spelling Task) and syntax (based on responses to the Oral Cloze-Revised Task). There were separate error analyses for the phonological, spelling, and syntactic categories respectively. Farsi errors in phonology, syntax, and spelling were also reported.

For the examination of the process of language effects (from Farsi to English), the contrastive analysis technique was used. These categories of errors were determined upon completion of the error analysis procedure (see below). Contrastive analysis in this study entailed these three steps: (a) separate descriptions were provided for L1 and L2, (b) grammatical and phonological elements to be compared between L1 and L2 were determined from the data, and (c) specified L1 and L2 elements were compared.

Scoring Procedure for Errors

After the criteria of (phonological, spelling and syntactic) errors in word reading were identified by (separate) error analyses, the scoring of those errors entailed the following procedures. Each participant had a tally made of the proportion of errors in each of the established categories. Only those items that had been responded to were scored. An example (of phonological errors) was that of a person who read a total of 10 words containing the "th" sound[5]. She/he responded orally to only five of these. Three

5 Note that this category (like all others) has already been identified by the error analysis procedure.

of these were pronounced incorrectly (errors). The error score was the proportion of 3/5 or three errors out of a total of five pronounced.

Scoring Procedure for Phonologically Correct Spelling Errors

In addition to the aforementioned system of error scoring, an additional technique was used to score spelling errors. In general, the unconstrained system (Lennox & Siegel, 1993, 1996) or "unconstrained letter-sound system" (Bruck & Waters, 1988, p. 80) was used to calculate the phonological accuracy of misspelled words. Specifically, a misspelling was judged as phonologically correct if it sounded like the target word by application of grapheme-phoneme conversion rules, regardless of positional rules. For example, the word "reach" in the WRAT Spelling Task could be written as "rech". "Rech" could be classified as phonological, because "e" can have either a short or a long sound associated with it (Fromkin & Rodman, 1983).

The scoring procedure for each participant involved the following steps. The first 10 spelling errors of the Spelling subtest of the WRAT were examined. Note that only those words that were attempted and incorrectly written in response to dictation were considered. Words not written or attempted were not included in the analysis. Next, the proportion of phonological accuracy was calculated for each of the 10 spelling errors. Finally, a mean percentage of phonological accuracy was calculated. This entailed calculating the sum of all 10 proportions and dividing by 10.

Error Analysis and Inter-rater Reliability

Inter-rater reliability was required for establishing the validity of the error analysis procedure. With respect to inter-rater reliability, the goal was to establish the reliability and meaningfulness of the scoring criteria. There were two major steps in this process. First, meaningful error categories had to be first identified. Once the error categories had been identified, a common set of scoring categories for the errors had to be established. These two steps are described below.

The first step (identification of error categories), involved the following process. First, every participant's syntactic, phonological, and spelling errors were recorded. Specifically, every participant had a separate file made for syntactic, phonological, and spelling errors. The next step was to examine all the errors made by all participants in a particular domain (i.e., phonological errors). The objective of this was to identify patterns of errors that had been made by all participants and to categorise them. For example, with respect to phonological errors, all words that had the letter "g" read incorrectly (e.g., "benign" in WRAT Reading Task) were categorised under the phonological error category of "phonological errors with g". This procedure was done in consultation with contrastive and error analysis researchers who were familiar with phonological, syntactic and spelling errors made by Farsi ESL/EFL learners. The selection and identification of all error categories were discussed with respect to both potential language effects (i.e., Maddieson, 1984) as well as cognitive processes (i.e., Brown & Haynes, 1985).

After the syntactic, phonological and spelling error categories had been identified, procedures were followed to ensure the reliability of the scoring criteria of those errors. Essentially, two independent raters developed a common set of scoring categories by following these steps. First, they coded one transcript together and then discussed their coding scheme. They clarified their criteria and categories. The second step was to take one other transcript and have each rater code it without talking to the other. The results were then compared and any discrepancies were reconciled by discussion. Criteria and categories were then refined. The third step was to repeat the previous step until 95% agreement on a single transcript was achieved prior to any discussion. The fourth step entailed taking another small set of transcripts (4-5) and repeating the procedure. Note that the aim was to compare, look for agreement, and to refine the criteria. The final step was undertaken once consistent agreement was achieved. Both raters coded all of the transcripts and again made comparisons. Finally, it was essential that all transcripts (errors) were coded using the final set of categories. This entailed revisiting the ones used at the beginning to test the scheme and making sure they were coded using the final criteria. In addition, the statistical reliability of the error scoring schemes were checked by calculating inter-rater reliability indices for the scoring of syntactic, phonological and spelling error categories.

Predictor variables or factors

Before investigating the questions of this study, we needed to outline the specific predictor and criterion variables (Kachigan, 1991; Stevens, 1996; Rencher, 1995). The predictor variables (or factors) were language category, language experience, reading related cognitive processes, reading ability in English, and demographic variables. The factors or predictor variables are described below:

Language category.

This factor was dichotomized at two levels. These were bilingual speakers of both Farsi and English and native English speakers.

Language experience.

The three factors used to identify language experience were length of residence in Canada (Baluch, 1996; Cummins & Swain, 1986), age on arrival to Canada (Cummins and Swain, 1986), and Farsi reading experience (FR) while in Canada (Baluch, 1996).

Length of residence had the following four levels: (a) 1-5 years, (b) 6-10 years, (c) 11-15 years, or (d) 15 plus years. Age on arrival had the following three levels: (a) 11-19 years old, (b) 20-27, or (c) 28-35 years old. Farsi reading experience in Canada had the following four levels: reading of Farsi materials (a) once a day, (b) once a week, (c) once a month, or (d) less than once a month.

Cognitive processes.

These were grammatical sensitivity, phonological awareness, phonological coding, orthographic awareness, working memory, and long-term memory. There were separate sets of scores for English reading related processes and Farsi reading related processes.

Reading ability in English and in Farsi.

Reading ability in English was characterized as having two levels (good and poor). Reading ability in Farsi was also characterized as having two levels (good and poor). The following procedures were used to distinguish between good and poor readers in English and Farsi.

The assessment of English reading ability was based on the reading subtest of the WRAT3 or Wide Range Achievement Test (Wilkinson, 1993) norm standards of reading ability. As noted in the WRAT3 manual, standard scores (based on the original raw scores) are used for comparisons between individuals (Wilkinson, 1993). The manual states that a standard score at or below 89 is considered below average reading ability (Wilkinson, 1993, p. 33). In this study, participants attaining a standard score of 89 or less were considered as poor readers. The cut-off standard score was 90. Participants attaining a standard score of 90 or above were considered as good readers and those with scores below 90 were considered as poor readers. By using the appropriate age norm tables (Blue Age norms- age 20 through 24, 25 through 34, 35 through 44), each participant's raw score was used to obtain their standard score. The obtained standard score determined that participant's reading ability as good or poor (with respect to their age group).

The assessment of Farsi reading ability was based on the Farsi Word Identification Task (Farrokh & Chalashgar, 1999). Since no normative data was available for the Farsi Word Identification Task, the following procedures were followed. The first step in the setting of Farsi reading ability was to examine the distribution of the raw data for the Farsi Word Identification Task[6]. A histogram of the raw scores of the Farsi Word Identification Task was plotted[7] (Figure 1). The ordinate (y-axis) indicates the number of subjects. The abscissa (x-axis) indicates the number of correct responses. Crocker and Algina (1986) recommend that a "cut score" (Crocker & Algina, 1986, p. 414) be placed in the distribution to maximize the discrimination between the two groups (good versus poor Farsi readers). Since the distribution was found to be bimodal, two distinct groups were identified based on their ability to read Farsi words. Using this

[6] Crocker and Algina (1986) define this process as "standard setting with data" (Crocker & Algina, 1986, p. 415).

7 Tests with a wide distribution of scores (such as the Farsi Word Identification Task) can allow for a more accurate distinction of subgroups in the sample data (Jaccard, 1983). The Farsi Word Identification Task has a distribution range of 106 items, whereas the Farsi reading task has a range of only 42 items.

bimodal distribution, the raw score separating the good readers versus poor readers was identified to be 73 (Figure 1).

Demographic variables.

The two factors in this category were age and education level in Canada (ELC). Age (Keshavarz, 1994) had the following three levels: (a) younger, 19-24; (b) middle, 25-29; or (c) older, 30-35. Education level in Canada (ELC) had the following four levels: (a) below grade 12, (b) grade 12 diploma, (c) incomplete university level, or (d) university degree or higher.

Criterion or dependent variables

There were three sets of criterion or dependent variables that included the following:

1. Errors in syntax, phonology, and spelling (as identified in error analysis).
2. Scores on reading tasks in English and Farsi. These were the reading subtest of the WRAT3 (Wilkinson, 1993), the Word Identification subtest of the Woodcock Reading Mastery Test-Revised (Woodcock, 1987), the Farsi Reading Task (Farrokh & Chalashgar, 1999), and the Farsi Word Identification Task (Farrokh & Chalashgar, 1999).
3. Scores on the spelling tasks in English and Farsi. These were the Spelling subtest of the WRAT3 (Wilkinson, 1993) and the Farsi Spelling Task (Farrokh & Chalashgar, 1999).

Interviews and Qualitative Analyses

Participants were also interviewed regarding their observations with respect to all the English and Farsi tasks taken. Four subgroups of participants were taken into consideration; good reading bilinguals, poor reading bilinguals, good reading native English speakers, and poor reading native English speakers. The first objective was to obtain qualitative reports from participants regarding their perceptions of processes (phonological and orthographic) involved in word reading and spelling in Farsi and English. The second objective was to examine each of the cognitive tasks in English and Farsi in order to obtain information about (a) perceptions of processes associated with each specified task, (b) patterns with which participants responded to items, and (c) items that seemed to pose the greatest difficulties.

The process of interviewing was designed to ensure that the information gathered from all participants was consistent, valid and reliable. The interviews comprised of the following four sets of questions. The following four criteria provided the main basis for systematically coding and subsequently analyzing the interview data. Note that each of the participants' responses were recorded with respect to each of the criteria outlined below.

1. Perceptions of cognitive processes. The theoretical basis for each of the cognitive processes would first be briefly explained to the participant. A one-page sheet was then given to the participant for reference purposes. This was to ensure that participants were accurate in their statements when referring to cognitive processes. It must be noted that many of the bilingual participants were well aware of a number of reading related cognitive processes due to their exposure to Iran's education system. There are equivalent

Farsi terms for phonological awareness, phonological coding, syntactic awareness and orthographic awareness. The Farsi terms are "shekastan va tajziye va tahleel-e seda" (phonological awareness), "tabdeel-e- khat va harf be seda" (phonological coding), "tashkheese dastoor-e zaban" (syntactic awareness), and "tashkheese khat bedoon estfadeye seda" (orthographic awareness). These terms are taught to children in Iran at the elementary school level (Teacher Training University of Tehran, 2000). Next, after having outlined the processes, the participant would be asked about their perceptions of the roles of phonological (coding and awareness) with respect to word reading and spelling. Note that for bilingual participants, questions pertained to both Farsi and English phonological processes, orthographic processes, word reading and spelling. An example of a question would be "As you did the ___ reading task, did you notice yourself relying on any of the cognitive processes we discussed, especially phonological and orthographic processes? If yes, can you briefly explain how these were implicated in your reading process?"

2. Perceptions of processes associated with each task. These questions asked the participant whether they had any unique observations regarding a particular task. For example, a sample question would be "what was your thinking process as you did the _____ task? Did you notice anything interesting in your thinking process as you did the task?"

3. Items that posed the most difficulties. The main issue was whether the participant found any particular items especially unique or difficult. A typical question would be "Were there any items on this task that you found difficult?"

4. Patterns with which participants responded to items. This information would already be available and recorded as a result of the participant having done the tasks. However, perceptions of participants were also recorded after the tasks were completed. The questions posed here were related to question 3 above. If a participant answered "yes" to question 3, a follow-up question would be "what made you respond the way you did to item ___?"

CHAPTER III

Results

Question One: What is the Relationship between Language Category and Reading Ability in English to Scores Attained in English Reading Related Cognitive Tasks?

The main objective of this research question was to compare Farsi speakers of good and poor English reading ability to their native English speaking counterparts with respect to their scores on English reading related cognitive tasks. Essentially, the relationship between language category and cognitive tasks as well as the relationship between reading ability and cognitive tasks was investigated. In addition, this question explored the possibility of a significant interaction between language category and reading ability with respect to scores on cognitive processing.

The standard scores and percentage scores for this analysis are reported in Table 1; raw scores for this analysis are reported in Appendix U. Table 2 also displays the results of Farsi speakers with respect to English reading ability on both their English and Farsi cognitive scores.

A 2X2 between-subjects multivariate analysis of variance (MANOVA) was performed on six dependent variables: Oral Cloze Task, Rosner Auditory Analysis Task, Word Attack, Orthographic Task, Working Memory Task, and Long-term Memory Task. Independent variables were language category (bilingual and native English speakers) and English reading ability (good and poor). The WRAT Reading Task was used to distinguish between good and poor readers in accordance to the procedures described in the method section.

SPSS MANOVA was used for the analyses. Order of entry of independent variables was language category then English reading ability. SPSS casewise deletion (SPSS 9, 1999) was used as a missing data treatment for incomplete data. This resulted in total N of 120 being reduced to 117, since there were three cases with incomplete data[1]. There were multivariate main effects for language category, $F\ (6, 98) = 4.81$, $p < .01$ by Wilk's Lambda criterion. The effect size, as indexed by eta squared, was .23. There were multivariate main effects for English reading ability, $F\ (6, 98) = 12.78$, $p < .01$ by Wilk's Lambda criterion. The effect size, as indexed by eta squared, was .44. There were no significant interaction (language category X English reading ability) effects.

Samejima (2000) has noted that even recent versions of MANOVA in SPSS (e.g., SPSS 9) set the default alpha value for follow-up univariate ANOVA analyses at .05. This would mean that the probability of at least one false rejection (with six ANOVAs) would be 1- .74 or .26, which is unacceptably high. SPSS (2000) has noted that the analyst must manually pre-select the alpha level for follow-up ANOVAs in the SPSS MANOVA menu. In this study the α for the follow up univariate analyses in MANOVA involving six dependent variables was set at $.15/6 = .025$ level of significance (Stevens, 1996, p. 198), a procedure based on the Bonferroni correction. The univariate analyses for the six dependent variables were as follows.

A 2X2 ANOVA was performed on the dependent variable of oral cloze with language category (bilingual, native English speaker) and English reading ability (good and poor) as factors. The only statistically significant effect was the main effect for

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[1] Three native English speakers did not do the Word Attack and WRAT Spelling Tasks.

English reading ability, F (1, 113) = 38.70, $p < .025$). The mean score for good readers was significantly higher than poor readers with respect to the Oral Close Task. The effect size, as indexed by eta squared, was .26. There were no significant interaction (language X reading ability) effects.

A 2X2 ANOVA was performed on the dependent variable of Rosner Auditory Analysis with language category (bilingual, native English speaker) and English reading ability (good and poor) as factors. The main effect for language category was significant, F (1, 113) = 19.24, $p < .025$). The mean score for bilinguals was significantly higher than native English speakers with respect to the Rosner Auditory Analysis Task. The effect size, as indexed by eta squared, was .15. The main effect for English reading ability was significant, F (1, 113) = 49.04, $p < .025$). The mean score for good readers was significantly higher than poor readers. The effect size, as indexed by eta squared, was .30. There were no significant interaction (language x reading ability) effects.

A 2X2 ANOVA was performed on the dependent variable of Word Attack with language category (bilingual, native English speaker) and English reading ability (good and poor) as factors. The only statistically significant effect was the main effect for English reading ability, F (1, 113) = 23.69, $p < .025$). The mean score for good readers was significantly higher than poor readers. The effect size, as indexed by eta squared, was .31. There were no significant interaction (language X reading ability) effects.

A 2X2 ANOVA was performed on the dependent variable of Orthographic Task with language category (bilingual, native English speaker) and English reading ability (good and poor) as factors. The main effect for language category was significant, F (1, 113) = 32.58, $p < .025$). The mean score for bilinguals was significantly less than native

English speakers with respect to the Orthographic Task. The effect size, as indexed by eta squared, was .04. The main effect for English reading ability was significant, F (1, 113) = 34.51, $p < .025$). The mean score for good readers was significantly higher than poor readers with respect to the Orthographic Task. The effect size, as indexed by eta squared, was .15. There were no significant interaction (language x reading ability) effects.

A 2X2 ANOVA was performed on the dependent variable of working memory with language category (bilingual, native English speaker) and English reading ability (good and poor) as factors. The only statistically significant effect was the main effect for English reading ability, F (1, 113) = 44.09, $p < .025$). The mean score for good readers was significantly higher than poor readers. The effect size, as indexed by eta squared, was .28. There were no significant interaction (language x reading ability) effects.

A 2X2 ANOVA was performed on the dependent variable of long term memory with language category (bilingual, native English speaker) and English reading ability (good and poor) as factors. The only statistically significant effect was the main effect for English reading ability, F (1, 113) = 6.98, $p < .025$). The mean score for good readers was significantly higher than poor readers. The effect size, as indexed by eta squared, was .06. There were no significant interaction (language X reading ability) effects.

The above results indicate that good readers do significantly better (higher scores) than poor readers on all reading related cognitive tasks. With respect to language category comparisons, bilinguals did significantly better (higher scores) than native English speakers on the Rosner Auditory Analysis Task and did more poorly (lower scores) than native English speakers on the orthographic awareness task. No other significant differences were found on cognitive tasks with respect to language category comparisons.

Question Two: How much of the Variance in Word Reading is accounted for by Cognitive Processes and Language Experience?

The objective of this question was to observe the amount of variance in English word reading accounted for by cognitive processes and language experience, among bilingual students. Word reading performance scores were obtained from two (separate) standardized word reading tasks: the Woodcock Word Identification Task and the WRAT Reading Task. The technique of analysis was sequential multiple regression.

In the sequential regression analysis, two main variables were entered. Cognitive processes was entered as one block by including the following tasks in the following order: oral cloze, Rosner Auditory Analysis, Word Attack, Orthographic Task, Working Memory Task, and Long-term Memory Task. Language experience was entered as the second block by including the following factors: Length of residence, age on arrival, and Farsi reading experience in Canada. Education level in Canada was entered as the third demographic factor. All assumptions for the statistical analyses were met satisfactorily.

The following procedure was used to account for the amount of variance accounted for by cognitive processes, language experience and education level in Canada. A form of commonality analysis (Kerlinger & Pedhazur, 1982), the Relative Pratt index (Pratt, 1987; Thomas, Hughes, & Zumbo, 1998; Zumbo & Thomas, 2000, Appendix V), was used to calculate the unique contribution of each variable to the variation in the dependent variable. The Relative Pratt index partitions the overall $\underline{R}^2$ and attributes a certain proportion of the overall $\underline{R}^2$ to each variable. The partitioning is additive so that one is able to compute the proportion of $\underline{R}^2$ attributable to each individual variable, as well as sets of variables (e.g., all of cognitive processes variables). One of the most important strengths of this method of variance partitioning is that it is not affected by either (a) the direction of the effect of the variables in the model or (b) the order of entry of individual variables or blocks of variables into the regression model (Thomas, Highes & Zumbo, 1998; Zumbo & Thomas, 2000). This is because the calculation of the Pratt index (Appendix V) for each independent variable is contingent upon the following elements: (a) the zero-order correlation of that independent variable with the dependent variable, (b) the beta weight of that independent variable, and (c) the total $\underline{R}^2$.

Table 3 displays the multiple regression equation coefficients for predicting the Woodcock Word Identification from the scores of cognitive processes, language experience and education level in Canada. A total $\underline{R}^2$ of .72 was accounted for by cognitive processes (block 1 containing 6 variables), language experience (block 2 containing 3 variables) and education level in Canada (block 3 containing 1 variable). Examination of the significance values for beta weights for all of the individual variables revealed that education level in Canada, length of residence, the Word Attack Task, and the Oral Cloze Task to be the best predictors. The Relative Pratt index (Table 4) indicated that cognitive processes tasks as a whole accounted for a unique contribution of 39% of the total $\underline{R}^2$, language experience variables 36%, and education level in Canada 25%. The cognitive processes with the greatest unique contribution to the total $\underline{R}^2$ was the Word Attack Task (19%). The language experience variable with the greatest unique contribution was length of residence (21%).

Table 5 displays the regression of cognitive processes, language experience and education level in Canada on the WRAT Reading Task. A total $\underline{R}^2$ of .72 was accounted for by cognitive processes (block 1 containing 6 variables), language experience (block 2 containing 3 variables) and education level in Canada (block 3 containing 1 variable). Examination of the significance values for Beta weights for all of the individual variables indicated that education level in Canada, age on arrival, and the Word Attack Task to be the best predictors. The Relative Pratt index (Table 4) indicated that cognitive processes tasks as a whole accounted for a unique contribution of 33% of the total $\underline{R}^2$, language experience variables 41%, and education level in Canada 26%. The cognitive process with the greatest unique contribution to the total $\underline{R}^2$ was the Word Attack Task (22%). The language experience variable with the greatest unique contribution was age on arrival (23%).

The results of this analysis indicated that variance in word reading was similar for both measures (Woodcock Word Identification and WRAT Reading), which suggests consistency in the regression data. Specifically, the regression model was a significant predictor of word reading by using a combination of cognitive processes, language experience and education level as block factors. Variance partitioning (Pratt analyses) indicated that cognitive processes and language experience accounted for similar amounts of variance in word reading followed by (lesser variance accounted by) education level.

Question Three: Are there Significant Differences between Bilinguals and Native English Speakers with Respect to Syntactic Error Scores on the Oral Cloze Task?

The main objective of this question was to determine whether any significant differences existed between bilinguals and native English speakers with respect to syntactic error scores. Specifically, the objective was to see whether bilinguals and native English speakers differed significantly with respect to certain categories of syntactic errors (e.g. prepositions). The Revised Oral Close Task (Farrokh et al., 1998) was used to identify specific syntactic errors in English. The next stage, error analysis, involved the classification of all the identified errors into distinct categories. Error analysis for the syntactic category revealed the following nine types of syntactic errors made by bilingual and native English speaking participants: (a) prepositions (Table 6), (b) subjunctive (Table 7), (c) noun (Table 7), (d) adjective (Table 8), (e) verb (Table 9), (f) adverb (Table 10), (g) interrogative adverb (Table 11), (h) auxiliary verb (Table 12), and (i) conjunctive pronoun (Table 13). As noted in the method section, each participant had a calculation made of the proportion of errors in each of the established categories. Only those items that were attempted were scored. This implies that the percentage of errors represent the proportion of mistaken items relative to the number of items the participant attempted to respond. For instance, to identify "verb" syntactic errors, a person was supposed to attempt three items examining verbs in the Revised Oral Close Task (Oral Cloze Task has three items examining verbs). If she/he responded orally to only two of these and one of them was pronounced incorrectly, the reported percentage of syntactic verb errors for that person was 50%. Table 14 displays the percentage of error scores for bilinguals ($\underline{n} = 60$) and native English speakers ($\underline{n} = 57$). The reliability of raters' scoring of the nine syntactic errors was good as indicated by the range of values for inter-rater reliability (98 - 99%) and Kappa (.94 - .98, $p < .05$) coefficients.

The main issue with many of the syntactic error categories was whether there were enough errors to warrant a statistical (between group) comparison. For example, one may have a syntactic category in which very few errors were made by participants (e.g., Table 6, preposition errors). In this case, a between group statistical comparison may arbitrarily identify (statistically significant) between group differences, however the practical significance of this finding would be questionable since the number of errors made with prepositions were few, and were made by a very small number of participants. Essentially, it was decided that there had to be a large enough number of errors made by participants for an error category to be subjected to a (statistical) analysis. If a particular subgroup made a large enough number of errors (20 errors) on a certain error category, then the error category was selected for a between group (bilinguals versus native English speakers) statistical analysis. The syntactic error tables contained information as to the total number of errors made by the following four subgroups: bilingual good readers, bilingual poor readers, native English speaking good readers, native English speaking poor readers. The only syntactic category with a large enough number of errors (>20) for statistical analysis was the category of verb errors.

The verb error scores (Table 14) had the characteristics of skewed distributions. These could not be normalized by using standard transformation techniques. As a result, non-parametric statistics (Mann-Whitney U Tests) were used to compare the verb error scores of bilingual participants to that of native English speakers. The Mann-Whitney U test revealed that bilingual students made more errors than native English speakers with respect to verb errors, $U = 806.0$, $p < .05$ (see Table 14).

Additional qualitative observations may be with respect to reading ability differences. Good readers made fewer overall errors than poor readers with respect to nouns and verbs. Poor readers had fewer overall errors than good readers on adverbs, auxiliary verbs and conjunctive pronouns. There were very little differences with respect to overall errors between the groups with respect to prepositions, subjunctives, adjectives, and interrogative adverbs.

The analyses of this question only identified between group differences with respect to syntactic verb errors. The following question allowed us to investigate the sources of variation in those errors among bilinguals.

Question Four: How much of the Variance in each Category of Syntactic Errors is accounted for by Cognitive Processes and Language Experience?

The main objective of this question was to examine the variance in syntactic errors with respect to cognitive processes and language experience among bilingual students. The results of the previous question however, only identified significant between group statistical and qualitative differences with respect to verb errors. As a result, sequential regression analyses were only performed with verb errors.

In this analysis, two main block variables were entered. Cognitive processes was entered as one block by including the following tasks in the following order: Rosner Auditory Analysis, Word Attack, Orthographic Task, Working Memory Task, and Long-term Memory Task. Note that the Oral Close Task was not entered as a predictor since the same variable cannot be used as both a predictor and criterion variable in the regression model (SPSS 9, 2000). Language experience was entered as the second block by including the following factors: Length of residence, age on arrival, and Farsi reading experience in Canada. Education level in Canada was entered as the third demographic factor. All assumptions for the statistical analyses were met satisfactorily for the regression analysis (verbs). The regression analysis of the syntactic verb errors are as follows.

Table 15 displays the multiple regression equation coefficients for predicting verb errors from the scores of cognitive processes, language experience and education level in Canada. A total $\underline{R}^2$ of .33 was accounted for by cognitive processes (block 1 containing 5 variables), language experience (block 2 containing 3 variables) and education level in Canada (block 3 containing 1 variable). Examination of the significance values for beta weights for all of the individual variables indicated that Farsi reading experience was the best predictor. The Relative Pratt index (Table 16) indicated that cognitive processes tasks as a whole accounted for a unique contribution of 8% of the total $\underline{R}^2$, language experience variables 90%, and education level in Canada 2%. The cognitive process with the greatest unique contribution to the total $\underline{R}^2$ was the Rosner Auditory Analysis Task (4%). The language experience variable with the greatest unique contribution was Farsi reading experience in Canada (46%), suggesting that it is the variable that best explains the variation in verb errors among bilingual Farsi speaking students.

Question Five: Are there Significant Differences between Bilinguals and Native English Speakers with Respect to Phonological Error Scores on the Word Reading Tasks?

The main objective of this question was to determine whether any significant differences existed between bilinguals and native English speakers with respect to phonological error scores. Specifically, the main objective was to see whether bilinguals and native English speakers differed significantly with respect to certain categories of phonological errors (e.g. phonological errors with "e").

The WRAT Reading Task as well as the Woodcock Word Identification Task were used to identify specific phonological errors in English word reading. The next stage, error analysis, involved the classification of these errors into distinct categories. Error analysis for the phonological category revealed the following thirteen types of phonological errors made by bilingual and native English speaking participants: (a) letter "a" (Table 17), (b) letter "i" (Table 18), (c) letter "u" (Table 19), (d) letter "o" (Table 20), (e) letter "e" (Table 21), (f) attaching vowel "e" to consonant clusters starting with "s" (Table 22), (g) multiple vowels (e.g., words containing "ua", Table 23), (h) letter "g" (Table 24), (i) letter "c" (Table 25), (j) letter "w" or specific sound of [w] (Table 26), (k) letter(s) "th" or specific sound of [θ] (Table 27), (l) letter(s) "ph" or specific sound of [f] (Table 28), and (m) sight errors (reading words as entirely different English words, Table 29). It must be noted that the last category (sight errors) was not considered as being only a "phonological" error (grapheme to phoneme decoding). This is because the nature of these particular sight errors seemed to imply a strong role by orthographic processes as well.

For scoring, each participant had a calculation made of the proportion of errors in each of the established categories. Only those items that were attempted were scored. This implies that the percentage of errors represent the proportion of mistaken items relative to the number of items the participant attempted to respond. For instance, to identify "th" phonological errors, a person was supposed to read eleven words containing the "th" sound (Woodcock Word Identification Task has eleven words with "th"). If she/he responded orally to only 5 of these and three of them were pronounced incorrectly, the reported percentage of phonological errors for that person was 60%. Table 30 displays the percentage of error scores for bilinguals ($n = 60$) and native English speakers ($n = 57$). The reliability of the raters' scoring of the thirteen phonological errors was good as indicated by the range of values for inter-rater reliability (.96 - .99%) and Kappa (.95 - .98, $p < .05$) coefficients.

As with the syntactic errors, the main issue with many of the phonological error categories (e.g., /c/) was practical significance; that is, whether there were enough errors to justify a between group statistical comparison. As with the syntactic errors, an error category was selected for analysis if at least one subgroup made a large enough number of errors (20 errors) on that category. The phonological error tables contained information as to the total number of errors made by the following four subgroups: bilingual good readers, bilingual poor readers, native English speaking good readers, native English speaking poor readers. Examination of the tables with reading errors indicated that there was a sufficient number of errors (>20) for statistical analysis in the following nine error categories: letter "i", letter "u", letter "e", attaching "e" to consonant cluster starting with "s", double vowels, letter "g", letter "w", letter(s) "th", and sight errors.

The error scores of all nine categories (Table 30) had the characteristics of skewed distributions. These could not be normalized by using standard transformation techniques. As a result, non-parametric statistics (Mann-Whitney U Tests) were used to compare the error scores of bilingual participants to that of native English speakers. The Mann-Whitney U tests revealed between group differences with respect to letter "i", letter "e", attaching "e" to consonant cluster starting with "s", letter "w", letters "th", and sight errors (see Table 30). The results are as follows. Bilingual students made more errors than native English speakers in the following five categories: errors with "i", $U = 357.0$, $p < .05$; "e", $U = 616.5$, $p < .05$); "w", $U = 507.0$, $p < .05$; "th", $U = 429.0$, $p < .05$; and attaching /e/ to consonant clusters starting with /s/, $U = 390.0$, $p < .05$. In contrast, native English speakers made more errors than bilingual students with respect to reading words as different words, $U = 514.5$, $p < .05$.

Generally, it was found that bilingual students made more errors across five of the nine categories and made less errors across one of them. It must be noted that for the word reading phonological errors of attaching "e" to consonant clusters starting with "s", the letters "w" and "th", native English speakers had virtually no errors.

Additional qualitative observations may be made with respect to reading ability and the numbers of errors made in the phonological categories recorded in Tables 17 – 29. Good readers had fewer overall numbers of errors than poor readers with respect to "a" (Table 17), "i" (Table 18), "u" (Table 19), "e" (Table 21), "multiple vowels (Table 23), and sight errors (Table 29). This was also true for those errors in which only bilinguals had errors in, namely errors in “w” (Table 26) and “attaching e to consonant clusters” (Table 22). However poor readers had fewer overall numbers of errors in “o” (Table 20), “g” (Table 24), “c” (Table 25), “th” (Table 27) and “ph” (Table 28). This may due to the fact that the items encountered with respect to “o” (Table 20), “g” (Table 24), “c” (Table 25), “th” (Table 27) and “ph” (Table 28) are mostly associated with the more difficult items in the WRAT Reading Task and the Woodcock Word Identification Task. In both the WRAT Reading Task and the Woodcock Word Identification Task, items (words) are placed in ascending order of difficulty and a participant is discontinued from testing after having made a specified number of consecutive errors. One reason poor readers may be making fewer errors in “o”, “g”, “c”, “th” and “ph” may be due to the fact that they have mostly been discontinued from the task before having had the opportunity of attempting the more difficult words associated with “o”, “g”, “c”, “th” and “ph”. One example is the category of “ph” errors (Table 28). There are a total of twenty-four errors made by good readers as opposed to one made by poor readers. The items associated with “ph” errors is the word “epistrophe” (item 102 of the Woodcock Word Identification task). With one exception, nearly all poor readers had been discontinued before the word “epistrophe”. Fewer errors were made by poor readers simply because they had less opportunity to attempt it. In relation to this, there may another explanation as to why good readers had more errors than poor readers. There were more good readers (n = 83) in this study than there were poor readers (n = 34). The greater numbers of errors made by good readers with respect to certain types of phonological errors may be a partly due to their larger sample size relative to poor readers. As a result, one reason there were more errors by good readers is that there more of them available to attempt items (easy or difficult) relative to poor readers. As additional point that may be made is that many of those poor readers had already been discontinued from the task (due to a specified number of consecutive errors); a factor which decreased their chances of attempting more advanced and difficult items such as "Terpsichorean" (WRAT Reading Task) or "Zeitgeist" (Woodcock Word Identification).

Question Six: How much of the Variance in each Category of Phonological Errors is accounted for by Cognitive Processes and Language Experience?

The main objective of this question was to examine the variance in phonological errors of "i", "e", attaching "e" to consonant clusters starting with "s", letter "w", "th", and sight errors with respect to cognitive processes and language experience among bilingual students. As a result, sequential regression analyses were performed with each of the aforementioned phonological (reading) errors as well as sight errors among bilingual students.

In each analysis, two main block variables were entered. Cognitive processes was entered as one block by including the following tasks in the following order: Oral Cloze, Rosner Auditory Analysis, Word Attack, Orthographic Task, Working Memory Task, and Long-term Memory Task. Language experience was entered as the second block by including the following factors: Length of residence, age on arrival, and Farsi reading experience in Canada. Education level in Canada was entered as the third demographic factor. All assumptions for the statistical analyses were met satisfactorily for all of the regression analyses. The Relative Pratt index (Thomas et al., 1998; Zumbo & Thomas, 2000, Appendix V) was used to calculate the unique contribution of each variable to the variation in the dependent variable. The regression analyses of the phonological errors are as follows.

