

The Role of Phonology, Morphology and Dialect in Reading Arabic among Hearing and Deaf Children

Hashemiah AlMusawi

Supervisor: Prof. Terezinha Nunes

Thesis submitted for the degree of Doctor of Philosophy

Lady Margaret Hall

2014

Dedication

I dedicate this humble effort to my dearest of all, the prophet Muhammad and his blessed family (peace be upon them). It is owing to their ultimate sacrifice that I am able to have conviction. With my faith in their generosity, I present this endeavour, hoping it merits the honour of their approval. I can only hope that my work will enhance the learning route of Arabic, the language of the Holy Quran.

Acknowledgment

This thesis is a result of years of interaction with, and support from, a great number of people. Hence, it is regretfully impossible to acknowledge all those who have contributed and likewise, it is impossible to express enough gratitude to those whom I can acknowledge.

I am immensely thankful to Professor Terezinha Nunes for taking me on as a student under her supervision, and offering continuous guidance and encouragement. Without her invaluable experience and insight, this work would not have been possible. My sincerest gratitude goes to the Senior Graduate Studies Administrator at the University, Mrs. Mary Smith. Her continuous care and efforts made many aspects of my time in Oxford easy and pleasant.

I wish to thank the institutions that have allowed me this opportunity, particularly, the University of Oxford, where the privilege of studying has been exhilarating, very rewarding and fulfilling, together with the Kuwaiti sponsoring authorities who were always responsive and supportive. I also truly appreciate the vital participation of all pupils, Headteachers and school Psychologists who have willingly and patiently gave me their time.

Finally, I am most deeply indebted to my patient, loving family. It is due to their unconditional support and prayers that I was able to face challenges and overcome hardships not only during this time, but throughout my entire life. With all my heart I thank my parents, husband, children, siblings, relatives and friends. Thank you for being there for me at all times.

Abstract

Phonological and morphological awareness are shown to be predictors of hearing and deaf children's literacy achievements in various languages, and Arabic is assumed to be no different. However, this might not be the case for two reasons. Firstly, the linguistic context of the Arab world is characterised by diglossia, i.e. the use of two different varieties of the same language in different settings. Hearing and orally educated deaf children will therefore encounter the vernacular variety of Arabic outside school, but are introduced to literacy in the more prestigious variety of Standard Arabic during instruction in school. Secondly, Arabic orthography has two forms: a fully vowelised script, which is typically taught in the first two years of school, and a non-vowelised script, which is the form of the written language widely used in society.

This study specifically aims to investigate whether phonological and morphological awareness are independent predictors of the emergent literacy achievement of hearing and orally educated deaf Kuwaiti children. This is in addition to the question of whether children's awareness of the two language forms, i.e. their dialect awareness, contributes to their literacy achievement and to their levels of phonological and morphological awareness. This investigation was carried out longitudinally through a number of phonological, morphological and dialect awareness measures utilised as predictors of literacy outcome skills of word reading, word spelling, pseudo-word decoding and reading comprehension. Variances of age and general cognitive ability were controlled for throughout all the analyses undertaken.

The results for the first target group of hearing children (N = 78, aged 6; 2 years) indicated a significant superiority of phonological awareness as the predominant predictor of all literacy skills across grade levels one and two. Morphological awareness was a predictor of first-graders' spelling ability, and was subsequently implemented to predict all the literacy skills of second-graders. Dialect awareness was a predictor of the word reading and reading comprehension ability only for second-graders, and its mediational effect was revealed when it was seen to significantly reduce the effect of phonological and morphological awareness on second-graders' reading skills after being examined as a control measure. The results for the second target group of orally educated deaf children (N = 34, aged 7; 6 years) indicated that phonological, morphological and dialect awareness were varyingly significant independent predictors of the subjects' literacy skills. A mediational effect of dialect awareness on the predictive link between morphological awareness and word spelling outcome was also evident.

Although the prediction association between literacy predictor and outcome measures was mostly consistent and similar across both groups, exceptions in the predictive pattern revealed that the deaf children were at a disadvantage in developing language awareness skills that facilitate efficient mapping of speech into the written form. These findings are discussed in terms of language-general and language-specific properties.

The outcomes offered by the current study cannot imply a cause-and-effect association, but allow for constructive identification of literacy predictors and assist in clarifying possible implications for children's literacy capabilities. As the strengths and needs of the examined groups have been clearly recognised, future investigations of causal and mediational analyses will validate the current findings about the Arabic diglossic phenomenon, and additionally specify an appropriate response in terms of practical educational plans.

Table of Contents

Chapter 1. Introduction **6**
1.1 An Overview of Deafness and Hearing Loss **8**
1.2 The Role of Oral Language in Literacy Development **9**
1.3 Predictors of Arabic Literacy Achievements **12**
1.4 Implications for Arabic Literacy Learning **14**
1.4.1 The Arabic Diglossic Context 15
1.4.2 Arabic Script and Orthography 17
1.5 The Present Study **21**
1.6 Organisation of the Study **24**

Chapter 2. Literature Review **27**
2.1 An Overview of the Arabic Language **28**
2.1.1 Arabic Diglossia 28
2.1.2 Arabic Script and Orthography 34
2.2 Language Predictors of Arabic literacy **37**
2.2.1 Phonological Awareness and Arabic Literacy 38
2.2.2 Morphological Awareness and Arabic Literacy 60
2.2.3 Dialect Awareness and Arabic Literacy 79
2.2.4 Summary and Conclusion 88

Chapter 3. Methods **93**
3.1 Methodological Issues **93**
3.2 Research Design **94**
3.3 Research Hypotheses **96**
3.4 Recruitment and Sampling **96**
3.5 Participants **99**
3.5.1 Hearing participants 99
3.5.2 Deaf participants 99
3.6 Procedures **101**
3.7 Measures **103**
3.7.1 Measures of Cognitive Ability 103
3.7.2 Measures of Literacy Predictors 107
3.7.3 Measures of Literacy Outcomes 122
3.8 Summary and Conclusion **130**

Chapter 4. Results **132**
4.1 Analysing Issues and Strategies **133**
4.2 Results for the Hearing Participants **135**
4.2.1 Preliminary Descriptive Analysis 136
4.2.2 Data Screening 143
4.2.3 Construct Validity 145
4.2.4 Main Analysis for the Hearing Participants 150
4.2.5 Summary of the Main Analysis 174
4.3 Results for the Deaf Participants **175**
4.3.1 Preliminary Descriptive Analysis 175
4.3.2 Main Analysis for the Deaf Participants 180
4.3.3 Summary of the Main Analysis 192
4.4 Summary of Results **194**

Chapter 5. Discussion **196**
5.1 The Predictive Role of Phonological Awareness in Literacy Development **197**
5.2 The Predictive Role of Morphological Awareness in Literacy Development **202**
5.3 The Predictive Role of Dialect Awareness in Literacy Development **211**
5.4 Concluding Remarks **216**
5.5 Significance **217**
5.6 Limitations **219**
5.7 Recommendations **220**
References **224**
Appendixes **248**

List of Tables

Table 3.1 - Measures of Literacy Predictors (Phase 1)……..106
Table 3.2 - Measures of Literacy Outcomes (Phases 2 and 3) ……123
Table 4.1- Cronbach's α, Means, Standard Deviations, Maximum, Skewness, and Kurtosis of the Predictor Measures 139
Table 4.2 - Cronbach's α, Means, Standard Deviations, Maximum, Skewness, and Kurtosis of the First Graders' and Second Graders' Outcome Measures 140
Table 4.3 - Inter-correlations between Phonological Awareness Tasks following Winsorisation..... 145
Table 4.4 - Communalities of the Phonological Factor Analysis 146
Table 4.5 - Total Variance Explained by Phonological Factor Analysis 147
Table 4.6 - Component Matrix of Phonological Factor Analysis 147
Table 4.7 - Total Variance Explained by the Dialect Factor Analysis 148
Table 4.8 - Communalities of the Dialect Factor Analysis 148
Table 4.9 - Correlations Between the Literacy Predictor and Outcome Measures in First- and Second-grade Hearing Children following Winsorisation and Factor Analyses 151
Table 4.10 - Predicting Word Reading in First Grade..... 154
Table 4.11 - Predicting Word Reading in Second Grade 155
Table 4.12 - Predicting Word Spelling in the First Grade 156
Table 4.13 - Predicting Word Spelling in the Second Grade 157
Table 4.14 - Predicting Pseudo-word Decoding in the First Grade 158
Table 4.15 - Predicting Pseudo-word Decoding in the Second Grade 159
Table 4.16 - Predicting Reading Comprehension in the First Grade 160
Table 4.17 - Predicting Reading Comprehension in the Second Grade 161
Table 4.18 - Unique Predictions of Word Spelling in the First Grade 163
Table 4.19 - Unique Predictions of Word Reading in the Second Grade 164
Table 4.20 - Unique Predictions of Word Spelling in the Second Grade 165
Table 4.21 - Unique Predictions of Pseudo-word Decoding in the Second Grade 166
Table 4.22 - Unique Predictions of Reading Comprehension in the Second Grade 167
Table 4.23 - Pearson's Correlations between the Phonological and Morphological Predictors, the Dialect Mediator and the Outcome Variables of Second-grade Children 171
Table 4.24 - Means, Standard Deviations, Maximum, Skewness and Kurtosis of the Predictor Measures among Deaf Children 177
Table 4.25 - Means, Standard Deviations, Maximum, Skewness and Kurtosis of the Outcome Measures among Deaf Children 178
Table 4.26 - Means and Standard Deviation Comparisons between the Deaf and the Hearing Children's Scores 179
Table 4.27 - Predicting Word Reading in Deaf Children 181
Table 4.28 - Predicting Word Spelling in Deaf Children 182
Table 4.29 - Predicting Pseudo-word Decoding in Deaf Children 183
Table 4.30 - Predicting Reading Comprehension in Deaf Children 184
Table 4.31 - Unique Prediction of Word Reading in Deaf Children 186
Table 4.32 - Unique Prediction of Word Spelling in Deaf Children 187
Table 4.33 - Unique Prediction of Reading Comprehension in the Deaf Children Grade 188
Table 4.34 - Pearson's Correlations between the Predictors, the Mediator and the Outcome Variables of Deaf Children 190

List of Figures

Figure 3.1 - An Outline of the Study Design....95
Figure 3.2 - Practice item of the Pseudo-word Production Task....113
Figure 3.3 - Test item of the Pseudo-word Production Task....113
Figure 3.4 - Sample Slides from the Dialect Discrimination Task....117
Figure 3.5 - Samples from Sentence Correction Task....120
Figure 3.6 - Sample from Word Choise Task....122
Figure 3.7 - Sample of the Word Reading Task Items....125
Figure 3.8 - Sample from the Pseudo-word Decoding Task....125
Figure 3.9 - Reading Comprehension Task....127
Figure 4.1 - The Scree Plot - Phonological Awareness....147
Figure 4.2 - Unmediated Path between Literacy Predictors and Literacy Outcomes....170
Figure 4.3 - Proposed Mediation Path between Literacy Predictors, Dialect Mediator and Literacy Outcome....170
Figure 4.4 - Established Mediation Model between Phonological Predictor, Dialect Mediator and Word Reading Outcome....173
Figure 4.5 - Established Mediation Model between Morphological Predictor, Dialect Mediator and Word Spelling Outcome for Deaf Children....191

Chapter 1

Introduction

Reading is a language-based skill (Wolf and Vellutino, 1993) which is greatly reliant on the individual's language progress from the earliest years throughout their lifetime (Alexander, 2005). It is a complex and multifaceted process in which the language components such as phonology, morphology and syntax, together with the sociocultural characteristics of readers, coordinate simultaneously. The complication of the reading process is even greater when constraints are imposed by a weak capability for natural language acquisition (e.g. due to deafness), or by a social compartmentalisation of language varieties (e.g. diglossia).

The aim of this project is to investigate the predictors of deaf children's achievements in learning to read and spell in Arabic. Deaf children typically exhibit severe literacy difficulties, and are known to fail in developing literacy skills when compared with their hearing peers (e.g. Lane and Baker, 1974; Trybus and Karchmer, 1977; Conrad, 1979; Moog and Geers, 1985; Lewis, 1996). Deaf children's literacy skills in English (Campbell et al., 1992; Marschark and Harris, 1996; Miller, 1997; Harris and Beech, 1998; Harris and Moreno, 2004), French (Leybaert and Alegria, 1995; Leybaert, 2000) and Hebrew (Miller, 1997; Tur-Kaspa and Dromi, 1998; 2001; Friedmann and Szterman, 2006) tend to be notably lacking. It is expected that the development of literacy skills would form a similarly major challenge for deaf children learning to read and spell in Arabic.

In this study, taking into account the sociolinguistic milieu in which Arab children are brought up, Arabic literacy attainments are inspected in two groups of Kuwaiti children: a

typically developing hearing group and an orally educated deaf group. Their reading and spelling skills are examined in relation to the predictive role of three specific language skills: phonological, morphological and dialect awareness. Phonological awareness refers to the ability to intentionally manipulate speech sounds which do not have any syntactic or lexical meanings (Adams, 1990; Stanovich and Siegel, 1994; Ehri et al., 2001; Nunes and Bryant, 2009). Morphological awareness refers to the ability to manipulate oral speech and understand a word's meaning structure (Carlisle, 1995; Nunes and Bryant, 2009). Dialect awareness refers to the individual's conscious perception of language variation within a community of speakers (Donmall, 1985 in Wolfram, 2004). It is further understood as a form of metalinguistic ability in which the language forms can be thought about and proficiently manipulated (Charity et al., 2004). Assessing literacy predictors is a major step towards gaining insight into the literacy development stage, especially for learners who are potentially exposed to reading constraints (Shaalan, 2009; Farran, 2010).

This chapter introduces the conceptual framework for the study and gives a general view of the challenges involved in learning to read Arabic. It commences by presenting a brief outline of deafness and the different types of hearing loss, and considers hearing devices that can restore auditory functions. Next, the role of oral language in literacy learning and deafness constraint are reviewed. The chapter proceeds by analysing the interplay of three components of oral language – phonological, morphological and dialect awareness – as key predictors of literacy skills among hearing and deaf children. Subsequently, the implications of the sociolinguistic constraint in which Arabic literacy acquisition is embedded are reviewed in two ways. Firstly, the diglossic nature of the Arabic setting is presented, showing some aspects of the linguistic distance between the Arabic literary form and the Kuwaiti spoken form. Secondly, aspects of Arabic script and orthography are presented,

illustrating the challenges involved in mapping these language forms. The chapter concludes with a brief statement of the rationale for the study and the hypotheses inspected in the investigation. Finally, a concise outline of the thesis chapters is presented.

1.1 An Overview of Deafness and Hearing Loss

The term 'deaf' covers a vast spectrum of hearing loss that ranges from mild hearing difficulties at one end to profound deafness at the other. When hearing loss occurs due to sound waves being blocked from reaching the inner ear, by ear-wax or fluid for example, the hearing loss is 'conductive' and can be treated by removing the cause of the blockage. 'Sensorineural' hearing loss, however, results from damage to the inner ear (cochlea) or to the nerves that send sound signals to the brain, causing deafness which tends to be long-term. Conductive hearing loss may also result from damage to the inner, outer or middle ear, or to the auditory nerve. Such conductive hearing loss may be combined with sensorineural hearing loss, referred to as 'mixed' hearing loss. Hearing loss can be diminished by the use of a hearing aid, an electronic device placed in the ear which amplifies sound. Cases where a hearing aid is ineffective may benefit from a cochlear implant, where the auditory nerve is connected to a device that converts sound into electrical impulses to stimulate the auditory nerve, which sends the impulses to the brain. In combination with a hearing amplification device, a cochlear device can be implanted, according to the specific type and degree of hearing loss.

The use of conventional hearing aids provides some, or even a major, benefit for children with mild to moderately severe unilateral hearing loss in classroom-oriented situations (Wendorf, 2010). Cochlear implants can provide substantial functional hearing for children who derive no improvement in hearing levels from conventional amplification (NIH, 1995).

There is evidence that hearing aids increase children's awareness of sound (Goldin-Meadow and Mayberry, 2001) and that most deaf children with cochlear implants show significant progress in their speech perception skills (Cheng, Grant, and Niparko, 1999), speech production skills (Tye-Murray et al., 1995) and oral language development (Bollard, Chute, Popp and Parisier, 1999). They become able to communicate, and may be educated in mainstream schools that serve primarily hearing children, or 'inclusion' schools that supplement regular classroom provision to meet their special needs.

Determining the cause and severity of the hearing loss, and whether the residual hearing can be used for linguistic communication, defines the deafness in terms of its audiology. For an educational focus, however, Estee-Wale (2004) suggests defining deafness in a meaningful way that describes how a child functions in a learning context. 'Deaf children', in the scope of this study, are those who are unable to process the linguistic information through their normal hearing sense, and whose educational performance may therefore be adversely affected. To compensate for their deafness, which occurred prelingually but was diagnosed and prescribed for in their early years, they use assistive devices for hearing amplification, or cochlear implants, or both, and are integrated into mainstream or 'inclusion' schools. They are educated by means of a strict oral/aural approach which focuses on their residual hearing and encourages lip-reading skills, to facilitate integration with their hearing peers. 'Hearing children' are those who have typical hearing ability and can comprehend conversational language without any assistive device.

1.2 The Role of Oral Language in Literacy Development

A vast amount of reading research has examined the essential importance of oral language skills for typical hearing children, and stressed the central role of phonological awareness in learning to read (e.g. Bradley and Bryant, 1983; Wagner and Torgesen, 1987; Goswami and

Bryant, 1990; Wagner et al., 1994; Badian, 1998). Related research, however, has revealed that linking phonological awareness to reading cannot completely explain the development of reading ability (Cain and Oakhill, 2004). Particular attention has therefore been given to the role of other oral language components, and specifically morphological awareness (Carlisle, 1988; Nunes et al., 1997a; Fayol et al., 1999; Assink et al., 2000; Mahony et al., 2000; Abu-Rabia, 2001; Ku and Anderson, 2003). Evidence has emerged from different languages demonstrating that notwithstanding the predominant importance of phonology in efficient reading, morphology still plays a prominent role across a variety of orthographic representations, whether alphabetic (Brittain, 1970; Carlisle, 1988; Carlisle and Nomanbhoy, 1993; Mahony et al., 2000; Nunes et al., 1997a; 1997b; 2003; 2006; Singson, Mohany and Mann, 2000; Fayol et al., 1999) or logographic (Ho, 1997; Chang et al., 2003; Ku and Anderson, 2003).

Deaf children's difficulties have been documented with respect to phonological (Campbell and Wright, 1988; 1990; Miller, 1997; Harris and Beech, 1998), syntactic (Tur-Kaspa and Dromi, 1998; 2001), and morphological awareness (Leybaert and Alegria, 1995; Miller, 2000; Breadmore, 2007). The main cause underlying these difficulties has been identified as a lack of auditory experience that prevents learners from developing effective phonemic awareness in order to accurately decode the words (Hanson and Fowler, 1987; Hanson and McGarr, 1989; Miller, 1997; Perfetti and Sandak, 2000; Charlier and Leybaert, 2000; Dyer et al., 2003). Their progression in processing the word's meaning into its broader concepts via syntactic and morphological constructs was therefore reduced, and their language competence consequently limited (Leybaert and Alegria, 1995; Clark et al., 2011). Linking phonological awareness and its associated skills to reading competence, deaf children's difficulties in mapping a given phoneme or morpheme into its written grapheme become particularly apparent.