Table 31 displays the multiple regression equation coefficients for predicting the "i" errors from the scores of cognitive processes, language experience and education level in Canada. A total $\underline{R}^2$ of .61 was accounted for by cognitive processes (block 1 containing 6 variables), language experience (block 2 containing 3 variables) and education level in Canada (block 3 containing 1 variable). Examination of the significance values for beta weights for all of the individual variables indicated that the Word Attack Task and age on arrival were the best predictors. The Relative Pratt index (Table 32) indicated that cognitive processes tasks as a whole accounted a unique contribution of 46% of the total $\underline{R}^2$, language experience variables 43%, and education level in Canada 11%. The cognitive process with the greatest unique contribution to the total $\underline{R}^2$ was the Word Attack Task (40%). The language experience variable with the greatest unique contribution was age upon arrival (38%).

Table 33 displays the multiple regression equation coefficients for predicting the "e" errors from the scores of cognitive processes, language experience and education level in Canada. A total $\underline{R}^2$ of .62 was accounted for by cognitive processes (block 1 containing 6 variables), language experience (block 2 containing 3 variables) and education level in Canada (block 3 containing 1 variable). Examination of the significance values for beta weights for all of the individual variables indicated the Word Attack Task and length of residence to be the best predictor variables. The Relative Pratt index (Table 32) indicated that cognitive processes tasks as a whole accounted for a unique contribution of 37% of the total $\underline{R}^2$, language experience variables 39%, and education level in Canada 24%. The cognitive process with the greatest unique contribution to the total $\underline{R}^2$ was the Word Attack Task (26%). The language experience variable with the greatest unique contribution was length of residence (37%).

Table 34 displays the multiple regression equation coefficients for predicting the errors of attaching "e" to consonant clusters starting with "s" from the scores of cognitive processes, language experience and education level in Canada. A total $\underline{R}^2$ of .64 was accounted for by cognitive processes (block 1 containing 6 variables), language experience (block 2 containing 3 variables) and education level in Canada (block 3 containing 1 variable). Examination of the significance values for beta weights for all of the individual variables indicated that the Oral Close Task, the Word Attack Task, age on arrival, and Farsi reading experience in Canada were the best predictors. The Relative Pratt index (Table 32) indicated that cognitive processes tasks as a whole accounted for a unique contribution of 49% of the total $\underline{R}^2$, language experience variables 51%, and education level in Canada 0%. The cognitive process with the greatest unique contribution to the total $\underline{R}^2$ was the Word Attack Task (23%) followed by the Oral Close Task (15%). The language experience variable with the greatest unique contribution was age on arrival (23%), followed by Farsi reading experience in Canada (19%).

Table 35 displays the multiple regression equation coefficients for predicting "w" errors from the scores of cognitive processes, language experience and education level in Canada. A total $\underline{R}^2$ of .67 was accounted for by cognitive processes (block 1 containing 6 variables), language experience (block 2 containing 3 variables) and education level in Canada (block 3 containing 1 variable). Examination of the significance values for beta weights for all of the individual variables indicated that the Word Attack Task, length of residence, and Farsi reading experience in Canada were the best predictors. The Relative Pratt index (Table 32) indicated that cognitive processes tasks as a whole accounted for a unique contribution of 39% of the total R^2, language experience variables 60%, and education level in Canada 1%. The cognitive process with the greatest unique contribution to the total R^2 was the Word Attack Task (33%). The language experience variable with the greatest unique contribution was length of residence (30%) although the Farsi reading experience in Canada also had a similar contribution (29%).

Table 36 displays the multiple regression equation coefficients for predicting "th" errors from the scores of cognitive processes, language experience and education level in Canada. A total R^2 of .50 was accounted for by cognitive processes (block 1 containing 6 variables), language experience (block 2 containing 3 variables) and education level in Canada (block 3 containing 1 variable). Examination of the significance values for beta weights for all of the individual variables indicated the Word Attack Task, length of residence and Farsi reading experience in Canada to be the best predictors. The Relative Pratt index (Table 32) indicated that cognitive processes tasks as a whole accounted for a unique contribution of 35% of the total R^2, language experience variables 63%, and education level in Canada 2%. The cognitive process with the greatest unique contribution to the total R^2 was the Word Attack Task (31%). The language experience variable with a similar contribution was age upon arrival (36%), followed by Farsi reading experience in Canada (27%).

Table 37 displays the multiple regression equation coefficients for predicting sight errors from the scores of cognitive processes, language experience and education level in Canada. A total R^2 of .52 was accounted for by cognitive processes (block 1 containing 6 variables), language experience (block 2 containing 3 variables) and education level in Canada (block 3 containing 1 variable). Examination of the significance values for beta weights for all of the individual variables indicated the Word Attack Task and education level in Canada to be the best predictors. The Relative Pratt index (Table 32) indicated that cognitive processes tasks as a whole accounted for a unique contribution of 73 % of the total $\underline{R}^2$, language experience variables 1%, and education level in Canada 26%. The cognitive process with the greatest unique contribution to the total R^2 was the Word Attack Task (32%).

In summary, all scores (except sight errors) were influenced by language experience, however the strongest relative influence of language experience was on errors with /w/ and /th/. Cognitive processes had their strongest relative influence on sight errors. With respect to errors with "i", "e", and attaching /e/ to consonant clusters with /s/, language experience and cognitive processes seemed to exert similar amounts of influence. The areas in which education level exerted a strongest relative influence was in /e/ errors and sight errors.

Question Seven: Are there Significant Differences between Bilinguals and Native English Speakers with Respect to Spelling Error Scores on the WRAT Word Spelling Task?

The main objective of this question was to determine whether any significant differences existed between bilinguals and native English speakers with respect to spelling error scores. Specifically, the main objective was to see whether bilinguals and native English speakers differed significantly with respect to certain categories of spelling errors (e.g. spelling errors with words containing vowel "e").

The WRAT Word Spelling Task was used to identify specific spelling errors (phonological or orthographic) in English word spelling. The next stage, error analysis, involved the classification of these spelling errors into separate and distinct categories. Error analysis for the spelling category revealed the following fourteen types of spelling errors made by bilingual and native English speaking participants: (a) words containing the "s", "z", or soft "c" sounds (Table 38); (b) words containing "q", hard "ch" and hard "c" sounds (Table 39); (c) words containing soft "ch" and soft "g" sounds (Table 40); (d) words containing "t", "d", and "th" sounds (Table 41); (e) words containing "ph", "f", and "v" sounds (Table 42); (f) words containing "m" and "n" sounds (Table 43); (g) words containing double consonants (e.g., the double "s" in “vicissitude”, Table 44); (h) words containing vowel "a" (Table 45); (i) words containing vowel "e" (Table 46); (j) words containing vowel "o" (Table 47); (k) words containing vowel "u" (Table 48); (l) words containing vowel "i" (Table 49); (m) words containing double vowels (e.g., “ie” in “Believe”, Table 50); and (n) writing a different word instead of the dictated word (Table 51).

Error scoring was done according to procedures outlined in previous questions involving scoring of syntactic and phonological errors. As before, each participant had a calculation made of the proportion of errors in each of the established categories. Only those items that were attempted were scored. This implies that the percentage of errors represent the proportion of mistaken items relative to the number of items the participant attempted to respond. For instance, to identify spelling errors with vowel “a”, a person was supposed to spell twelve words containing vowel "a" (WRAT Spelling Task has twelve words containing vowel “a”). If she/he only attempted six of these and three of them were spelt incorrectly, the reported percentage of phonological errors for that person was 50%. Table 52 displays the average percentage of error scores for bilinguals ($n = 60$) and native English speakers ($n = 57$). The reliability of the raters' scoring of the thirteen phonological errors was good as indicated by the range of values for inter-rater reliability (.96 - .99%) and Kappa (.95 - .98, $p < .05$) coefficients.

As with the syntactic and phonological errors, the main issue with many of the spelling error categories (e.g., /c/) was whether there were enough errors to justify a between group statistical comparison. As with the syntactic and phonological errors, an error category was selected for analysis if at least one subgroup made a large enough number of errors (20 errors) on that category. The spelling error tables contained information as to the total number of errors made by the following four subgroups: bilingual good readers, bilingual poor readers, native English speaking good readers, native English speaking poor readers. Examination of the tables with spelling errors indicated that there was a sufficient number of errors (>20) for statistical analysis in the following six categories: s, z, soft c sounds, ph, f, v sounds, words with double consonants, sounds of letter "a", sounds of letter "e", and words with double vowels.

All six categories of spelling errors (Table 52) had the characteristics of skewed distributions. These could not be normalized by using standard transformation techniques. As a result, non-parametric statistics (Mann-Whitney U Tests) were used to compare the error scores of bilingual participants to that of native English speakers. There were no significant between group differences found in any of the aforementioned spelling errors (Table 52).

Analysis of phonologically correct spelling errors however indicated a significant between group difference. Note that the scoring of these errors were done according to the procedure outlined in the method section (see p. 50). A misspelling was judged as phonologically correct if it sounded like the target word by the application of grapheme-phoneme conversion rules, regardless of rules of position (Lennox & Siegel, 1993). This system was originally devised by Bruck and Waters (1988) and is known as the unconstrained scoring system (Lennox & Siegel, 1996).

The reliability of the scoring of phonologically correct spelling errors by two raters was assessed by the inter-rater reliability (95%) and Kappa (.94, $p < .05$) coefficients. Examination of the ratio of skewness and kurtosis to their respective standard errors indicated that the distribution of phonologically correct misspellings followed the pattern of a normal distribution. This allowed for a parametric 2X2 univariate comparison.

A 2X2 ANOVA was performed on the dependent variable of unconstrained mean scores with language category (bilingual, native English speaker) and English reading ability (good, poor) as factors. The means and standard deviations for language category and English reading ability are displayed in Table 53. The main effect for language category was significant, $F(1, 113) = 6.87$, $p < .05$. The mean score for bilinguals was significantly higher than native English speakers with respect to unconstrained mean scores. The effect size, as indexed by eta squared, was .21. The main effect for English reading ability was significant, $F(1, 113) = 13.33$, $p < .05$. The mean score for good readers was significantly higher than poor readers with respect to unconstrained mean scores. The effect size, as indexed by eta squared, was .72. There were no significant interaction (language X reading ability) effects.

These results indicate that bilingual Farsi speakers make more unconstrained spelling errors in English than their native English speaking counterparts. It's possible that Farsi speakers use phonological processes to a large extent when attempting to spell English words. The possibility of this process is investigated by the regression and Pratt analyses of the next question. The results of the ANOVA also indicated that good and poor readers differ with respect to phonologically correct spelling errors. Specifically, the good readers of this study made more phonologically correct spelling errors than their poor reading counterparts. This also raises the possibility that good readers make more use of phonological processes in their English word spelling.

Before examining the next question, interesting qualitative observations may be made with respect to reading ability and the spelling errors recorded in Tables 38- 51. With the exception of "o" (Table 47), "u" (Table 48) and "i" errors, good readers had a larger number of overall errors than poor readers in the spelling categories. This phenomenon may be similar to that observed with the phonological errors discussed earlier: (1) the earlier discontinuing of poor readers from the spelling task relative to good readers and (2) the larger numbers of good readers relative to poor readers in this study. Like the WRAT Reading Task, the items of the WRAT Spelling Task are placed in ascending order of difficulty and a participant is discontinued from testing after having made ten consecutive errors. One reason poor readers may be making fewer errors may be due to the fact that they have mostly been discontinued from the task before having had the opportunity of attempting the more difficult words associated with categories such as "s, z, or soft c sounds" (Table 38). One example is the category of "s, z, or soft c sounds" (Table 38). Examination Table 38 indicates that most of the errors are due to more difficult spelling items such as "acquiesce", "pusillanimous", "malfeasance" and "vicissitude". The majority of these errors have been made by good readers. Few poor readers made these errors because many had been discontinued from testing before having the opportunity of attempting these more complex words. An additional factor, as with the phonological errors discussed before, is that there were more good readers (n = 83) in this study than there were poor readers (n = 34). The greater numbers of errors made by good readers with respect to spelling errors may be a partly a function of their larger sample size relative to poor readers. There were simply more good readers available to attempt items (easy or difficult) than poor readers.

Question Eight: How much of the Variance in each Category of Spelling Errors is accounted for by Cognitive Processes and Language Experience?

The main objective of this question was to examine the amount of variance in specified spelling errors with respect to cognitive processes and language experience among bilingual students. However, no sequential regression analyses were performed on any of the specified orthographic errors since no between group differences with respect to language category (bilingual versus native English speakers) had been identified (see previous question). Regression analysis was performed on phonologically correct spelling errors since a significant between group difference was identified (see previous question).

In this analysis, two main block variables were entered. Cognitive processes was entered as one block by including the following tasks in the following order: Oral Cloze, Rosner Auditory Analysis, Word Attack, Orthographic Task, Working Memory Task, and Long-term Memory Task. Language experience was entered as the second block by including the following factors: Length of residence, age on arrival, and Farsi reading experience in Canada. Education level in Canada was entered as the third demographic factor. All assumptions for the statistical analyses were met satisfactorily. . The Relative Pratt index (Thomas et al., 1998; Zumbo & Thomas, 2000, Appendix V) was used to calculate the unique contribution of each variable to the variation in the dependent variable. The regression analysis of phonologically correct spelling errors is as follows.

Table 54 displays the multiple regression equation coefficients for predicting phonologically correct spelling errors from the scores of cognitive processes, language experience and education level in Canada. A total $\underline{R}^2$ of .31 was accounted for by cognitive processes (block 1 containing 6 variables), language experience (block 2 containing 3 variables) and education level in Canada (block 3 containing 1 variable). Examination of the significance values for beta weights for all of the individual variables indicated that the Rosner Auditory Analysis Task was the best predictor. The Relative Pratt index (Table 55) indicated that cognitive processes tasks as a whole accounted for a unique contribution of 65% of the total $\underline{R}^2$, language experience variables 9%, and education level in Canada 26%. The variable with the greatest unique contribution to the total $\underline{R}^2$ was the Rosner Auditory Analysis Task (59%). This may indicate that the process of phonological analysis has an important relationship to making of phonologically correct spelling errors.

Question Nine: What is the Relationship between Reading Ability in Farsi and Attained Scores in Farsi Reading Related Cognitive Tasks?

This analysis allowed for the investigation of the relationship between Farsi reading ability and performance on Farsi reading related cognitive tasks. Specifically, the main objective of this question was to investigate the idea that good and poor readers of Farsi do not differ significantly with respect to Farsi cognitive tasks (i.e. Oranskij, 1975).

The assessment of Farsi reading ability was based on the Farsi Word Identification Task (Farrokh & Chalashgar, 1999). As noted in the method section, the histogram distribution (Figure 1) for the Farsi Word Identification Task was found to be bimodal. Two distinct groups (good versus poor) were classified based on their ability to read Farsi words. Using this bimodal distribution, the raw score separating the good readers versus poor readers was identified. The "cut score" (Crocker & Algina, 1986, p. 414) of 73 was placed in the distribution to maximize the discrimination between the two groups (good versus poor Farsi readers)[2].

The percentage scores for Farsi reading ability are reported in Table 56; raw scores for this analysis are reported in Appendix W. Table 57 also displays the results of Farsi speakers with respect to Farsi reading ability on both their English and Farsi cognitive scores.

A one-way between-subjects multivariate analysis of variance (MANOVA) was performed on six dependent variables: Farsi Oral Close Task, Farsi Auditory Analysis Task, Farsi Pseudoword Task, Farsi Orthographic Task, Farsi Working Memory Task, and Farsi Long-term Memory Task. The independent variable was Farsi reading ability (poor and good). SPSS MANOVA was used for the analyses. The independent variable entered was language category. Total N was 60.

There were multivariate main effects for Farsi reading ability, $F(1, 59) = 23.33$, $p < .01$ by Wilk's Lambda criterion. The effect size, as indexed by eta squared, was .73. Results of evaluation of assumptions were satisfactory. The selection of an alpha level of $.15/6 = .025$ for follow up univariate analyses in MANOVA involving six dependent variables was done according to the procedures of Samejima (2000) and Stevens (1996) outlined in question one earlier.

One – way ANOVAs were performed on each dependent variable with Farsi reading ability (good, poor) as the main independent variable (factor). Results found that good Farsi readers outperformed poor readers on all tasks except for the Farsi Long-term Memory Task. Specifically, Farsi good readers' mean scores were higher on the Farsi Word Identification Task, ($F(1, 59) = 107.53$, $p < .025$; eta squared = .82), Farsi Oral Cloze Task, ($F(1, 59) = 23.31$, $p < .025$; eta squared = .29), Farsi Auditory Analysis Task, ($F(1, 59) = 28.95$, $p < .025$; eta squared = .33), Farsi Pseudoword Task, ($F(1, 59) = 10.28$, $p < .025$; eta squared = .25), Farsi Orthographic Task, ($F(1, 59) = 73.54$, $p < .025$; eta squared = .56), and Farsi Working Memory Task, ($F(1,59) = 59.56$, $p < .025$; eta squared = .22).

These results show that good Farsi reading ability was associated with higher scores in Farsi oral cloze skills, Farsi auditory analysis skills, and Farsi pseudoword decoding skills, Farsi orthographic awareness, and Farsi working memory. Reading ability in Farsi was not associated with significant differences in the Farsi Long-term Memory Task.

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[2] Note that the median of this distribution is 78.5

Question Ten: What is the Relationship between Scores in English Reading Related Cognitive Tasks and their Farsi Counterparts?

In this analysis, two distinct areas of investigation were examined. The first was the investigation of the interdependence of reading related cognitive processes across Farsi and English (i.e., the relationship between auditory analysis in Farsi and English). Language experience variables (length of residence, age upon arrival, Farsi reading experience) were partialled out due to the possible influence of these factors on English reading related cognitive processes. The sample was the bilingual group (N = 60). The second area was the investigation of the relationship of word reading to reading related cognitive processes. Specifically, (a) the relationship English reading related cognitive processes to word reading in English and, (b) relationship of Farsi reading related cognitive processes to word reading in Farsi were examined. Language experience (length of residence, age upon arrival, Farsi reading experience) were partialled out due to the possible influence of these factors on the relationship between English word reading and English reading related cognitive processes. The sample was the bilingual group (N = 60). In addition, the relationship of English word reading to reading related cognitive processes among native English speakers was also reported. The sample was the native English speaking group (N = 57). The results were as follows.

First, in terms of the relationships between cognitive processing tasks in Farsi and English, results (see Table 58) showed positive relationships across languages for the oral close tasks (r = .69, p< .01), phonological awareness tasks (r = .81, p < .01), pseudoword reading tasks (r = .81, p < .01), orthographic awareness tasks (r = .79, p < .01), working memory tasks ($r = .86$, $p < .01$), and long term memory tasks ($r = .82$, $p < .01$). This suggests that there were strong relationships between similar tasks across languages. The partialling of language experience variables had no significant influence on these results (see Table 59).

Second, in terms of word reading, Farsi word reading was positively related to all Farsi cognitive processing tasks, with the exception of the Farsi Long-term Memory Task (see Table 58). Similarly, English word reading had more moderate and positive correlations with all of the English cognitive tasks with the exception of the orthographic awareness and long-term memory (see Table 58). The partialling of language experience variables had no significant influence on these results (see Table 59). Among native English speaking students, the Woodcock Word Identification Task and the WRAT Reading Task was significantly correlated with each of the English reading related cognitive processes, except for the Long-term Memory Task (see Table 60).

Follow-up Contrastive Analysis of Errors

Contrastive analysis was done with those syntactic and phonological errors (obtained from the Revised Oral Cloze and English Word Reading tasks respectively) in which bilinguals had significantly more errors. This qualitative procedure can be used to explain errors which can (at least partly) be attributed to language effect (i.e., interference) from the first language (i.e., Farsi) to the second language (i.e., English) (Jackson, 1981). Note that language effects are one of the processes that are proposed to take place as a consequence of the language experience of the ESL learner (James, 1981; Sajavaara, 1981; Selinker, 1972). The procedure of contrastive analysis was conducted by consulting the following sources: the sound inventories of the UCLA Phonological Segment Inventory Database (UPSID) (i.e., Maddieson, 1984), Cambridge Archives, the vowel contrasts section of the text "Pronunciation Contrasts in English" (Nilsen & Nilsen, 1973), the Farsi grammar section of "The History of the Persian Language" (Khanlari, 1979), and the linguistic archives of the Department of Foreign Languages of the Teacher Training University in Tehran, Iran (2000). The results of the contrastive analyses are as follows.

Syntactic Errors due to Language Effects.

As noted previously, the error analysis procedure identified that bilingual students had significantly more errors in verbs than their native English speaking counterparts. The contrastive analysis procedure was used to help explain the possible sources of language effects from Farsi to English with respect to verbs. There were three items containing verbs in the Revised Oral Close Task (Farrokh et al., 1998). An example of this is reported and the contrastive analyses with respect to verb errors are described.

Example of oral cloze item with verbs: Betty -------a hole with her shovel. In Farsi, verbs occur at the end of sentences (Forozanfar, 1979; Khanlari, 1979). This is in contrast to English, in which verbs occur in the middle of sentences. Bilingual students (with less than five years of residence) who made errors with verbs did mention that they had problems placing verbs in English. As noted by participant L.A. "in the oral cloze task I'm asked to supply a word that's missing in a sentence. How can the missing word be a verb, especially if it is in the middle of a sentence?" This is a case in which the rules of verb placement in Farsi have "negative transfer (alias interference)" (Jackson, 1981, p. 196) to verb placement in English.

<u>Phonological Errors Due to Language Effects.</u>

As noted previously, the error analysis procedure identified five errors in which the bilingual students had significantly more errors than native English speakers: (a) sounds with letter "i", (b) sounds with letter "e", (c) attaching "e" to consonant clusters starting with letter "s", (d) letter(s) "th", and (e) letter "w". The contrastive analysis procedure was used to help explain the possible sources of language effects from Farsi to English for each of the aforementioned errors.

There were a total of 47 words containing the letter "i" from the Woodcock Word Identification Task and the Reading Task of the WRAT respectively. Examples of these items are reported and the contrastive analyses with respect to them are described.

<u>*Examples of words containing letter "i": in, animal, finger in WRAT (Wilkinson, 1993); little, mechanic, carnivorous (Woodcock, 1987)*</u>. Despite the finding that language experience variables accounted for 43% of the variation in "i" errors, contrastive analysis examining the possible influence of language effects indicated that Farsi phonology contains all of the sounds associated with the English letter "i". Specifically, all of the sounds corresponding to the English letter "i" exist in Farsi as well. Errors with the letter "i" may be largely due to the ability to decode that letter in English. The Word Attack Task accounted for the most influence in the making of "i" errors (40%). This suggests that the cognitive process of phonological coding may be the single most important variable in the making of "i" errors.

There were 71 words containing the letter "e" in the Woodcock Word Identification Task and the Reading Task of the WRAT. Examples of these items are reported and the contrastive analyses with respect to them are described.

Examples of words containing letter "e": even, felt, egregious in WRAT (Wilkinson, 1993); help, expert, quadruped (Woodcock, 1987). Language experience variables accounted for 39% of the variation in "e" errors. However, contrastive analysis examining the possible influence of language effects indicated that Farsi phonology contains all of the sounds associated with the English letter "e". Specifically, all of the phones corresponding to the English letter "e" exist in Farsi as well. As in the case of letter "i", the most important cognitive process in the making of "e" errors was phonological coding as examined by the Word Attack Task (26%). This suggests that errors with the letter "e" may be strongly related to decoding skills of that letter in English.

There were 10 words containing words starting with the letter "s" in the Woodcock Word Identification Task and the Reading Task of the WRAT. Examples of these items are reported and the contrastive analyses with respect to them are described.

Examples of words starting with "s": spell, stretch in WRAT (Wilkinson, 1993); stop, spectacular (Woodcock, 1987). Language experience variables accounted for large proportion of the errors in this category (51%). Contrastive analysis investigating for language effects indicated a major difference in the phonological systems of Farsi and English with respect to words starting with consonant clusters with the letter "s". This phonological rule of Farsi may cause language effects or interference in the reading of English words (Keshavarz, 1994; Wilson & Wilson, 1987). Past contrastive analyses of

Farsi and English have predicted Iranian students making errors with consonant clusters starting with "s" (Baker & Goldstein, 1990; Keshavarz, 1994; Wilson & Wilson, 1987). In Farsi, no initial consonant clusters for words are allowed; each consonant in the initial position is either preceded or followed by a vowel (Baker & Goldstein, 1990; Keshavarz, 1994; Wilson & Wilson, 1987). Finally, the cognitive process that accounted for the most influence in the making of these errors was pseudoword reading or the Word Attack Task (23%).

There were 11 words with the letter "w" and 4 words with the letters "th" in the Woodcock Word Identification Task. Examples of these items are reported and the contrastive analyses with respect to them are described.

Examples of words with "w": swim, woman, twilight (Woodcock, 1987) and words with "th": with, zenith, mathematician, philanthropist (Woodcock, 1987). Language experience variables accounted for a large proportion of the errors of "w" and "th" (60-63%). Contrastive analysis investigating for language effects indicated a major difference in the phonological systems of Farsi and English with respect to the sounds corresponding to the graphemes of "w" and "th". Farsi does not have phonological representatives for the graphemes of "w" and "th" (e.g., Department of Foreign Languages of the Teacher Training University in Tehran, Iran, 2000). Typically, "w" is pronounced as "v" and "th" as "t" or "d" (Wilson & Wilson, 1987). It must also be noted that the cognitive process that accounted for the most influence in the making of "w" and "th" errors was pseudoword reading or the Word Attack Task (35-39%).

Farsi Syntactic, Phonological and Spelling Errors

Farsi Syntactic Errors.

Error analysis for Farsi syntactic errors on the Farsi oral cloze task revealed the following eight distinct categories of errors made by Farsi speakers: (a) prepositions, (b) nouns, (c) adjectives, (d) verbs, (e) adverbs, and (f) conjunctives. Note the similarity of these errors to those made by bilingual and native English speaking students on the Oral Close Task.

Farsi Phonological Errors.

Error analysis for Farsi phonological errors revealed the following 8 distinct categories of errors made by Farsi speakers: (a) vowel أ or [ae] as in "hat", (b) vowel إ as in "bet", (c) vowel ا or [o] as in "own", (d) vowel او or [u] as in "tool", (e) vowel آ or [o] as in "sofa", (f) ای or [i] as in "beet", (g) "tashdeed" or diacretic emphasizing stress on a particular consonant, and (h) "hamza". Note that the majority of these errors are due to diacretics. As noted previously, many Farsi vowels are represented by diacretics. Like Hebrew, these diacretics are not included in regular script, obliging the reader to "guess" the actual vowel in the word.

Farsi Spelling Errors.

Error analysis for Farsi spelling errors revealed the following six distinct categories of errors made by Farsi speakers: (a) Farsi [s] represented by three distinct graphemes (ث ص س), (b) Farsi [h] represented by two distinct graphemes (ح ه), (c) Farsi [t] represented by two distinct graphemes (ط ت), (d) Farsi [z] represented by four distinct graphemes (ذ ض ظ ز), (e) Farsi [gh] represented by two distinct graphemes (غ ق), (f) Hamza represented by a single grapheme (»), and (g) Ain represented by a single grapheme (ع).

The main reason why these errors occur are due to Arabic rules of spelling. In Arabic each of the above mentioned symbols are distinct sounds and have no similarity to one another (Khanlari, 1979). For example, the symbols (ت) and (ط) are represented as two different and distinct sounds in Arabic, whereas in Farsi both represent the sound [t]. Farsi, which is an Indo-European language, does not contain many of the consonants common to Hamito-Semetic languages such as Arabic (Mallory, 1989). As a result, when Arabic script was fully adopted by the 9th century, many of the Arabic letters representing sounds not found in Farsi were simplified as [s], [h], [t], [z], and [gh] (Arberry, 1953; Jahani, 1989; Lentz, 1937; Oranskij, 1975, 1977). This resulted in multiple representations for consonants such as [s].

Interviews and Qualitative Information

All bilingual participants were interviewed and responses categorised in accordance with the criteria outlined in the method chapter (p.79) after having been administered the Farsi and English tasks. Native English speakers were also interviewed. As noted in the method section, participants were first provided with an explanation of the theory of all of the reading related cognitive processes and were also given a handout summarising these processes. This was to ensure that participants' statements were accurate with respect to various cognitive processes such as phonological awareness, orthographic awareness, etc. As noted in the method chapter (p. 80) bilingual speakers were more familiar with the theoretical aspects of many of the cognitive processes due to their training in Iran's education system. The results of these interviews are reported below.

Farsi Word Reading Strategies

A large number of good Farsi readers (n=43) noted that they used both phonological and orthographic processes in Farsi word reading. As noted by participant E. F., "Farsi word reading cannot be done exclusively by just orthographic or phonological processes…both are involved". However, there was a slight distinction in the way phonological and orthographic processes were involved depending on the word's level of difficulty. When reading less difficult Farsi words (opaque or transparent), it was reported that orthographic processes were more frequently implicated. This means that they would refer to the word's orthographic shape or character in their orthographic lexicon. However, it was also reported that in such cases, phonological processes would also be involved. Even when certain difficult Farsi words were encountered, both orthographic and phonological processes were reported as being used. Many students (n = 41) noted that in such cases they would initially compare the word's orthographic character with another word (in their lexcion) with a similar orthographic structure (e.g., دقیانوس /daghyanoos/ -" prehistoric" with اقیانوس /oghyanoos/ - "ocean"). These students reported that even this strategy was not entirely orthographic; the retrieved word in the lexicon was "sounded out" as noted by participant M. M. However, the student would also attempt to phonologically decode the actual word on the task (e.g., "vehesht") independently of the aforementioned orthographic process.

English Word Reading Strategies

With respect to English word reading, the Farsi ESL students with five years or less of residence in Canada noted that they consistently tried to apply spelling to sound correspondence rules and as noted by participant Y. R., no attempt was made to "recognize the visual shape of the word" (orthographic strategy). However, Farsi ESL students with more than five years of residence in Canada reported using both spelling to sound correspondence rules as well as an orthographic strategy. Specifically, they reported that they would try to recall whether a certain word had been seen before, especially words that were high frequency. Of the native English speaking sample, the poor readers noted that one strategy they used to read unfamiliar words was to "try and see what it looked like". Examples of these types of errors with native English speaking poor readers were the reading of "causation" (in Woodcock Word Identification) as "Caucasian" or "benign" (in WRAT3 Reading Task) as "begin". This was not reported by the poor reading bilingual speakers; they noted that "the best strategy is to just try and decipher the letters". This is interesting because it implies that grapheme to phoneme conversion rules were used consistently in reading easy or difficult English words. However, it must be noted that many bilingual poor readers (n = 11) consistently read "benign" in the WRAT Reading Task as "begin". Many good reading native English speakers (n = 16) noted that in response to difficult words, they would rely more strongly on grapheme to phoneme conversion rules, however orthographic strategies could also be applied. Finally, good reading native English speakers noted that easier words would usually be read by a lexical strategy although many noted that they still "had the option of sounding it". It is interesting that the strategies reportedly used by good native English speakers to read easy and difficult English words are similar to reports of good Farsi readers reading easy and difficult Farsi words.

Farsi Word Spelling Strategies

It was consistently noted by both poor and good Farsi readers that the most difficult aspect of Farsi spelling was the fact that Farsi has numerous (scriptural) representations (Gholamain & Geva, 1999) for the consonants /s/ (as in "sat"), /h/ (as in "hat"), /t/ (as in "tea"), /z/ (as in "zebra"), and /gh/ ("ghain" and "ghaff" sound not represented in English). As noted in the discussion of Farsi spelling errors, the /s/ sound has three possible representations in dictation (ث ص س), the /h/ sound has two (ح ه), the /t/ sound has two (ط ت), the /z/ sound has four (ذ ض ظ ز), and /gh/ sound has two (غ ق). No other major sources of difficulty with Farsi dictation were reported.

English Word Spelling Strategies

English spelling ability was identified by using the WRAT3 manual (Wilkinson, 1993). The raw spelling scores were converted into standard scores with respect to age group norm tables in the WRAT3 manual (Wilkinson, 1993). The classification of good versus poor spelling ability was based on the ratings of standard scores on p.33 of the WRAT3 manual (Wilkinson, 1993). The cut point selected to distinguish between good and poor spellers was the standard score of 90.

A common observation made by poor bilingual spellers, was their difficulty in knowing what letters of the English alphabet represented which sounds. For example, it was not clear whether "ph" or "f" was to be used for the words "cacophony" or "malfeasance". Another observation made by bilingual students, was the lack of understanding of English spelling rules in general. Specifically, it was reported that there was a lack of awareness of positional constraints (knowledge of how sounds can change according to their position). One bilingual university student (S. T.) noted, "I don't always know what letter combinations could result in a particular English sound when I'm spelling". Native English speakers, who were poor spellers, also noted difficulties with rudimentary sound – spelling association rules. Like their bilingual counterparts, they also had difficulties knowing what letter was associated with which sound. However, one distinct observation with respect to all native English speakers who were poor spellers and readers ($\underline{n}$ = 16) is that their misspellings conformed least to grapheme-phoneme phonological guidelines. This means that if one were to read their misspellings, they would not phonologically correspond to the target words. This was not the case with good or poor reading and spelling bilingual speakers ($\underline{n}$ = 60) as well as good reading and spelling native English speakers ($\underline{n}$ = 39).

Farsi and English Syntactic Awareness

Many Farsi ESL students, who had been residing in Canada for five years or less, noted that the cues that they used for answering the oral cloze tasks for Farsi and English were different. When responding to the Farsi Oral Cloze Task, bilinguals noted that they tended to have less hesitation in their responses to items, as compared to the Revised Oral Cloze Task. Many bilingual students ($\underline{n}$ = 25) noted that this was mainly due to the fact that English grammar rules were not as "automatic" as Farsi was for them. There were also some distinct patterns in responding to Oral Cloze item 11 (The girl ____ is tall plays basketball well) with respect to language category and reading ability. Ten of 39 native English speakers (who were good readers) had substituted names such as "Judy", "Sally", "Sharon", etc. instead of a conjunctive adverb (e.g., "who") when encountering this item. This only occurred in three of 44 good reading bilingual speakers. In contrast, 24 bilinguals simply chose to not respond to this item. The patterns of all other errors made by good reading bilingual and native English speakers were similar; most responded with "whom", "jumping". Poor reading native English speakers (n = 18), responded mostly with items such as "there", "is", "very" and "many"; three gave no response. Poor reading bilingual students (n = 16) had responses similar to their native English speaking counterparts. Only two of these participants gave no response.

Farsi and English Phonological Awareness

The majority of the bilingual students noted that they found the Rosner Auditory Analysis Task to be the easiest one of all the cognitive tasks to perform. The bilingual students did very well as a group on this task (M = 37.5). Interviews with all bilingual students indicate that the Iranian educational system places a heavy emphasis on phonological awareness from elementary school. Specifically, children from grade one are (a) first taught phonemes (b) then taught syllables (c) taught to split (or analyze) words into syllables. Children learn all Farsi words by first analyzing them as separate syllables. This is a system that has existed in Iran's educational system for at least a century, however this format was both formalized and improved for the primary/elementary educational system by Gholamhossein Nayeri[3]. In summary, the Iranian educational system places a primary emphasis on the cognitive process of phonological awareness with respect to individual word reading. In addition, almost all bilingual students noted that they always used some type of analysis when learning a new

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[3] Nayeri also produced television programs for children in the 1980s in which the phonological analysis of Farsi words were an integral part of the program.

English word. This was especially true of those students who had had some form of English language training in Iran prior to arrival in Canada.

Item analysis of specific errors on the Rosner Auditory Analysis Task (Appendix X) made by good and poor (English) reading bilinguals as well as good and poor reading native English speakers revealed the following. The errors made by good English readers of both language groups among items 39-40 did not appear to be qualitatively different. Errors of phonological analysis on items 39 (continent) 40 (philosophy) made by bilingual and native English speaking good readers were similar; both groups had difficulty when the "tin" sound was removed from "continent" and when the "lo" was removed from "philosophy". However, the types of errors made by the two groups with respect to all other items seem to indicate that the source of errors may be different. In many cases, bilinguals seem to analyze the sound correctly (they are aware of what sound is to be removed), however the response provided is still incorrect. It may be that some type of "language effect" is present. For example, item 31(stream) demands removal of the "r" sound, resulting in "steam". Many bilinguals instead responded with "esteem" (good readers, n = 8; poor readers, n = 10); this may be related to the phenomenon of the reading error of attaching "e" to consonant clusters reported earlier. Another example is item 27(skin), which demands the "k" sound to be removed, resulting in "sin". Many bilinguals (good readers, n = 10; poor readers, n = 9) responded with "seen"; this may be related to the "i" errors of English reading reported earlier. Native English speakers who were poor readers (n=18) had the highest incidence of incorrectly responding with real English words in response to analysis demands. (Appendix X). An example is item

36(carpenter), which demands the "pen" sound to be removed, resulting in "carter". Seven poor reading bilinguals responded with "carpet", "Karen", "care" and "car".

English Pseudoword Decoding

Bilingual Farsi students, as a whole, did well on this task (M = 37.40). In total, 64 participants (bilingual and native English speakers) scored less than 37.40, which corresponded to the 54th percentile. This is because eight of the non-word items are actual phonological representations of Farsi words. These are: (4) raff (to rectify, to alleviate), (6) nan (bread), (7) un (that), (10) roo (visage; colloquial "being forward without being discreet"), (17) shab (night, evening), (21) bufty (bufty is "you wove"; from "buftan" to weave), (31) yeng (as in classical colloquial "yengeh" which means "bridesmaid"), (41) vauge (very similar to classical "vauge-h" or "word"). In addition, 39 of the original 60 bilingual students noted that many of the other words "sound like Farsi words". Examples are (35) "cigbet" and (38) "pafmotbem".

Item analysis of specific errors on the Word Attack Task (Appendix Y) made by good and poor (English) reading bilinguals as well as good and poor reading native English speakers revealed the following. The errors made by good English readers of both language groups among higher items (38-45) did not appear to be qualitatively different. The majority of errors made by bilingual and native English speaking good readers seem to be related to difficulties with respect to knowing which rules to apply in grapheme to phoneme decoding. For example, item 40 (monglustamer) was read as monglus"tamer" (as in the verb "to tame") by six good reading bilinguals and four good reading native English speakers. However, there were examples of what appeared to be at least partial language effects such as items 3 (ift) [read "eeft"], 5 (bim) [read "beem"], 15 (plip) [read "pleep"], 23 (straced) [read "estraced"], and (25) (thant) [read "tant"]. Both good and poor reading bilinguals had these errors, however the relative incidence of these were higher in the poor reading group (Appendix Y). A large proportion of poor reading native English speakers' errors frequently involved substituting real English words instead of correctly decoding the pseudowords. For example, 9 (gat) would be read as "gate" or 33 (gaked) as "gawked" (Appendix Y).

Farsi and English Orthographic Processes

Many of the bilingual students performed well on this task (M = 13.46). This was also true of native English speakers who were poor readers (subgroup M = 13.83). Many of these students (bilinguals and native English speakers of poor reading ability) noted that they would simply look at the word to see if it could like an English word encountered before. It must be noted that all participants (good and poor reading bilingual and native English speaking participants) noted that they had difficulty with item 14 (gwup-gnup) of the Orthographic Task. The comment made by a bilingual participant (B.T.) was typical of all cited participants "I cannot see how any of these items could possibly look like or even closely be an English word".

Item analysis of specific errors on the Orthographic Task (Appendix Z) made by good and poor (English) reading bilinguals as well as good and poor reading native English speakers revealed the following. Items 6 (miln milg) and 14 (gwup gnup) were the most difficult items for all four groups. With respect to other items overall, native English speakers of good and poor reading ability did better than their bilingual counterparts. In addition, poor reading bilingual students were the lowest performing subgroup (Appendix Z).

Farsi and English Memory Processes

There was one interesting observation made by 42 bilingual participants with respect to both the Farsi and English Working Memory Tasks. As the task demands became more difficult (i.e., more items had to be retained in working memory), bilingual students noted that they experienced more random and distracting thoughts. This was also reported by a large number of the native English speakers (n = 12) who were poor readers of English.

Many participants (bilinguals and native English speakers) reported that they used mnemonic memory strategies for helping them recall items in order. A common report was the tendency to try to link items together. The linking of items was reported to assist not only in recalling the words themselves, but to do so in the correct order. In the Farsi Working Memory Task, the majority of items end with verbs, although some items can end with adjectives (e.g., hot, warm). Interestingly, bilingual students noted that applying the linking strategy to the Farsi Working Memory Task was more difficult since the majority of Farsi sentences end with verbs.

A final observation with the Iranian students was the manner in which items were incorrectly recalled. Frequently, an item that had been forgotten from a previous set would be incorrectly recalled as part of the next set. This proactive interference is a case of the inability to clear from working memory information that is no longer relevant (Chiappe, Hasher, & Siegel, 2000). As noted by Chiappe et al. (2000) "proactive interference plays an important role in the decline of working memory performance associated with aging" (p. 15). Qualitative analysis of the data would seem to provide support for this finding. The frequency of these intrusion errors was lowest in the 19-22 year age group (n = 16), where only one case of intrusion was observed. In the 23-26 year old age group (n = 15), three cases of intrusion were observed. The 27-30 year old age group (n = 15) had three cases as well. However, the frequency of intrusion errors was highest in the 31-34 year age group (n = 14), where there were seven reported cases. In summary, there would seem to be more cases of observed proactive interference with increasing age.

A Note on Script and Direction of Reading.

A small number of bilingual students (n = 8) did note that they would sometimes start reading an English word from right to left (as in Farsi), but would then immediately "correct" themselves and proceed word decoding from left to right. The sole defining characteristic of this group was that they had resided in the range of 1 to 2 years in Canada.

CHAPTER IV

Discussion

The major focus of this investigation has been on the relationship between reading related cognitive processes and language experience to word reading performance as well as syntactic, phonological and spelling errors. The findings of this study have made a number of contributions to the literature. Following a brief discussion of the implications of the results of reading ability comparisons, the relationship of each of the reading related cognitive processes to word reading performance and errors is analysed and discussed in detail. The relative influence of cognitive processes and language experience on word reading will also be examined. In addition, the implications of the findings of this study with respect to the linguistic interdependence hypothesis will be discussed. Major implications will then be summarized, followed by discussions on limitations of the study, as well as future directions for research.

The Relationship of Reading Ability to Reading Related Cognitive Processes in English and Farsi

With respect to bilingual readers, good reading ability in English was found to be significantly associated with higher scores in oral cloze, auditory analysis, pseudoword reading skills, orthographic awareness, working memory and long term memory. With the exception of long-term memory, there were large effect sizes for all of the aforementioned processes. These results are in agreement with previous literature that has reported reading ability to be related to various reading related cognitive processes such as phonological processes (Carr et al., 1990; Olson et al., 1984; Siegel, 1993; Wagner & Torgesen, 1987), orthographic awareness (Doctor & Klein, 1992; Olson et al., 1984) syntactic awareness (Mann, 1998; Siegel, 1993), and working memory (Carr et al., 1990; Mann, 1998).

With respect to Farsi word reading, good readers performed better than poor readers on Farsi syntactic awareness, auditory analysis, pseudoword reading, orthographic awareness, and working memory tasks. In addition, the effect sizes for the aforementioned tasks were large; Farsi reading ability does seem to account for a major proportion of the variance in performance in Farsi syntactic, phonological, orthographic and working memory tasks. These results contradict previous literature (as cited in Teacher Training University of Tehran, 2000) that has predicted reading ability in Farsi to have no relationship to various reading related cognitive processes in Farsi. Specifically, the notion that Arabic based script confounds the relationship between reading ability and reading related cognitive processes among Iranian languages was not supported by the data of this study. Script does not appear to be a major factor in the development of Farsi reading ability. Instead, the results indicate the importance of cognitive processes such as phonological processes, orthographic awareness, syntactic awareness and working memory in the development of (Farsi) reading skills. This finding is in agreement with those found with adult Arabic ESL students (Henderson, 1983).

There were no significant differences between good and poor Farsi readers on the Farsi long-term memory task. This indicates that the Farsi long-term memory task does not distinguish well between good and poor readers of Farsi. The same may be said of the relationship of the English long-term memory task to English reading ability. Although the mean differences on the English long-term memory task between good readers and poor readers of English were statistically significant, the effect size of reading ability (good versus poor) was small. This indicates that long-term memory has little practical significance with respect to reading ability differences in English. The strength of association between reading ability and long-term memory in Farsi and English was statistically trivial. Long-term memory does not seem to be as important as other reading related cognitive processes (e.g., phonological processes) with respect to word reading performance. Instead, the results of this study indicate that the most important components of word reading (in Farsi and English) are syntactic, phonological, orthographic and working memory processes as outlined in reviews of bilingual learning by Carlo and Sylvester (1996), Carr and Levy (1990) and Siegel (1993). In addition, component reading related cognitive processing skills do seem to vary as a function of individual differences with respect to reading ability in both Farsi and English. Word reading in Farsi or English would seem to be a multi-factor process in that a number of reading related cognitive processes are involved.

However, another important issue is which cognitive processes seem to exert the most influence in Farsi and English word reading. In addition, other processes, such as language experience, can also account for the variation in English word reading performance as well as phonological, spelling, and syntactic errors. These issues are discussed below.

Phonological and Orthographic Processes, Word Reading, Phonological and Spelling Errors

Phonological awareness and coding were found to be significantly related to word reading in both Farsi and English. In particular, pseudoword reading and word reading were highly correlated in both Farsi ($r = .67$, $p < .01$) and English ($r = .55$, $p < .01$). This implies that the strategy of grapheme to phoneme coding is a process important to both Farsi and English word reading. This is consistent with past findings that have found strong relationships between pseudoword reading and word reading among bilingual Farsi speaking children (Gholamain & Geva, 1999), bilingual Arab Canadian children (Abu-Rabia & Siegel, 1999), Arabic and Berber speaking children (Wagner et al., 1989) and bilingual Arab university students (Henderson, 1983). Similar results were found among native English speakers with respect to the relationship between pseudoword and word reading ($r = .78$, $p < .01$).

There were significant correlations between phonological analysis and word reading in both Farsi and English. However, there were differences in the magnitude of the correlations with respect to Farsi and English. In Farsi, the magnitude of the correlation between the Farsi phonological Auditory Analysis Task and the Farsi Word Identification Task was strong ($r = .68$, $p < .01$). Among native English speakers, the strength of the relationship between phonological analysis and word reading was also strong ($r = .56$, $p < .01$). However, the strength of the correlation between the Rosner Auditory Analysis Task and the Woodcock Word Identification Task among bilinguals was moderate ($r = .43$, $p < .01$). Although Farsi speakers are very adept at the Rosner

Auditory Analysis Task, they may not be applying their analysis skills to the same extent in their English word reading as they do in Farsi. This is surprising considering reports made by many bilingual Farsi speakers that they always used a method of phonological analysis (segmenting) when learning new English words. It may be possible that phonological analysis skills are mostly implicated with respect to new or difficult English words and that this cognitive process is not involved to the same extent with more familiar words. This finding contradicts Baluch's theory that English word reading among bilingual Farsi speakers has no relationship to phonological analysis (Baluch, 2000).

Comparisons between the bilingual group and the native English speakers revealed that bilinguals significantly outperformed native English speakers with respect to the Rosner Auditory Analysis Task. As noted in the results section, auditory analysis skills are widely taught to children in Iran from pre-school. Students in Iran are encouraged to learn new or difficult words (opaque or transparent) by using their analysis skills. Iranian culture and education places an important emphasis and value on awareness of phonological segments and segmentation skills. Techniques such as segmenting words into syllables and phonemes are widely encouraged until grade 12 (Teacher Training University of Tehran, 2000). This emphasis on the cognitive process of phonological analysis seems to have resulted in varied levels of performance in both the Farsi Auditory Analysis Task as well as the Rosner Auditory Analysis Task. Selinker (1972) and Sridhar (1981) refer to this phenomenon as "transfer of training" (Selinker, 1972, p .216; Sridhar, 1981, p. 220). This is the case when the performance in L2 (i.e., English) may be due to "identifiable items in training procedures" (Selinker, 1972, p

.216) in L1 (i.e., Farsi). A consistent qualitative observation with respect to the data collection process was that many of the bilingual participants seemed to enjoy the Rosner Auditory Analysis Task most. In addition, a large number of bilingual participants (8 poor and 24 good readers of English) were very rapid in their responses with both the Farsi Auditory Analysis Task and the Rosner Auditory Analysis Task. This means that their responses were immediate and lacked any hesitation. Overall, the bilingual Farsi speakers did well on both the Rosner Auditory Analysis Task and the Farsi Auditory Analysis Task.

However, another possible explanation as to why the bilingual Farsi speaking participants of this study did as well as they did on the auditory analysis tasks in Farsi and English may have to do with Farsi orthographic structure. No studies have investigated this possibility. In general, Farsi orthography in its fully vowelised format is a very regular writing system (Baluch, 2000). However, Farsi also has cases with short vowels (diacritics) omitted, so that as in Hebrew, some words are phonologically opaque (Khanlari, 1979). There may be a relationship between the overall regularity of Farsi orthographic structure (especially with respect to its transparent vocabulary) and good performance in auditory analysis tasks.

Investigations in Italian word reading have indicated that there may be a relationship between orthographic regularity (predictable grapheme-phoneme correspondences) and phonological processes. Cossu, Shankweiler, Liberman, Katz and Tola (1988) compared the phonological segmentation abilities of Italian children attending schools in Italy to English speaking children attending schools in the U.S. The four groups of children studied were nursery, kindergarten, first and second grade respectively. The results indicated that the Italian children outperformed their US counterparts in tasks examining phonological segmentation (phonemes and syllables). Cossu et al. (1988) attribute this relative superior performance to Italian "orthographic language structure" (Cossu et al., 1988, p .11). Similar conclusions are reported in a more recent study of bilingual Italian-English speaking children in Toronto, aged 9-13 (D'Anguilli, Siegel, & Serra, in press). Of note was the fact that poor and skilled readers in the Italian bilingual group did better than poor and skilled native English speakers in the Word Attack task (D'Anguilli, Siegel, & Serra, in press). Among the explanations discussed for this finding is the greater regularity of Italian orthographic structure compared to English. It is possible that the bilingual children's English language skills benefit from the regularity of Italian (D'Anguilli, Siegel, & Serra, in press). These findings raise the question as to whether the performance of the bilingual students on the auditory analysis tasks can be solely attributed to training in phonological analysis skills in Iran. It may be possible that, like Italian, the overall regularity of Farsi orthographic structure (transparent words only) may at least partially influence performance in phonological analysis tasks.

Another important finding relates to orthographic awareness. Bilinguals, in general, did not perform as well as native English speakers on the orthographic task. This leads to the question as to why there is a significant difference between bilinguals and native English speakers with respect to the orthographic awareness task. It may be possible to partly explain this finding by more closely examining the statistical effect size. Although the mean differences on the orthographic task between bilinguals and native English speakers was statistically significant, the effect size of language category (bilinguals versus native English speakers) was relatively small. This indicates that language category does not account for the major proportion of variance in orthographic awareness scores. The strength of association (or eta squared) between language category (bilingual versus native English speaker) and performance on the orthographic awareness task was statistically trivial.

Closer examination of the data indicated that the lower scores of bilingual students on the orthographic task could be explained by the performance of a subgroup of bilinguals who were poor readers of English (n = 16). Most of these individuals arrived relatively recently to Canada (less than five years). Furthermore, they were not as familiar with English Roman based script as they were with Farsi Arabic based script. In fact, when this subgroup (n = 16) was excluded from the analysis, no significant differences were found between bilinguals and native English speakers with respect to the orthographic task.

In contrast to the findings with respect to phonological processes and word reading, the magnitude of the relationship between orthographic awareness and word reading in Farsi was different from that of English. Specifically, there was a strong relationship between the Farsi Orthographic Task and Farsi Word Identification Task. These results confirm those of Baluch (1993, 2000), Baluch and Besner (1991) and Baluch and Shahidi (1991) who note that orthographic awareness in Farsi has a strong relationship to Farsi word reading. In addition, this is consistent with interview data by Farsi speaking participants who noted that orthographic (as well as phonological) processes were important to Farsi word reading. However, the same relationship between orthographic awareness and word reading was insignificant in English. It may be possible that the same subgroup of bilinguals referred to earlier ($n = 16$) who were poor readers of English, and whose residency was a period of five years or less, were influencing these results. What is interesting is that when this subgroup was excluded from the correlation analysis between English word reading and orthographic awareness, the correlation index became significant and moderate in magnitude ($r = .31$, $p < .01$). This implies that it was mainly the poor English reading bilingual subgroup that failed to rely on orthographic awareness in their English word reading. A major reason for this may have been their relative lack of familiarity with English Roman based script orthographic rules. These results are interesting especially when examined in the context of the findings of Siegel, Share and Geva (1995) who compared English speaking dyslexic students with normal readers. Siegel, Share and Geva (1995) found that dyslexics had significantly higher scores on an orthographic awareness task in comparison to normal readers. This finding with dyslexics was attributed to the possibility that "in the course of the development of their reading skills, and because of their poor phonological skills, the dyslexics had learned to pay more attention to the visual-orthographic form of a word than to its sound" (Siegel, Share, & Geva, 1995, p. 252). In fact, dyslexics did more poorly than their normal reading counterparts with respect to the Word Attack Subtest. Dyslexics may have a core phonological deficit (Stanovich, 1988) with respect to reading. There is a contrast between the bilingual poor readers of this study and the English speaking dyslexic readers of the Siegel, Share and Geva study (1995). English speaking dyslexics seem to compensate for their relatively poor phonological (coding) skills by developing their orthographic awareness skills. In contrast, the lack of awareness of English alphabetic rules and orthographic conventions results in poor orthographic awareness skills in English among poor reading bilingual Farsi speakers. This may mean that the Farsi participants who were poor English readers were not efficient in terms of using a visual approach (or lexical access) to read English words. This may be attributed to the minimal exposure to English print with respect to background education discussed earlier. In contrast however, all Farsi participants (good and poor readers of English) were efficient in using phonological (coding) processes in reading English words.

A major implication of the results of the correlation analyses of word reading, phonological and orthographic processes is that the universal hypothesis for Farsi speakers as proposed by Baluch (1993, 2000) and Baluch and Besner (1991) was not supported. There is no evidence that bilingual Farsi speaking students have a selective bias towards visual or orthographic strategies and exclude phonological processes in either their Farsi or English word reading. The notion of English and Farsi word reading being devoid of phonological processes (Baluch & Besner, 1991; Baluch, 1993, 2000) has not been confirmed by the findings of this study. In fact, phonological processes, especially grapheme-phoneme correspondence rules, appear to be a significant component of word reading in both languages. Specifically, Farsi reading has a strong relationship to phonological analysis, phonological coding and orthographic processes. In English word reading, the most important process appears to be phonological coding. This was true for both bilinguals and native speaking English speakers. This is interesting because although the scripts of the two languages are different, both use alphabetic writing systems. This means that both Farsi and English word reading require similar processes of grapheme to phoneme decoding, despite the considerable differences in the scripts of the two languages. These same results and conclusions have been found in a recent study involving bilingual Farsi and English speaking children in grades 2 and 3 (Arab-Moghaddam & Senechal, 2001). Specifically, phonological coding is a process significantly related to both Farsi and English word reading among bilingual Farsi speaking children.

One question that may be raised is whether phonological decoding strategies of Farsi word reading transfer to English word reading. The studies of Brown and Haynes (1985) as well as Koda (1987) have indicated that L2 reading strategies may influence or even "transfer" (Koda, 1987, p. 133) to L2 word reading in English. Perhaps a sort of L1 word reading strategy transfer does take place, and bilinguals rely strongly on grapheme to phoneme decoding procedures or "phonological coding strategies" (Koda, 1989, p .218) in English word reading, simply because this is what they originally learned to do in Farsi word reading. Essentially, transfer may occur because grapheme to phoneme decoding is a process that is essential to Farsi word reading and is a skill that may actually transfer to English word reading. However, a different explanation is possible with respect to the similar correlations between word and pseudoword reading in Farsi and English. The ESL word recognition model of Meara (1984) and Meara et al. (1985) would explain this phenomenon not as a case of transfer, but one of bilingual students simply learning to adapt to the characteristics of the English Roman alphabet.

Using a dual route paradigm (Coltheart, 1978; Forster & Chambers, 1973; Meyer, Schvanevelt, & Ruddy, 1975) Meara, Coltheart and Masterson. (1985) have proposed an ESL word recognition model for English, which considers both orthographic and phonological routes. Using this model, Meara et al. (1985) note that ESL students using Arabic script would have difficulty reading English words because "the written form of a word does not usually contain information about the pronunciation of the vowels" (Meara et al., 1985, p .35). However, these ESL students would eventually learn to decode English words properly by "large-scale restructuring of the mechanisms of (English) word recognition" (Meara et al., 1985, p .35). Essentially, Farsi speakers may be adapting to the characteristics of the English alphabet by recognizing that (a) there are no diacretics representing opaque vowels in English and (b) English alphabets represent phonemes (consonants and vowels). The latter case at least, is analogous to Farsi word reading; perhaps this particular facet of grapheme to phoneme decoding in Farsi may transfer to English word reading.

Interestingly, phonological decoding not only is important to word reading performance, but also plays an important role in phonological errors. Specifically, phonological decoding was the cognitive process that consistently made a large unique contribution to the total $\underline{R}^2$ of all the phonological errors (26 – 40%). However, there was more variation with respect to language experience variables.

The most interesting observation with respect to errors with "w" and "th" was that language experience accounted for the major proportion of variance in the regression analyses (60 - 63 %). One of the processes resulting from language experience is language effects, or interference from L1 to L2. As noted in the literature review, language effects cannot be statistically measured or quantified; however, contrastive analysis can be used to qualitatively explain that process (Fisiak, 1990; James, 1981; Keshavarz, 1994; Sridhar, 1981). Contrastive analysis indicated that the graphemes corresponding to the sounds /w/ and [θ]"th" are not represented in Farsi. This results in

Farsi bilingual students decoding "w" as /v/ and /θ/ or /th/ as /t/ or /d/ (Maddieson, 1984; Teacher Training University of Tehran, 2000; Wilson & Wilson, 1987).

With respect to /w/ and /th/ errors, the Pratt indices for language experience indicated that length of residence and Farsi reading experience made the most relative contributions. Essentially, it may be possible to speculate that as length of residence increases, the number of errors with "w" and "th" may decrease. This may be because as language experience with English increases, the possibility of the process of a language effect from Farsi decreases. Conversely, the more Farsi language experience the Farsi speaker has while in Canada, the more likely it may be that she/he will experience language effects with respect to /w/ and /th/ sounds. This raises the interesting possibility that the frequency of exposure to Farsi literature exposes the Farsi speaker to the Farsi phonological system which is devoid of "w" and "th" sounds. This increased exposure may perhaps reinforce Farsi phonological rules and hence increase the likelihood of making language effect errors with "w" and "th" sounds in English.

With respect to errors of attaching /e/ to consonant clusters starting with (e+s), the Pratt indices for language experience indicated that age on arrival and Farsi reading experience made the most relative contributions. Interpretation of these results are interesting because they seem to indicate that the more exposure a bilingual person has to Farsi reading materials, the more likely she/he is to attach "e" to consonant clusters starting with "s". It may be possible that exposure to Farsi words and syntax increases the probability of making "e"-attach to-"s" errors. However, the relative Pratt index indicated that age on arrival accounted for a larger unique contribution to the total $\underline{R}^2$ of "e+s" errors than Farsi reading experience (26% versus 17%). The significance of age on arrival may mean that the older a person is when arriving to Canada, the more likely she/he would commit "e+s" errors. Hence, the older a Farsi speaker is when arriving to Canada, the more difficult it may be to master consonant clusters starting with "s" when reading English words, despite years of subsequent residence or education in Canada. There may be a connection between this possibility and Selinker's notion of "fossilizable linguistic phenomena" (Selinker, 1972, p .215). Essentially, Selinker defines fossilizations as linguistic errors that second language speakers will tend to persist with no matter how much "explanation and instruction he receives in the target language" (Selinker, 1972, p .215). In fact, education level in Canada accounted for only 2% of the unique contribution to total $\underline{R}^2$. Length of residence did not account for much variation either (4%). In addition, fossilization is seen as possible evidence for language effects or "language transfer" (Selinker, 1972, p .216) of L1 (i.e., Farsi) rules to L2 (i.e., English).

It is interesting that the Oral Cloze Task made a unique contribution of 14% to the total $\underline{R}^2$ of attaching "e" to consonant clusters. It may be possible that there is a relationship between sensitivity to English syntax and the (phonological) knowledge of decoding English words that begin with consonant clusters starting with "s". This would imply that there is a relationship between syntactic awareness and phonological coding in English. There was a moderate relationship ($\underline{r}$ = .51, $\underline{p}$ < .01) between the Oral Cloze Task and the Word Attack Task a finding similar to that obtained by Gottardo et al. (1996).

It was also interesting that Farsi speakers had a high incidence of errors with the letters ''i" and "e", despite the fact that the allophones corresponding to these exist in Farsi (Teacher Training University of Tehran, 2000). It may be that Farsi bilingual students are used to decoding vowels from graphemes differently in Farsi than in English. In Farsi, vowel sounds are represented by distinct letters and diacretics (Baluch, 1993; Forozanfar, 1979; Khanlari, 1979). In contrast, the English letters "i" and "e" can have multiple representations of sounds (Fromkin & Rodman, 1983). Multiple regression and Pratt analyses of the vowels "i" and "e" indicated interesting information with respect to the influences of reading related cognitive processes as well as language experience (age on arrival, length of residence and Farsi reading experience).

With respect to errors with "i", age on arrival accounted for the greatest unique contribution to the total $\underline{R}^2$ (38%). Length of residence and Farsi reading experience accounted for only a small fraction of the remaining variation with respect to language experience (5%). This may indicate two important points. First, performance in reading the letter "i" may not necessarily improve with a long length of residence in Canada. This again seems to be a phenomenon of the "fossilization" of the errors, like the errors of attaching "e" to consonant clusters mentioned earlier. Second, amount of exposure to Farsi reading (experience with L1) while residing in Canada appears to have neither a facilitating nor adverse relationship to the performance of reading the letter "i". It may again be possible to speculate that the older a Farsi speaker is when arriving to Canada, the harder it will be for her/him to master the decoding of the letter "i", despite years of subsequent residence in Canada.

The cognitive process that made the greatest unique contribution to the total $\underline{R}^2$, in the regression of "i" errors, was the word attack task (40%). This suggests that the most predictive cognitive process with respect to errors in "i" is phonological decoding. Central to this process is the knowledge of how the letter "i" is to be decoded in the context of its positioning in different English words. The pattern of findings with respect to errors with the letter "e" were similar to "i". With respect to reading related cognitive processes, word attack made a unique contribution of 26% to the total $\underline{R}^2$ of "e" errors.

However, there were differences with respect to the variables investigating language experience. Length of residence was the variable with the greatest unique contribution to the total $\underline{R}^2$ of "e" errors (39%). Education level in Canada was also important (24% of unique contribution to total $\underline{R}^2$). This indicates that, in contrast to the letter "i", the longer the bilingual student resides in Canada and the longer the exposure to Canadian education, the fewer errors are likely to be made with the letter "e". Therefore, the bilingual Farsi speaker seems likely to eventually master decoding of the letter "e" with increased length of residence and education in Canada.

As noted in the literature review, language experience results in at least five processes (Krezezowski, 1981; Selinker, 1972): (a) strategies of L2 communication, (b) overgeneralization of L2 materials, (c) transfer of L1 training, (d) strategies of L2 learning, and (e) the transfer of L1 syntactic, phonological and semantic elements to L2 (language effects). However, it may be possible to speculate that certain social processes may take place with increased length of residence. A small number of bilingual participants ($\underline{n}$ = 9) noted that they felt their English skills improve through "day to day contact with Canadian friends". This phenomenon is not unlike the concept of "environmental variance" (Olson et al., 1994) or variance in performance due to non-genetic or heritability factors. Although social processes with respect to mainstream culture were not studied, it may be necessary to investigate this phenomenon in future studies with respect to length of residence in Canada.

The phonological errors with respect to Farsi were different in nature than those of English. First, the majority of Farsi reading errors had to do with the opaque representation of vowels. This means that errors were not due to confusion of grapheme to phoneme decoding rules; they were more a consequence of trying to "guess" the actual vowel in the words. This is similar to problems experienced in Hebrew word reading (Bentin et al., 1984). These were in contrast to the English errors, which were generally the consequence of the application of incorrect grapheme to phoneme conversion rules.

One of the most interesting findings of this study pertains to spelling errors. There were no significant differences between bilingual and native English speaking students with respect to spelling errors. This indicates that not only did both groups make similar types of errors, but that neither group made significantly more errors (in any specified category) than the other. Bilingual students, however, did make significantly more phonologically correct spelling errors. This means that their misspelled words could still be pronounced like the actual target word by using grapheme-phoneme conversion rules. How is it possible that bilingual students made more phonologically unconstrained misspellings than native English speakers? One possible explanation is that bilingual students, in general simply rely more on phonological processes in their English spelling than native English speakers do. In fact, there was a moderate and significant correlation between spelling and pseudoword reading ($r = .54$, $p < .01$) and a strong correlation between spelling and auditory analysis ($r = .71$, $p < .01$) among bilingual students. Native English speakers also had significant correlations between spelling and pseudoword reading ($r = .49$, $p < .01$) as well as spelling and phonological analysis ($r = .51$, $p < .01$). An interesting question is evident: why is there a stronger relationship between auditory analysis and spelling in English among bilingual Farsi speakers than among native English speakers? This may be explained by the phenomenon of the well developed phonological analysis skills among the Farsi bilingual speakers. Specifically, it is possible that bilingual students apply phonological segmentation skills to a greater extent that their native English speaking counterparts. The results of the relative Pratt analyses seem to support this speculation. The Rosner Auditory Analysis Task accounted for 59% of the unique contribution to the total $\underline{R}^2$ of phonologically correct spelling errors. Among bilinguals, education level in Canada was the next most important variable (26%), which indicates that classroom instruction in spelling does have a relationship to phonologically correct spelling errors made by bilingual Farsi speaking students.

The subgroup with the least number of phonologically correct spelling errors was the poor reading and spelling native English speakers ($\underline{n}$ = 18). One distinct characteristic of their errors was the tendency to randomly insert vowels and consonants in the words they were attempting to spell. As a result, their spelling errors would not sound like the target word if grapheme-phoneme conversion rules were applied. There were even cases among poor reading native English speakers in which an entirely different word was written instead of the dictated word. This feature occurred to a much lesser extent among good reading native English speakers, but was rare among all bilinguals. It must be noted that the relationship between orthographic awareness and spelling among native English speakers was moderate ($\underline{r}$ = .37, $\underline{p}$ < .01). In contrast, the same relationship was not significant among both poor and good English reading bilinguals, indicating that orthographic awareness, as a process, is not significantly involved in English phoneme to grapheme transcription.

The majority of Farsi spelling errors related to the difficulty of knowing which of three graphemes of /s/, four graphemes of /z/ or two graphemes of /t/ to write in the context of different words. As indicated previously, all of these different graphemes originate from Arabic script (Khanlari, 1979; Forozanfar, 1979), where they are represented as totally distinct sounds. It is interesting to note that in English, it is also difficult to know which sounds represent which graphemes for certain consonants. In this respect, the Farsi and English spelling errors may have some similarity. However, there were virtually no errors with vowels in Farsi dictation. English errors, however, did show that spellers (both bilingual and native English speakers) often had difficulty knowing which grapheme(s) were to be used to correctly represent a dictated vowel. In Farsi, this does not occur because sounds for vowels can only be represented by distinct graphemes.

Syntactic Processes, Word Reading, and Syntactic Errors

Carlo and Sylvester (1996) report that in addition to phonological and orthographic processes, syntactic processes are also important to word reading. However, "more research is needed to understand the relationship between syntactic processing and L2 reading" Carlo & Sylvester, 1996, p .43). In addition, Carlo and Sylvester (1996) have noted that when investigating the syntactic processes of bilingual students, two important considerations must be made: (a) individual difference variables (i.e., cognitive processes) in syntactic processing and (b) the potential "negative transfer from the native language grammar" (Carlo & Sylvester, 1996, p .29) to English. This study has attempted to investigate both considerations.