In another avenue of research, phonological awareness is seen not to be a prerequisite for a deaf learner to become a capable reader (Izzo, 2002; Miller, 2005; Allen, Clark, Del Giudice, Koo, Lieberman, Mayberry and Miller, 2009). It has been further argued that the level of phonological awareness among prelingually deaf children does not necessarily depend on their auditory skill level, and is not necessarily a phonic ability (Hanson and McGarr, 1989; Leybaert and Alegria, 1995). Rather, phonological awareness may reflect deaf learners' visual observation by means of lip-reading or perceiving speakers' articulation (Leybaert and Alegria, 1995), or via the representation of orthographic or morphemic segments (Hanson and McGarr, 1989; Miller, 1997).

The instruction methods developed to strengthen either the phonological or the morphological awareness of deaf learners have been designed to support their reading and spelling proficiency, indicating the importance of these two skills. Phonemic awareness training and grapheme–phoneme correspondence teaching, both of which involve a grasp of how written words are represented in oral language, have resulted in improvements to the literacy skills of prelingually deaf children (Palmer, 2000). Similarly, theoretical (Gaustad, 2000; Nunes and Bryant, 2006) and empirical (Nunes et al., 2010) studies have identified the morpho-graphic analysis of written words as another valuable approach to overcoming the challenges faced by deaf children when decoding and comprehending print.

Manipulation of phonological and morphological units represents the children's oral ability skills. Therefore, their ability to think about and manipulate language forms, i.e. dialect awareness, may particularly influence their phonological and morphological awareness skills, and thus determine their literacy development. However, the phenomenon whereby dialect may interfere with phonological and morphological awareness skills seems unclear.

Charity, Scarborough and Griffin (2004), for instance, showed that African-American children's production of standard phonological and morpho-syntactic forms was correlated with their literacy skills from kindergarten through grade two. Terry and Connor (2010) also found that the spelling performance of African-American children at grade two is related to their spoken dialect variation in the production of phonological and morphological forms. By contrast, Sligh and Conners (2003) indicated that the association between reading and phonological awareness is not as strong for users of African-American English as it is for users of other varieties of the language. Findings by Apel and Thomas-Tate (2009) also revealed no relationship between levels of African-American learners' English use and their performance on measures of reading, spelling and morphological awareness. Although the indications given by these studies are somewhat controversial, it can be said that the relationship between dialect awareness and use, and reading attainment, is inconsistent as between African-American children using their own English dialect, and their peers using other English dialects. Clearer evidence about dialect awareness interference with phonological and morphological skills emerges from a research study conducted in the bi-dialectical setting of Greek-Cypriot learners. When children were measured for their awareness of the existence of two language forms in their community, their dialect awareness was found to assist their reading and spelling skills, which was also enhanced by their phonological and morphological awareness (Pittas, 2011).

1.3 Predictors of Arabic Literacy Achievements

Phonological and morphological awareness were found to be reliable predictors of literacy success for hearing children (Nagy, Berninger, and Abbott, 2006; Verhoeven and Carlisle 2006; Abu-Rabia, 2007; Mahfoudhi et al., 2010; Saiegh-Haddad and Geva, 2008; Farran, 2010), as well as for deaf children (Harris and Beech, 1998; Breadmore, 2007; Nunes et al.,

2010). In Arabic reading research however, there have been no published investigations to date into predictors of literacy achievement by deaf children, and in relation to hearing children few investigations have been undertaken. The available Arabic studies with hearing learners indicate that phonological awareness is related to word reading (Abu-Rabia 1997; 2001; Abu-Rabia et al., 2003; Abu-Rabia and Taha, 2004) and has a function in predicting basic literacy skills (Al-Mannai and Everatt, 2005; Saiegh-Haddad and Geva, 2008; Farran, 2010; Taibah and Haynes, 2011). Morphological awareness was found to be an equally strong predictor of Arabic reading proficiency across several learner groups and grade levels (Abu-Rabia, 2007; Saiegh-Haddad and Geva, 2008; Mahfoudhi et al., 2010; Farran, 2010).

The awareness of dialect or language varieties, in linguistic communities having similar characteristics to Arabic, was argued to be a contributing factor for effective literacy learning (Fogel and Ehri, 2000; Terry, 2006; 2012) and specifically found to assist children's reading and spelling skills, which were further enhanced by phonological and morphological skills (Pittas, 2011). In the context of learning to read in Arabic, where the spoken form differs substantially from the written form (Holes, 1987; 1988; 1990; 1995; Feitelson et al., 1993; Abu-Rabia, 2000; Saiegh-Haddad, 2003), the spoken dialect was found to critically influence phonological awareness (Saiegh-Haddad, 2003; 2004; 2007; Saiegh-Haddad et al., 2010) and morpho-syntatic awareness (Khamis-Dakwar et al., 2011), and to greatly hinder learners' attainment of literary Arabic (Ayari, 1996; Maamouri, 2009). Furthermore, many Arabic studies have established a link between forms of linguistic variation and poor literacy performance (Saiegh-Haddad, 2003; 2004; 2005; 2007; Abu-Rabia and Taha, 2006), where the exposure to literary form prior to formal education was often a key factor in enhancing the reading skills of beginning readers (Feitelson et al., 1993; Abu-Rabia, 2000; Khamis-Dakwar et al., 2011; Aram, Korat and Hassunah-Arafat, 2013).

Although the notion of dialect awareness has been explicitly questioned in the Arabic context (Khamis-Dakwar, 2005), its possible role in predicting literacy skills of hearing or deaf children remains absent from Arabic reading research. It can be expected, however, that Arab children's awareness of the totality of their language is responsible for their relative competence in using and manipulating any variety, and consequently, in determining their literacy abilities. Since learning to read is driven by a multitude of interdependent processes (Holden, Van Orden and Turvey, 2009), the predictive role of dialect awareness for reading and spelling ability may go beyond such a relation, and further account for children's linguistic competence in other domains. In particular, dialect awareness is expected to predict literacy achievement and also to act as a bridge, forming a relationship between phonological and morphological awareness predictors and literacy outcome skills.

Taking into account the clear findings about the factors that can be used to predict both hearing and deaf children's literacy in Arabic and other languages, it is hypothesised that the same factors will be significant predictors of Kuwaiti hearing and deaf children's literacy achievements. However, the contribution of phonological, morphological and dialect variables is implicated with sociolinguistic factors related to (1) the diglossic nature of the Arabic setting and (2) the characteristics of the orthographic representation of Arabic script.

1.4 Implications for Arabic Literacy Learning

Perfetti (2003) illustrates the concept of predicting reading development on the basis of oral language through the 'language constraint' on reading, where the oral language acts as a mediator between graphic forms and meanings. This concept is hypothesised to operate universally through all writing systems, without exception (Perfetti and Dunlap, 2008). Learning Arabic, however, is quite challenging, firstly because the Arabic language engages a diglossic situation; children speak a certain dialect but become literate in the standard form,

which can be viewed as a second language (Ferguson, 1959; Ayari, 1996; Eviatar and Ibrahim, 2000). The substantial differences between spoken and literary Arabic (Holes, 1987; 1988; 1990; 1995; Feitelson et al., 1993; Abu-Rabia, 2000; Saiegh-Haddad, 2003; Maamouri, 2009) present a mapping challenge for children who need to discern how their writing system systematically encodes their spoken language (Perfetti and Zhang, 1995; Perfetti, 2003). Secondly, Arabic orthography is complex in its representations. The way the script is handled in different contexts makes the relationships between phonemes and graphemes variable and inconsistent. This not only delays the attainment of literacy skills for many years (Azzam, 1993; Abu-Rabia and Taha, 2006), but also makes the acquisition of proficiency in Arabic reading and spelling almost impossible (Abu-Rabia and Taha, 2006).

1.4.1 The Arabic Diglossic Context

In the Arabic diglossic setting, two varieties of the language coexist and perform different communicative and social functions: the spoken dialect, acquired naturally with no official instruction, and the prestigious standard form, acquired after the dialect by means of deliberate instruction (Ferguson, 1959). 'Standard Arabic' represents a simplified version of Quranic and classical Arabic and is used in daily prayers and occasional religious ceremonies, as well as in elevated discourse, modern literature and the mass media (newspapers, serious programmes on radio and television, children's cartoons, etc.). It has a written script but no native speakers, and is never used for everyday conversations. 'Spoken Arabic' is the mother tongue and is learnt through exposure to everyday discourse and popular media (music, movies, entertainment shows, etc.). It has no standardised script, and there are no instructional materials developed for its native speakers. Although written dialect is commonly used in newspaper articles, unofficial communications (emails, blogs, and so on) and cultural publications such as poems, there is often inconsistency in the

spelling of words, which might be ‘spelled phonologically or etymologically (Habash et al., 2012: 714)’.

Although all Arabic dialects are structurally related to the standard literary form and share many overlapping patterns, any comparison between a specific spoken dialect and the standard form reveals important differences in all language domains (Altoma, 1969). The linguistic differences between the Kuwaiti dialect and the Arabic literary variety reflect variations at all levels: phonological and morphological, as well as syntactic and semantic (Aljenaie and Farghal, 2009; Ayyad and Bernhardt, 2009; Taqi, 2010; Aljenaie, 2010). Phonologically, a phonemic or a syllabic structure may appear in only one of the two forms, even if both forms share a subgroup of limited words. At the morphological level, the two language forms employ different inflections and derivations either to simplify a complex standard paradigm, or to compensate for different structures developed in the dialect. Syntactically, the two forms employ different word-order constraints that may affect sentence comprehension. At the level of lexical choice, the Kuwaiti dialect employs distinctive terms, or words with varying degrees of similarity or differences to phonological and morphological representations in the standard lexicon.

Although it can be said that the differences between spoken and written language are a common phenomenon, diglossia reveals the deep gap between the two language forms in a manner that makes formal language expression unattainable without considerable education (Coulmas, 1992). In such a community, children face extra mapping demands when trying to discern how the language’s spoken form encodes the standard written form (Perfetti, 2003).

1.4.2 Arabic Script and Orthography

Insight into the relationship between speech and print, which is referred to as orthographic awareness, requires knowledge of how letter symbols are organised to form words (Geudens, 2006). Alphabetic orthographies, which map the oral language at a phonemic level, present different degrees of difficulty. This partly depends on how consistently spoken phonemes are represented by written graphemes. This is referred to as orthographic *depth* or *transparency* (Share, 2008; Gunderson et al., 2009). In 'transparent orthographies' such as Spanish, the grapheme–phoneme consistency is regular, and decoding requires only a simple conversion process, enabling learners to master reading development early (Wimmer and Goswami, 1994). In 'deep orthographies' such as English, the grapheme–phoneme relationship is one-to-many, and decoding requires larger orthographic units like morphemes (Ziegler and Goswami, 2005). Because morphemes cannot be mastered before phonemes (Nunes et al., 2003; 2006; Ziegler and Goswami, 2005), learners' reading development in deep orthographic languages may be slower than in transparent orthographic languages (Gunderson et al., 2009). Arabic language is an exception. Its script is considered transparent or shallow if vowelised, but deep or opaque if not. Although vowels are crucial for correct pronunciation, they are generally absent from the written form. Whether vowels are presented or not, conveying the phonemic, morphemic, syntactic and semantic distinctions requires each word to be assigned the necessary vowel marks.

In the process of learning to read Arabic, children are first taught literacy through a fully vowelised script. This means that almost every consonant and its attached vowel is represented, and a consistent grapheme–phoneme correspondence can be mapped when the child is reading. However, displaying the vowels is not essential for comprehension of texts, and takes unnecessary time and effort. Arabic script includes a range of diacritical marks, and more than sixty basic graphemes occur with unclear word boundaries, so displaying

vowels would further contribute to an already complex visual presentation. Vowels and diacritical marks have therefore gradually been dropped from textbooks, starting at grade three, and are almost completely absent in reading texts above grade four. The grapheme–phoneme mapping process is therefore complex, and often causes considerable pronunciation ambiguity for the beginning or unskilled reader.

An example of this in English is the words *sank*, *sink*, and *sunk*, all of which would be represented in the same way if the short vowels were eliminated (i.e., as the consonant form *snk*). An Arabic example can be taken from the consonant root '*q, s, m*'. This root, if unvowelised, can represent different pronunciations and meanings such as *qasam* 'swear', *qism* 'section', *gasm* 'share', *qasama* 'he divided', *qassama* 'he apportioned', *qussema* 'it was divided', or *qassem* 'you divide/imperative'. In order to infer the appropriate vowel marks and identify the specific target lexicon from a range of possibilities, readers need to rely on both their linguistic knowledge and the context of comprehension. In addition to this *homographic* feature of Arabic, a considerable number of words are also *homophonic*. This means that even with the presence of vowels and diacritical marks, ambiguity may still be present. The vowelised word *'alam*, for example, may mean 'flag', 'figure', 'mountain' or 'mark' if there is no context to rely on for disambiguation.

Arabic research concerning reading performance in fully vowelised and partially vowelised materials reveals the remarkable facility of typical learners with a fully vowelised script, across a range of stimulus materials (Abu Rabia, 1996; 1997; Saiegh-Haddad, 2005). Similarly, deaf children demonstrate better use of consonants and stress placements when given fully vowelised phonological tasks, as opposed to partially vowelised or aural imitation words (Most, Levin and Sarsour, 2008). By contrast, unvowelised stimuli limit the reading proficiency of not only beginners and poor readers, but also adults and skilled

readers (Abu-Rabia, 1996; 1997; 2000; 2001; 2002). By conducting an analysis to categorise the spelling error patterns produced by students from grades one to nine, Abu-Rabia and Taha (2006) found that the most common errors were phonetic, and specifically related to the absence of short diacritical vowels. Interference from the spoken language has also been detected in spelling error patterns. Researchers have therefore argued that proficiency in Arabic reading and spelling is not likely to be attained easily, with typical or even advanced learners.

When Arabic learners move from reading a phonologically transparent orthography to a deep opaque one, they have to deal with an absence of phonological information. This forces them to employ more advanced literacy skills (Taouk and Coltheart, 2004; Abu-Rabia and Taha, 2006), such as morphological and syntactic knowledge, and/or to rely on the oral or written context (Abu-Rabia, 2002).

Alphabetic orthographies preserve morphological correspondence in the spellings of words (Verhoeven and Perfetti, 2003). However, grapheme–morpheme mapping has varying degrees of transparency or opacity whereby the sound or meaning of a compound word can be deduced from its constituent structure (Elbro and Arnbak, 1996). For example, in the process of constructing new words in English, a linear concatenative language, the stem morpheme preserves its unique form when attached to prefixes or suffixes. A stem word such as ‘employ’ retains its core phonemic and orthographic forms when the prefix ‘un’ and the suffix ‘ment’ are attached to derive the complex word ‘unemployment’. The linear connection feature of English orthography contributes to its morphological transparency, which in turn facilitates awareness of morphological cues (Carlisle, 2003). When a degree of phonological shift (i.e. heal / health) or orthographic shift (i.e. carry / carriage) occurs between morphologically connected words, the morphological structure becomes less transparent. This reduces learners’ awareness of morphological structures (Carlisle, 2003).

By contrast with the linear word derivation process in English, Arabic is a non-concatenative language with a non-linear derivational process. Most Arabic words are constructed of two morphemes: the root and the word pattern. The root, which is an unpronounceable lexical entity that generally consists of three consonants, is affixed according to different patterns in order to form stems. For example, the Arabic stem word *darasa*, meaning 'he studied', 'it vanished' or 'it wore out', is non-linearly composed of the root consonantal morpheme '*d, r, s*' that provides the word's core meaning, and the word-pattern *fa'ala*. The word-pattern is a fixed prosodic template that constitutes the grammatical information and the word class and the letters *f, ', l* are the locations in which the root letters to be integrated. The same root '*d, r, s*' combined with other word patterns (*fa'l*, *mufa''il*, *maf'ala*, etc..) can produce more stem words (*dars* 'lesson', *mudarris* 'teacher', *madrasa* 'school', etc..).

What adds opacity to the process of affixing a word-pattern on a consonantal root is that generating a new stem word from the given consonantal root may reveal a disconnection in the orthographic representation and/or the phonological string. For example, affixing the same consonantal root '*d, r, s*' to another word pattern such as *fā'il* modifies the root consonantal order to generate the new word stem *dāris* (a student / an old), which differs in terms of orthographic representation and phonological segmentation.

The word pattern can be built from prefixes, infixes and suffixes that intertwine linearly or nonlinearly with the root to form derivations. Linear concatenative operations may also align to form inflections. Arabic inflections operate as applications of obligatory rules that modify aspects of the word's features. Affixing a specific stem is dependent upon number (singular, dual, plural), person (first, second, third), gender (masculine, feminine) and mood (perfective, imperfective, imperative). Deconstructing complex morphological words in a

language with such rich derivational and inflectional features is inevitably challenging. In addition, an Arabic word may morphologically bind with a range of 'clitic morphemes' that have syntactic characteristics and are grammatically independent but phonologically bound to another word (Crystal, 1980; Alotaiby, Foda, and Alkharashi, 2010). Many prepositions, conjunctions and particles, and some pronouns, can be attached to the start or end of a single word, and thus correspond to an entire sentence. A word such as *anudarriskumuhā*, constructed from the consonantal root '*d, r, s*', corresponds to the complete sentence 'Shall we teach you these things?'. In this word there are five affixes, each representing one syntactic feature added to the stem base. It demands a considerable effort of deconstruction to accurately infer the meanings of words, adding to the challenge for learners of reading unvowelised texts.

Bearing in mind the demands of learning to read in such a rich and complex linguistic system, including switching from a transparent orthographic presentation to a deep one, it can be seen that literacy education for deaf Arabic learners is a challenging area. The attainment of reading ability demands not only the mastery of basic skills which deaf children regularly struggle with, but also the acquisition of advanced literacy abilities to handle the demands generated by the specific orthographic features of Arabic script, and by the diglossic nature of the Arabic setting.

1.5 The Present Study

Various complications are imposed on researchers by the context in which this study is conducted. In origin, the context of Arabic language development is diglossic (Ferguson, 1959; Ayari, 1996; Eviatar and Ibrahim, 2000). The impact of diglossia on literacy has been explored relatively little for Kuwaiti hearing children, and hardly at all for deaf Arabic

learners. Previous diglossic research on Arabic phonology is largely confined to the Palestinian context (Saiegh-Haddad, 2003; 2005; 2007), which has its own dialect, distinct from other Arabic dialects (Ferguson, 1959; Al-Wer, 1991; 1997; Fischer, 1997). The research procedures in this area, though useful, cannot be imposed on other varieties of Arabic without being assessed, adapted and modified to suit the features of the particular target dialect. Arabic morphology is rich (Beland and Mimouni, 2001; Abu-Rabia, 2002), but morphological awareness research is scant – especially by contrast with the various analyses of phonological awareness. The lack of a research basis to build upon presents a challenge not only to exploring a new field, but also to devising the necessary assessment approaches and tools. The lack of appropriate predictive measures for assessing typically developing children and those with literacy impairments in the Arabic diglossic context has been clearly highlighted (Shaalan, 2009; Farran, 2010; Tibi, 2010; Mahfoudhi et al., 2010).

Although some studies have examined the predictive role of certain components of standard language in the acquisition of literacy skill among beginners, no study has looked into morphological awareness as a predictor of Arabic literacy at an early reading stage, no research has considered dialect awareness as a predictor of literacy, and no evidence had been presented for interplay between the three interacting components underpinning Arabic literacy acquisition: phonology, morphology and dialect consciousness.

The present account studies the critical initial period of early phonological and morphological awareness skills amongst this group of less-studied Arab children: Kuwaiti deaf children who use hearing devices and are taught orally, due to the effect of spoken dialect on their reading and spelling skills. Aiming to measure overall literacy levels, having tested the effectiveness of the criteria, this research gives an account of eighty hearing

Kuwaiti children tested longitudinally at three phases, starting from the pre-school stage, continuing through year one, and ending at primary year two. The study is based on the hypothesis that during the early literacy stage, deaf and hearing children proceed on almost the same developmental trajectory.

Williams (2004) reviewed a series of studies concerned with deaf literacy learning, and concluded that deaf children, in their emergent reading, mirrored the developmental path followed by hearing children. It was hypothesised that their emergent spelling would also occur in parallel with that of their hearing peers. Considering these aspects of a similar starting point in literacy, and predictors of literacy development, it seems sensible to expect that most deaf children will develop basic literacy skills equivalent to those of their hearing peers. These expectations would be reasonable if hearing loss had been detected at an early age, and hearing devices used thereafter. These are therefore two features of the recruited deaf sample to be tested at two phases longitudinally, at the beginning and the end of the school year.

Although it is crucially important to investigate literacy development from the pre-school stage and over the first three years of primary school, the setting in Kuwait comprises the pre-literacy stage through first and second grade only, because Arabic-speaking schools switch from the vowelised form to the unvowelised form of Arabic by the third grade. This switch would necessitate a separate assessment, which is beyond the scope of this study.

The present study seeks to document aspects of oral language skills as predictors of reading and spelling skills attained by Kuwaiti children. It specifically hypothesises that their phonological, morphological and dialect awareness are predictors of Arabic literacy

development. While phonological and morphological awareness are expected to uniquely account for literacy skills, dialect awareness is expected to contribute to the learning process directly, and also depending on the levels of phonological and morphological awareness demonstrated by the children studied.

Because the Kuwaiti Arabic context does not provide the necessary assessment tools, literacy predictors and outcome tools must be developed, or adapted from other Arabic contexts, or from contexts with linguistic properties comparable to Arabic language. These assessment tools must be tested with the typically hearing children first, and thereafter employed with the deaf children. Assessments that turn out to be reliable with hearing children can be employed with deaf children, bearing in mind that they are taught by means of a strictly oral approach (Tymms et al., 2003). Assessing children's pre-literacy skills allows for constructive identification and intervention to improve their literacy capabilities, and to improve their chance of early reading success. This study is intended to assist the educators in identifying hearing and deaf children's strengths, needs and progress toward literacy in Arabic.

1.6 Organisation of the Study

This thesis consists of five chapters. The current chapter is a general introduction to the specified aims and rationale, and provides a general overview of deafness and hearing loss. Three components of oral language – phonological, morphological and dialect awareness – are presented as predictors of literacy learning. The constraints imposed by the diglossic nature of the Arabic setting, and the orthographic representation of Arabic script, are illustrated. The chapter ends with a concise outline of the organisation of the study.

Chapter 2 provides an expanded description of the background, explaining Arabic diglossia and the various forms of Arabic orality and literacy. The Arabic writing system and its orthographic rules and conventions are presented in detail. The chapter then presents the literature concerned with the role of phonological awareness, morphological awareness and dialect awareness as predictors of literacy attainment in Arabic, among typical hearing children as well as among deaf children.

Chapter 3 outlines the research design, hypotheses, the two groups of participants and the recruiting procedures followed for the three data collection phases. The measures used to assess cognitive ability, phonological awareness, morphological awareness, dialect awareness, spelling and reading skills are described in terms of their purpose, origin, instructions, items and scoring guidelines.

Chapter 4 reports the results of the three-phased longitudinal study for the hearing children in its first part and the deaf children's results in its second part. The first part commences by specifying the strategies for analysis, then presents the preliminary descriptive analyses, the reliability statistics for the measures, the data screening processes, the construct validity testing, and the main multiple regression models that explore the relationship between literacy predictor and outcome measures. The performance of hearing participants, including the reliability of the instruments and the construct validity of the instruments employed, provides the base for measuring the deaf children's performance on the predictor and outcome measures in the second part of the chapter.

Chapter 5 examines and discusses the study's results in relation to the research hypotheses and in relation to the findings of other studies with hearing and deaf children. It provides a

comprehensive summary of the study results and describes the expected theoretical, empirical and educational outcomes of the project. It ends by presenting the significance and limitations of the research, and recommendations for the way forward.

Chapter 2

Literature Review

The research on the development of literacy indicates that adequate assessment of language predictors is essential in providing an insight into the relevant factors for literacy success. Kyle and Harris (2006) indicate that a sound understanding of how deaf learners acquire reading and spelling abilities is attained by assessing which of their cognitive and linguistic abilities predict their literacy performance. Literature pertaining to the part played by phonological and morphological awareness skills in predicting later reading success or failure is being published at an increasing rate. Little of this literature is concerned with Arabic-speaking children, however, and even less is concerned with deaf literacy learners. The current review aims to present evidence describing the particular roles of phonological awareness, morphological awareness and dialect awareness as predictors of Arabic literacy success, as well as the interplay amongst them in the process of learning to read. As reading and spelling processing skills involve degrees of orthographic transparency, the review aims to address this related factor initially within the Arabic language context. This chapter introduces these principles in two major sections, as outlined below.

The first section provides an expanded overview of the Arabic language. It commences by presenting the Arabic diglossic setting and progresses by reviewing the various forms of Arabic orality and literacy. This section then provides background information about the Arabic writing system in terms of its script, and orthographic rules and conventions. The second section presents literature that is concerned with the roles of phonological awareness, morphological awareness and dialect awareness as predictors of success in learning to read

Arabic. The review refers specifically to evidence related to the reading development of typical hearing children first, then to evidence related to deaf children, in separate sections. To offset the paucity of Arabic reading research, the scope of the literature will be extended to include relevant evidence from the Hebrew language, which shares a number of linguistic features with Arabic (Blau, 1981; Ryding, 2005).

2.1 An Overview of the Arabic Language

Arabic is the richest living member of the Semitic languages, and is similar to Hebrew, Aramaic and Amharic (Ryding, 2005). It is the literary language of the Arabic-speaking countries and is widely studied as the liturgical language of Muslims throughout the world. Within Arabic-speaking countries, several spoken varieties of Arabic exist, but one written version is principally used in the sociolinguistic setting known as 'diglossia'.

2.1.1 Arabic Diglossia

The Arabic language was used as an example by Ferguson (1959) to discuss the diglossia phenomenon. He described the diglossic context as a situation where two linguistically related language varieties coexist to fulfill different social functions. The 'high' variety is the standardised form that is used for speaking and writing in formal settings, as opposed to the 'low' variety, which is an exclusively spoken form used in oral and informal communication.

It is known, however, that more than two varieties of the Arabic language exist. Scholars have argued for a tri-glossic (Suleiman, 1986) or even a multi-glossic (Al-Qenaie, 2011) setting, and have identified many levels of speech situations to give a more representative picture of all the Arabic varieties. These include classical Arabic, used in religious texts and traditional poems; modern standard Arabic, used in modern writing and official media;

different dialects according to geographical region, used in family and daily conversations; and educated spoken Arabic, used in lectures and in semi-formal settings (Shaaban, 1978; Sayah, 2002). Although the focus has changed, and the Arabic speech community tends to be seen as a range of varieties along a linguistic continuum rather than as bi-polar (Eid, 1990), standard Arabic can nonetheless be seen as inhabiting the high-level point of the continuum, with spoken Arabic at the low-level end. These two primary language forms are employed in complementary ways to serve different purposes.

Modern standard Arabic is the official language of Arabic-speaking countries, and its written form is relatively uniform across national boundaries. It is essentially a simplified version of classical Arabic, the language of the Holy Qurān and traditional poems; something which is most noticeable in its substantial lexical reduction, and in the considerable use of specific syntactic structures. The classical and the standard versions are both referred to as *Al-fuṣḥa* 'the eloquent', but classical Arabic is deemed to be superior and more prestigious as the language of religious practice. Classical/standard Arabic is not the mother tongue of any person, and can be viewed as a second language because it is first encountered by learners at school (Ayari, 1996).

Spoken Arabic dialects are the acquired native tongues of Arabic speakers and are the means of communication for the informal genres of media and daily discourse. Although Arabic dialects are related to the ancient dialects of classical Arabic, they are a product of interaction with neighbouring countries and of the colonising of nations. Arabic dialects vary widely according to diverse geographical regions and social classes within each region, to the extent that they are sometimes mutually incomprehensible. Since Arabic dialects are essentially spoken languages, a standardised written form has not yet been specified for any of them, although dialect publications do exist.

Although standard written Arabic and spoken Arabic dialects are all derived from classical Arabic, all the spoken dialects differ from the written form. The extent of variation between the standard form and the spoken form is seen in the domains of phonology, morphology, semantics and syntax. As the current study is concerned with Kuwaiti Arabic, the spoken variety used in the State of Kuwait, and standard Arabic, the lingua franca used in learning and education across the Arab world, the main linguistic variances between both forms are reviewed. These are presented in terms of the phonological, morphological and syntactic systems, as well as the lexical choices made by speakers (Ferguson, 1959; Holes, 1998; 2004; Habash, 2007; Aljenaie and Farghal 2009; Ayyad and Bernhardt, 2009; Taqi, 2010; Aljenaie, 2010; Al-Qenaie, 2011).

At the phonological level, the Kuwaiti dialect shares all twenty-eight consonants of standard Arabic with the probable exception of the emphatic phoneme *ḍ*. It is regularly, though not always, substituted by the shared phoneme *ẓ*, thus both are realised as *ẓ* (e.g. *ḍayf* 'guest' and *ẓifr* 'nail' are realised as *ẓaif* and *ẓifir* respectively). Certain Kuwaiti phonemes (*ch*, *g*, and *v*) are borrowed from foreign languages to accommodate loanwords into its lexicon (e.g. *chay* 'tea', *iglāṣ* 'glass', *vīdyo* 'video'). In addition to the absence of a standard phoneme and the presence of nonstandard phonemes in the Kuwaiti dialect, some phonemes may be reciprocally changed within a single lexicon. Kuwaiti speakers may pronounce the word *rajul* meaning 'a man', as *rijjāl*, using its origin standard phoneme *j*, or as *rayyāl*, where *j* is replaced by *y* in accordance with the speaker's affiliations. Also, the standard consonant *q* is realised as '*g*' (e.g. *gumar* for *qamar* 'moon'), or as *j* (e.g. *ṭirīj* for *ṭarīq* 'road'), or as its origin *q* (e.g. *qadīm* for *qadīm* 'old'). It may also be used interchangeably with the standard phonemes *gh* (e.g. *ighbār* or *iqbār* for 'dust', and *ghaym* or *qaym* for 'clouds').

Short vowels in standard Arabic (*a*, *u* and *i*) and their long variants (*ā*, *ū* and *ī*) are shared by the Kuwaiti dialect, but the latter also includes a few additional vowels that are not employed in standard Arabic. Kuwaiti dialect has an additional diphthong, *iy*, besides sharing the principal diphthongs (*aw* and *ay*) with standard Arabic, though they are realised differently. It is noticeable that variance in vowels and diphthongs between the two forms can produce differences in tense and/or meaning (e.g. Kuwaiti *'iysh*, 'rice' vs. standard *'aysh*, 'living').

As with the differences between the two language forms in the phonemic inventory of vowels and consonants, differences in syllabic structures also appear, though to a lesser extent. For instance, standard syllables only start with a consonant, or a consonant borrowed from a former word through the process of elision. In the Kuwaiti dialect, many spoken words start with an additional vowel *i* instead of the original consonant sound (e.g. *ismicha* vs. *samaka* 'fish'). In the case of shared words, different syllabic structures are formed for dialectic words as opposed to those that are applicable to the corresponding standard words. For instance, the bisyllabic Arabic pattern (CVCCV) for the word *ṣakhra*, meaning 'a stone', turns into a multisyllabic pattern (VCCVCV) to match the dialectic word *iṣkhara*. In total, the Kuwaiti dialect includes eight syllabic patterns, compared to only six types of syllable in standard Arabic.

At the morphological level, there are fifteen verbal patterns and eighteen nominal patterns in standard Arabic, but not all of them are functional in the Kuwaiti dialect. Furthermore, the two language forms use different inflections and different derivations, either to simplify the complex standard paradigm, or to compensate for different structures developed in the dialect which have no correlations in literary Arabic. For instance, the standard form embodies inflectional morphemes to signify person, number, gender, case and tense. In the

dialect, however, some inflectional structures are omitted (e.g. the dual form in verb conjugation) or consolidated (e.g. feminine and masculine in the plural form). Also, standard Arabic has rich derivational processes that cause stems to undergo infixational modification (e.g. *hātafa*, 'he made a phone call' is derived from the stem *hatafa*, 'he yelled'). Not all of these morphological derivations are active in the dialect form, which may encourage the use of derivatives that have no equivalent in the standard form (e.g. *dagdag*, 'he phoned repeatedly', is derived from the stem *daqqa*, 'he knocked').

Syntactically, the two forms utilise dissimilar word-order constraints that may affect overall sentence comprehension. Although standard Arabic follows a verb/subject/object word order, it is also usually flexible and allows for fronting and omissions in word ordering within a sentence. This flexibility relates to applying a specific diacritical mark on the last character of the word 'case ending', to determine the syntactic processing level of the word, even if word order is changed. The Kuwaiti dialect, however, typically follows subject/verb/object as a default word order, since the case ending is lost in all Arabic dialects.

The syntax of the main sentence types – relative, interrogative, demonstrative, negative and imperfective – in Kuwaiti dialect treats gender, number and case less systematically than standard Arabic does. For instance, the plural and dual forms of relative pronouns have disappeared and been replaced by a singular form, *illī*, which does not vary for gender, when expressing all relative statements. Also, the demonstrative system of the Kuwaiti dialect, *hādha*, *hādhy*, is quite close to that of standard Arabic, but the former remains simpler and less sensitive to case, number and gender. As opposed to standard Arabic, another sign of simplicity in the numbering system of the Kuwaiti dialect is that it does not generally follow the standard pattern of realising inflections, and has no specific number–gender agreement.

At the lexical level, many words in the Kuwaiti dialect resemble those of standard Arabic. This resemblance, however, is categorised by multiple levels of connection that vary from identical phonological representations (e.g. *bāb*, 'door'), to slight phonological differences in vocalic structures (e.g. the standard *shariba* vs. the dialect *shirab*, 'he drank'), to considerable changes in phonemic and morphemic structures (e.g. the standard *qiṭṭah* vs. the dialect *gaṭwah*, 'a cat') between the two forms. The Kuwaiti dialect also employs words which are uniquely dialectic and not shared with any standard Arabic equivalents (e.g. *bas* corresponds to the standard *faqaṭ*, 'only').

Essential everyday words are borrowed from English (e.g. *laiyt*, 'light'), Persian (e.g. *bakhat*, 'luck'), Hindi (e.g. *garī*, 'bicycle') and French (e.g. *abajora*, 'table lamp'). To compensate for this lexical borrowing, substitution and/or importation of phonemic forms or morphemic forms may occur. An example of phonemic compensation is the replacement of the English phoneme *p* by the Arabic phoneme *b* to generate the word *kumbyūtir* 'computer'. An example of morphemic compensation is the addition of the plural Arabic suffix *at* to the English word 'sticker' to generate the word *istikirzāt* 'stickers'. Although standard Arabic has permanent equivalents in foreign vocabularies, dialect speakers are not always aware of these, or do not perceive them as acceptable and usable.

Maamouri (1998) has asserted that in a scenario where the learner is not equipped with reinforcement that originates from mother-tongue acquisition, the gap between standard Arabic and spoken Arabic disadvantages them in terms of their basic reading skills. Maamouri (1998) perceived that Arab young and adult readers are unable to utilise an existing competence in the features of dialectic Arabic (syllabic structure, consonantal clustering, phoneme combination, and morphological and prosodic pattern structures) when learning to read. This suggests that the challenging task of phonographic interpretation in reading standard Arabic is not facilitated by the diglossic setting (Maamouri, 1977).

2.1.2 Arabic Script and Orthography

Arabic language uses a consonantal alphabetic script called 'abjad'. Abjad script consists of twenty-eight basic letters printed horizontally from right to left. It often uses one symbol for each consonantal sound, and typically does not mark vowels. A set of three basic short vowels, denoted as floating symbols, may appear optionally above or underneath the consonants. An account of Arabic consonants and vowels is provided below.

Arabic Consonants

Most Arabic consonants share a resemblance. Presenting straight or cursive strokes, and adding one, two or three dots, creates a distinction between them and signifies their variations. Each consonant has a detached form and many have up to three or four attached forms. Combining two or three letters into one form (ligatures), is evident in Arabic scripts either for saving time or emphasising the letters' visual beauty. To form words, letters are appended jointly in flowing strings. As words are written, gaps in a continuous line indicate spaces between different words. It should be noted, however, that six letters are disconnective, and present confusing spaces within a single written word.

Arabic script also uses the consonant/semi-consonant '*hamza*' to represent the sound of a glottal stop. The conventions for writing *hamza* are the most complicated set of Arabic spelling rules. *Hamza* and the other consonants can be written in multiple forms, and the correct form is determined both by its position in a word (separate, initial, middle or final) and by the connective properties of adjacent letters.

Among the basic alphabetic letters, three (*alif*, *wāw* and *yā*) represent consonants as well as long vowels. These are referred to as weak or irregular letters because they may revert to their original root representation in processing different types of words. Long vowels (i.e.

letters of prolongation), which must be written as part of the word, take longer to pronounce (*ā*, *ū* and *ī*) than an optionally written short vowel (*a*, *u* and *i*).

Arabic Vowels

The integral part of Arabic script is represented by a set of linguistic diacritical marks. Those appear above or beneath the consonants to facilitate vocalic representation and to clarify grammatical functions, along with the lexical differentiation of words.

Arabic diacritical marks can be divided into three sets as follows:

1. Vowel marks (*fatḥa* 'a', *ḍammah* 'u' and *kasra* 'i', where *sukūn*, meaning 'quiescence', is the absence of any of these vowels, i.e. no sound is uttered following the pronunciation of a consonant).
2. Nunation marks (doubled: *fatḥa* 'an', *ḍammah* 'un' and *kasra* 'in' presented in final positions of nominal words to imply indefiniteness, equivalent to the indefinite article 'a' in English). These are pronounced as short vowels but are followed by an unwritten 'n' sound.
3. Gemination mark (consonant doubling *shaddah*). This is typically associated with a short vowel or a nunation diacritic.

Although assigning each consonant with its vowel mark often generates the correct pronunciation and facilitates adequate understanding of a text (Azzam, 1989), this is a rare and optional occurrence. Habash (2010) indicated that 98 per cent of Arabic reading materials omit diacritical marks due to the permissive nature of Arabic script, which allows full, partial, or no diacritisation of texts.

The presentation of diacritical marks is specifically limited to the early years of primary education and to Quranic and poetic texts. The study of this form reveals that almost every

consonant and its attached symbols are assigned on a one-to-one mapping basis. The phonological forms, as well as grammatical functions at the morphological and syntactic levels, are transparent. However, several important exclusions may apply (El-Imam, 2004; Habash et al., 2007; Biadsy et al., 2009), even when a reader is assimilating transparent vowelised orthography. For example, the letter '*alif*', which is pronounced as *ā*, has different shapes in word-medial and -final positions, determined both by the word's derivational etymology and by spelling rules. The medial form of *alif*, which appears in a number of very common words such as the word *hā'ulā* 'those', is pronounced in full as *ā* without a written form. By contrast, the final form of *alif*, which appears in verbs to indicate the masculine plural conjugation case, has no pronunciation (e.g. *sami'ū* 'they heard'). This *alif* is dropped if it is followed by an enclitic (e.g. *sami'ūhā* 'they heard it'), and is not part of a verb if the third letter *wāw* was originally the root (e.g. *narjū* 'we hopes'). Another example of irregular spelling patterns concerns the prefix particle *al*, which corresponds to the English 'the'. The particle *al* is pronounced in full when added to nouns starting with a specific set of letters (lunar letters), but without the 'l' sound when added to nouns starting with another set of letters (solar letters). Assimilating the particle with the first sound of the word, depending on whether such a sound is pronounced or not, does not occur automatically until later on (Alhawary, 2011).