The relationship between syntactic awareness and word reading among bilingual students was moderate in English ($r = .33$, $p < .01$). However, this relationship became stronger ($r = .65$, $p < .01$) when poor English reading bilingual students were excluded from the analysis. These findings are in agreement with Brown (1990) who found that oral cloze tasks and word reading had strong correlations among bilingual international students. In addition, the findings with respect to good reading bilingual students were similar to the relationship of syntactic awareness and English word reading among native English speakers ($r = .72$, $p < .05$). Interestingly, there was also a strong correlation between the Farsi Oral Cloze Task and the Farsi Word Identification Task ($r = .64$, $p < .01$). Syntactic awareness and word reading are significantly related in both Farsi and English. The acquisition of English word reading skills among bilingual and native English speaking participants seems to be closely related to both syntactic awareness processes and phonological processes. The same seems true for Farsi Word Reading. Deficiencies with either of these processes appears to have a strong relationship to poor word reading performance.

With respect to verb errors, language experience made a very large contribution (74%) relative to cognitive processes (24%). However, it must be noted that the Oral Cloze Task was not entered in the regression analysis, since the same task cannot be used as both a predictor and criterion variable. The relative contribution of education level was negligible (2%). The influence of language effects in the making of verb errors was investigated by contrastive analysis. In Farsi, verbs occur at the end of sentences, which may then result in a language effect or "interference of Farsi grammar rules" (Keshavarz, 1994, p. 101) onto English grammar (verb) rules.

Working Memory, Long-term Memory, and Word Reading

There was a significant correlation between working memory and word reading across both languages. These results are consistent with previous research indicating significant relationships between word reading and working memory skills (Mann, 1998; Siegel & Ryan, 1988; Torgesen et al., 1994). The pattern of relationships between English word reading and working memory was similar for both bilingual students ($r = .51$, $p < .05$) and native English speakers ($r = .64$, $p < .01$).

However, what was interesting with respect to the regression results of the word reading tasks (Woodcock Word Identification and WRAT Reading Task) was the little amount of variance accounted for by memory processes. Specifically, working memory accounted for only 2-5% and long-term memory 0-2% of the unique contribution to the total R^2. These results are consistent with previous research that has indicated that working memory predicts little variance in word reading (Harrington, 1992) once phonological sensitivity or analysis skills have been partialled out (Gottardo et al., 1996).

The relationship of long-term memory and word reading was not significant in either English or Farsi. The long-term memory task was an explicit memory task (Heredia & Mclaughlin, 1992) in that it required the (semantic) recall of previously read sentences in a short body of text. It appears that word reading does not appear to have a strong relationship to the ability to remember the semantic aspects of what had previously been read.

An important issue that was addressed with respect to the English long-term memory task was Hall's hypothesis (1977) that Iranian students have superior long-term memory skills in comparison to native English speakers. This was not supported by the MANOVA and follow-up data of language category comparisons. These results complement earlier findings by Johnson (1981) and Malik (1990) that Iranian students do possess superior recall for (previously) unknown content. However, in past studies (e.g. Malik, 1990), Iranian students' long-term memory performance was not compared to the performance of native English speakers. Cultural emphasis on rote memory and recall appears to have no influence with respect to the long-term memory performance of bilingual Farsi speaking students.

The Relative Influences of Cognitive Processes and Language Experience on Word Reading Performance and Errors

Durgunoglu and Hancin (1992) have noted that a frequent question in bilingual L2 word reading research is how much of reading problems are due to language experience or cognitive processes. In fact, one of the major objectives of this study has been to investigate the relative amount of variance in word reading performance and specified errors that could be attributed to reading related cognitive processes and language experience. With respect to word reading (Woodcock Word Identification and WRAT Reading Task), the relative proportion of the total variance (R^2) explained by cognitive processes was in the range of 33-39%. Language experience explained a similar proportion (36-41%). Cognitive processes and language experience would seem to be the major factors accounting for the performance of English word reading with neither being necessarily more important than the other. Therefore, bilingual Farsi speakers' performance in word reading may be explained as being a combination of individual difference variables (cognitive processes) and language experience, with neither being necessarily more influential that the other. However, education level in Canada is also an important factor. In fact, education level in Canada accounted for at least 25% of the unique proportion of the total $\underline{R}^2$.

Language experience and cognitive processes seem to exert different amounts of variation with respect to different types of errors. The pattern of variance accounted for by language experience and cognitive processes with respect to the phonological errors of "i", "e", and "e+s", was similar. Specifically, language experience accounted for 39-51 % of the variance in total $\underline{R}^2$, and cognitive processes for 37-49%. However, the pattern of variance with respect to w errors was very different. Language experience accounted for a very large unique contribution to the total $\underline{R}^2$ (60 - 63 %). In contrast, cognitive processes accounted for most of the unique contribution to the total $\underline{R}^2$in sight errors in word reading (73%) as well as phonologically correct spelling errors (65%).

In summary, performance errors or miscues in English word reading may be seen as a combination of cognitive processes (with phonological and syntactic processes as the most important variables), language experience as well as education level in Canada. In general, this perspective in is agreement with notions that emphasise "both linguistic and direct acquisition of L2...as important components...of second language learning" (MacWhinney, 1992, p. 375). There was another crucial finding with respect to the relationship of English word reading to cognitive processes. Partialling of language experience variables had no influence on the significance or magnitude of the relationships between English reading related cognitive processes and English word reading. Essentially, language experience appears to have no influence on the correlations between cognitive processes and word reading. This finding with language experience complements those made with respect to the linguistic interdependence hypothesis. It's possible that this finding is highlighting the distinction between the language structures of L1 and L2 and the underlying (cognitive) proficiency that is consistent across both languages.

A Test of the Linguistic Interdependence Hypothesis: The Relationship of Reading Related Cognitive Processes in Farsi and English.

Farsi and English syntactic awareness skills, Farsi and English phonological processes (analysis and decoding), Farsi and English orthographic awareness, Farsi and English working memory and Farsi and English long-term memory skills were highly correlated. These relationships suggest that individual difference variables, rather than language experience, are the significant determinants of the aforementioned correlations. The individual difference variables are the reading related cognitive processes that are consistent across languages. Language experience appears to have no influence on the correlations between specific cognitive processes across languages (i.e., phonological awareness in Farsi and English). Partial correlations controlling for language experience indicated virtually no change in the significance or strength of the correlations between specific cognitive processes across Farsi and English. This finding lends support to the idea that the relationships observed are not dependent on language experience, suggesting that a person who has difficulties with a particular process in Farsi (i.e., syntactic awareness) will also experience difficulties with that same process in English. These results lend support to the theory that individuals use the same set (reading related) cognitive processes in both their first language (L1) and second language (L2) (Cummins, 1979; Cummins, et al. 1984; Cummins & Swain, 1986; Hodes, 1981; Royer & Carlo, 1991). Therefore, a bilingual Farsi participant with a processing deficiency in Farsi (e.g., working memory) would also show the same deficit in English.

An important implication of these results is that they do support the concept of a common underlying (cognitive) proficiency with respect to phonological and orthographic processes across both Farsi and English (Cummins & Swain, 1986). Conversely, the results of this study do not support the notion of a separate underlying proficiency (Cummins & Swain, 1986) for Farsi and English. A small number of Iranian researchers (as cited in The Teacher Training University of Tehran, 2000 have proposed that the Farsi Arabic based alphabet and European (Roman and Cyrrelhic) alphabets lead to separate underlying proficiencies with respect to phonological and orthographic processes among speakers of Iranian languages such as Farsi, Kurdish, Pashto, Ossetian, Luri and Baluchi. However, the results of this study do not support the notion that different scripts (Farsi Arabic based alphabet or English Roman alphabet) lead to separate underlying proficiencies with respect to reading related cognitive processes in Farsi or in English.

The strong correlations between the working memory tasks across languages as well as the long-term memory tasks across languages also lead us to question the validity of the independence model of bilingual memory (Kolers, 1966; Lopez & Young, 1974). The independence model contends that bilingual students have two separate memory processes; one for their first language (e.g., Farsi) and one for their second language (e.g., English) (Kolers, 1966; Lopez & Young, 1974). Harrington (1992) has noted that bilinguals' working memory performance is independent of language category; working memory performance is described as varying as a function of individual difference variables. The interdependence model states that bilingual long-term memory for semantic and conceptual information is consistent across languages (Heredia & McLaughlin, 1992). The data of this study indicate that, like other cognitive processes, working and long term memory are consistent across languages and are independent of the language spoken by the bilingual student.

Summary of the Most Important Findings

The results of this study may be summarised into the following sixteen points:

1. There are significant differences between good and poor readers with respect to performance on reading related cognitive processes such as phonological awareness, phonological decoding, orthographic awareness, and working memory, and this is true in both English and Farsi. Long term memory performance, however, does not seem to differentiate well between good and poor readers of Farsi and English and does not appear to be an integral component of the word reading process.

2. Phonological decoding was the most important cognitive process in the making of all identified phonological errors ("w", "th", "e", "i", attachment of "e" to consonant clusters).

3. Bilingual Farsi speakers did significantly better on the Rosner phonological analysis task than their native English speaking counterparts. This may be due to the strong emphasis of such skills in the educational and cultural system of Iran.

4. There was a strong relationship between auditory analysis and spelling in English. In fact, this relationship was stronger among bilingual as opposed to native English speaking participants. It may be that bilingual students have better phonological segmentation skills than their native English speaking counterparts.

5. Phonological analysis was found to be the most important cognitive process in the making of phonologically correct spelling errors among bilingual speakers. This would suggest that phonological segmentation skills are important to the English word spelling of bilingual Farsi speakers.

6. Bilingual students had significantly lower scores on the orthographic awareness task. These results were explained by a subgroup of bilinguals who were poor readers of English (n=16). These were more recent arrivals to Canada (less than 5 years) who were not as familiar with English Roman based script as they were with Farsi Arabic based script. Specifically, they had a lack of familiarity with the English Roman alphabet as well as with the conventions of orthographic rules of written English words.

7. Language experience and cognitive processes would seem to account for equivalent amounts of variance in English word reading. Education level is also important, but does not account for as much of the variance in word reading as cognitive processes or language experience.

8. Age on arrival is the language experience variable most important in the making of "i" and "attach e to consonant clusters with s" (e + s) errors. It may be that the older the

Fari speakers are when arriving to Canada, the more likely that their "i" and "e + s" errors will persist, despite a long period of residence and exposure to education in Canada.

9. Length of residence is the language experience variable most important in the making of phonological errors with "e", "th", "w". It would seem that the longer the bilingual Farsi speaker resides in Canada, the more proficient she/he will become at decoding these letters. However, education level in Canada was also found to be important with respect to "e" errors. It is possible that an increase in classroom instruction can have a significant influence in diminishing errors with "e".

10. Contrastive analysis investigating language effects indicated the following. The absence of /w/ and /th/ sounds in Farsi can lead to errors in decoding the English letters "w" and "th". Consonant clusters are always preceded by a vowel in Farsi, which can lead to errors with English consonant clusters (especially with /s/). Verbs occur at the end of sentences in Farsi, which can then lead to errors with verb placement in English.

11. The different nature of Farsi script leads to qualitatively different reading errors than in English. Farsi reading errors are mainly due to the opaque representations of vowels. It must be noted, however, that in Farsi each grapheme represents a unique sound (vowel or consonant).

12. Farsi spelling errors are mainly due to the fact that multiple representations exist for the same consonant in 4 cases (t, z, s, and gh). In this respect Farsi and English spelling errors are similar. However, the majority of remaining Farsi consonants have only one graphemic representation. In addition, vowel errors are virtually absent in Farsi, since each vowel in Farsi (opaque or transparent) has only one graphemic representation.

This is in contrast to English spelling where vowel sounds are not always represented by the same symbols.

13. There are two major challenges for Farsi ESL students learning English word reading. The first is the fact that English reading is characterised by complex and inconsistent correspondences between phonemes and their graphemic representations (Arab-Moghaddam & Senechal, 2001; Fromkin & Rodman, 1983). In Farsi, all vowels and consonants are always pronounced the same, regardless of their position in words (Khanlari, 1979). This results in Farsi speakers decoding all English graphemes in the same manner regardless of their position in words. Second, English script has no diacretic system for representing vowels. As a result, the Farsi speaker may assume that certain vowels in English may be represented by diacretics as they are in Farsi.

14. The partialling of language experience variables does not affect the magnitude of the correlations between English word reading and reading related cognitive processes. This indicates that the relationship of English word reading to related cognitive processes is not correlated with language experience.

15. Farsi word reading involves both phonological and orthographic processes. This result is not in agreement with literature that has proposed that Farsi word reading is devoid of phonological processes. In addition, the notion that phonological processes are not significantly implicated in the English word reading of bilingual Farsi students was not supported.

16. Reading related cognitive processes seem to be consistent across languages. These results support the notion of a common underlying proficiency independent of

language (L1 and L2). Conversely, the notion of the existence of separate proficiencies for phonological, orthographic and memory processes for L1 and L2 was not supported.

Limitations to Generalizability

The results of this study and the ensuing discussion may be limited in their generalizability. The following points are addressed below.

The Word Attack Task

The performance of bilingual Farsi speaking participants on the English Word Attack Task was somewhat higher than expected because many of the pseudowords are actual Farsi words (see Results p. 85). It must be noted that the confound of pseudowords being real words in another language is not uncommon to bilingual research; Zuckernick (1996) has cited similar difficulties with bilingual research in Scandinavian countries. One example is the Finnish pseudoword "Vuve" which is "dog" in Swedish; many Finns speak Swedish as a second language (Zuckernick, 1996). As a result, Finns would actually do better than expected in pseudoword tasks. For future studies with bilingual Farsi speaking students, it may be necessary to either select or design a new pseudoword task.

Error Analysis the Criteria for Selecting Errors for Statistical Analysis

One of the main issues with many of the syntactic, phonological and spelling error categories was whether there were enough errors to warrant a statistical (between group) comparison. For example, there were many categories in which very few errors were made by participants (e.g., Table 6, preposition errors). Statistical between group comparisons in these cases, may arbitrarily identify (statistically) significant differences, however the practical meaning of these findings would be questionable since the number of errors made was few to begin with. In addition, those errors may have been made by a very small number of participants. In this study it was decided that a large enough number of errors had to be made by at least one of the four following subgroups - bilingual good readers, bilingual poor readers, native English speaking good readers; native English speaking poor readers. A minimum criterion of twenty errors was selected and applied consistently to all syntactic, phonological and spelling errors. However, it would have been possible to apply more qualitative judgements in the selection of errors for subsequent statistical analyses. Although numbers of errors made by subgroups is important, it is possible to look at the "pattern" of errors in two ways. First, we can observe to see whether certain "types" of errors are more prevalent among certain subgroups. This was the case with phonological "i" errors in which bilingual students tended to substitute /ee/ sounds or poor reading native English speakers and sight errors. Although qualitative observations were reported and were also used in the contrastive analyses, they were not used in the decision making process of screening and selecting errors for statistical analyses. Second, we may be able to ascertain whether there is an "interaction" and/or "relationship" between reading ability and language category with respect to errors. Even though the skewed nature of the error data did not allow for a 2x2 ANOVA analysis, qualitative observations could be made. For example, with respect to the phonological error of "g" (Table 24), while good and poor readers had similar levels of errors, good reading native English speakers had many more errors than poor reading native English speakers. The good reading English readers also had more errors than good and poor reading bilinguals. Note that the issues discussed here pertain to a distinction between statistical significance versus a more "practical" (non-statistical) significance or meaning. This notion of practicality pertains to the qualitative sense of what the pattern of errors actually means. Any future ESL study using detailed error analyses and tables may benefit from a qualitative analysis of the data.

Farsi Word Reading

The findings of this study indicated that both orthographic and phonological processes are important to Farsi word reading. In addition, it was found that phonological coding was the process with the strongest significant relationship to word reading in Farsi. However, it is not clear whether these findings can be generalised to Farsi speakers in Iran or other Farsi speaking countries such as Afghanistan, Tajikestan, or the Tats (Khazar Jews) of the Caucasus. The main question is whether phonological processes are as strongly related to word reading (in Farsi) among individuals in Farsi speaking countries as they are among Farsi speakers residing in western countries such as Canada.

The Bilingual Sample

This study focused mainly on Farsi speakers from Iran. Specifically, these were Farsi speakers who were mainly from Tehran, Meshad, Arak, Qom, Yazd and Isfahan. There were no Farsi speaking participants from outside of Iran (e.g., Afghanistan). In addition, Iranians whose first languages were non-Farsi Iranian languages (e.g., Kurdish) or Turkish were excluded. This limits the generalizability of the findings of this study with respect to English word reading. Specifically, the results of this study apply mainly to bilingual Farsi speaking students from metropolitan Vancouver and not to the entire Iranian population now residing in British Columbia, Canada. In addition, this study may not be generalised to Farsi speaking EFL (English as a foreign language) learners in Iran. This is mainly because EFL students in Iran are immersed in a Farsi speaking majority environment and their learning of English is done solely through formal classroom instruction.

Decoding as a Cultural Practice: Its Effect on the Word Reading Process of Bilingual Farsi Speakers

Word decoding is also a cultural phenomenon in Iran. The Qur'an is widely taught from the first grade and is also taught (in a religious context) outside of school. Many Iranian children and adults can correctly decode the Arabic words of the Qur'an without having any comprehension of Arabic. Does this cultural practice in word decoding have any relationship to English word reading among bilingual Farsi speakers? Even though this question was not addressed in this study, one study has investigated the relationship between the cultural practice of word decoding and English word reading performance (Rosowsky, 2001). Rosowsky (2001) compared the English word reading performance of Mirpuri-Punjabi speakers speakers (age 11-12) to monolingual English speaking children in England. The Mirpuri-Punjabi speakers were all able to decode the Arabic text of the Qur'an even though they could not necessarily comprehend the semantic or syntactic aspects of the Arabic language. Rosowsky (2001) found that the Mirpuri-Punjabi speakers had higher scores than their monolingual counterparts with respect to English word decoding skills. This is attributed to the fact that "reading accuracy scores of these children (Mirpuri-Punjabi speakers) are almost certainly affected by their reading experience in the mosque Qur'anic schools" (Rososwky, 2001, p.68).

Any future ESL study involving Farsi speakers will need to address the possible relationship of Qur'anic instruction and English word reading performance.

Future Directions for Research

A number of important future directions for research may be suggested. These are discussed below.

Implications With Respect to Promotion of L2 Learning Among Farsi Speakers

There are at least three major implications of the results of this study with respect to using instruction to promote English word learning among bilingual Farsi speakers. The first has to with the use of phonics instruction. As noted previously, phonics instruction in Iran is used in conjunction with the acquisition of Farsi word reading and spelling skills. It may be beneficial to create a similar learning environment with respect to the acquisition of English word reading and spelling skills. The findings with respect to the relationship of phonological processes to word reading as well as phonologically correct spelling errors suggest that bilingual Farsi speakers are likely to apply phonological skills in their acquisition of English word reading and spelling. As a result, the introduction of English phonics instruction may facilitate the successful acquisition of English word reading and spelling skills among bilingual Farsi speakers.

The second implication of the results of this study has to do with the different natures of English and Farsi script, especially with respect to word reading. Recall that English is polyphonic in that its orthography contains graphemes that can be represented with more than one phoneme (Arab-Moghaddam & Senechal, 2001). For example the letter "i" in "mint" is decoded differently than the letter "i" in "pint". This is not the case in Farsi where each letter can represent only one distinct sound. This is a source of confusion among many bilingual Farsi speakers who are not accustomed to the somewhat inconsistent grapheme-phoneme correspondence rules in English in comparison to Farsi. It may be beneficial to ESL instruction to highlight this distinction between Farsi and English scripts. Farsi speakers would then be aware that many English letters are not always decoded in the same way when situated in different English words.

The third implication of the results of this study has to do with verb errors. Many Farsi speakers place verbs at the end of sentences in their spoken speech despite years of English language instruction (Keshavarz, 1994; Wilson & Wilson, 1987). In fact, there are cases where Farsi speakers are able to correctly place verbs in writing (e.g. essays) but continue to make verb placement errors in speech (Teacher Training University of Tehran, 2000). Standard English grammar instruction does seem to be effective with respect to removing English verb placement errors from Farsi speakers' speech (Keshavarz, 1994; Wilson & Wilson, 1987). Oral cloze exercises in the ESL classroom may help with this problem since they would allow Farsi speakers to exercise their English skills in an everyday oral context. This oral context may more closely approximate the context (common everyday speech) in which English verb placement errors take place.

Investigation of Phonological Awareness Processes among ethnic Farsi Speakers of Non-Iranian Nationality

One of the findings of this study was that Farsi speakers performed significantly better than native English speakers on the Rosner Auditory Analysis Task. However, this finding needs to be investigated further. Two areas of investigation are suggested. The first pertains to investigating the type(s) of phonics instruction that are common among Iran's classrooms. For example, do Iranian children engage in spontaneous segmentation and blending, alliteration and rhyming, etc.

The second area of investigation pertains to Farsi speakers outside of Iran. Are Farsi speakers from regions such as Afghanistan, Tajikistan, and Turkic-Jewish Tats (Khazars) from the Caucasus, also as proficient as mainstream Farsi speakers in Iran with respect to auditory analysis skills? Specifically: (a) Would their performance be as good as the Farsi speakers of this study on the Rosner Auditory Analysis Task as well as the Farsi Auditory Analysis Task? (b) Would their performance on the Rosner Auditory Analysis Task be significantly higher than native English speaker? (c) Would their phonological analysis skills in English show high correlations with the WRAT Spelling Task? The same questions could be asked with respect to speakers of non-Farsi Iranian languages such as Kurdish.

Investigation into the Reading Related Cognitive Processes of Students Who Speak Other Non-Farsi Iranian Languages: A Case for Kurdish

The most promising line of future research may be the investigation of the reading related cognitive processes of non-Farsi speaking Iranian-Canadians. This is mainly because the findings of these studies may have practical implications; they may help provide recommendations for English word reading instruction and ESL programs (like the recommendations for Farsi ESL students discussed earlier).

As noted previously, this study has not investigated the processes and errors of non-Farsi speaking Iranians, many of whom speak Kurdish, an Iranian language. Kurdish resembles Pahlavi, or middle Persian, a language that was spoken throughout the

Sassanian Persian Empire before the Islamic conquests of the 7th century (Arberry, 1953; Farrokh, 2001; Mackenzie, 1961; Meskoob, 1992; Misra, 1987; Nebez, 1975; Oranskij, 1975, 1977). As a result, Kurdish, unlike Farsi, still retains many of the original Indo-European words of Pahlavi (e.g., "gama" or game) as well as sounds such as [w] or "th" [θ].

Political turmoil and economic deprivation have forced millions of Kurds to immigrate to Europe and North America. A large amount of that immigration took place in the 1980s and 1990s (Izady, 1992). Kurds already form separate and distinct communities across the United States and Canada (Izady, 1992), especially in Burnaby and east Vancouver in British Columbia. Like Farsi speakers, many are rapidly entering the Canadian educational mainstream. One of the major factors in the educational and social adjustment of Kurdish Canadians will be their newly acquired skills in reading. No studies to date have examined either the reading related cognitive processes or English errors (i.e., phonology, syntax) of Kurdish Canadians who speak English as their second language. Similar studies may be possible with Pashto, an Eastern Iranian language widely spoken in Afghanistan and some portions of Central Asia as well as Pakistan (Jahani, 1989).

However, the issue of Iranians of Turkish speaking origin must also be addressed. In fact, Turkish speakers possibly form the second largest ethnic and linguistic minority in Iran today: up to a fifth of Iranians today may be Turkish speaking or of Turkic origin (Amiri, 1992; Halliday, 1977). Turkish is a Uralo-Altaic language totally distinct from Iranian languages such as Farsi or Kurdish (Cavalli-Sforza, 2000; Mallory, 1989; Renfrew, 1990).

Finally, another intriguing area of research may be the role of language effects on Farsi word reading. This is the case of Iranian individuals whose first language is not Farsi and who may experience language effects from their non-Farsi language on Farsi reading. This type of situation has been documented with respect to Turkic speaking Azerbaijanis who read words in Farsi (Khanlari, 1979). However, this raises another important question: do Iranians of non-Farsi speaking origin experience language effects from both their non-Farsi language and Farsi with respect to their English word reading? Any future research investigating the English word reading processes of Iranians of non-Farsi speaking origin will have to consider this phenomenon in the contrastive and error analyses.

Investigation into the Acquistion of Farsi Word Reading Skills Among Non-Iranians

It would be interesting to investigate the Farsi word reading acquisition processes of non-Iranian speakers (e.g. native English speaking Canadians). This type of study is of crucial importance since it would allow for the investigation of the cognitive processes involved in the acquisition of Farsi word reading skills. A similar study has already examined US students learning Arabic as a foreign language (Khaldieh, 1991). A comparison group of native Arabic speakers was also studied. Khaldieh (1991) has found that American learners of Arabic (beginner and advanced) use both orthographic and phonological processes in their Arabic word reading. These results have led Khaldieh (1991) to two important conclusions. First, learners of Arabic as a foreign language need to develop an awareness of the sound system of Arabic in order to improve Arabic word recognition. Second, these learners need to "develop a set of orthographic and phonological strategies as a necessary stage to acquire the graphic and sound systems of

Arabic" (Khaldieh, 1991, p.10). The Khaldieh study (1991) also found the same to be true with native Arabic speakers. Arabic word reading was significantly related to both phonological and orthographic processes among native Arabic speakers. In this present study, Farsi word reading was significantly related to both phonological and orthographic processes among bilingual Farsi speakers. It is likely that Canadian English speakers will also use phonological and orthographic processes in their Farsi word reading.

Metathesis Errors and Farsi Word Reading

One important factor that has not been addressed in this study has been the relationship of socio-economic factors to Farsi word reading errors. There is evidence from studies in Iran that Farsi speakers from lower socio-economic backgrounds differ in the types of errors they make with respect to Farsi words (Keshavarz, 2000). One example is metathesis. Metathesis in phonological coding refers to the process in which speech sounds in words are transposed (Yule, 1988). In essence, metathesis occurs when the normal sequence of two adjoining sounds in a word are changed (Keshavarz, 2000). The effect is typical in situations where people may say "aks" instead of "ask" or "purty good" instead of "pretty good" (Yule, 1988). It is possible to identify numerous cases of metathesis in Farsi (Keshavarz, 2000). Examples include /golf/ for /gofl/ (lock), /noxse/ for /nosxe/ (prescription), /istarkh/ instead of /istakhr/ (swimming pool) and /mardese/ for /madrese/ (school). Keshavarz (2000) notes that Farsi speakers from lower socio-economic backgrounds of Tehran have a tendency to make more metathesis errors than their more affluent and educated counterparts. Although metathesis errors did not occur with respect to Farsi reading in this study, it would be interesting to investigate this type of error among Farsi speakers who reside outside of Iran. Such a study may also take into account the factor of socio-economic status in order to see if it exerts any influence in the making of Farsi word reading errors.

Script, Direction of Reading and Eye Movement

Wilson and Wilson (1987) have reported that direction of Farsi word reading has no effect on English word reading. However statements made by a small number of participants ($\underline{n} = 8$) reported in the results section questions this assertion. There may be a relationship between length of residence and direction of reading. Specifically, a bilingual Farsi speaker who has very recently arrived to Canada may have the tendency to initially read from right to left when decoding the letters of an English word. This may especially be the case with individuals who have had little or no English language instruction in Iran. The possibility of the transfer of direction of Farsi word reading (or right to left eye movement) to English word reading suggests that an investigation may be warranted.

Socio-Cultural Factors

There are two ways in which cultural factors may play an important role in the successful acquisition of word reading skills. The first area is on the aforementioned phenomenon of cultural and/or educational training on processes such as L1 word reading strategy and training in reading related cognitive processes (e.g., phonological analysis skills). The second area is that of the relationship of the host culture (i.e., North American) to that of Iranian culture.

Iranians are generally not perceived in a positive fashion by mainstream North American culture (Modaressi, 2001; Shaheen, 1984). Negative cultural stereotyping of Iranians is very prevalent in mainstream news media and entertainment (Bill, 1999). This process may extend to the field of education as well. Gunderson (2000) has noted that "teaching and learning in North America are imbued with features of Eurocentric notions and ideas advocated by school boards, superintendents, and teachers" (p. 692). Citing Duff and Uchida, Gunderson (2000) notes that the "dominant view" (Gunderson, 2000, p. 694) with its clear notions of certainty and generalizations, does have a tendency to stereotype and tribalize others (e.g., Iranians). Mokhtari and Sheorey (1994) have emphasised the importance of positive motivation with respect to the successful acquisition of reading skills among adult ESL students. The main question for a possible future study in this area is whether the process of mainstream negative cultural stereotyping may have an effect on Iranian ESL students' motivation to successfully acquire English skills such as word reading.

This study has investigated the area of word reading performance and associated errors in both English and Farsi word reading among bilingual Farsi speakers. The results of this study clearly show that bilingualism does not impede the development of word reading skills. It was also interesting that reading related cognitive processes were consistent across languages, lending support to the idea of a common underlying proficiency across languages. While this study was conducted with only one language group, the results of this study may provide a useful impetus for further adult bilingual research.

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Appendix A

Word identification subtest of the Woodcock Reading Mastery Test-Revised

(Woodcock, 1987)

BASAL: The first 6 consecutive responses that begin with the first item on an easier page

CEILING: The last 6 failed responses that end with the last item on an easier page

Score (1 or 0) Error Response

1. ____ is ____

---

2. ____ you ____
3. ____ and ____
4. ____ up ____

---

5. ____ c at ____
6. ____ stop ____
7. ____ come ____
8. ____ jump ____
9. ____ help ____
10. ____ book ____

---

11. ____ play ____
12. ____ un ____
13. ____ blue ____
14. ____ two ____
15. ____ no ____
16. ____ boy ____
17. ____ little ____
18. ____ bed ____
19. ____ milk ____

---

20. ____ car ____
21. ____ swim ____
22. ____ fast ____
23. ____ down ____
24. ____ rug ____
25. ____ with ____
26. ____ find ____
27. ____ said ____
28. ____ night ____

---

29. ____ sleep ____
30. ____ after ____
31. ____ woman ____
32. ____ summer ____
33. ____ table ____
34. ____ work ____
35. ____ stove ____
36. ____ ground ____
37. ____ airplane ____

Score (1 or 0) Error Response

38. ____ chair ________
39. ____ because ________
40. ____ beautiful ________
41. ____ slowly ________
42. ____ watch ________
43. ____ early ________
44. ____ heavy ________
45. ____ already ________
46. ____ laugh ________

---

47. ____ hurry ________
48. ____ largest ________
49. ____ expert ________
50. ____ evening ________
51. ____ passage ________
52. ____ perceive ________
53. ____ gasoline ________
54. ____ calendar ________
55. ____ human ________

---

56. ____ twilight ________
57. ____ certain ________
58. ____ dwarf ________
59. ____ furnace ________
60. ____ amazement ________
61. ____ torpedo ________
62. ____ vehicle ________
63. ____ departure ________
64. ____ yardage ________

---

65. ____ urgent ________
66. ____ mechanic ________
67. ____ wounded ________
68. ____ zenith ________
69. ____ petroleum ________
70. ____ stigma ________
71. ____ spectacular ________
72. ____ cologne ________
73. ____ miser ________

Score (1 or 0) Error Response

74. ____ hysterical ____
75. ____ pedestrian ____
76. ____ yacht ____
77. ____ mathematician ____
78. ____ almanac ____
79. ____ relativity ____
80. ____ instigator ____
81. ____ prognosis ____
82. ____ judicious ____

---

83. ____ causation ____
84. ____ vernacular ____
85. ____ alkali ____
86. ____ philanthropist ____
87. ____ naive ____
88. ____ inordinate ____
89. ____ carnivorous ____
90. ____ artesian ____
91. ____ quintessence ____

---

92. ____ heterogeneous ____
93. ____ cygnet ____
94. ____ expostulate ____
95. ____ tableau ____
96. ____ zymolysis ____
97. ____ tuberculous ____
98. ____ surreptitious ____
99. ____ internecine ____
100. ____ tauce ____

---

101. ____ quadruped ____
102. ____ epistrophe ____
103. ____ dossier ____
104. ____ picayune ____
105. ____ cenology ____
106. ____ zeitgeist ____

Appendix B

Reading subtest of The Wide Range Achievement Test (WRAT 3) (Wilkinson, 1993)

BLUE READING

A B O S E R T H U P I V Z J Q

in	cat	book	tree
how	animal	even	spell
finger	size	felt	split
lame	stretch	bulk	abuse
contemporary	collapse	contagious	triumph
alcove	bibliography	horizon	municipal
unanimous	benign	discretionary	stratagem
seismograph	heresy	itinerary	usurp
irascible	pseudonym	oligarchy	covetousness
heinous	egregious	omniscient	
assuage	disingenuous	terpsichorean	

Appendix C

Farsi Reading Task (Farrokh & Chalashgar, 1998)

پا	سگ	سرد	شاه
زمین	بالدار	طبقه	اداره
ناراضی	ژرفنا	آتشبار	دوران
مطرود	منطق	پیوستگی	رامشگران
هتاکی	مستوفی	مغازله	متفرق
الوهیت	مشخصات	مستشرق	مستبشار
محافظه	استثناء	برراسته	مولد
خودرو	مستحضر	متقاعد	تیراژه
مرتد	متاع	متناقض	تشعشع
استغاثه	مطاع	سنجق	سترون
هوخشتر	مینیوچیتر		

Appendix D

Farsi Word Identification Task (Farrokh & Chalashgar, 1998)

۱. بلی	۱۱. دارا	۲۱. کمک	۳۱. آسان
۲. بلکه	۱۲. برادر	۲۲. مردم	۳۲. کاغذ
۳. دانه	۱۳. منیر	۲۳. پسر	۳۳. هواپیما
۴. پرواز	۱۴. دیوار	۲۴. قالی	۳۴. غذا
۵. نمک	۱۵. قلم	۲۵. همراه	۳۵. قطار
۶. آوازه	۱۶. رنگ	۲۶. شب	۳۶. ایران
۷. پرنده	۱۷. دختر	۲۷. خوابیدن	۳۷. زود
۸. بلند	۱۸. آهن	۲۸. چوبی	۳۸. سبک
۹. همه	۱۹. دفتر	۲۹. کارگر	۳۹. صندلی
۱۰. ساز	۲۰. انسان	۳۰. زمین	۴۰. برق

۴۱. روشن

۴۲. باری

۴۳. دوچرخه

۴۴. خانگی

۴۵. پالایش

۴۶. عظیم

۴۷. عجله

۴۸. مقوا

۴۹. مهپاره

۵۰. ارغوانی

۵۱. خاکساری

۵۲. چارمضراب

۵۳. ممیز

۵۴. چیستی

۵۵. بالاخره

۵۶. رفت‌بار

۵۷. سوگواری

۵۸. چهارمحال

۵۹. صلابت

۶۰. سترگ

۶۱. بی‌محابا

۶۲. ابراختر

۶۳. دقیانوس

۶۴. تندر

۶۵. هوانیروز

۶۶. مردار

۶۷. شرنگ

۶۸. گفتمان

۶۹. روزمرگی

۷۰. پهندشت

۷۱. ییلاق

۷۲. تهاتری

۷۳. دردانه

۷۴. قوالی

۷۵. قوسدار

۷۶. اطبا

۷۷. شوریده‌حال

۷۸. موشواره

۷۹. غوک

۸۰. قشلاق

۸۱. افتراآمیز

۸۲. سوءهاضمه

۸۳. تشابه

۸۴. قره‌قورت

۸۵. کلنگدن

۸۶. سفسطه

۸۷. سیادت

۸۸. پوزار

۸۹. سگالیده

۹۰. شورهزار

۹۱. پادافره

۹۲. متخلخل

۹۳. دگرشی

۹۴. نوگرویدگی

۹۵. فراق‌زده

۹۶. قیماق

۹۷. کاجیره

۹۸. ماوی

۹۹. منوم

۱۰۰. منقاد

۱۰۱. وهشت

۱۰۲. موسوس

۱۰۳. رضاعی

۱۰۴. منادات

۱۰۵. مفطر

۱۰۶. هوتخشبد

Appendix E

Word Spelling Subtest of the WRAT3 (Wilkinson, 1993)

BLUE SPELLING - EXAMINER USE ONLY

NAME A C F O W N G L D I K Y X

1	and	Bill and Bob play together.	and
2	in	They are in the pool.	in
3	him	They saw him in town.	him
4	make	She can make a dress.	mayk
5	cook	We cook our own dinner.	kuuk
6	must	We must do our work.	must
7	enter	Enter this way.	en-tĕr
8	light	The light is bright.	līt
9	reach	She couldn't reach the ball.	reech
10	circle	A circle is a round drawing.	sur-kĕl
11	explain	Explain how it happened.	ik-splayn
12	correct	Put down the correct answer.	kŏ-rekt
13	ruin	The house was in ruin after the fire.	roo-in
14	material	The material was expensive.	mă-teer-i-ăl
15	advice	My advice was forgotten.	ad-vīs
16	surprise	She may surprise you.	sŭr-prīz
17	believe	I believe you are right.	bi-leev
18	brief	I received a brief note.	breef
19	reasonable	His request was reasonable and just.	ree-zŏ-nă-bĕl
20	quantity	He ate a large quantity of food.	kwon-tĭ-tee
21	character	Her fine character was praised.	kar-ik-tĕr
22	success	Success makes people happy.	sŭk-ses
23	executive	The governor is a state executive.	ig-zek-yŭ-tiv
24	decision	Your decision was accepted by all.	di-sizh-ŏn
25	recognize	He did not recognize me.	rek-ŏg-nīz
26	anxiety	Floods create anxiety among people.	ang-zī-ĕ-tee
27	opportunity	He had no opportunity for success.	op-ŏr-too-ni-tee
28	lucidity	We think best in moments of lucidity.	loo-sid-i-tee
29	enthusiasm	People showed enthusiasm for the hero.	en-thoo-zi-az-ĕm
30	conscience	His conscience was clear.	kon-shĕns
31	possession	They took possession of the house.	pŏ-zesh-ŏn
32	belligerent	The soldier was belligerent and brave.	bi-lij-ĕ-rĕnt
33	medieval	Medieval times were long ago.	mi-dee-văl
34	charlatan	A charlatan is a pretender.	shahr-lă-tăn
35	cacophony	A cacophony is a mix of harsh sounds.	kă-kof-ŏ-nee
36	camouflage	Camouflage is a natural defense for many animals.	kam-ŏ-flahzh
37	acquiesce	To acquiesce is to comply with a demand.	ak-wi-es
38	pusillanimous	A pusillanimous person is weak in spirit.	pyoo-sĭ-lan-ĭ-mŭs
39	malfeasance	The governor was found guilty of malfeasance in office.	mal-fee-zăns
40	vicissitude	Unemployment is a vicissitude which can have devastating effects.	vi-sis-i-tood

Appendix F

Farsi Word Spelling Task (Farrokh & Chalashgar, 1998)

۱ . نام من زهرا است.	زهرا
۲. راستی که او چقدر ثروتمند است!	ثروتمند
۳. دست شما درد نکند.	دست
۵. همه از گرانی شکایت می کنند.	همه
۶. شهر از اینجا معلوم نیست.	معلوم
۷. این خیابان ورود ممنوع است.	ورود
۸. خوش آمدید، صفا آوردید!	صفا
۹. چراغ را روشن کن!	چراغ
۱۰. فیلم «دایرهٔ مینا» را دیده‌ای؟	دایره
۱۱. تورم بی‌سابقه‌ای حکمفرماست!	تورم
۱۲. چقدر سرخاب سفیداب مالیده!	سرخاب
۱۳. ناهار خورده‌ای؟	ناهار
۱۴. قلبم می‌تپد!	می‌تپد
۱۵. معینی استاد دانشگاه الهیات است.	الهیات
۱۶. این کار را توجیه نکن!	توجیه
۱۷. در مواجهه با دشواری‌ها صبور باش!	مواجهه
۱۸. از تالیفات زیادی دارد.	تالیفات
۱۹. من ترجیح می‌دهم ساکت بمانم.	ترجیح
۲۰. خصوصیات جالبی دارد.	خصوصیات
۲۱. فارسی سلیس است.	سلیس
۲۲. اینقدر غضبناک نشو!	غضبناک
۲۳. بر اثر انهدام تانک دو نفر مردند.	انهدام

۲۴. کشتی در آب غوطه‌ور است	غوطه‌ور
۲۵. مصطفی بیا اینجا!	مصطفی
۲۶. تثلیث مقدس برنادت را فراخواند!	تثلیث
۲۷. کار من در حال تعلیق است.	تعلیق
۲۸. اظهارات ایشان اساس ندارد.	اظهارات
۲۹. او به هروله رفت و من از پی او!	هروله
۳۰. ضمائم این پرونده را دیده‌ای؟	ضمائم
۳۱. تمدن یونان دچار اضمحلال شد.	اضمحلال
۳۲. مذموم را مجازات نکنید.	مذموم
۳۳. طحاوی ستاره‌ای درخشنده است!	طحاوی
۳۴. قسطوره بهای زیادی دارد.	قسطوره
۳۵. مستحیل یعنی دگرگون!	مستحیل
۳۶. ضروان شهری است در یمن!	ضروان
۳۷. ضواجع از صور فلکی است.	ضواجع
۳۸. غمیصاء و شعرای شامی قرینه هستند.	غمیصاء
۳۹. طاستیمور از امیران ایلخانی بود.	طاستیمور
۴۰. اقلیدس اسطقسات را نوشت.	اسطقسات

Appendix G

Revised Oral Cloze Task (Farrokh & Chahalshgar, 1998)

Instructions: This time I will read something to you and there will be a word missing. Where the word is missing I will say "blank". I want you to think of a word that would sound right in the blank. For example, I might say "the moon shines bright in the ___" (pause and repeat) and I want you to say "sky". So, it would be "The moon shines bright in the sky". O.K. let's try another one. I'll say "The children____with the toys" (pause and repeat). What's the missing word? (If the individual fails to respond, say "How about play?" Then it would be "The children play with the toys"). Let's try another one. The little puppy wags its____" (pause and repeat). Good!

1- Fred put the big turkey_____the oven.

2- My wife had a male baby who is my_____.

3- The farmer______put his diary cows in the barn.

4- I'll go to school________at six o'clock.

5-It was a sunny day with a pretty_____sky.

6- I went to see______animals in the zoo.

7- Betty____a hole with her shovel.

8- ________have you learned English so well?

9-With a piece______chalk, he sketched her face.

10- That is not enough money; I need_______dollars.

11-The girl____is tall plays basketball well.

12- Because it was getting dark, Joe went to________on the light.

13-Because of the rain yesterday, the children_______inside the house.

14- _______it was raining outside I slept in my bed.

15-Nancy knocked______before entering the house.

16-Since my 13 year old son grew 10 inches, he has become a very_____boy.

17-_______is Susan going to the doctor today?

18- When I knocked on the door, I thought someone_________be at home.

19-After her broken leg had healed, Laura found it hard to walk_____.

20-How________is this pool?

Appendix H

Farsi Oral Cloze Task (Farrokh, Vahabzadeh & Faizabadi, 1999)

در جملاتی که برای شما می‌خوانم، جای یک کلمه خالی است. هنگام خواندن هر جمله به جای کلمهٔ حذف شده می‌گویم « خالی » و از شما می‌خواهم مجموعه‌ای از کلماتی را که برای جای خالی این جمله مناسب است، پیدا کنید. برای مثال من می‌گویم : « ماه در .... می‌درخشد » (مکث وتکرار) و از شما می‌خواهم که بین لغات « در» و « می‌درخشد» کلمه‌ی مناسب را بگذارید، که در این صورت جملهٔ کامل شده می‌تواند چنین باشد: « ماه در آسمان می درخشد.» بیایید جمله‌ای دیگر را آزمایش کنیم. به این جمله دقت کنید: « کودکان با اسباب بازی‌ها .... » (مکث و تکرار).

۱. چه باران .... می‌بارد.

۲. مرد هفتاد و نه ساله .... سکتهٔ مغزی در گذشت.

۳. تیم ما .... جام حذفی به مقام نخست رسید.

۴. دوست من آرزو دارد که روزی به زیبایی تو سخن ....

۵. پرنده .... خود را بالای درخت می‌سازد.

۶. .... همان کامپیوتر است.

۷. رادیو .... تلویزیون از رسانه‌های جمعی محسوب می‌شوند.

۸. آیا شما مایل هستید سوار اتوبوس .... بشوید؟

۹. دیروز به ملاقات دوستم در بیمارستان ....

۱۰. لطفاً کتاب .... مجله‌ها را از روی میز برندارید.

۱۱. هیچ سربازی نباید .... سلاح خود از اینجا خارج شود.

۱۲. هواپیما .... میان ابرها پرواز می‌کند.

۱۳. او در فروشگاه به خرید .... !

۱۴. آموزش .... توسعهٔ اجتماعی است.

۱۵. لطفاً تا پایان هفته اتاق را .... کنید.

۱۶. از این محصول در فراورده‌های غذایی بهره ....

۱۷. سارا .... دارا به مدرسه رفت.

۱۸. تنها افرادی که .... هستند، می‌توانند به این ورزش بپردازند.

۱۹. گوشی را فوراً .... تلفن بگذار.

۲۰. این ماشین از .... من است.

Appendix I

Rosner Auditory Analysis Task (Rosner & Simon, 1971)

Now we are going to play a game of removing sounds from words. I'm going to say a word and then tell you to take part of the sound off and then say what's left. Here is how it will work. Say "cowboy". Wait for response. "Now say cowboy but without the boy sound". "Say toothbrush". Wait for the response. "Now say toothbrush again, but without the tooth sound". If the individual fails either of the two practice items, attempt to teach the task by giving the correct response, explaining why it is correct, and re-representing the item. If either item is failed again, discontinue testing and score the test at zero. If items are answered correctly, then proceed. Testing for all subjects ends after five consecutive errors. Present the remainder of the items in the same way (e.g., "say "man". Now say "man" without the /m/ sound").

cow(boy)	(practice)
tooth(brush)	(practice)
(s)at	(practice)

Check items answered correctly.
Mark line under last item attempted.

1. birth(day) ____
2. (car)pet ____
3. (m)an____
4. ro(de) ____
5. (w)ill____
6. (l)end____
7. (s)our____
8. (g)ate____
9. to(ne)____
10. ti(me)____
11. plea(se)____
12. stea(k)____
13. bel(t)____
14. (sc)old____
15. (c)lip____
16. (s)mile____
17. (p)ray____
18. (b)lock____
19. (b)reak____
20. s(m)ell____
21. (t)rail____
22. de(s)k____
23. (sh)rug____

24. cr(e)ate____ remove [ee], answer [crate]
25. s(m)ack____

26. re(pro)duce____ remove [pro], answer [reduce]
27. s(k)in ____
28. s(w)ing____
29. (st)rain____
30. g(l)ow ____
31. st(r)eam____
32. c(l)utter____
33. off(er)ing____ remove [er], answer [offing]
34. dy(na)mo____ remove [nuh], answer [dimo]
35. auto(mo)bile____ remove [muh], answer [autobeel]
36. car(pen)ter____ remove [puhn], answer [carter]
37. Ger(ma)ny____ remove [muh], answer [journey]
38. lo(ca)tion____ remove [kaa], answer [lotion]
39. con(tin)ent____ remove [tin], answer [conent]
40. phi(lo)sophy____remove [law], answer [fuhsophy] {fisophy is wrong; circle if subject gives this answer}

Appendix J

Farsi Auditory Analysis Task (Farrokh & Vahabzadeh, 1999)

حال به بازی حذف اصوات واژه ها سرگرم می شویم. من کلمه‌ای را می گویم و از شما خواهم خواست تا بخش خاصی از کلمه را حذف و باقیماندهٔ کلمه را برای من بازگو کنید. شیوهٔ کار به این صورت است :

من نخست از شما می خواهم بگویید « هواپیما.» سپس از شما خواهم خواست تا « پیما » را حذف کنید و باقیماندهٔ آن را برایم بازگو کنید. افرین! جواب درست « هوا » است. حالا شروع میکنیم.

۱. بو(سه)

۲. پر(ده)

۳. گل(دان)

۴. (سر) اب

۵. جان(دار)

٦. (یخ)چال

۷. ن(ام) دار

۸. (دست) مال

۹. رود(خان) ه

۱۰. گم (رک)

۱۱. سین(م) ا

۱۲. پیر(اهن)

۱۳. فدا(کاری)

۱۴. کف(ش)

۱۵. (آ) رام

١٦. شیر(ین)

۱۷. (پی) روز

۱۸. تار(یک)

۱۹. حال(ت)

۲۰. دست(ار)

۲۱. پا(رچه)

۲۲. سم(اور)

۲۳. کل(ا)م

۲۴. ر(ی) اضی

۲۵. د(یو) ار

۲۶. فیل(سوف)

۲۷. کشا(ور) ز

۲۸. (جر) ثقیل

۲۹. (کث) افت

۳۰. مضر(ات)

۳۱. (دائرة) المعارف

۳۲. تن(اول)

۳۳. مرا(کش)

۳۴. ماوراء (الطبیعه)

۳۵. (فتح ال) باب

۳۶. ترک (من) ستان

۳۷. (ر) امین

۳۸. سوق (الجیشی)

۳۹. (دارال)خلافه

۴۰. (بین ال) ملل

Appendix K

Word Attack subtest of the Woodcock Reading Mastery Test-Revised (Woodcock, 1987)

Score (1 or 0)	Error Response	Error Inventory
1.__ dee....d-e	________	3-34
2. __ ap.... a-p	________	28-15
3. __ ift....i-ft	________	30-26
4. __ raff...r-a-f	________	16-28-4
5. __bim....b-i-m	________	1-30-12
6. __nan....n-a-n	________	13-28-13
7. __ un....u-n	________	32-13
8. __fay....f-a	________	4-33
9. __gat....g-a-t	________	5-28-19
10. __roo....r-oo	________	16-39
11. __oss....o-s	________	31-17
12. __pog....p-o-g	______	15-31-5
13. __poe....p-o	_______15-36	
14. __weat ....w-e-t	________	22-34-19
15. __plip....pl-i-p	_________	25-30-15
16. __dud's....d-u-dz	_______	3-32-26
17. __shab....sh-a-b	_______	18-28-1
18. __whie....hw-i	_______	7-35
19. __vunnip....vun/hip	______	42/43
20. __nigh....n-i	_______	13-35
21. __bufty....buf/te	_______	44/45
22. __sy....s-i	_________	17-35
23. __straced ....str-a-st	_________	27-33-26
24.___chad....ch-a-d	______	2-28-3

Score (1 or 0)	Error Response	Error Inventory
25. __thant....th-a-nt	______	20-28-26
26. __tadding....tad/in	_____	46/47
27. __twem....tw-e-m	______	26-29-12
28. __laip....l-a-p	_______	11-33-15
29. __adjex....ad/jeks	_______	48/49
30. __gouch....g-ou-ch	_______	5-40-2
31. __yeng....y-e-n	_______	24-29-14
32. __zirdnt....z-er-d/nt	________	25-41-3/26
33. __gaked....g-a-kt	_________	5-33-26
34. __knoink....n-oi-nk	_______	13-38-25
35. __cigbet....sig/bet	________	50/51
36. __mancingful....man/sin/fel	_______	52/53/54
37. __wrey....r-a	_____ 16-33	
38. __pafmotbem...paf/mod/bem	________	55/56/57
39.__translibscage..tranz/lib/scj	_________	58/59/60
40. monglustamer..mon/glus/te/mer	___	61-62/63/64
41. __vauge....v-aw-j	_________	21-37-8
42. __gnouth....n-ou-th	________	13-40-20
43. __quiles....kw-i-lz	_________	10-35-25
44. __cyr....s-er	_________	17-41
45. __pnomocher....no/mok/er no/mo/cher		65/66/67

Appendix L

Farsi Pseudoword Task (Farrokh & Chalashgar, 1998)

۱. زیلی
۲. گیم
۳. سیگ
۴. ذوی
۵. شاج
۶. کولفی
۷. چینک
۸. کِه لاکِه
۹. پالور
۱۰. استرا
۱۱. گیکو
۱۲. سیکلوکه
۱۳. ژو
۱۴. سِران
۱۵. آرص
۱۶. خیلک
۱۷. خویا
۱۸. ژای
۱۹. سیگوک
۲۰. کیلاژ
۲۱. فولدوس
۲۲. شاک‌موژگه
۲۳. کولاز
۲۴. گاراو
۲۵. چارن
۲۶. شوژ
۲۷. شیلب
۲۸. شالا
۲۹. خراسه
۳۰. فالیلش
۳۱. فونک
۳۲. کوفپی
۳۳. شالگوپی
۳۴. کالوز
۳۵. خاف
۳۶. کوپو
۳۷. بیگ
۳۸. کاگو
۳۹. خاژو
۴۰. شاوی
۴۱. واشگ
۴۲. شیکبارو
۴۳. فاکیلوب
۴۴. فورژک
۴۵. فنوجحر

Appendix M

Orthographic Task (Siegel, Share, & Geva, 1995).

Name:____________ No. Correct:________

You are going to see pairs of letter strings that are not words. One of them is more like a word than the other. I want you to tell me which of the two is more like a word. Which one looks more like a word than the other? Which one has a spelling that is more like a word?

1. filv filk

2. tolz tolb

3. powl lowp

4. dlun lund

5. fant tanf

6. miln milg

7. togd togn

8. wolg wolt

9. moke moje

10. jofy fojy

11. cnif crif

12. bnad blad

13. hift hifl

14. Gwup gnup

15. nitl nilt

16. clid cdil

17. vism visn

Appendix N

Farsi Orthographic Task (Farrokh, Chalashgar & Faizabadi, 1999)

در اینجا، کلماتی به شما نشان داده می‌شوند که کلمهٔ واقعی نیستند. در هر زوج، یکی از کلمه‌ها ممکن است یک لغت باشد، اما در واقع اینطور نیست. از شما می‌خواهم به من بگویید که کدام یک از آنها می‌تواند شبیه به یک لغت واقعی باشد؟ املای کدام یک می‌تواند نزدیک‌تر به یک لغت فارسی باشد؟

۱. آپ	آک
۲. ذانش	پانش
۳. کالژگه	کالشگه
۴. آزاشته	آکاشته
۵. سیبا	میبا
۶. گپک	ژپک
۷. حارجی	لارجی
۸. خیوار	ذیوار
۹. پاستان	کاستان
۱۰. غارسی	قارسی
۱۱. ذفتر	ظفتر
۱۲. آپرو	آکرو
۱۳. النگ	کلنگ
۱۴. دمین	رمین
۱۵. محدرات	مگدرات
۱۶. کافیار	کانیار
۱۷. کدرسه	فدرسه

Appendix O

Working Memory Task (Siegel & Ryan, 1989)

INSTRUCTIONS: I am going to say some sentences and the last word in each sentence will be missing. I want you to tell me what you think the last word should be. Let's try one. "For breakfast the little girl had orange______". Now I am going to read two sentences. After each sentence I want you to **tell me the word that should go at the end of the sentence.** When I finish the two sentences, I want you to tell me the two words that you said for the end of each sentence. **Please tell me the words in the order you said them.** Let's try it. "When we go swimming we wear a bathing_______. Cars have to stop at a red_________." Discontinue when the individual has failed an entire level.

Note: **Announce** each new level. Record words in the **order** that the individual said them.

2A

1. In a baseball game, the pitcher throws the ___________.

2. On my two hands, I have ten ___________.

Responses_______________________________________.

2B

1. A turtle is slow, a rabbit is___________.

2. When we are sick we often go to the___________.

Responses_______________________________________.

2C

1. An elephant is big, a mouse is___________.

2. A saw is used to cut___________.

Responses_______________________________________.

3A

1. Running is fast, walking is___________.

2. At the library people read___________.

3. An apple is red, a banana is___________.

Responses____.

3B

1. The sun shines during the day, the moon at__________.

2. In the winter we have to shovel__________.

3. The young child had black hair and brown__________.

Responses____.

3C

1. In the summer it is very__________.

2. People go to see monkeys in a __________.

3. To cut meat we use a sharp __________.

Responses____.

4A

1. Please pass the salt and__________.

2. When our hands are cold we wear__________.

3. On my way to school I mailed a__________.

4. After swimming I was soaking__________.

Responses____.

4B

1. Snow is white, coal is__________.

2. After school the children walked__________.

3. A bird flies, a fish__________.

4. In the barn, the farmer milked the__________.

Responses____.

4C

1. In the autumn the leaves fall off the__________.

2. We eat soup with a __________.

3. On hot days I go to the pool to__________.

4. We brush and comb our__________.

Responses____.

5A

1.For the party, the girl bought a pretty pink__________.

2. Cotton is soft and rocks are__________.

3.Once a week we wash the kitchen__________.

4. In the spring the farmer plows the __________.

5. I throw the ball up and then it comes__________.

Responses____.

5B

1. In the fall, we need to rake__________.

2.At a birthday party, we usually eat ice cream and__________.

3. Sand paper is rough but glass is __________.

4. In the garden, the workers pick ears of __________.

5. Over the fields, the girl rode the galloping__________.

Responses____.

5C

1. With dinner we sometimes eat bread and__________.

2. In the daytime it is light, and at night it is __________.

3. Dogs have four__________.

4. At the grocery store we buy__________.

5. A man is big, a baby is __________.

Responses____.

Appendix P

Farsi Working Memory Task (Farrokh & Vahabzadeh, 1999)

من جملاتی را برای شما می‌خوانم که آخرین کلمهٔ آنها مفقود گشته . از شما می‌خواهم به من بگویید چه کلمه‌ای باید به جای کلمهٔ مفقود بیاید. بیایید آزمایش کنیم. « من برای صبحانه نان و پنیر ...... » سپس من دو جمله خواهم خواند. پس از هر جمله از شما می‌پرسم چه کلمه‌ای باید در جای خالی انتهای جمله قرار گیرد. هنگامی که دو جمله را تمام کردم، از شما می‌خواهم به من بگویید چه کلماتی در <u>انتهای</u> جمله ها قرار گرفته‌اند. <u>این کلمه‌ها را به همان ترتیبی که در جمله ها قرار داده‌اید بگویید</u>. آزمایش کنیم .
« من دیروز در استخر شنا ...... » « هواپیما را می‌بینم که در میان ابرها پرواز .... »

2A

۱. من هر روز پیاده‌روی ....

۲. در این خیابان هر روزه حادثه‌ای رخ ....

جواب ____________________________

2B

۱. چون کشتی نتوانست شناور بماند، غرق ....

۲. من هر روز پس از ناهار روی تخت دراز ....

جواب ____________________________

2C

۱. دیروز در سقوط هواپیما تمام سرنشینان کشته ....

۲. برو با اره این چوب را ....

جواب ____________________________

3A

۱. سال آینده به کلاس سوم خواهم ....

۲. بگو بیایند باغچه را بیل ....

۳. عقاب‌ها بال‌های بزرگ و منقار خمیده ....

جواب ____________________________

3B

۱. درجهٔ هوای امروز تورنتو چند ....؟

۲. جوجه باید از گربه دوری ....

۳. هر دویتان از این سخنرانی یادداشت ....

جواب ____________________________

3C

۱. ما همیشه لباس‌های‌مان را از بوتیک علی ....

۲. یک شعر از خودت را برایم ....!

۳. یادت هست که دیشب چگونه از تب ....

جواب ____________________________

4A

۱. هیچکدامتان نباید از این پس سیگار ....

۲. حتماً برو فیلم تازه‌ی اسپیلبرگ را در سینما ....

۳. چون مریضم، امروز به سر کار ....

۴. سفر طولانی تابستان پیش خیلی خسته کننده ....

جواب ______________________________

4B

۱. آسمان آبی بود ولی جنگل سبز به نظر ....

۲. هدفِ تو در زندگی ....

۳. هواپیما پرواز کرد و اوج ....

۴. آقا، برو کشکت را ....!

جواب ______________________________

4C

۱. صدای آسمانی شجریان در کنسرت پارسال ما را به وجد ....

۲. من با چلوکباب دوست دارم پیاز ....

۳. من خانهٔ خودم را میخواهم تعمیر ....

۴. آیا نامهٔ ۲۷ جولای من را دریافت ....؟

جواب ______________________________

5A

۱. مراد تو از این کلام ....؟

۲. امروز صبح اسم بچه‌ام در مهد کودک ....؟

۳. لیوان‌ها افتادند و ....

۴. دیروز نرخ دلار چند ....؟

۵. قد من یک متر و هفتاد سانتی‌متر ....

جواب ______________________________

5B

۱. ده دلار پول خرد به من ....

۲. دیروز بهمن عظیمی جاده‌ی هراز را زیر خروارها برف مدفون ....

۳. آیا این سیب‌ها مال تو ....؟

۴. او فردی بود که همیشه به خودش مغرور ....

۵. برای تشکیل رودخانه، جویبارها باید به هم ....

جواب ____

5C

۱. آخرین نفسش را کشید و دار فانی را وداع ....

۲. شش میلیون یهودی در اردوگاه‌های مرگ توسط نازی‌ها به قتل ....؟

۳. گربه چهار پا ....

۴. خطر سرطان پوست با فرسوده شدن لایه‌ی اوزون چند برابر شده ....

۵. منتظر من نباش، خودت تنهایی به سینما ....

جواب ____

Appendix Q

Passage for English Long-Term Memory Task (Farrokh, 1999)

One of the great unknown areas of the history of world war two is the area of German secret weapons. The engineers, technicians and scientists of Nazi Germany built and designed the world's first true long range missiles, rocket planes and jet fighters. Of particular interest is the Messerschmidt Me-262 which was the world's first true operational jet fighter, introduced in 1944. What made the Me-262 so special was that it was capable of reaching a top speed of 1000 kilometers an hour; a real achievement for its time! In addition, the Me-262 was capable of firing air to air missiles. On several occasions, the Me-262 fighters managed to destroy US fighters and bombers with relative impunity. The Germans however faced three major obstacles. First, the Germans did not have the raw materials needed to build the Me-262 in large numbers. Second, the Germans by 1944 were losing their major sources of fuel, especially the Ploesti oilfields in Rumania, which by 1944 were being overrun by the Russians. Third, Germany no longer was able to produce enough qualified pilots to fly their new airplanes.
Another little known, but fascinating area, is the design of a super bomber by the Germans that could fly, non-stop, from Berlin to the coastal areas of the United States. This bomber actually made an experimental flight from Berlin to New York and the pilots of this plane even took photographs of New York's Empire State building. In honor of this achievement, this plane was nicknamed by Adolf Hitler as the Messerschmidt "New York".

The Germans also helped pioneer and mass produce rockets. They developed a rocket known as the V-2 that could attack London from bases in German occupied Belgium. There were also plans to develop a super rocket version of the V-2, which was known as the A-4. The A-4 was able to reach any part of the United States from bases in Germany.

Another little known fact from World War Two is that the Germans designed a super tank known as the Tiger tank. There is a common misconception that the Russians built the best tanks of World War Two; their famous T-34 tank. The German Tiger was so deadly that on many occasions, a handful of Tigers could easily destroy dozens. sometimes hundreds of enemy tanks. In one occasion, 5 Tigers destroyed close to 120 Russian tanks!

Appendix R

English Long-Term Memory Task (Farrokh, 1999)

(1) The scientists, engineers and technicians of Nazi Germany helped to design, build and mass produce the following:

a) biological weapons
b) jet fighters
c) a and b
d) none of the above

(2) The Germans had the following problems in mass producing their jet fighters:

a) lack of trained pilots
b) lack of fuel
c) lack of raw materials
d) all of the above

(3) The German super bomber could fly:

a) from Berlin to Greenland
b) from Berlin to New York with fuel stop
c) From Berlin to Canada
d) non-stop from Berlin to the coastal areas of the United States

(4) The German V-2 rocket could hit London from:

a) Holland
b) France
c) Luxembourg
d) Belgium

(5) The best tank of World War Two was the:

a) The American Sherman
b) The German Tiger tank
c) The Russian T-34
d) The British Churchill

(6) The following was the world's first true jet fighter:

a) The Heinkel 162
b) The Messerschmidt Me-262
c) The Arado Ar 234
d) The Focke-Wolf FW-190

(7) The Germans were losing their major oilfields to the Russians by 1944. In which country were these oilfields located?

a) Germany
b) Poland
c) Rumania
d) Belgium

(8) The German super bomber was nicknamed by Hitler as the:

a) Heinkel "New York"
b) Messerschmidt "Berlin"
c) Heinkel "New York"
d) Messerschmidt "New York"

(9) The Germans had plans to design and launch a super-rocket known as the A-4 from:

a) bases in Belgium against any part of the United States
b) bases in Germany against any part of the United States
c) bases in Belgium against France
d) bases in Germany against Belgium

(10) A small number of German super tanks could:

a) destroy hundreds of enemy tanks
b) fight for days without having to take additional fuel
c) achieve speeds of up to 80 kilometers an hour
d) do very little

Appendix S

Passage for Farsi Long-Term Memory Task (Farrokh & Vahabzadeh, 1999)

سلت‌ها از جالب‌ترین و ناشناخته‌ترین مردمانی بودند که در اروپا می‌زیستند. سلت‌ها از اقوام هندواروپایی بودند که با مردمان هندواروپایی دیگر مانند اقوام ژرمن و ایتالیایی و نیز ایرانیان باستان و اسلاوها نسبت داشتند. نفوذ سلت‌ها در موسیقی، معماری و فرهنگ همچنان در اروپای امروز ادامه دارد.
زبان‌های سلتیک زمانی در اروپا غالب بوده‌اند. سلت‌ها حتی در دورترین نقطه‌های اروپا یعنی سرزمینی که امروز ترکیه است، نیز می‌زیسته‌اند. نام شهر آنکارا، پایتخت ترکیهٔ امروزی، نیز از واژه‌ی سلتیکِ « آنکیرا » می‌آید. نام شهر امروزی گالیسیا در اروپای شرقی و نام کشور بلژیک نیز از ریشهٔ سلتیک می‌آیند. نام رودخانهٔ مشهور دانوب نیز از واژهٔ سلتیکِ « دانوویوس » می‌آید. زبانِ سلتیک تنها در مناطق ولش، اسکاتلندی و ایرلندی در انگلستانِ امروز و نیز بریتانی در منطقهٔ نورماندی در فرانسه بازمانده است.

جامعهٔ سلت به سبب پهناوری و پیچیدگی آن مشهور است. جامعهٔ سلت از سه طبقه تشکیل می‌شد: موبدان، جنگجویان و کشاورزان. طبقهٔ بازرگان نیز طبقهٔ « چهارمین» بود، اما به عنوان پایین‌ترین طبقه در سلسله مراتب اجتماعی محسوب می‌شد. جالب‌ترین نکته در مورد جامعهٔ سلت نقش مقتدرانهٔ زنان در این جامعه بود. برعکس جوامعِ یونانِ باستان و سپس رومی‌ها، زنان در جامعهٔ سلت می‌توانستند جنگجو، موبد یا رهبرانی با درجهٔ ژنرالی باشند. گزارش‌هایی از تاریخ‌نگارانِ رومی در دست است که در مواردی زنان موبد سلتی را در حال قربانی کردن زندانیان برای خدایانِ سلت مشاهده کرده‌اند. قیام مشهور سلت‌های انگلستان بر علیه حکومتِ رومی‌ها را نیز « بودیکا» زنِ سلتی رهبری کرده بود. زنان همچنین در جنگ‌های اسکاتلندی‌ها بر علیه حکومت انگلستان در قرن‌های بعدی نیز شرکت داشته‌اند.

اساطیر سلتی نیز غنی و گوناگون هستند. بیشترِ اسطوره‌های سلت ناظر بر تثلیث مقدسی از خدایان بودند، اما جالب آن است که این زنان بودند که این تثلیث‌ها تشکیل می‌دادند. بعدها در سنت مسیحی، تثلیث مقدس کاملاً مردانه شد. سنت سلتیک بر نقش رابطهٔ خونی در ایجاد خویشاوندی و دوستی میان قبایل تأکید می‌کرد. آیینی نیز وجود داشت که در آن دو دشمنِ پیشین رگِ دست‌های خود را می‌بریدند تا خونشان در جام شراب بریزد. پس از آن، رهبران قبایل برادر محسوب می‌شدند. یکی از کارهای زنندهٔ سلت‌ها زنده زنده سوزاندن اسیران بود. پس از فتحِ « گُل» (فرانسهٔ امروز)، ژولیوس سزار گزارش کرد که سلت‌ها قفس چوبیِ بزرگی به شکل پیکر انسان می‌ساختند و سپس آن را از اسیران می‌انباشتند و قفس را به آتش می‌کشیدند. کار زنندهٔ دیگر سلت‌ها بریدن و به نمایش گذاردن سرِ دشمنان‌شان در هنگام نبرد بود.