Such examples suggest that the claim made by Newman (2006) and others, who have claimed that the vowelised written form of Arabic is transparent, is not completely accurate. Newman (2006) stated that Arabic orthography operates along the 'what you see is what you get' norm, because the spelling structures of Arabic precisely denote its phonemic inventories. It is obvious, however, that this is not the case, since irregularities in the presentation of basic phonemic and morphemic units do exist. The occurrence of

unpredictable spelling related to sound correspondence is possible, which can cause confusion and pose challenges for beginner language learners. It may therefore be more appropriate to expect that the correspondence between the spelling and pronunciation of vowelised Arabic orthography is positioned somewhere between that of transparent languages and opaque languages.

The multiplicity of consonantal forms and the paucity of displayed vowel marks, stemming from the nature of Arabic script, presents a challenge for inexperienced readers. In order to supply the missing vowels, Maamouri (2005) asserted that Arabic readers must rely on the context as a source of word recognition, besides their need to learn more than sixty basic letter-forms. This means that reading undiacritised Arabic text requires readers to understand first, and then read correctly. Maamouri (1998: 44) commented that 'Arab learners do not seem to follow the easy transition from "learning to read" to "reading to learn" that most children experience all over the world'. Instead, they experience a totally reversed experience of what is generally understood to be the purpose of reading, i.e. understanding (Maamouri, 2005).

Since the preceding section has introduced the basic facts about the Arabic orthographic and sound systems, the following section will present the relevant literature relating to the range of cognitive and linguistic foundations of early reading success, among both hearing and deaf children.

2.2 Language Predictors of Arabic literacy

This section aims to present evidence describing the general roles of phonological, morphological and dialect awareness as predictors of Arabic literacy success. Subsections

will specifically review the evidence regarding deaf children's awareness in the particular areas of phonological and morphological awareness. Since reading and spelling processing skills involve orthographic transparency, a further subsection will discuss this factor in relation to hearing and deaf learners. As for dialect awareness and Arabic literacy skills, the review will present the literature concerning how spoken dialect may influence phonological and morphological development, and subsequently Arabic language acquisition. A summary of the key contributions provided by the literature will conclude this section.

2.2.1 Phonological Awareness and Arabic Literacy

Investigations into different languages have revealed a connection between learners' phonological awareness and literacy skills, and have specifically shown that their degree of phonemic awareness is causally related to their early attainment of reading skills (Bradley and Bryant, 1983; Wagner and Torgesen, 1987; Goswami and Bryant, 1990; Wagner et al., 1994; 1997; Byrne, 1996; Burgess and Lonigan, 1998; Badian, 1998). Arabic reading research has only recently begun to examine the predictive contribution of phonological awareness towards learning and literacy skills (Al- Mannai, 2006; Mahfoudhi et al., 2010; Elbeheri et al., 2011; Taibah and Haynes, 2011). The following section provides an account of the phonological prediction studies that have been carried out to date.

A cross-sectional and longitudinal study was conducted by Al-Mannai (2006) in order to identify the best predictors of variability in reading and spelling among Arabic-speaking Bahraini children. The sample consisted of 171 students, from grades one to three, whose ages ranged from approximately 6 to 10 years old. The researcher aimed to investigate whether their phonological awareness skills were predictors of Arabic literacy skills, and whether the underlying cognitive processes involved in the initial acquisition of Arabic

reading and spelling were comparable to those of literacy acquisition in other languages and associated orthographies.

The students were examined with regard to the predictor measures of phonological awareness, short-term memory, speed of processing and non-verbal ability, which included block design and picture completion, taken from an Arabic version of the WISC. The phonological awareness measures comprised phoneme and rhyme measures. In the phoneme measure, children had to listen to two sounds: a word/non-word without its last phoneme, and the same omitted phoneme on a separate occasion. They were then asked to construct the entire word/non-word accordingly. The rhyme measure required the children to listen to strings of three words/non-words, two of which rhymed with each other, within a single string. The children then were asked to identify the non-rhyming one. Their literacy outcome skills were assessed using measures of single word reading and spellings taken from school reading materials, and non-word reading and spelling derived from real words.

Regression analyses of the cross-sectional study in the first instance were performed on each of the literacy measures for the three grades, after controlling for age, sex, grade and school. For all of the outcome measures (word reading, non-word reading, word spelling and non-word spelling), the best predictor was either of the rhyme measures, word or non-word, accounting for approximately 12%, 10%, 14% and 10% of each of the outcome tasks respectively. In the second instance, most students from grades one or two who had taken part in the previous year's tests were followed longitudinally. They performed the literacy outcome tasks again to produce a new set of outcome measures to be regressed against the same predictor measures, as executed the first time. The longitudinal regression analyses confirmed the cross-sectional analyses by identifying phonological awareness measures as

the main predictors of literacy measures. Rhyming measures progressively accounted for more variance (i.e. up to 26%) in all literacy measures, except for the word spelling outcome, in which the value decreased by 6%. The non-word phoneme measure, however, explained about 24% of the variability in the word spelling on the second occasion after displaying no significant predictive role the first time. The word phoneme measure also contributed to approximately 7% of non-word spelling, 6% of word reading and 3% of non-word reading. The only non-phonological predictor was block design, which accounted for about 9% of variability in the non-word reading outcome.

Although cross-sectional and longitudinal assessments produced consistent evidence, which identified phonological awareness as core predictors of Arabic literacy skills, the results were not identical. The results identified rhyming as the main predictor for beginner readers, as it did in the first test. Test two showed an increase in the predictive validity of the phoneme measure with second and third graders, which even exceeded the rhyme's prediction in some instances. The prediction pattern which emerged through use of the relatively transparent Arabic form in this study did not seem to follow the typical pattern of transparent orthographies, but instead was more comparable with less transparent orthographies. More specifically, the Arabic language revealed a closer literacy prediction commonality with that of English-based literature in the early stages of learning to read.

The cross-sectional and longitudinal models conducted by Al-Mannai (2006) indicated a predictive association between phonological awareness and Arabic literacy skills, and also suggested a role for orthographic transparency. Phonological awareness was considered to be a control variable in a subsequent study seeking to establish the role of orthographic discrimination in relation to Arabic reading development.

Elbeheri, Everatt, Mahfoudhi, Abu-Aldiyar and Taibah (2011) conducted a large-scale study by testing three groups of Kuwaiti children, two of whom were second to fifth graders, the other being a group of learning-disabled children from grades three to five. The first group performed tasks that were mainly concerned with phonological skills, whereas the second group was presented with tasks mainly for assessing their visual memory. Both groups were tested on the outcome measures of reading comprehension fluency and orthographic processing on which the study was based. The reading comprehension fluency measure involved the comprehension and fluency of the learners' reading, while the orthographic discrimination measure involved identifying identical or similar pairs of words or non-words based on the visual features of Arabic letters. The third group consisted of learning-disability children, who were tested on a selection of tasks requiring phonological and visual memory skills, and tasks involving literacy skills and orthographic discrimination. The phonological measures in this study included a range of tasks in order to allow for better assessment of phonological effects on reading comprehension. These included non-word reading as a phonological decoding measure, initial/middle/final sound deletions as a phonological awareness measure, non-word repetition as a phonological memory measure, and rapid naming as a measure of fluent access to phonological forms.

When regression analyses were performed to predict the comprehension fluency of the first group of second to fifth graders, orthographic processing contributed to about 4% of variation in comprehension fluency, after controlling for phonological predictors. Values of up to 8% were calculated as the percentages of variance explained by the phonological measures, in which the sound deletion measures contributed to about 2% of outcome variation. The results of the second visual memory group revealed a contribution of about 9% of orthographic processing towards the same outcome measure, but these students were

not tested on the same phonological tasks as the first group.

For further assessment of the orthographic influence, in addition to the phonological tasks, a set of statistical analyses were performed, with the first group being divided into two sub-groups according to their grade levels. For the younger subgroup, orthographic processing did not predict significant levels of comprehension fluency beyond that predicted by the phonological measures. Phonological processing consisted of four related tasks: non-word accuracy and fluency, sound deletion, non-word repetition and rapid naming tasks. These contributed to approximately 17%, 1%, 3% and 0.3% of the outcome measure, respectively. These values were slightly different, both in positive and negative directions, for the older subgroup, but the main change was that orthographic processing was the strongest significant predictor in the latter subgroup. Among the learning-disabled group, one phonological skill, measured by the non-word reading task, contributed to 8% of the variation in comprehension fluency. All of the other phonological measures, including the phoneme awareness measure of sound deletions, made no significant contribution towards the outcome.

Although the lack of predictive validity of the initial/middle/final sound deletion measure was expected within the learning-disabled group, as has often been reported in previous literature, the level of variance explanation of 1% among the second and third grade typical children was low, and cannot be possibly validated as an indication of their phonological awareness level. One reason for the poor performance of second and third graders may be the researchers' reliance on the sound deletion task, without incorporating additional tasks to assess phonological awareness levels. The utilisation of diverse tasks with a progressive developmental nature is crucial in providing a reliable assessment, since the awareness of larger rhyme/syllable units is acquired earlier than for smaller phoneme units (Tunmer and

Nesdale, 1985; Adams, 1990; Tibi, 2010).

The task's instructions may have also contributed to the poor performance of second and third graders; they were asked to delete a phoneme from one position in a word (initial, middle or final). For deleting the target phoneme from a given Arabic word, the authors presented the following example, taken from the English version: 'Say "dog" without the "d" sound with a correct response being "og" (p. 131)'. Although this instruction is suitable for the English language, where many consonant and vowel clusters can occur in many different positions, it is not always possible to apply it to the Arabic language as many phonotactic restrictions are imposed on cluster formations. For example, deleting the middle phoneme *j* from the word *rajul* meaning 'a man' produces 'raul'. The deletion process in such an example creates an unacceptable vowel cluster 'au', which does not exist in Arabic. Also, deleting the middle phoneme 'm' from the word *jamal*, meaning 'camel', must produce *jaal*, not *jal*, where the latter cluster is pronounced with a shorter vowel duration than the former. Such responses, which demand a high level of clarity in terms of producing a specific vowel length or cluster formation, present difficulties in terms of them being revealed by the examinee, and noted by the examiner. Given that the criteria for selecting the measure's items was neither stated nor exemplified in Arabic by the authors, a potential source of confusion may be inevitable with regard to phonemic manipulations, especially when students are instructed to delete middle phonemes.

It is worth mentioning that the ways in which phonemes, clusters or syllables are combined together to form a word's string differs across different languages (Lass, 1984). Although the Arabic language utilises an alphabetic orthography, it is considered structurally to be a syllabic language where orthographic units are embodied in syllabic template, i.e. in more

than a single phoneme (Bat-El, 2011). Dominance in the segmentation process is thus given to the syllabic units rather than the phonemic ones. Saiegh-Haddad (2003) detected a solid cohesion in Arabic between the consonant and its subsequent vowel. She proposed that the children's difficulty in manipulating phonemes was due to the phonological and orthographic structures of Arabic, which represent consonant–vowel combinations rather than single sound segments (Saiegh-Haddad, 2007). Research has also revealed that the influence of phoneme position might be language-specific and may vary between Arabic and Hebrew, which employs a body-coda structure, whereas English employs an onset-rime syllable structure (Share and Blum, 2005; Saiegh-Haddad, 2007). Ben-Dror et al. (1995a) further clarified that because English letters are mostly mapped into phonemic segments, the child's enhanced awareness of a single phoneme is predictable.

It would therefore be better to avoid tasks with phoneme-medial deletions, which are more appropriately designed for English readers. Including various levels of phonological manipulations alongside the phonemic deletion measure may also assist in achieving an impartial assessment in relation to the Arabic language. Byrne and Fielding-Barnsley (1990) have indicated that it does not matter whether the initial, medial or final phoneme positions are measured. Rather, it is the adequate representation of the different phonetic classes within the assessed language awareness skills that are of concern.

With a similar aim of perceiving phonological awareness in terms of initial, medial and final deletions, Mahfoudhi, Elbeheri, Al-Rashidi and Everatt (2010) conducted another prediction study in Kuwait. Their aim was to assess the unique predictive validity of morphological awareness, in contrast to phonological awareness, in Arabic children's reading comprehension fluency. Two groups of participants were recruited. One group included

children with learning difficulties from grades three to eight (N= 86). The other group comprised mainstream children from grades three to six (N= 166) to match the first group in age or reading level. Measures of reading comprehension fluency, and phonological and morphological ability, were applied to both groups, whilst controlling for the child's grade level, sex, and non-verbal reasoning ability (Raven or WISC-R). For phonological predictor variables, the researchers described the sound deletion task discussed above and also employed a rapid naming task to assess fluent access to a phonological form.

Through the conducted series of regression analyses, phonological measures alone accounted for 10% of the outcome variation, with very similar predictive validities for the sound deletion (β= .255) and rapid naming (β= -.216) tasks amongst the typical third- to sixth-graders. For participants with learning difficulties from the same age group (i.e. third to sixth grade), regression models revealed no significance in the prediction abilities of any independent variables, except for age and gender. However, for the third- to eighth-graders with a reading level equal to that of the normal third- to sixth-graders, phonological abilities significantly accounted for about 2% of the reading comprehension outcome. The morphological measures in this study had a unique predictive validity in relation to reading comprehension, beyond that of phonological measures and non-verbal ability (third- to sixth-graders). In contrast, despite evidence of similar achievements in the morphological measures as between the mainstream and learning-difficulty children, morphology was not a significant predictor of outcome in the learning-difficulties group. This study did not, however, specify whether reading comprehension fluency was assessed by means of transparent or non-transparent orthography. The use of fully vowelised, partially vowelised or unvowelised Arabic text is important for interpreting the results. The degree of orthographic transparency relates significantly to patterns of mapping consistency and

reading strategy (Wimmer and Goswami, 1994).

A recent cross-sectional study conducted in Jeddah, Saudi Arabia, by Taibah and Haynes (2011) also sought to assess the predictive validity of phonological skills in beginner readers. The sample consisted of 237 children aged between 6 and 9 years, who were given Arabic language instruction at kindergarten level. The study specifically aimed to examine the predictive relationships between phonological processing abilities (i.e. phonological awareness, rapid naming and phonological memory) and early reading skills (i.e. word recognition, non-word reading fluency, oral reading fluency and retelling fluency) while controlling for their non-verbal intelligence ability (Arabic TONI 2; correct completion of matrix). In order to assess phonological awareness skills, researchers developed an elision task and a blending task, each containing a list of items of increasing difficulty. The blending task progressed from combining syllables to combining individual phonemes, while the elision task progressed from deleting a whole word from a set of compound words to deleting individual phonemes. The researchers reported that when the given words were processed in the elision task, real words were obtained to facilitate scoring for the examiners, and understanding of the task for the children. This, however, appeared to have led to the misinterpretation that a number of incorrect responses were correct in the tasks. For example, the child was instructed to say *sibāq* 'race' without the *b*, with the correct answer being identified as *sāq* 'leg' by the researchers. The correct response, in fact, is 'siāq', which is a non-word that includes a sequence of vowels (iā) which is unacceptable according to Arabic pronunciation conventions. Ambiguity in the instructions given, or inaccuracy in the marking scheme, mean that the resultant figures should be interpreted with a degree of caution.

The results showed that the phonological awareness measure was the best predictor for word

recognition, non-word reading fluency, oral reading fluency and retelling fluency across all age groups. The highest R^2 values attained for each of the outcome variables were 53%, 46%, 40% and 31%, respectively. Significant predictive abilities of lower magnitude were also seen in the task of rapid naming, ranging from 3% to 16% of the variance in word recognition and non-word reading fluency outcomes. Predictive validities for rapid naming were not, however, detected for most of the outcomes, apart from predicting 10% of the oral reading fluency of the grade three participants only.

When rapid naming was first included in the regression model after controlling for gender, language exposure and cognitive abilities, phonological awareness remained the best predictor of all the outcome variables for the participants in kindergarten and grade one, explaining a range of 21% to 43% of variation. In grade two, rapid naming was a better predictor of word recognition and non-word reading fluency outcomes, while the phonological awareness measure better predicted oral reading fluency and retelling fluency outcome measures. Although the values of variance explained (R^2) are remarkably high when compared with the figures reported in previous studies, Taibah and Haynes's study reached similar conclusions about the predictive power of phonological awareness in Arabic literacy skills at the early learning stage.

All of the studies that have been reviewed so far have led to the conclusion that phonological awareness has a significant predictive function in relation to early literacy skills in the Arabic language. This is regardless of their variation in emphasis (phonological, morphological or orthographic), design (cross-sectional and/or longitudinal) or their sampled population (Bahraini, Kuwaiti or Saudi Arabian). What further highlights the role of phonological awareness in Arabic literacy success is that children with learning difficulties showed little

or no indication of phonological awareness when compared to the awareness level of their typically developing peers. It is, however, important to consider two main shortcomings in connection with the measurement tools used to assess phonological awareness in the studies reviewed. The first shortcoming is specific to the studies that improperly employed medial phoneme deletions and provided ambiguous instructions for manipulations, as discussed above. The second is common to all studies and is related to the unconvincing nature of the construct through which the level of phonological awareness was assessed. Despite an increasing awareness of the structural elements of words, a factor which has been found to affect the performance of phonemic manipulations in Arabic (Saiegh-Haddad, 2004; 2005; 2007), the dialectic elements received no consideration when the measurement tools were constructed. Since phonological awareness is defined as the ability to manipulate speech sounds, it follows that performance of a phonological awareness task may vary in accordance with the identity of the particular phoneme or syllable, and whether it is present in or absent from the learner's naturally acquired language. Unfortunately, although the reviewed studies have all referred to the diglossic context of the Arabic language and its subsequent tangible effects, none of them have reflected this in their methodological design. This highlights a major shortcoming in Arabic predictive studies, in an inconsistency between theoretical awareness of such a context and the practical application of it to research and investigation. These studies had the potential to provide a more comprehensive account of children's phonological awareness by including assessment items that were dialect-specific. It has been recognised that phonological awareness is the 'insight into how spoken words are structured (Geudens, 2006: 25)' and is built upon the features of phonological representations that are already established in the mind (Li, 2010). Therefore, excepting spoken items from the assessment tools may result in an underestimation of the child's phonological sensitivity, especially in the early stages of phonological development. Furthermore, the ability to

appreciate different linguistic characteristics is more crucial in some languages than in others (Ziegler and Goswami, 2005), particularly when phonological representations differ according to the features of the languages and the characteristics of the users (Branum-Martin et al., 2012).

As the phonological characteristics of Arabic language were discussed, the following is an account of research studies investigating the specific features of deaf learners and how they may acquire and use the phonological representations of the language.

2.2.1.1 Phonological Awareness and Deafness

Elements of the robust evidence, outlined above, which indicates a positive relationship between phonological awareness and reading attainment with typical readers, have been shown to be controversial with deaf ones. Some researchers believe that phonological awareness is indispensable for a skilled deaf reader (Colin, Magnan, Ecalle and Leybaert, 2007), since findings indicate that good deaf readers demonstrate better phonological awareness skills than unskilled deaf readers (Perfetti and Sandak, 2000; Nielsen and Luetke-Stahlman, 2002; Luetke-Stahlman and Nielsen, 2003; Colin et al., 2007). Other researchers suggest that phonological awareness is irrelevant for a skilled deaf reader (Izzo, 2002; Miller, 2005), since no significant correlation between phonological awareness and reading comprehension skills has been detected (Hanson and Fowler, 1987; Hanson and McGarr, 1989; Leybaert, 1993; Miller, 1997; Izzo 2002; Kyle and Harris, 2006). Some of these researchers have stressed the contribution of other language elements integrated with the reading process.

Within the widening debate regarding the importance of phonological awareness in the

literacy learning of the deaf, Arabic and Hebrew studies have investigated these two constructs in recent years (Miller and Abu-Achmed, 2010; Miller, 2010; Kargin et al., 2012). By examining phonological awareness, a link to orthographic representation and syntactic awareness has been suggested to explain the sequence responsible for the reading process. Below is an account of these studies.

Miller and Abu-Achmed (2010) carried out a study to analyse whether ability to read is affected by the poor phonological skills of prelingually deaf Arabic readers. Forty deaf participants from grades four to twelve were tested for reading skills, along with forty hearing peers from the same age range acting as a control group. The intelligence of all the participants was within the normal range for their age. Sign language was the preferred means of communication for the deaf children, and their hearing loss was classified as 'profound'. The study was based on a comparison classification paradigm, where the participants were asked to rapidly categorise real words that had existing word letter strings, and comparable pseudo-word homophones that had unacceptable letter strings (according to standard Arabic rules), into categories of related and unrelated words. The pseudo-word homophonic letters were generated by using Arabic words that included certain graphemes, which could be orthographically distorted into their homophonic equivalents, without changing their phonological properties.

Several analyses were executed to compare the number of items correctly categorised by the two groups. These analyses showed that the real-word reading skills of the deaf participants developed successfully through their school years and, in fact, paralleled the recognition skills of their hearing peers. However, a marked development in the phonological awareness of the deaf participants was not detected as the older participants' categorisation of real-words was significantly better than for the younger participants, while this was not the case

with the pseudo-word homophones. This implied that phonology might not provide an adequate explanation for reading failure in learners who have prelingual deafness. Rather, orthographic representation was suggested as underlying the sequence of the reading process among the deaf learners.

Kargin and colleagues (2012) specifically looked at the peculiarities of the orthographic representation of five different languages (Arabic, Hebrew, English, German and Turkish) on the word-processing skills of deaf readers. The researchers examined a sample of sixth- and seventh-graders that included 124 hearing and 132 prelingually deaf participants who were all sign-language users. The subjects were presented with a set of familiar identical and non-identical word pairs and asked to make rapid same/different classifications in order for the researchers to compare their perceptual versus conceptual processing abilities. At the perceptual level, the participants were required to extract information from the features of visual language processing and build on the conceptual base to develop their reading skills. At the conceptual level, the participants had to retrieve their knowledge to mediate the inconsistency between two conceptually similar but visually distinct words. The researchers proposed that if the deaf participants relied on a phonological strategy to perform this mediating function, they would underperform in relation to the hearing subjects, in terms of basic language concepts.

Statistical analysis, which focused on the speed and accuracy of word processing in both groups, showed that the deaf participants were comparable to their hearing counterparts in most measured orthographies in terms of both speed and accuracy, and at both perceptual and conceptual levels. Accordingly, the researchers argued that deaf learners' word-processing skills might not be phonological in nature, as the phonological level is often

found to be low amongst prelingually deaf individuals. They appear instead to rely on orthographic reading strategies for mediating the meanings of written words. The Arab and Turkish deaf readers, however, manifested poor word-processing skills, but factors other than their deafness were considered to be the explanation for their performance. For the Arabic readers, Kargin et al. (2012) proposed that visuo-perceptual processing of written words, rather than conceptual processing, caused these differences in performance and skill levels. Since the letters used in the Arabic stimuli were neither pointed nor vowelised, the confusion caused meant that augmented processing skills were needed in order to deal with the complex grapheme–phoneme relationship. The Turkish participants, who read in a language characterised by shallow orthography, showed markedly weaker processing skills than those who read in languages exhibiting deep orthographies (Hebrew and English), and were also weaker than those who read in the shallow orthography of another language (German). The researchers therefore suggested that even if the influence of orthographic depth on word reading competence is significant, its overall contribution might be minimal in the presence of other contributing factors. One important factor in relation to the underperformance of Arab deaf participants, in comparison to their peers who were reading in the other orthographies, was identified as the diglossic setting of Arabic, where learning to read is almost equivalent to learning a new language. The researchers consequently highlighted the importance of substantial exposure to visual texts in expressive contexts, and further suggested investigating the syntactic awareness of the deaf in broader studies.

Miller (2010) investigated the role of phonemic, orthographic and syntactic awareness in Hebrew reading, which is structurally very closely related to Arabic. The study recruited participants from primary and secondary schools and universities. Twenty-one prelingually deaf participants from grades three and four took part, and twenty-nine hearing participants

were sampled from the same grade levels. The deaf participants were integrated partly or fully into mainstream schools, as their primary communication mode varied between oral language and auxiliary language, such as signing. The researcher employed one test to assess phonemic/orthographic awareness and another to assess reading comprehension. The phonemic/orthographic test comprised a number of sets each containing four pictures, all of which could be described by sign language. The task was to point out the two drawings out of four that had names with a particular phonemic feature in common. Some sets were designed to detect a reliance on a phonological strategy when pointing out initial and final targeted phonemes from pictures orthographically represented by two different graphemes. An English example represented the initial phoneme ‘k’ by two different graphemes, ‘car’ and ‘key’, where ‘lamp’ and ‘apple’ were also added to the set. It was expected that in order to identify the two drawings with the same initial phoneme, the resemblance would be detected by sounding out the words and probing their phonological properties, as an indication of phonological awareness. Other sets were designed in a similar way to detect participant awareness of initial and final specified phonemes when they were represented phonologically and orthographically by two identical graphemes. An English example was represented by two identical graphemes in the initial position of ‘dog’ and ‘disk’, where ‘knife’ and ‘fork’ were also added to the set. For identifying the two drawings with the same initial phonemes, it was expected that phonemic resemblance would be detected by means of orthographic awareness, since the same letter graphemes represented the same sounds. The reading comprehension test comprised of sentences with different levels of syntactic complexity. Half of these sentences were semantically plausible, i.e. it was reasonable to assume that they could occur in real life, and the rest were semantically implausible, i.e. they were unlikely to occur in real life.

In order to conduct statistical analyses, the participants were subdivided into distinct groups according to their hearing status and educational level. Generally, measures of phonological awareness and orthographic awareness were noted to be considerably lower in the deaf participants than in their hearing counterparts. When considering the deaf sample separately, the participants achieved higher levels for their orthographic awareness skills than for their phonological awareness skills. Also, higher orthographic awareness scores were obtained for sign-language users than for those who communicated orally, but no significant difference was detected between the phonological awareness scores of the two groups of deaf participants. Orthographic awareness was also found to significantly increase for the deaf participants between primary and high-school levels, which was not the case for the phonological awareness measure.

The deaf group also demonstrated an impressive increase in their reading comprehension level through successive stages of education, despite their markedly low comprehension scores in primary school. More success was displayed by the deaf group in relation to understanding the semantically implausible sentences. The comprehension of semantically plausible sentences was found not to be associated with the deaf group's phonological levels, while this association was noted for the hearing group. Therefore, the assumption was made in this study that phonological awareness might not be a relevant factor in deaf participants' reading failure.

Miller (2002) studied the development of phonological and orthographic word recognition processes as a consequence of the communication mode in two groups of prelingually deaf individuals; one group included twenty-seven participants who were raised and educated using a strictly oral approach (with a mean grade of 6.9), and the other group consisted of

twenty-two participants whose preferred means of communication was Hebrew Sign Language (also with a mean grade of 6.9). A third group of thirty-nine hearing individuals (with a mean grade of 6.5) was also recruited to serve as a control. The three groups had to categorise a set of familiar Hebrew nouns which varied in terms of their pointing presentations (unpointed, correctly pointed, incorrectly pointed but phonologically correct, or incorrectly pointed and phonologically incorrect), into three semantic categories (animal, body part, food). Children were asked to ignore the vowel diacritics when deciding which category the word belonged to, as when the chosen nouns are unvowelised they had only one possible meaning. The assessments were based on a computer-controlled research paradigm which measured the participants' sensitivity to phonological and orthographic alterations in the target stimuli, by presenting the nouns one at a time and measuring the time and accuracy of the child's categorisation ability. It was assumed that the different pointing presentations of the words would affect their categorisation abilities qualitatively and quantitatively for both the hearing and deaf groups.

The results obtained were processed statistically using multivariate analyses of variance (MANOVA). Significant effects were calculated for both decision latency and accuracy among all the participants. The prelingually deaf participants, who were users of sign language, did not demonstrate clear phonological processing of the target words. They also exhibited undifferentiated effects produced by the different pointing variations of the given words. Yet this group did not appear to be at a significant disadvantage in categorising the target stimuli when their word recognition strategies were considered. Furthermore, the hearing group and the orally educated deaf group demonstrated phonological coding abilities for the visually presented target words. Both groups showed a degree of sensitivity to the different pointing presentations, albeit not in a uniform manner, while making their

categorical decisions with a comparable level of efficiency.

So far, it can be concluded that, in contrast to the converging findings from studies that included hearing readers, studies of the phonological awareness and reading achievements of deaf readers tend to produce equivocal outcomes. As with studies investigating hearing, the principal concern has been to trace the role of phonological awareness in Arabic reading skills. This has revealed consistent conclusions that such awareness is predictive of strong reading skills among Arabic readers, and that poor readers demonstrate low levels of phonological awareness and weak decoding skills when compared to their normal peers. As with studies of deaf learners, two main issues were raised in the studies conducted: firstly, whether deaf learners can be considered to be phonologically aware, and secondly, whether their phonological awareness is mediated by the orthographic factor or by the communication mode. Kargin et al. (2012) and Miller (2002) have shown that Hebrew phonological abilities were demonstrated by orally educated deaf individuals, but not by deaf individuals who used sign language. However, in Miller and Abu-Achmed's (2010) Arabic study, Kargin et al.'s (2012) and Miller's (2010) Hebrew studies, it was found that higher orthographic awareness scores were detected for signers than for those who were communicating orally. The findings also suggested that apart from reading in Arabic orthography, which initiates a complex grapheme–phoneme relationship if unvowelised, variability in orthographic representations, whether transparent or nontransparent, might not affect the relationship between phonological awareness skills and literacy levels (Kargin et al., 2012).

Although results are far from conclusive, it appears that there is significant variation in the level of phonological awareness achieved by deaf learners, and in the extent to which such awareness supports their literacy development. Variation also occurs in the development of

the association between phonology and literacy. Embracing orthographic particularities as an influential factor, when considering the role of phonological awareness in reading outcome, is recommended in order to reach a convincing conclusion about the reading levels of the deaf.

A number of studies have found that when sets of phonological and orthographic information are consistent, deaf learners' performances on phonological awareness tasks are notably better (Sterne and Goswami, 2000; Dyer et al., 2003; Kyle and Harris, 2006). However, the orthographic representation of Arabic script is unique in being opaque when unvowelised, and also in being somewhere between transparent and opaque if vowelised. This means that an account of its importance is imperative when phonological awareness is considered. A brief statement about the implications of orthography for typical hearing readers is essential, and this will be addressed in the following section.

Orthographic Representation

Young Arab users have to suppress many of their spoken phonological habits and learn new, standard phonological rules. They have to concurrently acquire the orthographic rules of the language, as the standard phonological structures are not always transparently represented in the written form. In addition to the effect of the diglossic phenomenon, variability in learners' perception of the Arabic orthographic system has been highlighted as a factor that may affect the predictive power of phonological awareness (Everatt and Elbeheri, 2008).

The orthographic characteristics of Arabic are considered to be visually complex, and the processes involved are found to be cognitively demanding for Arabic speakers (Ibrahim, Eviatar and Aharon-Peretz, 2002; 2007). Wagner (1993) found that the graphemic variability

and the absence of vowelisation marks were common stumbling blocks to word comprehension amongst young learners. Likewise, Azzam (1993) identified the absence of diacritical marks as the key reason for misreading and misspelling, not only for beginners, but at all levels of Arabic reading proficiency. Instead, the presentation of reading materials using vowels has significantly enhanced the reading accuracy of skilled, as well as poor, readers (Abu-Rabia, 1998).

In studying the influence of orthographic representations on deaf readers, Most, Levin, and Sarsour (2008) investigated the contribution of Arabic orthographic depth on the abilities of twenty-three Palestinian-Arabic speakers aged between 8 and 12 years with severe to profound hearing loss. Subjects were using different sensory aids, and communicating either orally or by speech and sign concurrently. They spoke the same Arabic dialect, and were all integrated into mainstream schools as a special group. The employed stimuli consisted of two lists of words (monosyllabic and bisyllabic) with different stress placements. For each of the six Arabic vowels, there were three pairs of real words (standard and dialectical) and two pairs of pseudo-words. Each word was printed once with full vowelisation and again with partial vowelisation, and was also imitated auditorily. As the researchers evaluated the effect of Arabic orthography on syllable stress and vowels, they found that fully vowelised words resulted in a high percentage of correct vowel production, while partially vowelised and aurally presented words led to lower scores. Full vowelisation also produced correct consonants and correct stress placements.

For further analysis, the participating children were split into groups reflecting the severity of their hearing loss and type of sensory aid: profound or severe loss with hearing aid, and profound with cochlear implants, respectively. Children with profound hearing loss and

hearing aids had a lower level of production performance than similarly performing children with severe hearing loss and hearing aids, and also children with profound hearing loss and cochlear implants.

Most et al.'s (2008) study, and other empirical studies (Spencer, Tomblin and Gantz, 1997; Moog and Geers, 1999; Geers, 2003; 2004), highlight that increased exposure to spoken language, especially via cochlear implants, may explain the reading performances of profoundly deaf children, which improved and exceeded expectations, in comparison to typical findings for deaf children without assistive hearing aids. This suggests that heightened exposure to and use of the spoken language delivers greater opportunities to access the underlying sound structure or phonological representation.

It can be inferred from the reviewed studies that where deaf learners are concerned, various implications are involved that are not apparent with a hearing group. The widely diverse characteristics of deaf populations in terms of their degree of hearing loss, communication approach, hearing devices and schooling system, along with the paucity of Arabic studies in the field of deaf education, hinder researchers from demonstrating clear outcomes which can be interpreted as cause-and-effect relationships. One conclusion however, that can be drawn from the reviewed studies, is that phonological skills are largely demonstrated by orally educated deaf learners who use assistive hearing aids, excluding those who sign. Sign-language users, however, showed higher orthographic abilities than to their orally educated peers. Another finding that can be acknowledged when reading Arabic, irrespective of which deaf population groups are studied, is that the degree of transparency of Arabic orthography is essential for studying the association between phonological awareness and literacy success. The higher the level of orthographic transparency, the better the learner's

phonological decoding and reading proficiency in the Arabic language. However, if deep unvowelised reading materials were represented to an Arabic reader, another awareness skill would be expected to play a role in the reading process: morphological awareness.

2.2.2 Morphological Awareness and Arabic Literacy

In recent years, many researchers have argued that the morphology of Arabic and Hebrew, as root-based languages, contributes fundamentally to their reading and spelling systems (Prunet, Béland and Idrissi, 2000; Ravid, 2001; Béland and Mimouni, 2001; Abu-Rabia, 2002; Abu-Rabia, Share and Mansour, 2003). Researchers have claimed that although the decoding of vowelised words can be addressed consistently on a grapheme–phoneme conversion base with no dependence on the word's morphological formation, the identification of unvowelised Arabic words cannot be processed simply without any morphological information. More specifically, word identification in Semitic languages is grounded on the identification of word roots for prime lexical access, which subsequently leads to the retrieval of the missing phonological information and accurate word pronunciation (Abu-Rabia, 2001; 2002).

In order to understand the morphological properties of the Semitic languages and how they stimulate the reading process, a representative set of developmental studies are presented, followed by a review of morphological prediction studies.

Developmental Studies

Prunet, Beland and Idrissi (2000), Ravid and Malenky (2001), Beland and Mimouni (2001) and Ravid (2001) have all claimed that Semitic readers are sensitive to the morphological structure of a word, and that the representation of words in their mental lexicon is root/morpheme-based. This claim has been supported several times through studies testing the reading strategy of Hebrew readers (Frost, 1994; 1995; Deutsch and Frost, 2002). According to Frost (1994; 1995), the primary process of a reading strategy in Hebrew is distinguished by the conversion of units (single letter and the attached vowel mark) into consonantal information. Once vowels are omitted, the secondary process involves the use of morphological information (root-pattern morphemes) in order to supply the missing vowels. Frost (1994) tested for the consequence of postponing the appearance of vowel diacritics under an unmarked word in a naming task. He found that the Hebrew readers were keen to delay word identification and wait for vowel marks (presented in points) to appear, even if the words were phonologically explicit and could be read in only one way. Frost (1995) confirmed that the delay period in naming Hebrew words consistently increased or decreased according to the number of absent vowels in the printed stimuli. This finding indicated that phonology was not recovered from the mental lexicon as a holistic lexical unit, but instead was processed primarily by applying grapheme–phoneme conversion rules. The fewer the vowels presented in the script, the slower the identification process turned out to be.

Ravid (2002) reported an Arabic study conducted by Kawar and Sakran (1997), which provided developmental evidence for the important role of roots in Arabic languages. The researchers assessed eighty Arab-Palestinian kindergarteners, grade-schoolers and adults on two morphological tasks, which were orally administrated. The ‘root identification’ process required an identification of the root relations between two target words, then the subject

indicating whether or not the two words were related (e.g. *kitāb* 'book' and *maktabah* 'library' are related by the root *k*, *t*, *b*). Young participants were able to identify root relations between two words with no significant differences between the age groups, meaning that the root awareness had emerged early on. The 'root analogies' required an ability to use the same root in another word as well as being able to produce words in analogy with stimulus items (e.g. *mu'allim* 'teacher' elicited the correct response as *ta'līm* 'teaching', with the shared root *'*, *l*, *m*). Likewise, the young participants (except the pre-schoolers) were easily able to use a given root in other words. The researchers also reported that most of the participants' responses were derivational, whereby their root manipulation ability was obvious, and fewer responses, even by pre-schoolers, were inflectional.

In studies conducted by Clark and Berman (1984) and by Berman (2000), Hebrew-speaking pre-schoolers also showed an early ability to extract roots from familiar words as well as new words. Consistent evidence was found for advanced levels of processing Hebrew adjectives by affixing nonlinear derivational morphemes, in comparison to suffixing linear inflectional morphemes (Berman, 1997; Ravid and Nir, 2000). Arabic and Hebrew studies have concluded that the basic processes of word recognition and reading are attributable to the mediating role of root awareness.

Word-pattern morphemes are less noticeable because they are typically vocalic templates and hold grammatical rather than lexical information as roots (Ravid and Schiff, 2006). Semitic developmental studies have rarely investigated the morphemic construct of patterns, and generally suggested that the explicit awareness of patterns delay the emergence of root awareness (Ravid and Malenky, 2001). Ravid and Schiff (2006) however, examined the capability of Hebrew-speaking primary-schoolers to analyse roots and patterns in complex

written Hebrew words. Children were instructed to extract and recombine roots and patterns to produce morphological components that solve an analogical problem. The results obtained not only showed findings consistent with previous studies in relation to the ability to manipulate word roots, but also showed learners' familiarity with, and early competitive ability to manipulate, word patterns.