فرهنگ سلت در هنر و معماری اروپا همچنان می‌زید. تمام نقش‌هایی که در آن پرنده‌های بزرگ و جانورانِ بالدارِ اسطوره‌ای وجود دارند، عموماً ریشه‌های سلتیک دارند. این امر که ساز زُمرنای اسکاتلندی ریشهٔ سلتی دارد، مشخص نیست. این ساز ممکن است از شرق اروپای امروز آمده باشد. سربند، موی بلند، شلوارهای گشاد و سبیل بلند از علائم مشخصهٔ سلت‌های باستان بودند. زنان سلت معمولاً لباس‌هایی به رنگ‌های روشن و تزیین شده در بر می‌کردند و در هنگام همراهی مردان در میدان‌های نبرد شلوار نیز می‌پوشیدند. در نقش‌های هنری سلت‌ها نیز رنگ‌های روشن و طرح‌ها و پیکرهای خمیده بسیار رایج بودند. سلت‌ها عموماً علاقهٔ چندانی به طرح‌های سادهٔ هندسی و خط‌های مستقیم نداشتند. با وجود آن که سلت‌ها از پهنهٔ امروز اروپا به کلی ناپدید شده‌اند، اما تأثیر و میراث آنها همچنان در هنر، معماری، موسیقی و اسطوره شناسی پابرجاست.

Appendix T

Farsi Long-Term Memory Task (Farrokh & Vahabzadeh, 1999)

۱. سلت‌ها به یکی از گروه‌های زبانی زیر تعلق دارند:

الف) اورال ـ آلتایی

ب) فنلاندی ـ اوگری

پ) هندواروپایی

ت) هامیت وسنمیتی

۲. دورترین منطقه‌ی شرقی که سلت‌ها بدان دست یافتند، کدام یک از کشورهای زیر بود:

الف) ترکیه امروزی

ب) اسپانیا

پ) روسیه

ت) آلبانی

۳. جامعه سلتیک مشتمل بر طبقه‌های زیر بود:

الف) سه طبقهٔ جنگجویان، موبدان و کشاورزان

ب) دو طبقهٔ موبدان و جنگجویان

پ) سه طبقهٔ جنگجویان، موبدان و تاجران

ت) یک طبقهٔ جنگجویان و یک طبقهٔ کوچک موبدان

۴. از نظر سلت‌ها، زنان

الف) برتر از مردان بودند.

ب) پایین‌تر از مردان بودند.

پ) دارای مقام مساوی با مردان بودند.

ت) قادر به رهبری نبودند.

۵. ساز زرنای اسکاتلندی

الف) ریشهٔ سلتیک دارد.

ب) احتمالاً از ریشهٔ غیرسلتی است و از شرق اروپا می‌آید.

پ) منشاء یونانی دارد.

ت) دارای هر دو منشاء رومی و سلتیک می‌باشد.

۶. سلت‌ها منسوب به

الف) اروپایی‌های ژرمن و اسلاو زبان بودند.

ب) ایرانیان و هندیان باستان بودند.

پ) هم «الف» و هم «ب» بودند.

ت) هیچیک از جواب‌های بالا نبودند.

۷. نام پایتخت امروزی ترکیه از واژهٔ

الف) «انگورلار»، نامی از ریشهٔ ترکی، می‌آید.

ب) «آنکیرا»، نامی از ریشهٔ سلتی، می‌آید.

پ) «آنکوریاتیس»، نامی از ریشهٔ یونانی، می‌آید.

ت) «آنکورانوم»، نامی از ریشهٔ رومی، می‌آید.

۸. در جامعهٔ سلت، کدامیک از طبقه‌های زیر دارای پست‌ترین شغل بودند:

الف) جنگجویان

ب) موبدان

پ) تاجران

ت) کشاورزان

۹. شورش سلت‌ها در انگلستان برعلیه رومی‌ها تحت رهبری

الف) ورسینجنوریکس، رهبر بزرگی بود که خود در «گمل» به دنیا آمده بود.

ب) بودیکا، یک زن ژنرال بود.

پ) دانوویوس، موبدی جنگجو بود.

ت) سنت پاتریک ایرلندی بود.

۱۰. طرح‌های هنری سلت‌ها

الف) روشن، رنگارنگ و پر از پیکرهای خمیده بودند.

ب) هندسی و پر از خط‌های مستقیم بودند.

پ) بیشتر محدود به رنگ بودند.

ت) بیشتر محدود به خط بودند.

Appendix U

Raw Scores of Bilingual Farsi Speakers and Native English Speakers on English Cognitive Tasks With Respect to English Reading Ability (Classified by WRAT Standard Scores)

	Good Reading Bilingual Speakers (n = 44)	**Poor Reading Bilingual Speakers (n = 16)**	**Good Reading Native English Speakers (n = 39)**	**Poor Reading Native English Speakers (n = 18)**
Task	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
WRAT Reading	37.36 (3.45)	19.44 (6.63)	37.97 (3.64)	24.50 (5.22)
Woodcock Word Identification	99.73 (5.57)	69.31 (8.45)	102.21 (2.59)	79.00 (7.88)
Oral Cloze	17.05 (2.27)	14.19 (3.51)	16.51 (1.63)	13.84 (1.65)
Rosner Auditory Analysis	39.08 (1.87)	36.68 (2.17)	36.33 (2.54)	34.89 (4.14)
Word Attack	39.79 (2.78)	35.00 (4.51)	40.36 (3.39)	34.64 (4.2)
Orthographic Awareness	14.45 (1.81)	12.44 (2.23)	14.64 (1.98)	13.83 (1.65)
Working Memory	8.14 (1.92)	6.15 (2.32)	8.38 (1.98)	6.06 (1.92)
Long Term Memory	7.20 (1.87)	6.00 (1.67)	6.62 (1.77)	5.64 (2.16)

Appendix V

Pratt Index Formula (Pratt, 1987; Thomas et al., 1998; Zumbo & Thomas, 2000)

The Pratt index is a tool that allows one to account for the unique contribution of each individual independent variable to the total R^2 of multiple regression, a technique similar to commonality analysis (Kerlinger & Pedhazur, 1982). Essentially, the formula is this:

$$\text{Pratt index} = \frac{B_i \times r_i}{R^2}$$

- B_i = Beta weight of the variable
- r_I = The 0-order correlation of that variable with Y
- R^2 = The total variance in Y accounted for by the Regression model

Appendix W

Raw Scores of Farsi Speakers on Farsi Cognitive Tasks With Respect to Farsi Reading Ability (Classified by Farsi Word Identification Task)

	Good Farsi Readers (n = 44)	**Poor Farsi Readers (n = 16)**
Task	Mean (SD)	Mean (SD)
Farsi Word Identification	98.89 (5.93)	62.53 (7.64)
Farsi Oral Cloze	16.93 (1.96)	14.43 (2.05)
Farsi Auditory Analysis	37.43 (2.06)	34.67 (1.92)
Farsi Psuedoword	37.97 (3.93)	34.83 (3.63)
Farsi Orthographic Awareness	13.70 (1.66)	10.07 (1.62)
Farsi Working Memory	8.40 (2.02)	5.42 (2.24)
Farsi Long Term Memory	6.90 (1.56)	6.17 (1.80)

Appendix X

Bilingual and Native English Speakers' Errors on the Rosner Auditory Analysis Task

Bilingual Good Readers (n = 44)	Bilingual Poor Readers (n = 16)
12- stea(k) – *estay (4)* 19 – (b)reak – *reeak (1), rock (1), beak (1), make (1)* 27 – s(k)in – *seen (10)* 28 – s(w)ing – *seeng (5), in (1)* 31 – st(r)eam – *esteam (8), tream (1), seem (2), team (1)* 39 – con(tin)ent – *content (4), coninent (1), content (1), cotent (1)* 40 – phi(lo)sophy – *fisophy (3), pulophy (1)*	5 – (w)ill – *eel (4)* 15 – (c)lip – *elp (1), leep (5), sleep (1)* 25 – s(m)ack – *mack (2), sake (1), suck (1)* 27 – s(k)in – *seen (9)* 28 – s(w)ing – *seeng (6), wing (1)* 31 – st(r)eam – *esteam (10), seem (3)* 39 – con(tin)ent – *content (1), cont (1), canent (2), coninent (1)*
Native English speaking Good Readers (n = 39)	**Native English speaking Poor Readers (n = 18)**
9 – to(ne) – *tie (1), to (3)* 24 – cr(e)ate –*crate (1), cray (1), corate (1), creet (3)* 31 – st(r)eam –*storm (1), team (1), tam (1), seam (1)* 33- off(er)ing – *offee (1), offering (1), offer (1), offring (1)* 37 – Ger(ma)ny –*Jeerney (1), Jeramy (2), Jerry (3), creet (1), Germ (1)* 39 – con(tin)ent – *content (4), cotent* (1), cotent (2), conet (2), conten (1) 40 – phi(lo)sophy – *fisophy (9), phooey (1)*	10 – ti(me) – *tea (3), it (1), try (2)* 11- plea(se) – *lay (3), play (3)* 15 –(c)lip – *ip (4), leap (1), lamp (1)* 19 – (b)reak – *ache (2), rack (1), brink (1)* 20 – s(m)ell – *ale (2), well (1), sile (1), ell (1)* 24 – cr(e)ate – *cree (1), great (2), creet (2), gate (1), ca (1)* 31 – st(r)eam – *seem (3), team (2), team (1), team (1)* 35 – auto(mo)bile – *auto"bill" (1), automile (1), automotive (1), autoplan (1), auto (1), audible, bile (1)* 36 – car(pen)ter – *carpet (4), Karen (1), care (1), car (1)* 37 – Ger(ma)ny – *Jerry (4), German (1)* 39 – con(tin)ent – *conet (1), cotent (1), content (2), conin (1), cunett (1)*

Note: Numbers in parentheses are number of cases with errors in the item; Only items with at least 5 cases of errors are recorded.

Appendix Y

Bilingual and Native English Speakers' Errors on the Word Attack Task

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)
3- ift – *eeft (5)* 5-bim- *bam (1), beem (6)* 14 – weat –*vet (7)* 15- plip – *pleep (7)* 23 – straced – *estraced (9), stayed (1)* 25 – thant – *tant (6)* 38- pafmotbem- *pafmottbem (3), pafmotbem (1), pafmotbeem (1), pafmodern (1)* 39-translibscage – *trancelibcage (2), transleebscage (2), transilbcage (1)* 40-monglustamer – *mongelustamer (1), as in word "tamer" (6), mongloostamer (1)* 41- vauge – *vaj (3), vagee (1), wauge (1), vague (1)* 42-gnouth – *outch (1), auch (1), "g" not silent (7), gnout (3), geno (1)* 45-pnomocher - *"p" not silent (10), "ch" as in "chat" (1), pnomocker as in "mocking"(4), pnomosher (2)*	3- ift –*eeft (13)* 5-bim- *beem (17)* 14 – weat – *vet (8)* 15- plip – *pleep (14)* 18-whie –*vee (9)* 23 – straced – *estraced (11)* 25 – thant – *tant (11)* 27- twem – *tvem (3), tweem (2)*
Native English speaking Good Readers (n = 39)	**Native English speaking Poor Readers (n = 18)**
34 – knoink – *"k" not silent (7)* 39-translibscage – *"cage" separate word (2), translibskeege (1), tanslibsage (1)* 40-monglustamer – *monglustmer (1), as in word "tamer" (4), monglustaamer as in "hammer (1)* 41- vauge – *vague (6), voug (1)* 42-gnouth – *"g" not silent (8)* 45-pnomocher – *pnomocker as in "mocking"(2), "p" not silent (6), "ch" as in "chat" (1)*	9- gat – *gate (5)* 14 – weat – *whew (1), wait (5)* 18-whie – *why (2), high (6)* 20 – nigh – *knee (5), night (1), sigh (1)* 22 – sy –*see (4), seen (1)* 23 – straced – *straight (1), struck (1), traced (2), streak (1)* 25 – thant – *that (2), thank (1), dant(1)* 29 – adjex – *ajaxs (7)* 33- gaked – *baked (1), gawked (1), cat (1), gag (1), gaaked (1)* 34 – knoink - *"k" not silent (7), Ron (1)* 36 – mancingful – *mansingfeel (3), manseenful (2)* 37- wrey – *Roy (1), row (2), rye (1), raw (2), wire (1)*

Note: Numbers in parentheses are number of cases with errors in the item; Only items with at least 5 cases of errors are recorded.

Appendix Z

Total Number of Incorrect selections made by Bilingual and Native English Speakers on the Orthographic Task

Orthographic Task Items	Bilingual Participants Good Readers (n = 44)	Bilingual Participants Poor Readers (n = 16)	Native English Speakers Good Readers (n = 39)	Native English Speakers Poor Readers (n = 18)
1. filv filk	2	3	3	2
2. tolz tolb	6	5	5	5
3. powl lowp	12	6	6	2
4. dlun lund	2	1	3	0
5. fant tanf	2	3	6	1
6. miln milg	25	9	11	10
7. togd togn	5	4	7	4
8. wolg wolt	2	2	2	2
9. moke moje	2	2	2	2
10. jofy fojy	8	5	9	2
11. cnif crif	2	1	2	0
12. bnad blad	1	1	1	1
13. hift hifl	3	2	2	1
14. gwup gnup	16	9	12	8
15. nitl nilt	3	3	1	0
16. clid cdil	2	0	1	0
17. vism visn	6	9	8	5

Table 1.

Scores of Bilingual Farsi Speakers and Native English Speakers on English Cognitive Tasks With Respect to English Reading Ability (Classified by WRAT Standard Scores)

Task	**Good English Reading Bilingual Speakers (n = 44)**	**Poor English Reading Bilingual Speakers (n = 16)**	**Good English Reading Native English Speakers (n = 39)**	**Poor English Reading Native English Speakers (n = 18)**
WRAT Reading (Standard Scores)	Mean = 105.59 SD = 5.79	Mean = 68.31 SD = 12.99	Mean = 105.82 SD = 7.96	Mean = 77.38 SD = 10.87
Woodcock Word Identification (Standard Scores)	Mean = 107.14 SD = 11.33	Mean = 63.25 SD = 18.73	Mean = 110.97 SD = 6.76	Mean = 76.38 SD = 17.01
Oral Cloze (percentage scores)	Mean = 80.68 SD = 11.39	Mean = 70.94 SD = 17.53	Mean = 87.56 SD = 8.18	Mean = 69.17 SD = 8.27
Rosner Auditory Analysis (percentage scores)	Mean = 95.17 SD = 4.68	Mean = 89.69 SD = 5.39	Mean = 91.14 SD = 6.35	Mean = 80.13 SD = 10.34
Word Attack (Standard Scores)	Mean = 112.79 SD = 10.00	Mean = 98.31 SD = 9.93	Mean = 112.47 SD = 12.48	Mean = 88.33 SD = 10.48
Orthographic Awareness (percentage scores)	Mean = 84.14 SD = 10.65	Mean = 73.83 SD = 13.14	Mean = 86.12 SD = 11.64	Mean = 81.37 SD = 9.73
Working Memory (percentage scores)	Mean = 67.80 SD = 11.03	Mean = 49.45 SD = 10.36	Mean = 69.87 SD = 12.51	Mean = 43.06 SD = 15.97
Long Term Memory (percentage scores)	Mean = 72.04 SD = 10.75	Mean = 60.00 SD = 12.73	Mean = 66.15 SD = 11.71	Mean = 56.36 SD = 14.57

Table 2.

Scores of Bilingual Farsi Speakers on English and Farsi Cognitive Tasks With Respect to English Reading Ability (Classified by WRAT Standard Scores)

English Tasks	Good English Reading Bilingual Speakers (n = 44)	Poor English Reading Bilingual Speakers (n = 16)	Farsi Tasks	Good English Reading Bilingual Speakers (n = 44)	Poor English Reading Bilingual Speakers (n = 16)
WRAT Reading (Percentiles)	Mean = 105.59 SD = 5.79	Mean = 68.31 SD = 12.99	—	—	—
Woodcock Word Identification (Percentiles)	Mean = 107.14 SD = 11.33	Mean = 63.25 SD = 18.73	Farsi Word Identification (percentages)	Mean = 74.29 SD = 17.62	Mean = 81.19 SD = 18.41
Oral Cloze (Percentages)	Mean = 80.68 SD = 11.39	Mean = 70.94 SD = 17.53	Farsi Oral Cloze (percentages)	Mean = 79.43 SD = 10.90	Mean = 75.62 SD = 13.89
Rosner Auditory Analysis (Percentage)	Mean = 95.17 SD = 4.68	Mean = 89.69 SD = 5.39	Farsi Auditory Analysis (percentages)	Mean = 90.74 SD = 5.87	Mean = 88.44 SD = 6.38
Word Attack (Percentages)	Mean = 112.79 SD = 10.00	Mean = 98.31 SD = 9.93	Farsi Psuedoword (percentages)	Mean = 82.77 SD = 7.24	Mean = 75.69 SD = 11.51
Orthographic Awareness (Percentages)	Mean = 84.14 SD = 10.65	Mean = 73.83 SD = 13.14	Farsi Orthographic Awareness (percentages)	Mean = 68.98 SD = 13.39	Mean = 72.43 SD = 17.15
Working Memory (perecentages)	Mean = 67.80 SD = 11.03	Mean = 49.45 SD = 10.36	Farsi Working Memory (percentages)	Mean = 65.34 SD = 12.03	Mean = 47.40 SD = 11.18
Long Term Memory (percentages)	Mean = 72.04 SD = 10.75	Mean = 60.00 SD = 12.73	Farsi Long Term Memory (percentages)	Mean = 67.04 SD = 11.79	Mean = 60.63 SD = 12.60

Table 3.

Regression of Cognitive Processes, Language Experience and Education Level in Canada on Woodcock Word Identification

Farsi Bilingual participants (n = 60)
Model Summary

Model	R	R Square	R Square Change	F Change	Durbin-Watson
1	.692	.479	.479	8.12*	
2	.833	.694	.215	11.74*	
3	.849	.721	.026	4.61*	2.068

Model 1: Reading related cognitive processes
Model 2: Reading related cognitive processes, language experience
Model 3: Reading related cognitive processes, language experience, education level in Canada

* Significant at p< .05

Table 4

Relative Pratt Indices for Word reading Performance

Farsi Bilingual participants (n = 60)

	READING RELATED COGNITIVE PROCESSES FACTOR							LANGUAGE EXPERIENCE FACTOR				
DV	Oral Cloze Task	Rosner Auditory Analysis	Word Attack Task	Ortho Task	Working Memory Task	Long Term Memory Task	COGNTIVE PROCESSES PROPORTION OF R-SQUARED	Age on Arrival	Length Of Resid	Farsi Reading Exper	LANGUAGE EFFECTS PROPORTION OF R-SQUARED	ELC
Wood	.10	.05	.19	.00	.05	.00	.39	.09	.21	.06	.36	.25
WRAT	.03	.06	.22	.00	.02	.02	.33	.23	.10	.08	.41	.26

Note: DV = Dependent Variable; Wood = Woodcock Word Identification Task, Wrat = WRAT reading Task; ELC = Education Level in Canada

Table 5.

Regression of Cognitive Processes, Language Experience and Education Level in Canada on WRAT reading Task

Farsi Bilingual participants (n = 60)
Model Summary

Model	R	R Square	R Square Change	F Change	Durbin-Watson
1	.650	.423	.423	6.48*	
2	.826	.683	.260	13.63*	
3	.846	.716	.033	5.78*	1.811

Model 1: Reading related cognitive processes
Model 2: Reading related cognitive processes, language experience
Model 3: Reading related cognitive processes, language experience, education level in Canada

* Significant at $p < .05$

Table 6.

Number of Syntactic Errors made by Bilinguals and Native English Speakers on Prepositions

Oral Cloze Items:	**Good Reading Bilingual Speakers (n = 44)**	**Poor Reading Bilingual Speakers (n = 16)**	**Good Reading Native English Speakers (n = 39)**	**Poor Reading Native English Speakers (n = 18)**
1. Fred put the turkey ___ the oven.	*No Errors made on this item by this subgroup*	*at (1)* *to (1)*	*roast (1)*	*cook (1)*
4. I'll go to school ___ six o'clock.	*No Errors made on this item by this subgroup*	*No Errors made on this item by this subgroup*	*No Errors made on this item by this subgroup*	*morning (1)* *in-the-morning (1)*
9. With a piece ___ chalk he sketched her face.	*White (6)* *Writing (1)*	*White (2)*	*white (3)* 1 participant did not attempt this item	*white (2)* *red (1)*
Total Number Of Errors	7	4	4	6

Numbers signify number of cases with the particular errors.

Table 7.

Number of Syntactic Errors made by Bilinguals and Native English Speakers on Subjunctive and Noun

Oral Cloze Items:	**Good Reading Bilingual Speakers (n = 44)**	**Poor Reading Bilingual Speakers (n = 16)**	**Good Reading Native English Speakers (n = 39)**	**Poor Reading Native English Speakers (n = 18)**
[Subjunctive] 14. ____ it was raining outside, I slept in my bed.	*No Errors made on this item by this subgroup* 8 participants did not attempt this item	*due (1)* 4 participants did not attempt this item	*Suddenly (1)* 1 participant did not attempt this item	*today (4)* *Maybe (1)* *nightly (1)* *damn! (1)* 1 participant did not attempt this item
Total Number Of Errors with Subjunctive	0	1	1	7
[noun] 2. My wife had a male baby who is my ____.	*No Errors made on this item by this subgroup*	*wife (1)* *brother (1)*	*Brother (2)*	*mother (1)*
Total Number Of Errors with Noun	0	2	2	1

Numbers signify number of cases with the particular errors.

Table 8.

Number of Syntactic Errors made by Bilinguals and Native English Speakers on Adjectives

Oral Cloze Items:	**Good Reading Bilingual Speakers (n = 44)**	**Poor Reading Bilingual Speakers (n = 16)**	**Good Reading Native English Speakers (n = 39)**	**Poor Reading Native English Speakers (n = 18)**
5. It was a sunny day with a pretty ____ sky.	*No Errors made on this item by this subgroup* 12 participants did not attempt this item.	*blue-ish (1) (also said blue-yee)*	*Cloudy (1)* 7 participants did not attempt this item.	*No Errors made on this item by this subgroup* 3 participants did not attempt this item.
6. I went to see ____ animals at the zoo.	*No Errors made on this item by this subgroup* 5 participants did not attempt this item.	*No Errors made on this item by this subgroup* 3 participants did not attempt this item.	*Dinosaur (1)* 2 participants did not attempt this item.	*lots (1)* *lions (1)* 1 participant did not attempt this item.
10. That is not enough money, I need ____ dollars.	*a-some-hundred (1)* *something (1)* *fewer (2)* 4 participants did not attempt this item.	*Something (1)* *Few (1)* 6 participants did not attempt this item.	*Millions (1)* *the (1)* *[also said "more the"]*	*something (1)* *rich (1)* 1 participant did not attempt this item.
16. Since my 13 year old son grew 10 inches, he has become a very ____ boy.	*short (1)*	*Small (1)*	*No Errors made on this item by this subgroup*	*No Errors made on this item by this subgroup*
20. How ____ is this pool?	*depth (1)*	*Bigger (1)* 1 participant did not attempt this item.	*No Errors made on this item by this subgroup*	*well (1)* *strong (1)*
Total Number Of Errors	6	5	4	6

Numbers signify number of cases with the particular errors.

Table 9.

Number of Syntactic Errors made by Bilinguals and Native English Speakers on Verbs

Oral Cloze Items:	**Good Reading Bilingual Speakers (n = 44)**	**Poor Reading Bilingual Speakers (n = 16)**	**Good Reading Native English Speakers (n = 39)**	**Poor Reading Native English Speakers (n = 18)**
7. Betty ____ a hole with her shovel.	*dig (6)* *digging (2)* *is (1)*	*Dig (2)* *Digging (3)* *Cut (1)* *to (1)*	*No Errors made on this item by this subgroup* 3 participants did not attempt this item.	*handled (1)* *slit (1)?* *built (1)* *spading(1)* 2 participants did not attempt this item.
12. Because it was getting dark, Joe went to ____ switch on the light.	*light (4)* *room (1)* *turning (4)* *turns (1)* *in (1)* *read (1)* 1 participant did not attempt this item	*Light (6)* *Room (1)* *Street (1)* *Home (1)* *Find (1)* 1 participant did not attempt this item	*No Errors made on this item by this subgroup* 2 participants did not attempt this item	*shut (1)* *walk (1)* *ran (1)* *sleep (1)* *under (1)* 1 participant did not attempt this item
13. Because of the rain yesterday, the children____ inside the house.	*stay (2)* *stuck (1)* *to (1)* *to the (1)*	*Stay (2)* *to (2)*	*No Errors made on this item by this subgroup*	*play (1)* 1 participant did not attempt this item
Total Number Of Errors	26	21	0	10

Numbers signify number of cases with the particular errors.

Table 10.

Number of Syntactic Errors made by Bilinguals and Native English Speakers on Adverbs

Oral Cloze Items:	**Good Reading Bilingual Speakers (n = 44)**	**Poor Reading Bilingual Speakers (n = 16)**	**Good Reading Native English Speakers (n = 39)**	**Poor Reading Native English Speakers (n = 18)**
15. Nancy knocked____ before entering the house.	*On (9)* *Door (6)* *at-the-door (1)* 7 participants did not attempt this item	*on (7)* *door (1)* *at(1)* 1 participant did not attempt this item	*open (1)* *three times (1)* *door (2)* *on (1)* *very hard (1)* *up (1)* 1 participant did not attempt this item	*on (4)* *door (2)* *off (1)* *she (1)* 3 participants did not attempt this item
19. After her broken leg had healed, Laura found it hard to walk____.	*With (1)* 12 participants did not attempt this item	*No Errors made on this item by this subgroup* 7 participants did not attempt this item	*No Errors made on this item by this subgroup* 1 participant did not attempt this item	*No Errors made on this item by this subgroup* 2 participants did not attempt this item
Total Number Of Errors	17	9	7	8

Numbers signify number of cases with the particular errors.

Table 11.

Number of Syntactic Errors made by Bilinguals and Native English Speakers on Interrogative Adverbs

Oral Cloze Items:	**Good Reading Bilingual Speakers (n = 44)**	**Poor Reading Bilingual Speakers (n = 16)**	**Good Reading Native English Speakers (n = 39)**	**Poor Reading Native English Speakers (n = 18)**
8. ____ have you learned English so well?	*Rita (1)* *you (1)* *how-much (1)* 7 participants did not attempt this item	*Sam (1)* *Roya (1)* 7 participants did not attempt this item	*now (1)* *Ron (1)* *Sandra (1)* *Kelly (1)* *Fred (1)* 3 participants did not attempt this item	*Sammy (1)* *have-I (1)* 3 participants did not attempt this item
17. ____ is Susan going to the doctor today?	*was (1)* *which (1)* 7 participants did not attempt this item	*which (1)* *should (1)* 6 participants did not attempt this item	*hey (1)* 7 participants did not attempt this item	*yes (1)* *are-you (1)* *will (1)* 8 participants did not attempt this item
Total Number Of Errors	5	4	6	5

Numbers signify number of cases with the particular errors.

Table 12.

Number of Syntactic Errors made by Bilinguals and Native English Speakers on Auxiliary Verb Errors

Oral Cloze Items:	**Good Reading Bilingual Speakers (n = 44)**	**Poor Reading Bilingual Speakers (n = 16)**	**Good Reading Native English Speakers (n = 39)**	**Poor Reading Native English Speakers (n = 18)**
3. The farmer ____ put his diary cows in the barn.	*Somebody (1)* *Joe (1)* *Sean (1)* *Benny (1)* *Son (1)* 21 participants did not attempt this item	*No Errors made on this item by this subgroup* 7 participants did not attempt this item	*will-one-day (1)* *one-day (1)* *helping (1)* *who (1)* *said (1)* 13 participants did not attempt this item	*him (1)* *herded (1)* *walked (1)* 14 participants did not attempt this item
18. When I knocked on the door, I thought someone ____ be at home.	*would-have-been (1)*	*they (1)*	*will (1)* *was (1)*	*really (1)* 2 participants did not attempt this item
Total Number Of Errors	6	1	7	4

Numbers signify number of cases with the particular errors.

Table 13.

Number of Syntactic Errors made by Bilinguals and Native English Speakers on Conjunctive Pronouns

Oral Cloze Items:	**Good Reading Bilingual Speakers (n = 44)**	**Poor Reading Bilingual Speakers (n = 16)**	**Good Reading Native English Speakers (n = 39)**	**Poor Reading Native English Speakers (n = 18)**
11. The girl____ who is tall plays basketball well.	*Jane (1)* *Joanna (1)* *Jenny (1)* *Jumping (3)* *Whom (2)* 22 participants did not attempt this item	*Sally (1)* *Gita (1)* *Here (1)* *Was (1)* *Whom (1)* *Very (1)* *Jumps (1)* *Big (1)* *Pretty (1)* 2 participants did not attempt this item	*Sarah (1)* *Sally (1)* *Sue (1)* *Samantha (1)* *Sharon (1)* *Sandra (1)* *Suzie (1)* *Joan (1)* *running (1)* *Jumping (4)* *Whom (3)* 1 participant did not attempt this item	*Serena (1)* *Judy (1)* *Jenny (1)* *there (1)* *is (1)* *cute (1)* *whom (1)* *very (1)* *strong (1)* *many (1)* 3 participants did not attempt this item
Total Number Of Errors	8	9	16	10

Numbers signify number of cases with the particular errors.

Table 14.

Syntactic Verb Errors: Average Percentage of Error Scores and Mann-Whitney U Tests

Farsi Bilingual and Native English Speaking participants (n = 117)

	Average Percentage of Errors (%)		
Type of Syntactic Error	**Bilinguals**	**Native English Speakers**	**Mann–Whitney U Statistic**
Verb Total number of Items: 3	18% Range: 33% - 100%	9% Range: 0% - 67%	806.00*

* Significant at $p < 0.05$

Table 15.

Regression of Cognitive Processes, Language experience and Education Level in Canada on Verb Errors

Farsi Bilingual participants (n = 60)

Model Summary

Model	**R**	**R Square**	**R Square Change**	**F Change**	**Durbin-Watson**
1	.300	.090	.090	1.195	
2	.569	.324	.234*	4.098*	
3	.574	.329	.005*	.236	1.81

Model 1: Reading related cognitive processes
Model 2: Reading related cognitive processes, language experience
Model 3: Reading related cognitive processes, language experience, education level in Canada

* Significant at $p < 0.05$

Table 16

Relative Pratt Indices for Verb Errors

Farsi Bilingual participants (n = 60)

	READING RELATED COGNITIVE PROCESSES FACTOR						LANGUAGE EXPERIENCE FACTOR				
DV	Rosner Auditory Analysis	Word Attack Task	Ortho Task	Working Memory Task	Long Term Memory Task	COGNTIVE PROCESSES PROPORTION OF R-SQUARED	Age on Arrival	Length Of Resid	Farsi Reading Exper	LANGUAGE EFFECTS PROPORTION OF R-SQUARED	ELC
Verb	.04	.00	.02	.02	.00	.08	.19	.25	.46	.90	.02

.Note: DV = Dependent Variable; ELC = Education Level in Canada

Table 17.

Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers with "a"

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Reading Task) **Alcove** *(Allcove – "All" instead of "Al") 1* **Unanimous** *(Anonymous) 1* **Contemporary** *(/a/ as in /**hat**/) 1* **Stratagem** *(strateegem) 1* **Irascible** *(iriscible) 2* *(Woodcock Word Identification)* **Amazement** *(amusement) 1* Total number of errors in cell = 7	*(WRAT Reading Task)* **Lame** *(lime) 1* **Abuse** *(/a/ as in /**hat**/) 1* **Stretch** *(estratch) 1* **Stratagem** *(strateegem) 1, (strataygem) 1* **Contemporary** *(/a/ as in /**hat**/) 1* *(Woodcock Word Identification)* **Airplane** *(/**aa**/ as in /plan/) 1* **Furnace** *(furnayce) 1* **Dwarf** *(/a/ as in /**hat**/) 1, (dorf) 1* **Yardage** *(/**a**/ as in /**hat**/) 1* **Amazement** *(amusement)1,(amaazement)1* **Almanac** *(almonic) 1* **Inordinate** *(inordinut) 1* **Relativity** *(/**a**/ as in /**hat**/) 1* **Instigator** *(/**a**/ as in /**hat**/) 1* Total number of errors in cell = 17	**TOTAL BILINGUAL SPEAKERS:** **24**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Reading Task) **Contagious** *(/**ta**/ **like** /**da**/ & hard /g/) 1* **Stratagem** *(Straitagem) 1* **Seismograph** *(Seismogreeph) 1* *(Woodcock Word Identification)* **Amazement** *(amusement) 1* Total number of errors in cell = 4	*(WRAT Reading Task)* **Abuse** *(obese) 1, (oppose) 1* **Alcove** *(Allcove – "All" instead of "Al") 1* **Lame** *(loom) 1* **Contagious** *(/a/ as in /**hat**/) 3, (/ta/ as in /**tab**/) 1* **Stratagem** *(stretegame) 1, (strateegem) 1* **Municipal** *("Pal" as in **"my pal"**) 2* **Seismograph** *(seismogreeph) 1* *(Woodcock Word Identification)* **Calender** *(cylinder) 1* **Dwarf** *(dorf) 1* **Almanac** *(almonic) 1, (almanic) 1* **Prognosis** *(prognaasis, like "Onassis") 1* **Alkali** *(alkeeli) 1, (alkolee) 1* **Philanthropist** *(philianthropist) 1* Total number of errors in cell = 18	**TOTAL NATIVE ENGLISH SPEAKERS:** **22**
TOTAL GOOD READERS: 11	**TOTAL POOR READERS: 35**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 18.

Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers with "i"

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Reading Task) **In** *(een) 2* **Split** *(espleet) 2* **Finger** *(feenger) 1* **Benign** *(Beneen) 3* **Unanimous** *(Anonymous) 1* **Itinerary** *(Eetinerary) 2* **Bibliography** *(beebliography) 4* **Horizon** *(Horeezoon) 4* **Municipal** *(mooneeceepal) 2* **Omniscient** *(Omneesee-ent) 2* *(Woodcock Word Identification)* **Is** *(eez) 1* **Milk** *(meelk) 2* **Swim** *(sweem) 2* **With** *(veet) 1* **Alkali** *(alkalee) 5* **Miser** *(meeser) 3* **Internecine** *(interneseen) 1* **Carnivorous** *(carneeveerous) 1* **Stigma** *(steegma) 1* **Mathematician** *(matemateecian) 6* **Philanthropist** *(pheelantropist) 3* Total number of errors in cell = 44	*(WRAT Reading Task)* **In** *(een) 3* **Finger** *(feenger) 9* **Animal** *(aneemal) 5* **Unanimous** *(unaneemous) 7* **Discretionary** *(deeskretionary) 5* **Horizon** *(horeezoon) 3, (horeezon) 1* **Municipal** *(mooneeceepal) 6* **Itinerary** *(eetinerary) 1* **Benign** *(beneen) 2, (Benayn) 1* **Bibliography** *(beebliography) 6* *(Woodcock Word Identification)* **Is** *(eez) 8* **Little** *(leetle) 1* **Milk** *(meelk) 5* **With** *(veet) 6* **Vehicle** *(Veheecle) 4* **Beautiful** *(Beauteefool) 1, (Booteefool) 1* **Stigma** *(esteegma) 1* **Mathematician** *(matemateecian) 8* **Philanthropist** *(pheelantropist) 4* **Miser** *(meeser) 9* **Judicious** *(judeecious) 1* **Instigator** *(eenstigaator) 1* **Alkali** *(alkalee) 2* Total number of errors in cell = 101	**TOTAL BILINGUAL SPEAKERS:** **145**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Reading Task) **Benign** *(Beneen) 1* **Oligarchy** *(ologarchy) 1* *(Woodcock Word Identification)* **Alkali** *(alkalee) 1* **Internecine** *(interneseen) 10* Total number of errors in cell = 13	*(WRAT Reading Task)* **Horizon** *(Horezoon) 1* **Bibliography** *(Bablography) 1* **Benign** *(Beneen) 1* **Zenith** *(zenniyth) 1* *(Woodcock Word Identification)* **Miser** *(meeser) 1* **Inordinate** *(inordonato) 1* **Hysterical** *(historical) 4* **Alkali** *(alkalee) 2* Total number of errors in cell = 12	**TOTAL NATIVE ENGLISH SPEAKERS:** **25**
TOTAL GOOD READERS: 57	**TOTAL POOR READERS: 113**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 19.

Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers with "u"

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Reading Task) **Bulk** *(boolk) 1* **Usurp** *(usoorp) 1, (usarp) 1* **Unanimous** *(ananimous) 5, (anonymous) 1* **Municipal** *(mooneeceepal) 2* *(Woodcock Word Identification)* **Quadruped** *(/ruped/ as in* ***/duped/****) 9* Total number of errors in cell = 20	*(WRAT Reading Task)* **Bulk** *(boolk) 4* **Abuse** *(aboos) 3* **Usurp** *(usoorp) 3* **Municipal** *(mooneeceepal) 6* *(Woodcock Word Identification)* **Beautiful** *(Beauteefool) 1, (Booteefool) 1, (bootifool) 1* **Hurry** *(harry) 2* **Urgent** *(yoorgent) 1, (orgent) 1* **Vernacular** *(vernacoolar) 1* **Quadruped** *(very long /o/ vs /u/) 1* Total number of errors in cell = 25	**TOTAL BILINGUAL SPEAKERS:** **45**
English speaking Good Readers (n=39)	**English speaking Poor Readers (n=18)**	
(WRAT Reading Task) **Usurp** *(/Os/urp as in /us/) 1* *(Woodcock Word Identification)* **Picayune** *(picayene) 1* **Quadruped** *(/ruped/ as in* ***/duped/****) 8* Total number of errors in cell = 10	*(WRAT Reading Task)* **Abuse** *(abose) 3, (obese) 3, (oppose) 1* **Usurp** *(usarp) 1, (usalp) 1* **Unanimous** *(ananimous) 1, (anonymous) 9* *(Woodcock Word Identification)* **Vernacular** *(vernacoolar) 1,(vernacalar) 1* **Quadruped** *(/rup/ said as /rope/) 1* Total number of errors in cell = 22	**TOTAL NATIVE ENGLISH SPEAKERS:** **32**
TOTAL GOOD READERS: 30	**TOTAL POOR READERS: 47**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 20.

Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers with "o"

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Reading Task) **Alcove** *(alcaav) 1* **Horizon** *(Horeezoon) 4* **Covetousness** *(coovetousness) 1* *(Woodcock Word Identification)* **Woman** *(vooman) 3* **Philanthropist** *(philanthrapist) 1* **Carnivorous** *(carneeveerous) 1* **Cenology** *(ceniology) 1* **Zymolosis** *(zymolisis) 2* **Epistrophe** *(epistraaphe, /aa/ as in /hat) 2* Total number of errors in cell = 16	*(WRAT Reading Task)* **Contemporary** *(contemparary) 1* **Covetousness** *(cowvetousness) 1, (coovetousness) 1* *(Woodcock Word Identification)* **Book** *(boook) 2* **Woman** *(vooman) 2* **Torpedo** *(tarpedo) 1* Total number of errors in cell = 8	**TOTAL BILINGUAL SPEAKERS:** **24**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Reading Task) **Alcove** *(alcoov) 2* **Covetousness** *(cowvetousness) 3, (caavetousness – long /a/ as in /hat/) 3* *(Woodcock Word Identification)* **Epistrophe** *(epistraphe) 1* **Cenology** *(ceniology) 2* Total number of errors in cell = 11	*(WRAT Reading Task)* **Covetousness** *(/o/ read as in "co-author") 1* *(Woodcock Word Identification)* **Prognosis** *(prignosis) 1, (prognesis) 1* **Expostulate** *(expestulate) 1* **Carnivorous** *(carniveerous) 1* Total number of errors in cell = 5	**TOTAL NATIVE ENGLISH SPEAKERS:** **16**
TOTAL GOOD READERS: 27	**TOTAL POOR READERS: 13**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 21.

Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers with "e"

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Reading Task) **Heresy** *(here **e** see) 1* **Covetousness** *(cove**e**tousness) 1* **Stratagem** *(strata**g**am, also hard /g/) 2* *(Woodcock Word Identification)* **Zenith** *(zeenit) 4* **Quadruped** *(quadrupo**d**) 1, (/e/ is silent as in "duped") 9* Total number of errors in cell = 18	*(WRAT Reading Task)* **Heresy** *(heeresy) 1* **Stretch** *(estratch) 1* **Lame** *(lam**b**) 1* **Heresy** *(here **e** see) 4* **Egregious** *(**a**gregious) 1* *(Woodcock Word Identification)* **Evening** *(ev**a**ning) 2* **Expert** *(expeert) 3* **Mechanic** *(meechanic) 3* **Torpedo** *("pedo" as is "Pedro") 3* **Petroleum** *(peetroleum) 1* **Zenith** *(zeenit) 4* Total number of errors in cell = 24	**TOTAL BILINGUAL SPEAKERS:** **42**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Reading Task) **Stratagem** *(strataga**me**) 1* *(Woodcock Word Identification)* **Hysterical** *(hystorical or "historical") 1* **Quadruped** *(/e/ is silent as in "duped") 8* **Picayune** *(picayunee) 4* Total number of errors in cell = 14	*(WRAT Reading Task)* **Lame** *(lam**b**) 2* **Heresy** *(2^{nd} /e/ silent as in "here") 5, (here **e** see) 1* **Covetousness** *(cove toes ness) 2* *(Woodcock Word Identification)* **Torpedo** *(Torp**u**do) 1* **Inordinate** *(inord**o**nat**o**) 1* **Expert** *(exp**o**rt) 1* **Evening** *(ev**a**ning) 1* **Miser** *(misser, like "miss **her**") 1* Total number of errors in cell = 15	**TOTAL NATIVE ENGLISH SPEAKERS:** **29**
TOTAL GOOD READERS: 32	**TOTAL POOR READERS: 39**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 22.

Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers on Attaching "e" to Consonant Clusters Starting With "s"

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Reading Task) **Spell** *(espell) 1* **Split** *(esplit) 2, (esplit) 2* **Stretch** *(estrech) 1* **Stratagem** *(estrata game) 1, (estratagem) 1* *(Woodcock Word Identification)* **Stop** *(estop) 1* **Stigma** *(estigma) 1* **Spectacular** *(espectacular) 1* Total number of errors in cell = 11	*(WRAT Reading Task)* **Spell** *(espell) 4* **Split** *(esplit) 8, (espeeleet) 1* **Stretch** *(estrech) 6, (estratch) 1* **Stratagem** *(estrategem) 7* *(Woodcock Word Identification)* **Stop** *(estop) 5* **Sleep** *(esleep) 6* **Slowly** *(eslowly) 2* **Stove** *(estove) 5* **Stigma** *(estigma) 6, (esteegma) 1* **Spectacular** *(espectacular) 6* Total number of errors in cell = 58	**TOTAL BILINGUAL SPEAKERS:** **69**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
No Errors made in this category by this subgroup Total number of errors in cell = 0	No Errors made in this category by this subgroup Total number of errors in cell = 0	**TOTAL NATIVE ENGLISH SPEAKERS:** **0**
TOTAL GOOD READERS: 11	**TOTAL POOR READERS: 58**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 23.

Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers with Multiple Vowels

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Reading Task) **Contagious** *(contageeyoos, & hard /g/) 3* **Bibliography** *(biblography) 1* **Omniscient** *(omniseeyent) 1* **Disingenuous** *(disengenus) 1* **Covetousness** *(cove tauce ness) 2* **Triumph** *(trumph) 3* **Assuage** *(assage) 3* **Seismograph** *(seesmograph) 8* **Heinous** *("hinous" or "highness") 8* *(Woodcock Word Identification)* **Naïve** *(nave) 2* **Carnivorous** *(carnivorious) 1* **Heterogeneous** *(heterogenus) 1* Total number of errors in cell = 32	*(WRAT Reading Task)* **Book** *(boook) 4* **Omniscient** *(omniseeyent) 2* **Triumph** *(trumph) 5, (tramph) 3* **Assuage** *(assage) 5* **Seismograph** *(seesmograph) 6* **Heinous** *("hinous" or "highness") 4* *(Woodcock Word Identification)* **Said** *(sayd) 2* **Laugh** *(loff) 1* **Beautiful** *(bootifool) 1, (Booteefool) 1* **Early** *(eerly, as in "eerie") 1* **Certain** *(certane, as in "cane") 2* **Naïve** *(nave) 3* **Pedestrian** *(pedestrane) 1* **Tableau** *(tableeyoo) 2* **Causation** *(cossation) 1, (cowsation) 1* **Quintessence** *(Queentessence) 2* Total number of errors in cell = 46	**TOTAL BILINGUAL SPEAKERS:** **78**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Reading Task) **Assuage** *(assage) 5* **Omniscient** *(omniseeyent) 3* **Heinous** *("hinous" or "highness") 15* *(Woodcock Word Identification)* **Tableau** *(tableeyoo) 2, (table) 2* **Zeitgeist** *(zeitgeest) 3, (zeetgeist) 5, (zeetgeest) 2* Total number of errors in cell = 37	*(WRAT Reading Task)* **Assuage** *(assooge) 1, (assage)1, (assege) 1* **Triumph** *(tramp) 2, (trumph)2* **Heinous** *("hinous" or "highness") 5, (honous) 1, (heinious) 2, (hyenas) 3* **Seismograph** *(seesmograph) 8* **Covetousness** *(cove toes ness) 1* *(Woodcock Word Identification)* **Said** *(sad) 1, (side) 2* **Twilight** *(toelight) 1* **Wounded** *(wonded) 1* **Artesian** *(artisan) 2* **Pedestrian** *(pedestrane) 2;* **Naïve** *(nave) 1* Total number of errors in cell = 37	**TOTAL NATIVE ENGLISH SPEAKERS:** **74**
TOTAL GOOD READERS: 69	**TOTAL POOR READERS: 83**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 24.

Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers with "g"

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Reading Task) **Benign** *(hard /g/ as in "egg") 2* **Egregious** *(2nd "g"- hard /g/ as in "egg") 16* **Disingenuous** *(hard /g/ as in "egg") 7* *(Woodcock Word Identification)* **Cologne** *(hard /g/ as in "egg") 1* **Cygnet** *(/g/ silent) 1* Total number of errors in cell = 27	*(WRAT Reading Task)* **Contagious** *(hard /g/ as in "egg") 5* **Benign** *(hard /g/ as in "egg") 5* **Egregious** *(2nd "g"- hard /g/ as in "egg") 4* *(Woodcock Word Identification)* **Cologne** *(hard /g/ as in "egg") 6* **Prognosis** *((/j/ instead of /g/) 2* Total number of errors in cell = 22	**TOTAL BILINGUAL SPEAKERS:** **49**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Reading Task) **Contagious** *(hard /g/ as in "egg") 2* **Egregious** *(2nd "g"- hard /g/ as in "egg") 23* **Assuage** *(hard /g/ as in "egg") 1* **Disingenuous** *(hard /g/ as in "egg") 15* *(Woodcock Word Identification)* **Cologne** *(hard /g/ as in "egg") 1* **Cygnet** *(/g/ silent) 2* Total number of errors in cell = 44	*(WRAT Reading Task)* **Contagious** *(hard /g/ as in "egg") 2* **Benign** *(hard /g/ as in "egg") 3* **Egregious** *(2nd "g"- hard /g/ as in "egg") 4* **Assuage** *(hard /g/ as in "egg") 1* *(Woodcock Word Identification)* **Rug** *(ruj) 1* **Urgent** *(hard /g/ as in "egg") 1* **Cologne** *(hard /g/ as in "egg") 3* **Prognosis** *((/j/ instead of /g/) 2* Total number of errors in cell =17	**TOTAL NATIVE ENGLISH SPEAKERS:** **61**
TOTAL GOOD READERS: 71	**TOTAL POOR READERS: 39**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 25.

Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers with "c"

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Reading Task) **Irascible** *(Iraskibble) 6* *(Woodcock Word Identification)* **Cenology** *(Kenology) 5* Total number of errors in cell = 11	*(WRAT Reading Task)* **Irascible** *(Iraskibble) 4* **Omniscient** *(/k/ instead of /c/) 2* *(Woodcock Word Identification)* **Cenology** *(Kenology) 1* Total number of errors in cell = 7	**TOTAL BILINGUAL SPEAKERS:** **18**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Reading Task) **Irascible** *(Iraskibble) 10* *(Woodcock Word Identification)* **Cenology** *(Kenology) 3* Total number of errors in cell = 13	*(WRAT Reading Task)* **Irascible** *(Iraskibble) 3* **Municipal** *(/k/ instead of /c/) 2* *(Woodcock Word Identification)* **Judicious** *(hard /c/ as in /cat/) 1* Total number of errors in cell = 6	**TOTAL NATIVE ENGLISH SPEAKERS:** **19**
TOTAL GOOD READERS: 24	**TOTAL POOR READERS: 13**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 26.

Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers with "w"

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(Woodcock Word Identification) **With** *(veet) 1* **Woman** *(vooman) 3* **Dwarf** *(dvarf) 1* **Wounded** *(voonded) 3* Total number of errors in cell = 8	*(Woodcock Word Identification)* **Woman** *(vooman) 2* **Swim** *(sveem) 9* **With** *(veet) 6* **Work** *(vork) 1* **Watch** *(vatch) 2* **Twilight** *(Tvilight) 1* **Dwarf** *(dvarf) 4* **Wounded** *(voonded) 7* Total number of errors in cell = 32	**TOTAL BILINGUAL SPEAKERS:** **40**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
No Errors made in this category by this subgroup Total number of errors in cell = 0	No Errors made in this category by this subgroup Total number of errors in cell = 0	**TOTAL NATIVE ENGLISH SPEAKERS:** **0**
TOTAL GOOD READERS: 8	**TOTAL POOR READERS: 32**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 27.

Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers with "th"

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(Woodcock Word Identification) **Philanthropist** *(Philantropist) 7, (Philantropeest) 3* **Mathematician** *(matemateecian) 6* **Zenith** *(Zeenit) 5* Total number of errors in cell = 21	*(Woodcock Word Identification)* **Philanthropist** *(Pheelantropist) 4* **Mathematician** *(matemateecian) 8* **Zenith** *(Zeenit) 4, (Zeneet) 1* Total number of errors in cell = 17	**TOTAL BILINGUAL SPEAKERS:** **38**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
No Errors made in this category by this subgroup Total number of errors in cell = 0	No Errors made in this category by this subgroup Total number of errors in cell = 0	**TOTAL NATIVE ENGLISH SPEAKERS:** **0**
TOTAL GOOD READERS: 21	**TOTAL POOR READERS: 17**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 28.

<u>Number of Phonological (Reading) Errors made by Bilingual and Native English Speakers with "ph"</u>

<table>
<tr><td>Bilingual Good Readers (n=44)</td><td>Bilingual Poor Readers (n=16)</td><td></td></tr>
<tr><td>(WRAT Reading Task)
• No errors detected
(Woodcock Word Identification)
Epistrophe (epistropee) 4, (episropnee) 1, (Epistrone) 1
Total number of errors in cell = 6</td><td>(WRAT Reading Task)
• No errors detected
(Woodcock Word Identification)
• No errors detected
• All Subjects discontinued before "Epistrophe"
Total number of errors in cell = 0</td><td>TOTAL BILINGUAL SPEAKERS:
6</td></tr>
<tr><td>English speaking Good Readers (n=39)</td><td>English speaking Poor Readers (n=18)</td><td></td></tr>
<tr><td>(WRAT Reading Task)
• No errors detected
(Woodcock Word Identification)
Epistrophe (Epistropee) 14, (Epistrone) 4
Total number of errors in cell = 18</td><td>(WRAT Reading Task)
• No errors detected
(Woodcock Word Identification)
• No errors detected
• 17 Subjects discontinued before "Epistrophe"
Epistrophe (Epistropee) 1
Total number of errors in cell = 1</td><td>TOTAL NATIVE ENGLISH SPEAKERS:
19</td></tr>
<tr><td>TOTAL GOOD READERS: 24</td><td>TOTAL POOR READERS: 1</td><td></td></tr>
</table>

Note: Numbers beside each word signify number of cases with the particular error.

Table 29.

Bilingual and Native English Speaking' Phonological Errors of Reading words as Different Words (Sight Errors)

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Reading Task) **Heresy** *(Heresay) 1* *(Woodcock Word Identification)* **Amazement** *(Amusement) 1* **Causation** *(Caucasian) 1* Total number of errors in cell = 3	*(WRAT Reading Task)* **Tree** *(Three) 1* **Lame** *(Lamb) 2* *(Woodcock Word Identification)* **Furnace** *(Finance) 1* **Amazement** *(Amusement) 1* **Hysterical** *(Historical) 1* Total number of errors in cell = 6	**TOTAL BILINGUAL SPEAKERS:** **9**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Reading Task) **Heresy** *(Heresay) 4* *(Woodcock Word Identification)* **Almanac** *(Maniac) 1* **Amazement** *(Amusement) 1* **Tableau** *(Table) 1* **Hysterical** *(Historical) 1* **Cenology** *(Senility) 1* Total number of errors in cell = 9	*(WRAT Reading Task)* **Split** *(Sprint) 1, (Spit) 1, (Spilt) 1;* **Bulk** *(Book) 1, (Blink) 1;* **Abuse** *(Oppose) 1, (obese) 3* **Bibliography** *(Biography) 2, (Bible grab) 1 (Bible Book) 1;* **Unanimous** *(Anonymous) 9* **Benign** *(Begin) 8;* **Discretionary** *(Dictionary) 3, (Discuss) 1, (Discretion) 1, (Extraordinary) 1;* **Heresy** *(Here say)7;* **Covetousness** *(Convention) 1;* **Psuedonym** *(Sodium) 1* **Usurp** *(Spurt) 1;* **Heinous** *(Highness) 5* **Disingenuous** *(Distinguish) 1* *(Woodcock Word Identification)* **Car** *(Cat) 1;* **Bed** *(Red) 1;* **Said** *(Sad) 1, (Side) 1;* **Departure** *(Department) 1*; **Hurry** *(Harrass) 1, (Hungry) 1, (Sorry) 1*; **Calendar** *(Cylinder) 1;* **Expert** *(Export) 1, (Except) 1;* **Perceive** *(Preserve) 1;* **Dwarf** *(Draft) 1;* **Miser** *(Mister) 1;* **Wounded** *(Wonder) 1;* **Relativity** *(Related) 1;* **Spectacular** *(Spectacle) 1;* **Hysterical** *(Historical) 4;* **Instigator** *(Investigator) 1;* **Prognosis** *(Progress) 1;* **Quintessence** *(Queen Tessa)1;* **Judicious** *(Judge) 1, (Judas) 4;* **Causation** (*Caucasian) 4;* **Philanthropist** *(Poltergeist) 1, (Phone Christ)* 1; **Tableau** *(Taboo) 1;* **Surreptitious** *(Serpent) 1, (Superstitious) 1* Total number of errors in cell = 87	**TOTAL NATIVE ENGLISH SPEAKERS:** **96**
TOTAL GOOD READERS: 11	**TOTAL POOR READERS: 93**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 30.

Phonological Errors: Average Percentage of Error Scores and Mann-Whitney U Tests

Farsi Bilingual and Native English Speaking participants (n = 117)

	Average Percentage of Errors (%)		
Type of phonological Error	**Bilinguals**	**Native English Speakers**	**Mann–Whitney U Statistic**
Sounds of letter "i" Total number of Items: 47	10% Range: 4% - 48%	1% Range: 0% - 10%	357.00*
Sounds of letter "u" Total number of Items: 23	5% Range: 0% - 19%	3% Range: 2% - 5%	660.00
Sounds of letter "e" Total number of Items: 71	10% Range: 3% - 11%	2% Range: 1% - 5%	616.50*
Attach "e" to words starting with "s" Total number of Items: 10	17% Range: 0% - 90%	0% Range: All scores are 0 %	390.00*
Double vowels (eg. "ua") Total number of Items: 47	5% Range: 2% - 19%	3% Range: 2% - 12%	615.00
Sounds of letter "g" Total number of Items: 27	5% Range: 0% - 20%	4% Range: 0% - 15%	763.50
Sound of letter "w" Total number of Items: 11	7% Range: 0% - 10%	0% Range: All scores are 0 %	507.00*
Sound of letters "th" Total number of Items: 4	24% Range: 0% - 100%	0% Range: All scores are 0 %	429.00*
Sight errors Total number of Items: 148	3% Range: 0% - 21%	7% Range: 0% -58 %	514.50*

* Significant at p < .05

Table 31.

Regression of Cognitive Processes, Language experience and Education Level in Canada on Errors with "i"

Farsi Bilingual participants (n = 60)

Model Summary

Model	R	R Square	R Square Change	F Change	Durbin-Watson
1	.663	.439	.439	4.436*	
2	.780	.608	.169	4.451*	
3	.782	.612	.004	.321	1.672

Model 1: Reading related cognitive processes
Model 2: Reading related cognitive processes, language experience
Model 3: Reading related cognitive processes, language experience, education level in Canada

* Significant at $p < .05$

Table 32

Relative Pratt Indices for Phonological and Sight Errors in Word Reading

Farsi Bilingual participants (n = 60)

	READING RELATED COGNITIVE PROCESSES FACTOR							LANGUAGE EXPERIENCE FACTOR				
DV	Oral Cloze Task	Rosner Auditory Analysis	Word Attack Task	Ortho Task	Working Memory Task	Long Term Memory Task	COGNTIVE PROCESSES PROPORTION OF R-SQUARED	Age on Arrival	Length Of Resid	Farsi Reading Exper	LANGUAGE EFFECTS PROPORTION OF R-SQUARED	ELC
"i"	.02	.01	.40	.02	.01	.00	.46	.38	.03	.02	.43	.11
"e"	.00	.04	.26	.04	.01	.02	.37	.01	.37	.01	.39	.24
"e+s"	.15	.00	.23	.00	.10	.03	.49	.23	.04	.19	.51	.00
"w"	.00	.03	.33	.00	.03	.00	.39	.01	.30	.29	.60	.01
"th"	.03	.01	.31	.00	.00	.00	.35	.00	.36	.27	.63	.02
Sight	.04	.09	.32	.12	.11	.05	.73	.00	.01	.00	.01	.26

Note. e+s = Attach /e/ to clusters with /s/; Sight Reading Errors = Reading a word as an entirely different word; ELC = Education Level in Canda.

Table 33.

Regression of Cognitive Processes, Language experience and Education Level in Canada on Errors with "e"

Farsi Bilingual participants (n = 60)

Model Summary

Model	**R**	**R Square**	**R Square Change**	**F Change**	**Durbin-Watson**
1	.572	.327	.327	3.656*	
2	.763	.582	.255	9.147*	
3	.785	.617	.035	4.584	1.859

Model 1: Reading related cognitive processes
Model 2: Reading related cognitive processes, language experience
Model 3: Reading related cognitive processes, language experience, education level in Canada

*Significant at p <.05

Table 34.

Regression of Cognitive Processes, Language experience and Education Level in Canada on Errors of Attaching "e" to Consonant Clusters Starting With "s"

Farsi Bilingual participants (n = 60)

Model Summary

Model	R	R Square	R Square Change	F Change	Durbin-Watson
1	.657	.432	.432	4.301*	
2	.798	.637	.205	5.846*	
3	.803	.644	.007	.612	1.947

Model 1: Reading related cognitive processes
Model 2: Reading related cognitive processes, language experience
Model 3: Reading related cognitive processes, language experience, education level in Canada

* Significant at $p < .05$

Table 35.

Regression of Cognitive Processes, Language experience and Education Level in Canada on Errors with "w"

Farsi Bilingual participants (n = 60)

Model Summary

Model	R	R Square	R Square Change	F Change	Durbin-Watson
1	.647	.418	.418	4.078*	
2	.811	.657	.239	7.191*	
3	.818	.669	.012	1.079	1.964

Model 1: Reading related cognitive processes
Model 2: Reading related cognitive processes, language experience
Model 3: Reading related cognitive processes, language experience, education level in Canada

* Significant at $p < .05$

Table 36.

Regression of Cognitive Processes, Language experience and Education Level in Canada on Errors with "th"

Farsi Bilingual participants (n = 60)

Model Summary

Model	**R**	**R Square**	**R Square Change**	**F Change**	**Durbin-Watson**
1	.618	.381	.381	3.494*	
2	.706	.499	.118	2.399*	
3	.706	.499	.000	.043	2.046

Model 1: Reading related cognitive processes
Model 2: Reading related cognitive processes, language experience
Model 3: Reading related cognitive processes, language experience, education level in Canada

* Significant at $p < .05$

Table 37.

Regression of Cognitive Processes, Language experience and Education Level in Canada on Sight Errors

Farsi Bilingual participants (n = 60)

Model Summary

Model	**R**	**R Square**	**R Square Change**	**F Change**	**Durbin-Watson**
1	.665	.443	.443	7.020*	
2	.681	.464	.022	.673	
3	.721	.520	.056	5.697*	1.820

Model 1: Reading related cognitive processes
Model 2: Reading related cognitive processes, language experience
Model 3: Reading related cognitive processes, language experience, education level in Canada

* Significant at $p < .05$

Table 38.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing s, z, or Soft c Sounds

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Lucidity** *(lusidity) 1;* **Conscience** *(consciense) 2, (concions) 1, (comscions) 1, (concsenss) 1, (concious) 1, (consience) 1;* **Acquiesce** *(aquiz) 2, (aquizz) 1, (acauize) 1, (accuise) 2, (acquize) 3, (aquize) 1, (acquise) 1, (acquiess) 3, (acquese) 2, (aquisec) 1, (accrious) 1;* **Pusillanimous** *(pucilanimous) 2, (pucilanemis) 1, (pucilanimace) 2, (pucellanimous) 2, (puscilanimous) 1, (pisselaminous) 1, (pussillanimous) 4, (pussilanimus) 1, (pocelanamous) 1, (pusselanimous) 1, (personalamous) 1;* **Malfeasance** *(mallfisans) 1, (malfisans) 1, (malfisants) 1, (mallphozanse) 1, (malfizence) 1, (malfizance) 1, (malfezence) 1, (mulphisants) 1, (mouphesis) 1;* **Vicissitude** *(visisitude) 1, (visissitude) 1, (vissicitude) 3, (vissisitude) 1, (vissicitute) 1, (visicitude) 1, (vasisutude) 1, (vississitude) 2, (vicicitude) 1, (viccissitude) 2, (vicisitute) 2, (vicisitude) 2, (vecesitude) 1, (varscitude) 1, (feccicitute) 1* Total number of errors in cell = 68	*(WRAT Spelling Task)* **Circle** *(sercole) 1, (sercel) 1;* **Advice** *(advise) 2;* **Surprise** *(surprize) 3, (surprice) 1, (sorprize) 2;* **Reasonable** *(reazanabal) 1* **Decision** *(decition) 2, (desistion) 1, (dezision) 1, (deceeshen) 1, (dessisen) 1;* **Recognize** *(recognice) 1, (rekognize) 1;* **Lucidity** *(lousidity) 2, (lusedity) 1, (loosidity) 2, (lositity) 1, (lossidety) 1;* **Enthusiasm** *(enthusiazim) 1, (intoziasm) 1;* **Conscience** *(concious) 3, (contionse) 2, (concince) 1, (consiens) 1;* **Acquiesce** *(accuise) 1, (ackuiesce) 1, (accuize) 1;* **Pusillanimous** *(pucilanimace) 1, (pusilanimous) 1* **Malfeasance** *(mallphizanse) 1, (malphizains) 1* **Vicissitude** *(vissisitude) 2* Total number of errors in cell = 44	**TOTAL BILINGUAL SPEAKERS:** **112**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Surprize** *(surprise) 2, (surprice) 1* **Decision** *(desicion) 2, (deciotion) 1* **Recognize** *(recognice) 2, (recognise) 1* **Conscience** *(conciense) 1, (conciense) 1, (consceinse) 1;* **Acquiesce** *(acquiese) 7, (acquiese) 1, (acquiesse) 2, (acquiess) 1, (aquiese) 2, (aquiece) 1, (acquiece) 1, (acquies) 1, (aquiess) 1, (acqueous) 1, (aqueous) 1, (acuiese) 1, (aquious) 1, (accuies) 1;* **Pusillanimous** *(pucilamenous) 1, (pucilanamous) 3, (pucilanemous) 1, (pussilanimous) 2, (pussillanimous) 1, (puscilanimous) 2, (pucelaminous) 1, (puscillanimous) 1, (puscellanomous) 2, (puscelanemous) 1, (potsiphlneous) 1;* **Malfeasance** *(malphescence) 2, (malfezence) 1, (malfiscents) 1* Total number of errors in cell = 81	*(WRAT Spelling Task)* **Advice** *(advise) 6, (advase) 1;* **Surprize** *(surprice) 5;* **Reasonable** *(rezion) 1* **Decision** *(desicion) 1, (desision) 1, (dessision) 1, (dissision) 1, (diccission) 1, (descion) 1, (dision) 1;* **Recognize** *(recognise) 1,(recomise) 1,(recongnise)1;* **Enthusiasm** *(entutsiasi) 1* **Conscience** *(consinise) 1, (conscions) 1, (concseise) 1, (conscious) 3, (consenious) 1, (contioush) 1;* **Acquiesce** *(acquiece) 1, (aquius) 2;* **Malfeasance** *(malphecence) 1* **Vicissitude** *(viscitude) 1* Total number of errors in cell =37 **Vicissitude** *(vissitude) 2, (visitude) 2, (vissitude) 1, (vissitudes) 1, (visicitude) 1, (viscitude) 2, (viscisitude) 3, (viscicitude) 1, (viscissitude) 2,(visisitude) 2, (visicitude) 1, (vissiccitude) 1, (vassissitude) 1, (visissitude) 1, (vissicitude) 2, (vessisitude) 2, (vicicitude) 1, (vicciccitude) 1, (viscitoude) 2, (visicitod) 1*	**TOTAL NATIVE ENGLISH SPEAKERS:** **108**
TOTAL GOOD READERS: 149	**TOTAL POOR READERS: 81**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 39.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing q, Hard ch, and Hard c Sounds

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Quantity** *(kwantety) 1, (quntity) 1* **Character** *(karacter) 1* **Cacophony** *(kakofony) 1, (kakophony) 1, (kacophony) 1, (kocofony) 1, (chacophony) 1, (cakophony) 1,* **Camouflage** *(kemophlaj) 1* **Acquiesce** *(aquiz) 1, (aquizz) 1, (accuise) 1, (aquize) 1, (acousce) 1, (accuiesce) 1, (aquiece) 1 (accrious) 1* Total number of errors in cell = 18	*(WRAT Spelling Task)* **Quantity** *(counteity) 1, (coantitee) 1, (kantiti) 1* **Character** *(caractor) 1, (caracter) 1, (karacter) 1, (cractor) 1* **Recognize** *(rekognize) 1* **Cacophony** *(Cakophoni) 1, (kacofony) 1, (cackophony) 1, (cakaphony) 1, (kecoffany) 1* **Acquiesce** *(accuise) 1, (ackuiesce) 1, (accuize) 1* Total number of errors in cell = 16	**TOTAL BILINGUAL SPEAKERS:** **34**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Cacophony** *(kacoffany) 1* **Acquiesce** *(aquiese) 2, (aquiece) 1, (aquiess) 1, (aqueous) 1, (acuiese) 1, (aquious) 1, (accuisce) 1, (accuies) 1* Total number of errors in cell = 10	*(WRAT Spelling Task)* **Quantity** *(conqti) 1* **Recognize** *(reckagnize) 1* **Cacophony***(cachophany) 1,(kackaphony)1* **Acquiesce** *(aquius) 1* Total number of errors in cell = 5	**TOTAL NATIVE ENGLISH SPEAKERS:** **15**
TOTAL GOOD READERS: 28	**TOTAL POOR READERS: 21**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 40.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing Soft ch and Soft g Sounds