Predictive Studies

Few studies have been conducted in recent years to examine the predictive ability of morphological awareness in Arabic literacy learning, all of which hypothesised its lack as a potential source of reading difficulties (Abu-Rabia et al., 2003; Abu-Rabia, 2007; Mahfoudhi et al., 2010). Predictive studies in Hebrew (Levin et al., 2001) and bilingual settings (Saiegh-Haddad and Geva, 2008; Farran et al., 2012) have also contributed to the body of research that seeks to identify the role of morphology in reading acquisition.

This review begins with an account of Arabic morphological research studies, followed by an account of a Hebrew study which compensates for the scarcity of Arabic studies focusing on the early reading stage. A brief account of morphological research into the bilingual setting of English-Arabic studies is also outlined, to avoid depending on accessible English research.

Abu-Rabia, Share and Mansour (2003) investigated word identification and other cognitive processes of normal-reading and reading-disabled children. The subjects were sixty Arab primary-schoolers with an age range of 7.5 to 10.5 years, divided into three reading groups as follows: a reading-disabled group from grade five, normal readers from grade five, and normal readers from grade three who were all selected based on the Raven test and a reading comprehension task. The researchers compared the performance of reading-disabled with

both age-matched and reading-level matched counterparts in tests of phonological decoding and orthographic processing and also measured syntactic and morphological awareness, working memory, and visual processing. Two morphological awareness measures were addressed in this study. The 'judging morphological relationships' test consisted of sets of equal numbers of key verbs and nouns. By presenting each key word, the participant was given four alternatives pairs of words, and then s/he needed to decide whether or not they were morphologically related (inflection and derivation categories) or not (rhyme and semantic categories). The 'morphological production' consisted of an equally numbered set of verbs and nouns in which the participant needed to produce as many family words as possible from each given key word, within 30 seconds.

Assessment of the participants' literacy level was based on several measures. The word identification task was comprised of a list of vowelised words selected from basal readers, with increasing difficulty levels in terms of syllabic numbers and frequency of usage. The spelling task was comprised of a list of dictation words selected from the same source, and according to criteria similar to the identification task. The reading comprehension task was comprised of a passage followed by multiple-choice questions. Two further experimental reading measures were used to examine the word recognition processes, separated into two forms: orthographic processing and phonological decoding.

ANOVA was used to test the differences in the mean scores attained by the reading-disabled group in grade five, and the two control groups in grades three and five. For the three achievement measures, namely word identification, reading comprehension and spelling, the reading-disabled group attained mean scores that were significantly lower than those of their counterparts in the control groups. With regard to the particular interest in morphological

awareness measures in this review, the results of the morphological judgement task also showed statistical differences between the three groups, with the reading-disability group at the lowest level. The same was also noted for the mean scores of the morphological derivation task. ANCOVA was then used to adjust for the children's reading levels and IQs, revealing a similar set of results for both the morphological tasks, except that the two control groups' scores were not significantly different. Since the varying level of the outcome was matched by the differences in morphological awareness measures between the three groups to a lesser extent than the phonological awareness measures, morphology was suggested to be the second highest predictor of the outcomes.

Because morphological awareness was found to be a key discriminator of reading levels, Abu-Rabia (2007) aimed specifically at assessing the roles of morphology and short vowelisation in reading Arabic among reading-disabled and normal readers through grades three, six, nine and twelve. A large sample was recruited from all grade levels in this study, in which thirty normal and thirty reading-disabled learners were included from grade three. The reading-disabled were identified as such according to a number of tests, in which their performances differed significantly from their normal counterparts on all reading, spelling and working memory measures, but not on the non-verbal test. The researcher hypothesised that normal readers should perform significantly better than reading-disabled readers on all reading outcome measures, and that phonology (short vowelisation) and orthographic factors (morphology and spelling) are strong predictors of reading accuracy and comprehension in both groups.

Instead of employing oral morphological tasks, as had previously been done in 2003, the researcher used two similar tasks but aimed to reveal morphological awareness in a written

form. In the morphological identification task, the reader was given each item with three words, two of which had a shared root that needed to be identified and marked accordingly. In the morphological production task, however, the reader had to generate and write down at least two different words derived from the same given root. The study also assessed the readers' phonological awareness by vowelising three words (apart from their final vowels) in a number of sentences taken from the basal readers. Another task assessed the readers' syntactic competence level by vowelising only the case ending letters of three words in a set of given sentences. A list of vowelised words ordered by difficulty addressed the isolated reading skill, while another analogous list of words assessed the spelling skill level. Reading comprehension skills were further measured by narrative texts taken from the basal readers, followed by explicitly and implicitly related multiple-choice questions.

One-way ANOVA was used to examine the differences between the reading-disabled and the normal readers at grade three. Statistically significant differences between the two groups of readers were shown in all the reading measures. This analysis was followed by a stepwise regression to examine the predictive weight of phonological, morphological and syntactic awareness towards reading comprehension and reading isolated words. The regressions identified for the normal readers showed a significant predictive ability for morphology, presented specifically by morphological identification (74%) and spelling (3%) as predictor variables in relation to the reading comprehension measures. The morphological identification uniquely predicted the test scores for the reading accuracy of isolated words (34%) above and beyond the additional variables. The regression conducted for the reading-disabled readers revealed spelling ability to be the best predictor of reading comprehension (57%), and reading accuracy of isolated words (23%). The syntax measure, however, did not have any specific predictive validity for either of the groups of third-graders.

In fact, phonology measures (short vowelisation) were not statistically significant predictors across all grades (three, six, nine and twelve) among normal and reading-disabled readers, while the orthographic factors, including morphological awareness (identification and/or production) and spelling (higher level of morphology) were significant predictors for reading comprehension and reading isolated words throughout all grades, and in both the participating groups.

Due to the observed contributions of morphological awareness to Arabic literacy skills, Mahfoudhi, Elbeheri, Al-Rashidi and Everatt (2010) examined the predictive power of morphological awareness as against that of phonological processing, in relation to reading comprehension fluency. Eighty-six reading-disabled students from grades three to eight were matched in age and grade level to 166 mainstream students from grades three to six. Measures of reading comprehension, and phonological and morphological ability, were applied to both groups, while controlling for their grade level, sex and non-verbal ability. The children's morphological awareness skills were assessed using segmentation and production measures. The segmentation measure examined their ability to separate suffixes or prefixes from given stems. Participants were asked to insert a line where they supposed that the given word could be segmented into two meaningful entities. The production measure examined the ability to produce or derive pseudo-words using morphological construction rules. Participants were asked to apply a real, specified morphological pattern to a given pseudo-root. These tasks had to be answered in writing. The reading comprehension fluency measure required the completion of a number of sentences by the choice of one word from four presented options.

Controlling for grade level, sex and non-verbal ability, regression analyses revealed that morphological awareness was the best predictor of variability in reading comprehension

levels, with a unique contribution of 8% to 9% for the mainstream participants. A closer look at the beta values of the given tasks signified that the segmentation task had a stronger effect, with a beta value of .293, than the morphological production task, which had a beta value of .185. The results of the reading-disabled group did not show significant predictive validity for morphological awareness in relation to the comprehension fluency outcome.

The evidence reviewed so far points to a predictive connection between morphological awareness and Arabic literacy skills (Abu-Rabia et al., 2003; Abu-Rabia, 2007; Mahfoudhi et al., 2010). Morphological awareness was placed as either the dominant (Abu-Rabia, 2007; Mahfoudhi et al., 2010) or the secondary (Abu-Rabia, 2003) predictor of typical readers, and an absence or poor performance on morphological identification or production tasks was seen as a key characteristic of poor readers (Abu-Rabia, 2007; Mahfoudhi et al., 2010). The morphological awareness in one case explained a unique variance of 8% to 9% in relation to reading comprehension skill (Mahfoudhi et al., 2010), and in another case explained a unique variance of 34% in relation to reading isolated words (Abu-Rabia, 2007). For the study carried out by Abu-Rabia et al. (2003), where regression analyses were not employed but the variances of predictor and outcome measures were analysed and studied, morphological awareness was a key discriminator of reading levels, though its specific contribution has not been assessed.

It is noteworthy that all the reviewed studies either utilised vowelised reading measures (Abu-Rabia et al., 2003; Abu-Rabia, 2007) or did not specify the nature of the reading task in terms of vowel representation (Mahfoudhi et al., 2010). As Arabic orthography varies in its transparency or depth according to the presence or absence of vowels, the trend in representing reading measures with vowels when assessing morphological awareness becomes somewhat unconvincing. This is firstly because the studies were conducted with

learners from grades three to twelve, who were expected to read the non-vowelised form of Arabic, which is also the standard form presented in reading materials. Secondly, presenting vowels does not allow the reader to recall the language's morphological rules when processing reading. This is because the vowelised Arabic words hold a phonologically transparent structure, and so reading in such conditions becomes entirely based on converting the phonological units into consonantal information as a primary reading strategy. Ravid (2001; 2002) indicated that only when vowels are omitted is the Semitic reader encouraged to rely on the secondary reading strategy, based on root-morpheme tracing, to assign the missing vowels. Arabic is not the only language in which, when new words are phonologically transparent, readers are likely to draw on their phonological skills. When readers encounter opaque and multi-morphemic words, they employ morphological analysis skills (see Nagy et al., 2006).

In order to distinguish the specific contribution of morphological awareness in reading from that of phonological awareness, it is essential to extract the unique effect on the reading process that morphological awareness is responsible for independently, as distinct from its shared variance with phonological awareness (see Carlisle and Nomanbhoy, 1993; Deacon and Kirby, 2004). Another means of gaining an accurate measure of the contribution of morphological awareness to literacy attainment is to assess on writing/spelling outcomes. Arabic writing systems exhibit a form of balance between preserving the spelling of root-pattern morphemes, and obeying grapheme–phoneme regularities, whereby a spelling task can meet both developmental levels.

Although no Arabic study has investigated the predictive validity of morphological awareness in a spelling task, and no study has inspected the Arabic reading achievement of

beginners who read in an essentially vowelised written form, an attempt has been made in Hebrew reading research not only to account for the predictive power of morphological awareness with early readers, but also to employ a spelling outcome measure that may yield more specific predictions.

Levin, Ravid and Rapaport (2001) studied the reciprocal relationship between progress in morphological awareness (inflectional and derivational) and Hebrew writing skills (word, consonant and vowel writing), in a longitudinal manner. Forty Hebrew-speaking children from the kindergarten stage (mean ages: 5; 11) were followed through the first grade (mean ages: 6; 5) using three assessment tasks. In one morphological task, the child was orally presented with a noun base and a familiar isolated, inflected possessive pronoun (but not a complicated one), and was asked to pronounce them jointly in one word. In the other morphological task, the child was also orally introduced to a familiar base noun and was asked to transform it into a derived denominal adjective to achieve a pair agreement. The writing task consisted of a series of pairs classified into groups according to syntactic (nouns; adjectives), gendered (masculine; feminine), and syllabic (open ends with a vowel; close ends with consonant) features.

Children's writing skills and morphological knowledge were found to be correlated in kindergarten, and again in first grade. Each component also showed a significant improvement through their kindergarten stage and their first grade. Hence, further analyses were run to examine whether a reciprocal correlation existed between the two components, and whether they were able to predict each other's development. Hierarchical two-step regressions were used first, with first-grade writing skills being the outcome, controlling for the children's writing skill level in kindergarten to test the predictive validity of their inflectional and derivational morphological knowledge, separately as well as collectively.

For the word-writing and consonant-writing tasks, morphological awareness did not reveal significant predictive abilities. Morphological inflection and derivation, however, contributed to 7% and 10% of the vowel-writing skill respectively, and when the learners were tested together these factors accounted for 10% of the outcome. Another set of regression analyses was done using morphological inflection, derivation and their combined variable in first grade as the outcomes. Children's performance of each variable in the kindergarten stage was used as a control variable for its parallel first-grade variable in the set of outcomes. This was done to measure the unique significant contribution of the writing measure to each outcome. By that account, word-writing significantly contributed 0.7 %, 11% and 4% respectively. Consonant-writing correspondingly accounted for 10% and 7% of the morphological derivation skill and the inflection-derivation combined variable, whereas vowel-writing only accounted for 6% of the derivation variable. Thus learning to write enhanced learners' oral morphological skills, and an awareness of oral morphology enhanced their writing skills, and particularly their vowel-writing.

Relying on Hebrew studies to compensate for the scarcity of Arabic morphological studies can be justified by the two languages' similar script patterns. However, a major difference between Hebrew and Arabic must be considered with early readers. The diglossic setting in which Arabic children are raised demands that they acquire new sets of phonological, morphological, syntactic and semantic representations, in addition to those with which they were familiar prior to literacy instruction. Conversely, Hebrew children are exposed to the same version of the language that they are already orally familiar with when learning to read. Therefore, the detected reciprocal relationship between progress in morphological awareness and writing skills in Hebrew, and/or the degree of variance explained by morphological awareness in writing skills, may not necessarily be paralleled in the case of Arab beginners.

This is because assessment of the morphological awareness of early readers should be based on their oral spoken experience demonstrating more proficient language skills, which can determine their later usage of morphological rules in the written form (Nunes and Bryant, 2006). Arabic spoken and written forms are substantially different and are arguably regarded as a form of bilingualism (Kaye, 2003).

In the context of bilingual research, two predictive studies examined the relations between phonological and morphological awareness abilities and literacy learning across English and Arabic. Saiegh-Haddad and Geva (2008) conducted an exploratory study to analyse the contribution of phonological awareness and morphological awareness to word and pseudo-word reading accuracy, and to the complex-word reading fluency of Canadian-Arabic children. The researchers found that, while phonological awareness was a predictor of word-reading across English and Arabic, morphological awareness in the two languages did not correlate. They also found that Arabic and English morphological awareness predicted only learners' own complex-word reading fluency. Farran, Bingham and Matthews (2012) followed a parallel line of enquiry and examined the relationship between phonology, morphology, and vocabulary and reading development in English-Arabic children in the US. In corroboration of the above studies, their findings revealed associations between phonological awareness skills across English and Arabic. Again, however, these associations did not hold for morphological awareness abilities.

Whilst the universality of phonological awareness has been confirmed through several studies (Al-Mannai, 2006; Saiegh-Haddad and Geva, 2008; Farran et al., 2012), the dissimilarities in morphological structure between Arabic and English mean that no links have been identified between levels of awareness in the two languages. These results confirm

that morphological awareness is mainly a language-specific linguistic construct that occurs as a function of language proficiency (Saiegh-Haddad and Geva, 2008). Therefore using the English literature, which offers abundant research, to infer conclusions about the morphological awareness of Arab deaf learners is inhibited by the typology of the language. In reviewing evidence relating to the morphological awareness of deaf individuals, excessive dependence may be laid on Hebrew studies, where the totality of research may prove to be insufficient.

2.2.2.1 Morphological Awareness and Deafness

The specific awareness or use of morphology by deaf learners has been examined in Arabic research in only one very recent study, which analysed the morpho-syntactic skills of Palestinian Arab children (Friedmann and Haddad-Hanna, 2013). A few Hebrew studies have also examined some aspects of the morpho-syntactic skills of the deaf in comparison with their hearing peers (Tur-Kaspa and Dromi, 1998; Tur-Kaspa and Dromi, 2001; Friedmann and Szterman, 2006). Although none of these studies has accounted for the predictive role of morphological awareness in relation to literacy skills, they have provided some insight into the nature and level of such awareness among deaf Semitic learners. The following is an account of these studies.

Tur-Kaspa and Dromi (1998) aimed to examine the spoken and written language of prelingually deaf children in order to compare their morpho-syntactic production in the two modalities of Hebrew. The study sample consisted of thirteen severely to profoundly deaf children (with a mean age of 11.9) who were orally educated and integrated into regular mainstream classrooms, as well as nine typically hearing children (with a mean age of 11.65) who served as a comparison group. Spoken and written samples were gathered using several methods that stimulated the verbal and non-verbal communication ability of the deaf

children. These comprised open-ended questions about the children's background and everyday activities such as ‘How many brothers and sisters do you have?’, open-ended questions about past and future incidents such as ‘What are your plans for the summer vacation?’, a coloured poster about different events to be described by the child, a set of coloured pictures representing a sequence of events to be arranged and described by the child (adopted from *Look What I’ve Got!* by Browne, 1987), and a wordless picture book to be narrated by the child (*Frog Where Are You?* by Mayer, 1969). These methods were intended to cover all possible morpho-syntactic structures (simple and complex) that occur in common daily speech (e.g. subject–verb, subject–verb–object, nominals, possessives, questions, and so on).

Different patterns emerged in the analysis in spoken and written language of the deaf group samples, indicating significant differences across modalities. Rich morpho-syntactic structures were only used in the spoken language, and in the written modality the morpho-syntactic range produced was limited. The deaf children had more grammatical marker errors in their speech than in their writing production, and consistently made more errors than the hearing children in both modalities. Various errors such as the omission of main constituents (noun or verb phrase), the omission or substitution of morphological indicators, violation of grammatical agreement rules, and violation of word order constraints were detected in the samples obtained from the deaf children. Within the hearing group, various structures were abundantly used with similar distributions across both modalities, though few exceptions were observed.

For an additional assessment of these sets of data, Tur-Kaspa and Dromi (2001) conducted further analyses inspecting the extent and variety of grammatical errors that were produced by those deaf children who had previously participated in 1998. Their analyses revealed that

the most frequent grammatical error was the omission, or inapplicable selection, of obligatory morphemes such as definite markers (*the*), locative prepositions (*on*, *in*, *between*), and markers of inserting in relative clauses (that). The next most common error was failing to conform to the mandatory rules of grammatical agreement (i.e. subject–verb and noun–adjective agreement in terms of number, gender and person). Omission of a main syntactic component of a sentence (i.e. the subject or a verb phrase) were also recorded for the deaf group.

The researchers interpreted the omission of morphological markers as signifying a low level of morphological awareness among deaf Hebrew learners, while their failure to demonstrate morphological agreement was seen as being due to their lack of morpho-syntactic abilities. The comparison-hearing group who made fewer errors instead showed particular manipulation ability with derivational morphology, rather than with inflectional processes. This indicated that deaf children might have a certain problem with the inflectional rather than derivational morphology of Hebrew. This study also highlighted relatively few word-order errors by Hebrew deaf children, in comparison to English studies which reported results for orally educated deaf children. The researchers thus suggested giving specific consideration to the grammatical structure of the target language being studied, especially where deaf children are involved.

Because Hebrew language allows for object movement in simple sentences (object/verb/subject) without any additional morphological change (topicalisation/topic-fronting), and also allows object relative clauses to be constructed either by movement or without movement (with a pronoun at the embedded object position), another study specifically concerning this linguistic feature of Hebrew was conducted.

Friedmann and Szterman (2006) studied some of the morpho-syntactic structures of the Hebrew language that are known to be especially difficult for orally trained deaf individuals in other languages (e.g. movement-derived sentences). They investigated the comprehension of subject and object relative clauses in fourteen prelingually orally trained deaf children. These children ranged in age from about 7 to 10 years and had different degrees of hearing loss, but were users either of a hearing aid or a cochlear implant. For some of them, the onset of language intervention programmes and the fitting of a hearing aid had happened at as early as five months old. The study revealed that these children had significant difficulties with the comprehension of object relatives and the topicalisation of object-verb-subject sentences, which hindered them in easily determining who did what to whom. The production of relative clauses yielded comparable results as children revealed a significant difficulty in the production of object-relatives as well as subject-relatives. In many instances, they produced ungrammatical sentences while trying to avoid the production of an object-relative, or to construct a sentence without a relative clause. This study, however, verified that deaf children who had hearing aids or cochlear implants before the age of eight months were competent in understanding the morpho-syntactic features in sentences similarly to those of hearing control, who were approximately two and a half years younger. Early identification of the hearing loss and an early start for intervention services were important predictors of morpho-syntactic comprehension. No correlation was observed between the children's comprehension and the degree of hearing loss, the type of hearing aid, or the duration of cochlear implant usage.