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Conscience** *(concions) 1, (concience) 3, (concsenss) 1, (concious) 1, (consience) 1* **Charlatan** *(**sh**arlatan) 5, (**sh**arleton) 1* **Camouflage** *(comofla**sh**) 1, (camofla**sh**) 1, (kemophlaj) 1* Total number of errors in cell = 16	*(WRAT Spelling Task)* **Conscience** *(concious) 3, (contionse) 2, (concience) 1, (concince) 1, (consiens) 1* **Belligerent** *(beli**j**erent) 1* **Charlatan** *(**sh**arlatan) 2, (**sh**arlatown) 1* **Camouflage** *(camofla**sh**) 1* Total number of errors in cell = 13	**TOTAL BILINGUAL SPEAKERS:** **29**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Conscience** *(concience) 2, (conciense) 1, (cosience) 1, (conciense) 1, (conceincee) 1, (concience) 1* **Charlatan** *(**sh**arlutan) 1, (**sh**arlitan) 1, (**sh**arlatan) 1* **Camouflage** *(camouphaje) 1, (camouflaje) 1, (camaflau**ch**) 1* Total number of errors in cell = 13	*(WRAT Spelling Task)* **Conscience** *(consinise) 1, (concience) 2, (concseise) 1, (consenious) 1, (contioush) 1* **Belligerent** *(beli**j**erant) 1, (beli**dg**erent) 1* Total number of errors in cell = 8	**TOTAL NATIVE ENGLISH SPEAKERS:** **21**
TOTAL GOOD READERS: 29	**TOTAL POOR READERS: 21**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 41.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing t, d, and th Sounds

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Enthusiasm** *(entusiasm) 3* **Charlatan** *(charlatton) 1, (charlotten) 1, (charlottown) 1, (charlottown) 1* **Vicissitude** *(vissicitute) 1, (vicisitute) 2, (feccitute) 1* Total number of errors in cell = 11	*(WRAT Spelling Task)* **Opportunity** *(aporchonity) 1* **Enthusiasm** *(infosiasim) 2, (entusiasm) 1, (entusiasim) 1, (intoziasm) 1, (intosiasim) 1* Total number of errors in cell = 7	**TOTAL BILINGUAL SPEAKERS:** **18**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Enthusiasm** *(entusiasm) 1, (entusiasim) 1* **Charlatan** *(charlotten) 2, (charletton) 1, (charlotten) 2, (charlotton) 1, (charletton)1, (charlotteton) 2, (charlottan) 1, (charlatten) 1, (charlottane) 1* Total number of errors in cell = 14	*(WRAT Spelling Task)* **Lucidity** *(lucitidy) 2* **Enthusiasm** *(entutsiasi) 1* Total number of errors in cell = 3	**TOTAL NATIVE ENGLISH SPEAKERS:** **17**
TOTAL GOOD READERS: 25	**TOTAL POOR READERS: 10**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 42.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing ph, f, and v Sounds

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Cacophony** *(cacoughphony) 2, (cucoughphony) 1, (chacoughphony) 2* **Cacophony** *(kakofony) 2, (kocofony) 1, (cacofony) 1, (cakofony) 1* **Camouflage** *(camouphlage) 2, (chamophloge) 1, (camophlage) 2, (kemophlaj) 1* ***Malfeasance*** *(mallphozanse) 1, (mulphisants) 1, (mouphesis) 1, (malpheasance) 5, (malphisence) 1, (malphasence) 1* **Vicissitude** *(feccicitute) 1* Total number of errors in cell = 27	*(WRAT Spelling Task)* **Cacophony** *(kacofony) 2, (kecoffany) 1* **Malfeasance** *(mallphizanse) 1, (malphizains) 1* Total number of errors in cell = 5	**TOTAL BILINGUAL SPEAKERS:** **32**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Cacophony** *(cocoffiny) 1, (cacoffeny) 1, (cacofony) 2, (cacaufany) 1, (cucoughphony) 1, (chacoughphony) 1, (caucauffany) 1, (cacofoni) 1, (cocougheny) 1, (cacqughany) 1, (cacuffin) 1, (kacoffany) 1* **Camouflage** *(camophlage) 1, (camouphlage) 2, (camouphaje) 1, (camoglag) 1, (camophelogue) 1* **Malfeasance** *(malpheasance) 3, (malphesence) 2, (malphesance) 2, (malpheseance) 1, (malphescence) 1, (malphisence) 1, (malphescence) 1, (malphesents) 1, (mulphisonce) 1, (malphiveous) 1, (malthesis) 1* **Vicissitude** *(phisithitude) 1* Total number of errors in cell = 33	*(WRAT Spelling Task)* **Brief** *(breff) 1* **Cacophony** *(kcofeny) 1* **Camouflage** *(camophlage) 1* **Malfeasance** *(malphecence) 1* Total number of errors in cell = 4	**TOTAL NATIVE ENGLISH SPEAKERS:** **37**
TOTAL GOOD READERS: 60	**TOTAL POOR READERS: 9**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 43.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing m and n Sounds

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Pusillanimous** *(pisselaminous) 1, (pusillaminous) 1, (pusillaminous) 2* Total number of errors in cell = 4	*(WRAT Spelling Task)* No Errors made in this category by this subgroup Total number of errors in cell = 0	**TOTAL BILINGUAL SPEAKERS:** **4**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Pusillanimous** *(pucilamenous) 1, (pusilaminous) 1, (pucelaminous) 1, (pusilamemous) 1* Total number of errors in cell = 4	*(WRAT Spelling Task)* **Him** *(hen) 1* **Recognize** *(recomise) 1* Total number of errors in cell =2	**TOTAL NATIVE ENGLISH SPEAKERS:** **6**
TOTAL GOOD READERS: 8	**TOTAL POOR READERS: 2**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 44.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing Double Consonants (e.g. the double /s/ in "vicissitude")

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Success** *(sucsess) 1* **Belligerent** *(beligerent) 8, (Beligerant) 3, (biligerent) 3, (biligerant) 2, (beligirent) 1, (beligrent) 1* **Possession** *(posession) 5, (posision) 1, (possesion) 3, (poseision) 1* **Pusillanimous** *(pucilanimous) 1, (pucilanemis) 1, (pucilanimace) 2, (puscilanimous) 1, (pisselaminous) 1, (posilanimus) 1, (pusilanimous) 6, (pusilanimos) 2, (pusalimouse) 1, (pussilanimus) 1, (pocelanamous) 1, (pusselanimous) 1, (personalamous) 1, (posilanimous) 1, (pusilanous) 1* Total number of errors in cell = 73	*(WRAT Spelling Task)* **Correct** *(courect) 1, (corect) 3, (coorect) 1* **Success** *(succese) 1, (succese) 1, (sacsace) 1, (scess) 1, (sucksess) 1* **Opportunity** *(aporchonity) 1* **Belligerent** *(beleagurant) 1, (beligerent) 2, (blegerent) 1, (deligerent) 1, (belijerent) 1* **Possession** *(possesion) 4, (posession) 2* **Pusillanimous** *(pucilanimace) 1, (pusilanimous) 1, (plusilanmous) 1*; **Vicissitude** *(vissisitude) 2* Total number of errors in cell = 28 **Vicissitude** *(visisitude) 1, (vissicitude) 3, (vissisitude) 1, (vissicitute) 1, (vicicitude) 4, (viciccitude) 2, (visicitude) 1, (vasisutude) 1, (vicicitude) 1, (vicisitute) 2, (vicisitude) 2, (vecesitude) 1, (varscitude) 1, (feccicitute) 1*	**TOTAL BILINGUAL SPEAKERS:** **101**
English speaking Good Readers (n=39)	**English speaking Poor Readers (n=18)**	
(WRAT Spelling Task) **Success** *(success) 2, (sucsess) 1* **Opportunity** *(oportunity) 1* **Belligerent** *(beligerant) 12, (beligerent) 9, (buligerent) 1, (beligert) 1, (biligerent) 2* **Possession** *(posession) 2, (possesion) 5, (possesion) 1, (posession) 2, (posesien) 1* **Pusillanimous** *(pucilamenous) 1, (pucilanamous) 1, (pucilanemous) 1, (pusilaminous) 1, (pussilanimous) 2, (pusilanimous) 3, (puscilanimous) 2, (pucilanimous) 2, (pucelaminous) 1, (pusilanimous) 1, (pusolanimous) 1, (puscelanemous) 1, (pewsilanemous) 1, (piusolanomous) 1, (posilanimous) 1, (pusilanaimous) 1, (pusilamemous) 1, (piersolanamous) 1* Total number of errors in cell = 68	*(WRAT Spelling Task)* **Correct** *(corect) 1, (corocet) 1* **Success** *(suces) 1, (sucksess) 1,(succsess) 2, (sekess) 1* **Opportunity** *(oportunity) 1* **Belligerent** *(belijerant) 1, (beligerant) 1, (beligerent) 2, (belidgerent) 1, (beliegerante) 1, (beligment) 1, (belidunce) 1* **Possession** *(posesion) 1, (posession) 2, (posseion) 1* **Vicissitude** *(vicsisitude) 1* Total number of errors in cell = 21 **Vicissitude** *(visisitude) 6, (visicitude) 1, (viscitude) 2, (viscisitude) 3, (viscicitude) 1, (vicisitude) 1, (visisitude) 1, (visicitude) 1, (vissiccitude) 1, (vicicitude) 4, (vessisitude) 1, (vicciccitude) 1, (viscitoude) 1, (visicitod) 1, (phisithitude) 1*	**TOTAL NATIVE ENGLISH SPEAKERS:** **89**
TOTAL GOOD READERS: 141	**TOTAL POOR READERS: 49**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 45.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing Vowel a

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Anxiety** *(enxiety) 1* **Charlatan** *(charlatine) 1, (charlatton) 1, (charlotten) 1, (sharleton) 1, (charlottown) 1, (charlottown) 1* **Medieval** *(midevil) 2, (medievil) 1, (medivel) 1* **Camouflage** *(comoflash) 1, (camaflouge) 2, (camoflauge) 2, (camaflauge) 1, (chamophloge) 1, (camofloge) 1, (camoflauge) 1, (kemophlaj) 1* **Malfeasance** *(malfizence) 1, (malfezence) 1, (mulphisants) 1, (mouphesis) 1, (malfasence) 2, (malfesence) 1, (malphisence) 1, (malphasence) 1* Total number of errors in cell = 30	*(WRAT Spelling Task)* **And** *(end) 2*; **Material** *(motereeal) 1, (mitereale) 1* **Character** *(chrector) 1* **Anxiety** *(enxiety) 2, (enziaty) 1, (ensiety) 1* **Medieval** *(medivel) 1* **Charlatan** *(charlaton) 2, (charlatown) 1, (sharlatown) 1* **Cacophony** *(kecoffany) 1* **Camouflage** *(camofeloge) 1* Total number of errors in cell = 16	**TOTAL BILINGUAL SPEAKERS:** **46**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Charlatan** *(charlotten) 2, (charletan) 1, (charletton) 1, (charlaton) 2, (charleton) 3, (charlotan) 1, (charlotten) 2, (charlotton) 1, (charletton)1, (charlotteton) 2, (charlottan) 1, (charlatten) 1, (charlottane) 1, (sharlutan) 1, (sharlitan) 1* **Medieval** *(medievil) 1, (medevial) 1* **Cacophony** *(cocoffiny) 1, (cocopheny) 1, (cucoughphony) 1, (caucophony) 3, (caucauffany) 1, (cocophony) 1, (cocougheny) 1* Total number of errors in cell = 32	*(WRAT Spelling Task)* **And** *(end) 2* **Character** *(carrictar) 1* **Anxiety** *(ensisdy) 1* **Charlatan** *(charlaton) 1, (charlitan) 1, (charleton) 2, (charaloton) 1, (chaloton) 1* **Medieval** *(medievol) 1, (medivial) 1, (medevil) 1* **Camouflage** (*camaflauge) 1, (camafouge) 1, (camoflauge) 1* Total number of errors in cell = 16	**TOTAL NATIVE ENGLISH SPEAKERS:** **48**
TOTAL GOOD READERS: 62	**TOTAL POOR READERS: 32**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 46.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing Vowel e

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Decision** *(dissicion) 1, (disiton) 1* **Belligerent** *(belligerant) 2, (billigerent) 3, (Beligerant) 4, (biligerent) 4, (biligerant) 3* **Medieval** *(midival) 1, (midevil) 2* Total number of errors in cell = 21	*(WRAT Spelling Task)* **Enter** *(inter) 3* **Belief** *(bilife) 1* **Character** *(caractor) 3, (chrector) 1* **Executive** *(exacative) 2, (exacetive) 1, (exacutive) 1, (exaqutive) 1* **Decision** *(dicesion) 1* **Enthusiasm** *(infosiasim) 2, (intoziasm) 1, (intosiasim) 1* **Medieval** *(midival) 1* Total number of errors in cell = 19	**TOTAL BILINGUAL SPEAKERS:** **40**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Belligerent** *(belligerant) 3, (beligerant) 13, (buligerent) 1, (belligeran) 1, (biligerent) 2* Total number of errors in cell = 20	*(WRAT Spelling Task)* **Material** *(matareal) 1, (matierial) 1, (matiaral) 1* **Character** *(caractor) 1, (carrictar) 1, (caricature) 1* **Decision** *(dissision) 1, (diccission) 1, (dision) 1* **Belligerent** *(belijerant) 1, (beligerant) 1, (beliegerante) 1, (billigerent) 1* Total number of errors in cell = 13	**TOTAL NATIVE ENGLISH SPEAKERS:** **33**
TOTAL GOOD READERS: 41	**TOTAL POOR READERS: 32**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 47.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing Vowel o

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Reasonable** *(reasenable) 1* **Opportunity** *(oppurtunity) 5, (oppartunity) 1* **Cacophony** *(cacoughphony) 1* Total number of errors in cell = 8	*(WRAT Spelling Task)* **Correct** *(courect) 1, (coorect) 3* **Reasonable** *(reazanabal) 1, (reasenable) 1* **Opportunity** *(upportionaty) 2, (aporchonity) 1, (upportonity) 2, (uppertunity) 1, (opputunity) 1* **Cacophony** *(kecoffany) 1* Total number of errors in cell = 14	**TOTAL BILINGUAL SPEAKERS:** **22**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Opportunity** *(oppurtunity) 2, (oppurtunity) 1* **Cacophony** *(cocoffiny) 1, (cocopheny) 1, (cacoffeny) 1, (cacaufany) 1, (cucoughphony) 1, (chacoughphony) 1, (caucauffany) 1, (cacophany) 1, (cacopheny) 1, (cocougheny) 1, (cacqughany) 1, (cacuffin) 1, (kacoffany) 1* Total number of errors in cell = 16	*(WRAT Spelling Task)* **Reasonable** *(rezion) 1, (reasable) 2* **Recognize** *(reckagnize) 1, (recanize) 1* **Opportunity** *(oppurtunity) 2* **Cacophony** *(cachophany) 1, (kackaphony) 1* Total number of errors in cell = 10	**TOTAL NATIVE ENGLISH SPEAKERS:** **26**
TOTAL GOOD READERS: 24	**TOTAL POOR READERS: 24**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 48.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing Vowel u

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Executive** *(execative) 1* **Lucidity** *(loocidity) 1* **Pusillanimous** *(pisselaminous) 1, (posilanimus) 1, (posillamous) 1, (pocelanamous) 1, (personalamous) 1, (posilanimous) 1* Total number of errors in cell = 8	*(WRAT Spelling Task)* **Surprise** *(sourprise) 1* **Success** *(sacsace) 1* **Opportunity** *(upportionaty) 1, (aporchonity) 1, (upportonity) 1, (opportionity) 1* **Lucidity** *(lousidity) 1, (locidity) 1, (loosidity) 1, (lositity) 1, (lossidety) 1* **Enthusiasm** *(infosiasim) 1, (intoziasim) 1, (intosiasim) 1* Total number of errors in cell = 14	**TOTAL BILINGUAL SPEAKERS:** **22**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Lucidity** *(loosidity) 2* **Pusillanimous** *(pewsilanemous) 1, (piusolanomous) 1, (posilanimous) 1, (potsiphlneous) 1, (piersolanamous) 1, (puesillanimous) 2* **Vicissitude** *(viscitoude) 1, (visicitod) 1* Total number of errors in cell = 11	*(WRAT Spelling Task)* **Success** *(seccess) 1, (sekess) 1* **Lucidity** *(locidity) 3, (elacity) 1, (loocidity) 2, (likelily) 1* **Enthusiasm** *(inthousism) 1* Total number of errors in cell = 10	**TOTAL NATIVE ENGLISH SPEAKERS:** **21**
TOTAL GOOD READERS: 19	**TOTAL POOR READERS: 24**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 49.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing Vowel i

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Quantity** *(kwantety) 1* **Pusillanimous** *(pucilanemis) 1, (pucellanimous) 2, (pisselaminous) 1, (pocelanamous) 1, (pusselanimous) 1* **Vicissitude** *(vasisutude) 1, (vecesitude) 1, (varscitude) 1, (fecicitute) 1* Total number of errors in cell = 11	*(WRAT Spelling Task)* **Him** *(hem) 1* **Circle** *(Sercole) 1, (sercel) 1* **Quantity** *(counteity) 1* **Decision** *(dicesion) 1, (decesion) 1, (deceeshen) 1* **Opportunity** *(upportionaty) 2* **Lucidity** *(lossidety) 1* **Belligerent** *(beleagurant) 1* Total number of errors in cell = 11	**TOTAL BILINGUAL SPEAKERS:** **22**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Decision** *(deciotion) 1* **Belligerent** *(bellegerent) 1* **Pusillanimous** *(pucelaminous) 1, (pusolanimous) 1, (puscellanomous) 2, (puscelanemous) 1, (piusolanomous) 1* **Vicissitude** *(vassissitude) 1* Total number of errors in cell = 9	*(WRAT Spelling Task)* **Him** *(hen) 2, (hem) 1* **Advice** *(advase) 3* **Surprize** *(surpriese) 2* **Quantity** *(quantaty) 2* **Belligerent** *(beliegerante) 1* **Pusillanimous** *(piersolanamous) 1* Total number of errors in cell = 12	**TOTAL NATIVE ENGLISH SPEAKERS:** **21**
TOTAL GOOD READERS: 20	**TOTAL POOR READERS: 23**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 50.

Number of Spelling Errors made by Bilingual and Native English Speakers with Words Containing Double Vowels (e.g. "ie" in "Believe")

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Reach** *(rich) 1;* **Ruin** *(Rauene) 1, (rouin) 1, (rowing) 2, (roin) 1;* **Believe** *(belive) 1* **Quantity** *(kwantety) 1, (quntity) 1* **Conscience** *(concions) 1,(comscions) 1,(concious) 1;* **Medieval** *(midival) 1, (midevil) 2, (medival) 5, (medivel) 1, (medeval) 1, (medeival) 1;* **Camouflage** *(comoflash) 1, (camoflash) 1, (camaflouge) 2, (camoflauge) 2, (camaflauge) 1, (camaflage) 2, (chamophloge) 1, (camophlage)2, (camoflage) 3, (camofloge) 1, (camoflauge) 1, (kemophlaj) 1* **Acquiesce** *(aquiz) 2, (aquizz) 1, (acauize) 1, (accuise) 1, (acquize) 3, (aquize) 1, (acquise) 1, (acousce) 1, (acquesce) 1, (acquias) 1, (acquisc) 1, (acquese) 2, (aquisec) 1, (accrious) 1;* **Pusillanimous** *(pucilanemis) 1, (pucilanimace) 2, (posilanimus) 1, (pusilanimos) 2, (pussilanimus) 1* **Malfeasance** *(mallfisans) 1, (malfisans) 1, (malfisants) 1, (malfiesance) 1, (mallphozanse) 1, (malfizence) 1, (malfizance) 1, (malfezence) 1, (mulphisants) 1, (malfasence) 2, (malfesance) 2, (malfesence) 1, (malphisence) 1, (malphasence)1* Total number of errors in cell = 75	*(WRAT Spelling Task)* **Cook** *(coke) 3;* **Reach** *(reech) 2, (rich) 2* **Explain** *(xeplayn) 1, (explane) 2, (explayn) 1, (explan) 1, (expline) 1, (esplane) 1* **Ruin** *(rowin) 1, (rowen) 2, (rouen) 1, (roven) 1, (rain) 1, (rwon) 1, (roon) 1* **Material** *(mataleal), (motereeal) 1, (mitereale) 1, (materil) 1;* **Belief** *(bilife) 1, (belive) 3, (belive) 1, (breaf) 1, (bleive) 1* **Brief** *(breef) 2, (brife) 1, (breaf) 1* **Reasonable** *(risoneball) 1;* **Quantity** *(counteity) 1, (coantitee) 1, (qoantity) 1, (kantiti) 1;* **Decision** *(deceeshen) 1, (dessisen) 1;* **Anxiety** *(angzaety) 1, (angziety) 1, (enziaty) 1;* **Enthusiasm** *(enthusasm) 1* **Conscience** *(concious) 3, (contionse) 2, (concince) 1* ; **Medieval** *(midival) 1, (mediavale) 2, (medivel) 1, (medival) 1* **Camouflage** *(camoflash) 1, (camofeloge) 1* **Acquiesce** *(accuise) 1, (accuize) 1* **Pusillanimous** *(pucilanimace) 1* **Malfeasance** *(mallphizanse) 1, (malphizains) 1* Total number of errors in cell = 66	**TOTAL BILINGUAL SPEAKERS:** **141**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Explain** *(explian) 1;* **Brief** *(breif) 1, (brife) 1* **Conscience** *(conceincee) 1, (consceinse) 1* **Possession** (posesien) 1; **Medieval** (medival) 5, (medeval) 1, (mediaeval) 1, (medevial) 1, (medeival) 1, (meideval) 1; **Camouflage** *(camoflage) 2, (camophlage) 1, (camoflag) 1, (camoflage) 2, (camoflauge) 3, (camoflague) 1, (camaflage) 1, (camuflage) 1, (camoflouge) 1; (camoglag) 1, (camaflauch) 1, (camophelogue) 1;* **Acquiesce** *(acqueous) 1, (acquisce) 1, (aqueous) 1, (aquious) 1, (accuisce) 1,* **Malfeasance** (malphesence) 2, (malphesance) 2, (malpheseance) 1, (malphescence) 1, (malphisence) 3, (malfesence) 2, (malfesants) 3, (malfesance) 2, (malfeseance) 2, (malfezence) 2, (malfeesence) 1, (malfeesance) 1, (malphescence) 1, (malfiesance) 2 Total number of errors in cell = 55	*(WRAT Spelling Task)* **Explain** *(esplin) 1, (explane) 3, (explan) 1* **Ruin** *(wrone) 1, (roowin) 1, (roune) 1* **Material** *(matareal) 1, (matterol) 1, (materio) 1, (matiaral) 1* **Believe** *(beleave) 1, (beeth) 1, (belive) 2* **Brief** *(brif) 1, (breif) 2, (breef) 1, (breff) 1* **Reasonable** *(resonable) 1, (rezion) 1, (resoble) 1;* **Quantity** *(qonetic) 1, (eanati) 1, (conqti) 1* **Anxiety** *(ensisdy) 1, (anixty) 1* **Enthusiasm** *(enthusansim) 1, (inthousism) 1, (enthusaium) 1;* **Medieval** *(medivial) 1, (medival) 2, (medevil) 1;* **Camouflage** *(camophlage) 1, (camoflage) 1, (camaflauge) 1, (camafouge) 1, (camoflauge) 1* **Acquiesce** *(aquius) 1;* **Malfeasance** *(malphecence) 1* Total number of errors in cell = 43	**TOTAL NATIVE ENGLISH SPEAKERS:** **98**
TOTAL GOOD READERS: 130	**TOTAL POOR READERS: 109**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 51.

Bilingual and Native English Speaking' Spelling Errors of Writing a Different Word Instead of the Dictated Word

Bilingual Good Readers (n=44)	Bilingual Poor Readers (n=16)	
(WRAT Spelling Task) **Ruin** *(ruined) 1* Total number of errors in cell = 1	*(WRAT Spelling Task)* Total number of errors in cell = 0	**TOTAL BILINGUAL SPEAKERS:** **1**
English speaking Good Readers (n=39)	English speaking Poor Readers (n=18)	
(WRAT Spelling Task) **Ruin** *(rowing) 2* Total number of errors in cell = 2	*(WRAT Spelling Task)* **Enter** *(answer) 1* **Light** *(white) 1* **Character** *(caricature) 1* **Decision** *(disown) 1* **Possession** *(position) 1* Total number of errors in cell = 5	**TOTAL NATIVE ENGLISH SPEAKERS:** 7
TOTAL GOOD READERS: 3	**TOTAL POOR READERS: 5**	

Note: Numbers beside each word signify number of cases with the particular error.

Table 52.

Spelling Errors: Average Percentage of Error Scores and Mann-Whitney U Tests

Farsi Bilingual and Native English Speaking participants (n = 117)

	Average Percentage of Errors (%)		
Type of Spelling Error	**Bilinguals**	**Native English Speakers**	**Mann–Whitney U Statistic**
s, z, soft c sounds Total number of Items: 15	20% Range: 0% - 43%	20% Range: 0% - 40%	1357.00
ph, f, v sounds Total number of Items: 8	11% Range: 0% - 33%	12% Range: 0% - 25%	1370.00
Words with double consonants Total number of Items: 7	43% Range: 0% - 100%	40% Range: 0% - 100%	1480.50
Sounds of letter "a" Total number of Items: 12	14% Range: 0% - 44%	13% Range: 0% - 25%	1248.50
Sounds of letter "e" Total number of Items: 17	7% Range: 0% - 60%	7% Range: 0% - 40%	1184.00
Words with double vowels Total number of Items: 18	24% Range: 0% - 80%	19% Range: 0% - 67%	1424.50

The Mann-Whitney U Statistic was not statistically significant at $p < 0.05$.

Table 53.

Means and Standard Deviations of Bilingual Farsi Speakers and Native English Speakers on Phonologically Correct Spelling Errors with Respect to Reading Ability

English Reading Ability		Language Category: Bilingual	Monolingual
	Good	X = .68 (.30) (n = 44)	X = .53 (.27) (n = 39)
	Poor	X = .41 (.27) (n = 16)	X = .36 (.20) (n = 18)

Table 54.

Regression of Cognitive Processes, Language experience and Education Level in Canada on Phonologically Correct Misspellings

Farsi Bilingual participants (n = 60)

Model Summary

Model	R	R Square	R Square Change	F Change	Durbin-Watson
1	.393	.154	.154	1.492	
2	.539	.291	.136	2.942*	
3	.556	.309	.019	1.225	2.068

Model 1: Reading related cognitive processes
Model 2: Reading related cognitive processes, language experience
Model 3: Reading related cognitive processes, language experience, education level in Canada

* Significant at P< .05

Table 55

Relative Pratt Indices for Phonologically Correct Spelling Errors

Farsi Bilingual participants (n = 60)

	READING RELATED COGNITIVE PROCESSES FACTOR							LANGUAGE EXPERIENCE FACTOR				
DV	Oral Cloze Task	Rosner Auditory Analysis	Word Attack Task	Ortho Task	Working Memory Task	Long Term Memory Task	COGNTIVE PROCESSES PROPORTION OF R-SQUARED	Age on Arrival	Length Of Resid	Farsi Reading Exper	LANGUAGE EFFECTS PROPORTION OF R-SQUARED	ELC
PCS	.00	.59	.01	.01	.04	.00	.65	.03	.05	.01	.09	.26

Note. PCS = Phonologically Correct Spelling Errors; ELC = Education Level in Canada.

Table 56.

Percentage Scores of Farsi Speakers on Farsi Cognitive Tasks With Respect to Farsi Reading Ability (Classified by Farsi Word Identification Task)

	Good Farsi Readers (n = 30)	**Poor Farsi Readers (n = 30)**
Farsi Word Identification (Percentage scores)	Mean = 93.27 SD = 5.58	Mean = 58.99 SD = 10.02
Farsi Oral Cloze (Percentage scores)	Mean = 84.67 SD = 9.98	Mean = 72.16 SD = 10.23
Farsi Auditory Analysis (Percentage scores)	Mean = 93.58 SD = 5.16	Mean = 86.67 SD = 4.80
Farsi Psuedoword (Percentage scores)	Mean = 84.37 SD = 8.74	Mean = 77.41 SD = 8.07
Farsi Orthographic Awareness (Percentage scores)	Mean = 80.59 SD = 9.79	Mean = 59.22 SD = 9.51
Farsi Working Memory (Percentage scores)	Mean = 70.00 SD = 11.85	Mean = 45.16 SD = 12.61
Farsi Long Term Memory (Percentage scores)	Mean = 60.00 SD = 12.61	Mean = 61.71 SD = 11.02

Table 57.

Scores of Bilingual Farsi Speakers on English and Farsi Cognitive Tasks With Respect to Farsi Reading Ability (Classified by Farsi Word Identification Task)

English Tasks	**Good Farsi Reading Bilingual Speakers (n = 30)**	**Poor Farsi Reading Bilingual Speakers (n = 30)**	**Farsi Tasks**	**Good Farsi Reading Bilingual Speakers (n = 30)**	**Poor Farsi Reading Bilingual Speakers (n = 30)**
WRAT Reading (Standard Scores)	Mean = 86.53 SD = 20.92	Mean = 104.76 SD = 9.44	—	—	—
Woodcock Word Identification (Standard Scores)	Mean = 84.37 SD = 26.19	Mean = 106.50 SD = 14.54	Farsi Word Identification (percentage scores)	Mean = 93.27 SD = 5.58	Mean = 58.99 SD = 10.02
Oral Cloze (percentage scores)	Mean = 82.83 SD = 14.77	Mean = 73.33 SD = 11.17	Farsi Oral Cloze (percentage scores)	Mean = 84.67 SD = 9.98	Mean = 72.16 SD = 10.23
Rosner Auditory Analysis (percentage scores)	Mean = 94.83 SD = 5.08	Mean = 92.58 SD = 5.59	Farsi Auditory Analysis (percentage scores)	Mean = 93.58 SD = 5.16	Mean = 86.67 SD = 4.80
Word Attack (standard scores)	Mean = 110.23 SD = 14.19	Mean = 107.63 SD = 8.72	Farsi Psuedoword (percentage scores)	Mean = 84.37 SD = 8.74	Mean = 77.41 SD = 8.07
Orthographic Awareness (percentage scores)	Mean = 83.53 SD = 10.29	Mean = 67.53 SD = 10.10	Farsi Orthographic Awareness (percentage scores)	Mean = 80.59 SD = 9.79	Mean = 59.22 SD = 9.51
Working Memory (percentage scores)	Mean = 57.78 SD = 12.63	Mean = 47.05 SD = 13.05	Farsi Working Memory (percentage scores)	Mean = 70.00 SD = 11.85	Mean = 45.16 SD = 12.61
Long Term Memory (percentage scores)	Mean = 68.33 SD = 11.78	Mean = 69.33 SD = 12.80	Farsi Long Term Memory (percentage scores)	Mean = 60.00 SD = 12.61	Mean = 61.71 SD = 11.02

Table 58

Correlations Between Farsi and English Word Reading and Related Cognitive Processing Tasks

Farsi Bilingual participants (n = 60)

	Farsi Word Identification Task	Oral Cloze Task	Rosner Auditory Analysis Task	Woodcock Word Attack Task	Orthographic Task	Working Memory Task	Long Term Memory Task
Woodcock Word Identification	-.235	.333**	.425**	.553**	.024	.505**	.295
WRAT Reading Task	-.282	.417**	.463**	.620**	.104	.528**	.279
Farsi Oral Cloze Task	.635**	.694**	.416**	.431**	.362**	.355**	.216
Farsi Auditory Analysis Task	.677**	.451**	.807**	.454**	.416**	.120	.165
Farsi Pseudoword Task	.667**	.558**	.579**	.813**	.368**	.222	.213
Farsi Orthographic Task	.564**	.451**	.311*	.271*	.790**	-.041	.279
Farsi Working Memory Task	.472**	.341**	.403**	.372**	.160**	.855**	.397**
Farsi Long Term Memory Task	.332	.437**	.377**	.122	.411	.355**	.817**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 59

Partial Correlations Between Farsi and English Reading and Related Cognitive Processing Tasks
(Controlling for age on arrival, length of residence, Farsi reading experience in Canada)

Farsi Bilingual participants (n = 60)

	Farsi Word Identification Task	Oral Cloze Task	Rosner Auditory Analysis Task	Woodcock Word Attack Task	Orthographic Task	Working Memory Task	Long Term Memory Task
Woodcock Word Identification	.207	.364*	.438**	.616**	.018	.478*	.228
WRAT Reading Task	.196	.461*	.434**	.605**	.215	.351*	.253
Farsi Oral Cloze Task	.575**	.660**	.438**	.400**	.379*	.522**	.295
Farsi Auditory Analysis Task	.702**	.405**	.838**	.476**	.380**	.259*	.125
Farsi Pseudoword Task	.639**	.532**	.575**	.846**	.336**	.294*	.1761
Farsi Orthographic Task	.535**	.388**	.380**	.267**	.811**	.195	.351
Farsi Working Memory Task	.452**	.385**	.409**	.408**	.179**	.837**	.382**
Farsi Long Term Memory Task	.331	.405**	.324**	.095	.392	.397**	.806**

** Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Table 60

Correlations Between Word Reading and Reading Related Tasks (Native English Speakers and Bilinguals)

Native English speakers (n = 57) scores recorded above highlighted diagonal

Bilingual Farsi speakers (n=60) scores recorded below highlighted diagonal

	Woodcock Word Identification	WRAT Reading Task	Oral Cloze Task	Rosner Auditory Analysis Task	Woodcock Word Attack Task	Orthographic Task	Working Memory Task	Long Term Memory Task
Woodcock Word Identification		.884**	.715*	.556**	.782**	.367*	.636**	.235
WRAT Reading Task	.886**		.698**	.632**	.757**	.354*	.709**	.353
Oral Cloze Task	.333*	.417**		.613**	.601**	.405**	.485**	.071
Rosner Auditory Analysis Task	.425**	.463**	.303**		.624**	.263*	.538**	.215
Woodcock Word Attack Task	.553**	.620**	.507**	.525**		.292*	.618**	.109
Orthographic Task	.024	.104	.405**	.280*	.252		.049	-.096
Working Memory Task	.505**	.528**	.269*	.304*	.302*	.049		.293*
Long Term Memory Task	.295	.279	.351*	.205	.143	.292*	.340**	

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Figure 1.

Histogram distribution of scores for Farsi Word Identification Task