As deaf Hebrew-speaking children showed low levels of morpho-syntactic comprehension and production, Friedmann and Haddad-Hanna (2013) aimed at investigating these skills in the context of Arabic diglossia where the first acquired language form is distant from the

second literary form, and where deaf learners are not sufficiently exposed to the literary language during the critical stage of language acquisition, i.e. through the first years of life. The participants were twenty-four deaf Palestinian-Arabic-speakers who ranged in age from 9 to 21 years. They had different degrees of hearing loss and were users of hearing aids or cochlear implants, or neither. Their age of diagnosis and intervention ranged from 8 months to 10 years old. All the participants except one studied in regular schools, all were trained orally and none were sign-language users. The deaf group participated selectively in the study's experiments along with the hearing control group, who ranged in age from 8 to 18 years old, and also participated selectively, based on 7 to 10 participants per experiment. Four experiments were performed to examine the subjects' comprehension of sentences derived by syntactic movement, including subject- and object-relatives, Wh-questions and topicalisation sentences which all included a resumptive object clitic pronoun attached to the verb. The three utilised types of tasks (sentence–picture matching, comprehension questions, and reading and paraphrasing) were all semantically reversible so that the examinees were not able to define the meanings of the sentences by simply relying on the words. The sentences were presented in both language forms: standard Arabic and Palestinian Arabic, where the sentences of the latter form were phonologically adjusted according to the specific dialect practised by each Palestinian participant.

The general performance of the deaf learners across different ages was poor in terms of comprehension of sentences exhibited in both forms, i.e. Palestinian Arabic and standard Arabic. Their comprehension of the standard sentences, however, was much poorer than that of their hearing controls, as not even a single deaf participant performed at the control level. Despite the wide age range of the participants, no relationship was found between age and performance, as subjects at the two extremes performed similarly. The researchers noticed

that morpho-syntactic ability remained impaired even for the older participants, who had received standard written input for many years. The results implied that a lack of first language input, i.e. spoken dialect, at the critical period for first language acquisition will greatly affect the ability to acquire a second language, i.e. standard Arabic. The late fitting of hearing aids and late onset of intervention services was also expected to account for their poor performance.

The conclusion that can be reached from the Hebrew studies (Tur-Kaspa and Dromi, 1998; 2001; Friedmann and Szterman, 2006) and the Arabic study (Friedmann and Haddad-Hanna, 2013) is that the morpho-syntactic abilities of deaf and hearing children are different. The comprehension and the production of morpho-syntactic structures were significantly lower than those of hearing children. Although these studies used diverse measurement devices and recruited from various deaf populations, which varied in their ages, degrees of hearing loss, diagnosis ages, fitted devices, communication modes and school systems, they all lead to convergent conclusions: an indication of low morpho-syntactic awareness associated with low literacy achievement is at least suggested for the Semitic readers.

It is noteworthy, however, that the reviewed studies did not address plain morphological awareness at the word level, but only assessed morpho-syntactic awareness at the sentence level. It is thus reasonable to expect that deaf learners may acquire morphological awareness at the word level first, and that their subsequent advanced level of morpho-syntactic awareness is progressively acquired later on. Pure morphological awareness at the word level has not been studied yet with deaf learners of the Semitic languages.

Mapping the above-mentioned literature, which suggests a wide-ranging role for phonological and morphological awareness in predicting literacy achievement among

hearing and deaf children, it is expected that these factors will be predictors of the Arabic literacy attainment of Kuwaiti hearing and deaf children. However, the contribution of the phonological and morphological variables may vary depending on the characteristics of the linguistic context and the characteristics of the learners themselves. If the existence of the two variant forms of Arabic has implications in terms of literacy proficiencies, then learners' good awareness of the varieties of their language, i.e. their dialect awareness, is expected to be a constructive factor in their literacy potential. Andrews (1998: 8) has asserted that if children 'become more aware of the totality of language...they will consequently be more sensitive to and competent in using language confidently'.

2.2.3 Dialect Awareness and Arabic Literacy

Some studies investigating the effect of dialect on literacy ability have focused on defining the differences between the linguistic areas of the standard and dialect forms, and describing their properties and boundaries (Washington and Craig, 1994; Treiman, 2004). Other studies were correlational in nature, and were conducted to determine the relationship between two or more variables, such as the children's vocabulary levels and reading achievements (Campbell, Dollaghan, Needleman and Janosky, 1997) or their levels of dialect variation and literacy acquisition (Terry and Connor, 2010; Terry, Connor, Thomas-Tate, and Love, 2010). Interest has also been shown in distinguishing dialect variants from disorders (Washington and Craig, 1999; Rodekohr and Haynes, 2001; Clark, 2006) and proposing an intervention framework to reduce dialectical constraints as a source of literacy difficulties. Fogel and Ehri (2000), for example, applied certain exposure strategies to written texts and found that the better the reading comprehension outcomes of learners' standard English, the better their awareness of nonstandard English.

Arabic studies followed similar patterns to those evident in English ones, and focused on defining the linguistic differences between standard and dialect forms (Feitelson et al., 1993; Azzam, 1993). In such studies, many researchers affirmed that standard Arabic should be viewed as a second language (Ayari, 1996; Eviatar and Ibrahim, 2000) because the transparent relation between daily speech and book-related literacy is asserted to be very poor (Feitelson et al., 1993; Abu-Rabia, 2000; Saiegh-Haddad, 2003), and noticeable in all language domains (Holes, 1995). The linguistic distance between the two Arabic varieties was held responsible for creating serious pedagogical dilemmas, leading to lack of adequate literacy skills and learner self-confidence, in addition to poor academic attainment and, consequently, high repetition and drop-out rates among Arab students (Ayari, 1996; Maamouri, 1998). To address these concerns, the effect of exposure to standard literary Arabic prior to the schooling stage (Feitelson et al., 1993; Abu-Rabia, 2000), and the levels of interest in learning it during school (Khamis-Dakwar, 2005), were tested in the literature. The effect of exposure to the literary form, and the learner's assumptions about acquiring the standard form, are briefly described below. This is followed by a detailed account, in two separate sections, of the effect of the Arabic diglossic setting on the phonological and morphological developments of readers.

Feitelson, Goldstein, Iraqi and Shareand (1993) examined the potential causal link between early exposure to literary Arabic texts and the development of literary learning among kindergarteners who had listened regularly to standard Arabic story-readings every day for five months. Compared to the control class, experimental classes achieved significantly higher scores on the listening comprehension measures and showed their ability to use a richer vocabulary and more complex sentences in telling a picture story. Abu-Rabia (2000) compared the reading abilities of first- and second-graders who had been experimentally

exposed to standard Arabic stories during their kindergarten stage with the reading abilities of a matched control group. In line with Feitelson's findings, Abu-Rabia found that exposure to literary Arabic in diglossic situations enhances kindergarteners' reading skills in the first and second grades of primary school. He concluded that early exposure to standard Arabic texts improved children's performance on reading tests two years later.

Apart from experimental exposure, children's attitudes towards literary Arabic and their perception of learning the standard form of the language were investigated by Khamis-Dakwar (2005). Thirty Palestinian-Arab children, drawn from the first, second, and third grades, participated in the study. The method by which children's attitudes and perception was tested involved individual interviews with each child and asking each of them a few questions, such as how easy they find learning standard Arabic and whether they think it is important to learn it. The children's statements implied that the two language forms are perceived as two different systems, where they sometimes transform words from one form to the other to resolve some naming and comprehension problems which they claimed to face. Although they reported that standard Arabic is essential for the purposes of reading, spelling and learning, they demonstrated low levels of interest in learning it. Their perception that learning standard Arabic is easy also decreased with their progress through the school grade levels. They seemed to focus especially on the phonological and lexical differences they encountered between the standard Arabic form and the dialect form, rather than on the morpho-syntactic differences.

The following are two accounts considering the effects of the Arabic diglossic context. The first concerns the phonological development of Arabic literacy skills, while the second relates to the learner's morphological development. Subsequently, the interaction between phonology, morphology and dialect, examined in a bi-dialectical setting is reviewed. This

section will then conclude with a summary of the current state of knowledge concerning the dialect awareness of deaf Arabic learners.

2.2.3.1 Phonological Development in Diglossic Arabic

There has been a rapid growth in studies investigating the effects of the diglossic context of Arabic on the learner's phonological acquisition. These have specifically focused on establishing correlations between areas of phonological linguistic variations and levels of literacy performance among beginners (Saiegh-Haddad, 2003; 2004; 2007; Saiegh-Haddad et al., 2010).

Saiegh-Haddad (2003) tested phonological variables that differ between the standard and the dialect language forms, and hypothesised that the phonological distance between the two varieties of Arabic will affect the children's phoneme isolation and pseudo-word decoding skills. Kindergarten and first-grade children were introduced to phonemic awareness tasks, which manipulated the position of target phonemes and the position of the syllabic structure of pseudo-word stimuli. The study showed that children at both grade levels, and especially kindergarteners, found standard phonemes more difficult to isolate than dialect phonemes in both their initial and final position. The syllable was also found to be harder to analyse when the phoneme was in the standard form and embedded in its initial position. When pseudo-word decoding tasks were introduced, first-graders seemed to be highly accurate in their decoding of the dialect syllabic structures, in contrast to decoding standard syllabic structures, which is not part of their oral experience. The study concluded that the linguistic distance between the two forms of Arabic negatively affects children's phonological awareness, and subsequently their acquisition of basic reading processes.

The children's performance in the phoneme isolation task was further assessed by Saiegh-

Haddad (2004), who examined the lexical and phonemic distances between the standard and the dialect forms. The researcher specifically investigated whether the lexical status of the word (i.e. standard, dialect or pseudo) or the children's linguistic affiliation (i.e. dialect vs. standard) would affect Palestinian kindergarten-age children's and first-graders' ability to access or isolate phonemes. Participants were introduced to two phonemic awareness test clusters: initial phoneme isolation and final phoneme isolation. Each cluster consisted of three tests that varied in the lexical status of the stimulus word. The study showed that standard words were considerably more difficult for kindergarteners to analyse than either dialect words or pseudo-words. Moreover, standard phonemes were significantly harder to isolate when they were inserted within standard words than within pseudo-words. The results showed that when the dialectic phonemes were tested, no lexical status effect on the children's performance was detected. By contrast, the children achieved less in pseudo-word testing when the standard form phonemes were tested, suggesting their increased difficulty with the isolation of standard Arabic phonemes.

Saiegh-Haddad (2007) used the isolation of four standard phonemes to compare two groups of children speaking different varieties of Palestinian Arabic. The participants were two groups of first- and second-graders speaking two distinct dialects, which differed in including or omitting four essential standard phonemes. The researcher looked at the effect of three factors on the phoneme isolation skill: the phoneme's position (initial vs. final), linguistic context (singleton vs. cluster) and linguistic affiliation (standard vs. dialect). The results analyses showed that the children's phoneme isolation performance depended significantly on their linguistic affiliation, i.e. the presence or absence of the phoneme in their spoken dialect. For the group where the four standard phonemes were absent from their dialect, they found it significantly more challenging to isolate them than to isolate phonemes

existing in their dialect. By contrast, this difference was not significant for users of the other dialect, where the four phonemes were essentially present in their dialect. With regard to the effect of phoneme position and linguistic context, initial phonemes and initial singleton phonemes were the most difficult to segment, especially for younger children. In comparison, the final phonemes were the easiest to isolate both as singletons and clusters for all the children.

Following the difficulty observed with using phoneme segmentation tasks in ruling out the standard phonemes (Saiegh-Haddad, 2003; 2004; 2007), Saiegh-Haddad, Levin, Hende and Ziv (2010) used a phoneme recognition task that did not require any phonological production to test the effect of phoneme identity (standard vs. dialect) on the children's phoneme recognition ability. By using a picture selection task, Palestinian kindergarteners were asked to manipulate two types of phoneme (standard vs. dialect) in addition to two types of distractor (cognate phoneme vs. phonetic neighbour). In line with previous findings, the children's recognition of standard phonemes was not as good as that for spoken phonemes.
The research empirical findings (Saiegh-Haddad, 2003; 2004; 2007; Saiegh-Haddad et al., 2010), together with the children's perceptions and statements (Khamis-Dakwar, 2005) indicate that the phonological properties of lexical items are represented differently in the two Arabic varieties, and that they might interfere with each other in the process of literacy acquisition. Interviewing Arab primary school children also revealed their awareness of their language varieties which positively affected their literacy learning (Khamis-Dakwar, 2005). The extent to which the awareness of Arabic language varieties might be related to literacy achievements has not yet been investigated, even in the phonological domain, which provides an abundance of diglossic research.

2.2.3.2 Morphological Development in Diglossic Arabic

Morphological and syntactic development in the diglossic context of Arabic, and the competence of Arab children in realising and comparing the different sentence structures of the two language varieties, has only recently been examined. Khamis-Dakwar, Froud and Gordon (2011) examined 120 Palestinian-Arab children from first to fifth grade whose ages ranged from 6; 4 to 12; 4. A forced-choice grammatical judgement task comprising two parallel lists of standard and dialectic items was employed. The experiment started by introducing two characters shown in pictures: a food seller (who is expected to use Palestinian dialect), and a television announcer (who is expected to use standard Arabic), while the experimenter explained the different varieties of Arabic used by them. As the children agreed that they could recognise these two varieties of Arabic, and that the two characters would not speak similarly, the experimenter read the sentences from each list and the children selected which item sounded more appropriate for the speaker shown. Ten structures, including dual and plural marking, and adjective definiteness and indefiniteness, were examined in this study, with each structure being deployed across different test items. Four structures were similar across the two language varieties (variety match structures), and six were different (variety mismatch structures).

Analyses indicated an association between the children's level of familiarity with the language variety and the linguistic structures. Structures that incorporated a mismatch between standard and spoken Arabic, compared to structures that were not different between the two varieties, produced significantly lower responses through all grade levels. The differences between performances on match versus mismatch structures were also significant in standard Arabic for all grade levels, but not in spoken Arabic at the first and second grade levels. Yet, a significantly higher number of errors was recorded in the variety mismatch

spoken items at the third, fourth and fifth grade levels. Moreover, the particular language variety and the structural properties predicted the children's success or otherwise in the grammatical judgement task. The findings also suggested an interaction between these predictors, and proposed that cross-variety interference could be a factor for learners' morpho-syntactic development in Arabic.

This study further investigated the degree of exposure to, and the use of, standard Arabic, based on a parental questionnaire. No significant effect on children's morpho-syntactic development by home exposure to standard Arabic was indicated. The researchers strongly emphasised the importance of raising learners' awareness of the different morpho-syntactic structures as between the standard and the spoken varieties from the children's early schooling years, in preference to the current practice of introducing these grammatical concepts in the later learning stages at secondary school level.

It is notable that the reviewed studies of the possible interference effects of Arabic diglossia on literacy skills are not well distributed across the whole Arab region, and have mainly related to Palestinian Arabic dialects. Although Arabic dialects vary (Holes, 1995; Ayari, 1996; Ferguson, 1959; Al-Wer, 1991; 1997), findings can be generalised to include different Arabic varieties, as long as the Arabic dialects in question share an approximately comparable language structure and are all distinct from that of standard Arabic (Suleiman, 1986; Ibrahim, 1986).

Despite the growing body of research concerning the effect of the diglossic context on the phonological and morphological development of young readers of Arabic, no study has yet examined dialect awareness as a predictor of Arabic literacy learning, and there is no

evidence to clarify the interplay between the three elements underpinning Arabic literacy acquisition: dialect, phonology and morphology. The predictive role of dialect awareness towards literacy outcomes, and the possible effects that phonological and morphological awareness levels have on it, have been addressed only in a single study by Pittas (2011). Pittas proposed that, in the bi-dialectical setting of Greek-Cypriot, dialect awareness is a predictor of literacy learning. A sample of 404 children from grades one and three participated in the study, from different state schools in Cyprus. The researcher used three different measures to assess the children's phonological and morphological awareness, along with their dialect awareness levels.

The measures for assessing dialect awareness were dialect identification, sentence translation and pseudo-word translation tasks. The 'dialect identification' measure included a story which was read to the children with alternating sentences in both language varieties, i.e. modern standard Greek and Greek-Cypriot dialect. The children were presented with two characters and, after hearing each sentence of the story, had to identify the one speaking the standard form and the one speaking the dialect form. The 'sentence translation' measure involved children listening to a set of sentences in the dialect form and writing them down in the standard language form, which was the same procedure as that followed for the 'pseudo-word translation task', but with pseudo-words rather than real words in the latter. The findings of the study indicated that dialect awareness predicts literacy performance and assists children's reading and spelling, while also being enhanced by phonological and morphological awareness. Accordingly, it can be expected that, in addition to the potential predictive role of dialect awareness, there is a dependency to some extent on phonological and morphological awareness when the dialect relationship with literacy is explored. In particular, children may vary in their relative competence in dialect awareness, depending on

the particular phonological and morphological awareness levels being tested.

Although the diglossic context is a well-established concept when applied to readers of Arabic, and in other bi-dialectical settings, there has surprisingly been no scientific research conducted with deaf individuals concerning the effect of such a context on their literacy acquisition. Since the linguistic duality of Arabic has been found to be responsible for some of the difficulties that native Arab children encounter (Ayari, 1996; Maamouri, 1998), it is logical to expect dual academic difficulties among deaf beginning readers: language constraints resulting from Arabic diglossia, and from limited access to oral speech. The situation is rather more complex with Arab deaf signers. Abdel-Fattah (2005) stated that the deaf community may not even be aware of the presence of the dialect variety, since all Arabic varieties lack a written form. He indicated that the major difference between the standard form and the dialect form is dismissed, and the language is preserved as one form when communicating or translating into sign language. The sign languages, per se, are almost as numerous as the Arabic dialects are.

2.2.4 Summary and Conclusion

The current chapter has reviewed research evidence from studies conducted mainly in Semitic language orthographies, which have assessed the connection between phonological, morphological and dialect awareness and the literacy skills of hearing and deaf learners. To summarise the literature, the following conclusions can be drawn:

Phonological Awareness

1. Arabic prediction studies have identified phonological awareness as a key predictor of individual differences in reading achievement. This finding was common to all studies,

whether they inspected the predictive role of phonological awareness or other language components of morphology, orthography, etc. The predictive relationship was consistent through cross-sectional and longitudinal designs, and with different populations of Arabic-speaking nations, including the Kuwaiti one. The absence of phonological awareness indication was a determining factor of the reading-disabled groups, whenever they were recruited, by comparison with their normal-hearing peers.

2. In some of the reviewed studies, the measurement tools used to assess phonological awareness skills were unconvincing in terms of eliciting phonemic manipulation or giving instructions, and also in terms of the absence of items reflecting dialect speech patterns. These studies, however, have contributed to the body of research seeking Arabic literacy predictors, and have provided an insight into Arab children's phonological sensitivity and development.

3. The detected relationship between hearing learners' phonological awareness and reading attainment seemed to be equivocal when Arab deaf learners were studied. Some studies revealed that deaf learners adapt their phonological strategies in order to read, while others have indicated their reliance on their orthographic skills. Considering the preferred communication mode of deaf learners as one factor involved in their literacy learning, phonological abilities were mostly demonstrated by the orally educated deaf learners, but not by the signers. Users of sign language, however, demonstrated higher levels of orthographic awareness when compared to their orally educated peers.

4. The variability in learners' perception of the Arabic orthographic system has been highlighted as another factor affecting the relationship between phonological awareness and

literacy skills. Representations of fully vowelised Arabic script, in particular, have resulted in higher literacy skills when compared to partially vowelised or unvowelised ones.

Morphological Awareness

1. Evidence obtained from developmental studies has shown that Semitic readers are sensitive to the morphological structures of words, and that the basic process involved in word recognition and reading was attributed to their morphemic awareness.

2. Predictive studies have pointed to a positive correlation between morphological awareness and literacy skills among Arabic hearing readers from third grade and above. An indication of absence or poor performance on morphological awareness measures was observed throughout the reviewed studies when reading-disabled groups were examined.

3. Arabic morphological studies were conducted with readers who were supposed to read in the deep unvowelised form, but reading materials were presented with full vowelisation. None of the studies has tested beginning readers, who essentially read in the vowelised transparent form of Arabic. The alteration of the relevant applications, however, established the base for investigating the morphological awareness of Arabic beginning readers who have not yet been a research subject. Another motivation was identified in a Hebrew study conducted with beginners, in which along with the detected reciprocal relationship between morphological awareness and literacy learning, the predictive validity of morphological knowledge accounted significantly for the variance of writing skills.

4. Examination of the morphological awareness of deaf children has been limited to a few Semitic studies examining some aspects of their morpho-syntactic skills. Reliance on the

literature related to English was restricted by the typology of the languages, as some bilingual studies have shown that morphological awareness is a language-specific construct, though the universality of the phonological predictors has been confirmed. Although there has been no prediction study concerning morphological awareness of deaf Semitic readers, the reviewed studies have provided some insight into the association between their low levels of morpho-syntactic awareness and their low level of literacy skills. It is, however, reasonable to assume some degree of morphological awareness at the word level, since morpho-syntactic awareness is attained progressively after morphological awareness at the word level is acquired.

Dialect Awareness

1. Arabic studies have focused on defining the linguistic differences between standard and dialect forms, with many researchers affirming that standard Arabic should be viewed as a second language due to the non-symmetrical relation between speech and writing. Exposure of learners to standard literary Arabic prior to their formal education has often been established as a key to enhancing reading skills.

2. Correlational studies have established consistent associations between areas of phonological linguistic variation and levels of literacy performance, whereby a difficulty in recognising and segmenting standard phonemes has been repeatedly confirmed. An association has also been revealed between children's morpho-syntactic development and their familiarity with, and competence in realising, the sentence structures of the two language varieties.

3. Although diglossic context is a well-established and thoroughly investigated concept, no

study has yet examined dialect awareness as a predictor of Arabic literacy learning, and no study has clarified the extent to which dialect awareness might be related to levels of phonological and morphological awareness. Additionally, no scientific research has been conducted with deaf individuals concerning the effects of such awareness on learners' literacy acquisition skills.

This Study

The empirical evidence cited thus far represents all the related literature currently available in which phonological, morphological and dialect awareness has been investigated. Although the available studies have examined the predictive role of phonological and morphological components of standard language in acquiring Arabic literacy skill, no study has examined morphological awareness among beginning readers, and no study has examined dialect awareness as a predictor of their literacy success. Further, no evidence has been adduced to clarify the interplay between the three elements underpinning Arabic literacy acquisition: phonology, morphology and dialect. The present study attempts to provide empirical evidence regarding the literacy ability of a group of typically developing hearing subjects, in order to establish a base for examining orally educated deaf subjects. Throughout this account, the aim is to understand the initial, and critical, period of development of phonological and morphological awareness skills among hearing and deaf Kuwaiti children, in the light of the possible effect of spoken dialect on reading and spelling skills.

The following chapter provides an account of several designed and adapted predictor and outcome measures for longitudinal analyses over three time periods. Such an assessment in the Kuwaiti context is still missing, and would be of value for the regular monitoring of reading development in future research.

Chapter 3

Methods

This chapter aims to provide an outline of the research design, hypotheses, participants and recruiting procedures followed in the three phases of the research study. It then proceeds with an account of several adapted and designed measures for analysing cognitive ability, phonological awareness, morphological awareness, dialect awareness, spelling skills and reading skills. These are described in terms of their purpose, origin, instructions, items and scoring guidelines. Prior to this, a brief overview of the methodological issues and challenges in the field of the study is offered.

3.1 Methodological Issues

Since the aim of this thesis is to make a contribution to understanding Kuwaiti deaf children's literacy learning, and analyse the educational implications of new research, the context in which the study was carried out presented several challenges to the researchers. First, the context of language development involves a diglossic situation. Deaf children's literacy learning in such linguistic contexts has very rarely been analysed. Even in research with hearing children, the impact of diglossia on literacy is a relatively new domain of research that has not been explored thoroughly in the Kuwaiti context. Secondly, previous research on learning to read Arabic has usually been carried out within other contexts of spoken Arabic; therefore assessment instruments must be adapted and evaluated in order for the research to be valid. Assessments that have turned out to be reliable, as well as strong and independent predictors of literacy in hearing children, will be deemed to reliably and validly assess deaf children's literacy. This framework allows for the development of

specific research hypotheses, and specific plans for data collection and analysis. Ethical issues of importance include following the University principles of confidentiality, obtaining consent forms, and exposing participants to a range of positive and enjoyable literacy experiences. With these issues in mind, tasks were designed and adapted (where possible) in order to be stimulating for the children involved, and kept to a minimum in order to allow for the evaluation of their reliability and validity.

The first step, in order to examine the effectiveness of the intended tools and to encapsulate a miniature version of the planned research, was to conduct a pilot study. This was done with a group of second-grade children, prior to executing the main study. The pilot study revealed a number of points of interest that helped to improve the tools, instructions and procedure of the proposed research. A summary of the pilot outcomes is reported independently in Appendix 1. Since the purpose of the pilot trial was achieved and the efficiency of the study instruments was tested, the information obtained was incorporated into the main study design.

3.2 Research Design

Because the present study is concerned with the connection between early language awareness skills measured orally, and later achievements in a number of reading and spelling tests, longitudinal research design is necessary. Longitudinal data allows for assessment of predictive value and developmental sequencing, thereby clarifying evidence for or against the research hypothesis (Nunes et al., 2006; Nunes and Bryant, 2006; 2009).

Testing was carried out before and after the children's formal literacy instruction. On the first occasion, phonological, morphological and dialect awareness skills were assessed as predictor variables, and on the second and third occasions, outcome literacy skills were

examined. The influence of the general cognitive factor was controlled in the first occasion by means of two standardised intelligent tests in a verbal and a non-verbal form: the 'Peabody Picture Vocabulary Test' and 'Raven's Coloured Progressive Matrix Test' respectively. The following diagram (Figure 3.1) depicts the study design.

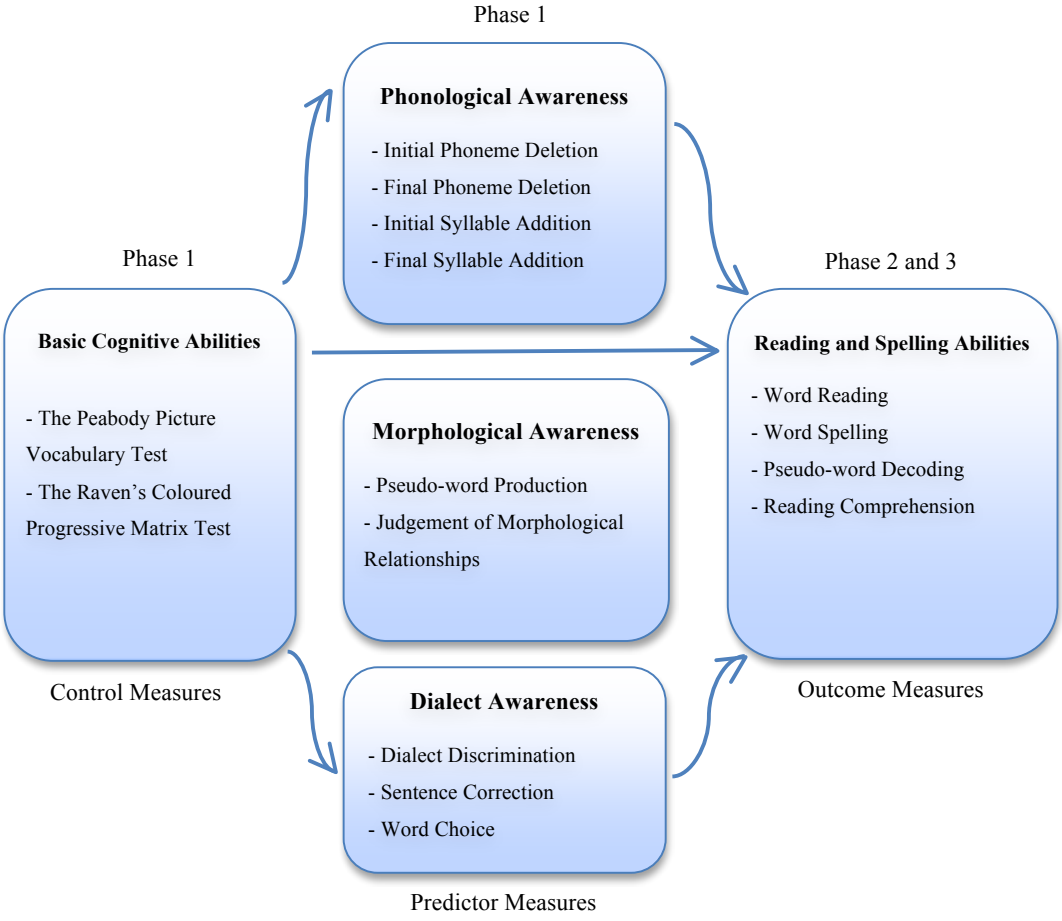


Figure 3.1

An Outline of the Study Design

Hearing and deaf children were tested in phase 1 to assess their oral language skills, with the employment of a number of phonological, morphological and dialect awareness tasks as predictor variables. In phase 2, the literacy skills of deaf children and first-grade hearing children were tested by means of a number of tasks presented to determine outcome

variables. In phase 3, hearing children were tested once more with the same literacy outcome tasks used at the end of the first grade, in order to examine the progressive correlation between predictor variables and later literacy outcomes. This replication is of great importance in order to test the adequacy of the model developed with the first data set. Basic cognitive skills presented in verbal and non-verbal tasks were used as a control in order to remove their effect as alternative explanations for the relation between the predictors and the outcomes.

3.3 Research Hypotheses

Using a longitudinal sample, this study was based on three specific hypotheses:

1. Children's performance on phonological, morphological and dialect awareness measures predicts their performance on reading and spelling measures independently of their age and cognitive ability.

2. Children's phonological and morphological awareness make contributions to the prediction of literacy outcomes that are independent of each other.

3. Children's dialect awareness contributes to their reading and spelling skills; this contribution depends on their particular levels of phonological and morphological awareness.

3.4 Recruitment and Sampling

The recruitment process started at the office of the Educational Research and Development Administration, where the director was met and the purpose and plan of the research were discussed. The study was approved, and permission letters were sent to the educational

districts in Kuwait (Al-Āṣima, Al-Farwāniyya, Al-Aḥmadī, Ḥawalī and Mubarak Al-Kabīr). One district (Al-Jahrā) was excluded from the sampling frame, due to several key factors. Firstly, Shah, Shah and Radovanovic (1999) reported a substantial difference between the excluded and the included districts in their socioeconomic profiles. They identified 54% of the children in the excluded district as having a low socioeconomic status in terms of parents' education level (45% illiterate) and income (54% low-income households). These are among the commonly reviewed factors related to children's vocabulary and literacy level (Hart and Risley, 1995; Westerlund and Lagerberg, 2008). Although the socioeconomic situation is expected to change rapidly, there is no further current data available, hence the decision to keep possible differences to a minimum. Secondly, this district is also the least developed (Radovanovic et al., 1999), and has the lowest number of state schools by district (Public School Guide, Kuwait Government, 2011). Its population is dominated by an originally nomadic/Bedouin community (Radovanovic et al., 1999; Al-Qenaie, 2011) who practise a dialectical form which differs from the subtle dialect used in the other districts (Brown and Ogilvie, 2009). Finally, the inclusion of this district would require the use of different dialect awareness measures, which is beyond the scope of this study.

The included educational districts had received official approval from the office and therefore sent 'letters of notification' to two state schools in each district in which one boys' and one girls' school were selected, or it was left for the researcher to select the state schools randomly. For recruiting deaf children, however, approval letters were issued from the Private Educational Sector to all state and private schools in which deaf children, with no additional disability, are educated.

The authorisation letters were required by the schools in order for them to co-operate, and

facilitate the researcher's task of gaining access and collecting data. Letters were reviewed by the head teacher of each school and a prepared consent form was signed following a briefing as to the study's aims and procedures. Consequently, the school's psychologist or sociologist was asked by the head teacher to cooperate with the researcher. A quiet room was provided and parent's consent forms were distributed to a random sample of fifteen first-graders at each primary school. Sample-drawing procedures were based on a directory of children's names and on a balanced number from each class of the school's first grade. The first eight children in each school who returned a signed consent form and also gave verbal consent were recruited to participate in the study. Essential information concerning the participant's background (e.g. date of birth, nationality, etc.) was gathered from the school's files at the start of the data collection process.

Based on guidelines provided by Stevens (1996) and Tabachnick and Fidell (2007), a total of 80 hearing children were recruited. Stevens recommended 15 cases per predictor to obtain a reliable equation when researching social science. Tabachnick and Fidell provided a formula ($N > 50 + 8m$) for computing the required sample size based on (m), the number of independent predictor variables. As the current study set up phonological, morphological and dialect awareness as three predictor variables, the sample size had to be no less than 45 according to Stevens, or 74 according to Tabachnick and Fidell.

The same process for recruiting hearing children was followed with 37 Kuwaiti deaf children who met the research specified criteria (to be listed later). There was no refusal among them to participate, but 3 withdrawals occurred in the second phase of the study due to personal reasons and particular circumstances.

3.5 Participants

Below is an account of the two groups of hearing and deaf participants, and their demographic characteristics.

3.5.1 Hearing participants

Eighty hearing Kuwaiti children (40 boys and 40 girls) were selected randomly from ten single-sex primary state schools, of which five were educated boys and five girls. Their ages ranged from 67 to 81 months (M= 73.25, SD= 3.906), with an average age of 6 years and 2 months (74 months) at the start of the school year when the data collection was carried out. The whole sample participated longitudinally in the first and second research phases. For the third research phase, however, two participants withdrew due to school change, and the difficulty of obtaining updated information about the schools they had moved to.

The sample drawn from the attendees of state schools is believed to be representative of the most common social class in Kuwait, the middle class. Although there is neither an official definition of social class nor an interest in the research committee in defining it (Shah et al., 1999), it is mostly seen among Kuwaitis as a consequence of the family's origin, with ethnicity playing no major part in defining it (Holes, 1989; Taqi, 2010; Al-Qenaie, 2011).

3.5.2 Deaf participants

Thirty-four deaf children (16 boys and 18 girls) were recruited from all available deaf specialist schools and units in Kuwait. These were aged from 70 to 112 months (M= 93.35, SD= 10.608), with an average age of 7 years and 6 months (90 months). For many participants, the specific degree of hearing loss, their exact age at the onset of deafness, and their individual intelligence quotient score, were unobtainable from the school records.

However, the following inclusion criteria were ensured with the recruited sample.

1. According to the medical certificates of hearing impairment requested by the schools prior to the children's admission, participants were either prelingually deaf or their deafness had occurred at an early age. This criterion negated the effects of early exposure to language that may have facilitated language acquisition.

2. Participants had the advantage of early implantation of cochlear devices or hearing aids. There were 18 deaf children fitted with hearing aids and 16 were cochlear implant users, 3 of whom were fitted with hearing aids as well. Their main communication mode was spoken language, and all were orally educated.

3. Participants were accepted to study at the involved schools following a screening test for other educationally significant disabilities such as vision-based problems and behavioural or emotional disorders. They were also mentally assessed by an intelligence test called *Al-Amal* which is accepted as an effective screening test by most schools of Special Educational needs in Kuwait. These imply that other than deafness, there are no other factors affecting the linguistic capacity of the participants.

4. Participants represented the middle socioeconomic class, since the schools involved are generally attended by middle-class children, whereas enrolling is either free or available at a reasonable charge.

The available background information about the deaf participants and their speech and pronunciation problems, if any, was gathered from the school's psychotherapist prior to testing sessions. Each child was usually included in a class of hearing children according to his/her educational level (determined by the teacher and/or by the number of years of

schooling), which ranged from first to third grade. Deaf and hearing children study together in the first part of the school day. In the second part, deaf children receive small-group support lessons in addition to weekly individual auditory and speech therapy sessions.

Previous Systematic Exposure to Standard Arabic and Written Texts

Prior to formal schooling, most of the participating children, hearing and deaf, went through two non-compulsory years of kindergarten, where they were exposed to Quranic verses, stories and poems. They were occasionally encouraged to experiment with writing, but there was no formal teaching exposure to the standard form. White (1987) argued that random exposure to target literacy patterns is insufficient for the effective learning of a language form. In conformity with the Arabic language, Khamis-Dakwar, Froud and Gordon (2011) found no significant effects of informal exposure to the standard Arabic on children's competence in Arabic.

3.6 Procedures

Hearing participants were assessed at the very beginning of the first grade in order to avoid significant formal exposure to literacy instruction before the assessments. They were tested again at the end of the first grade and then at the end of the second grade in order to evaluate their literacy skills following two years of instruction. Testing in the first phase (September to October) was conducted individually by the researcher in one of their school's quiet rooms. The data collection of the first phase was completed over two consecutive days in two or three sessions with a duration of 25 to 45 minutes per session. The second and third phases were conducted during the later stages of the school year (April to May) at the end of two consecutive school years, i.e. in the first and second grades. The assessment tasks of the

second and third phases were administered individually, or with small groups of 2 to 8 children. Each child was assessed over one or two sessions within the same week. The average administration time was approximately 15 to 30 minutes for the individually applied measures, and 20 to 40 minutes for the group applied measures. Children's responses were noted on data-sheets as well as being audio-recorded for later verification. Encouragement, but no feedback on performance, was given to the children during the application of tasks. The tasks were not timed, and children were given breaks between testing sessions, or as needed. Deaf children went through similar procedures but were only tested in the first two phases of the study. However, all testing sessions were applied individually, with longer durations. Deaf children were also encouraged to pay close attention to lip-reading during task administrations.

A variety of methods of task presentation and procedures (booklets, illustrations, PowerPoint slides, pictures, cards, pencils and papers, etc.) were used to stimulate the attention and motivation of the children. For testing preparation purposes, each participant was given two or three practice items, with feedback on their responses preceding the experimental trials of each task. The instructions for all the measures were presented simply in the Kuwaiti spoken dialect to enhance the children's understanding of the task. Consonantal or lexical variations that are often used by different Kuwaiti groups, and believed to influence the recognition of the task instructions or its items, were considered. For example, the phoneme *j* was presented by the researcher as *j* or *y* when appropriate to facilitate the child's understanding (e.g., *jaddah* or *yaddah* for grandmother). The child's particular realisations could easily be distinguished during the preparation process for the testing session, when the child was asked for his/her verbal consent. The application of a number of socio-phonetic variations is a feature of Kuwaiti society, and may indicate the user's origin affiliation (Taqi, 2010; Al-Qenaie, 2011).

3.7 Measures

A number of measures aimed at assessing phonological, morphological and dialect awareness skills were utilised as literacy predictors in the first phase of the study. Reading and spelling measures were used to assess literacy outcomes in the second and third phases. In addition, two tests of intelligence were employed in the first phase to gauge cognitive abilities and to act as a control when seeking an association between predictor and outcome variables.

Next, an account of cognitive measures is presented, followed by literacy predictor measures and literacy outcome measures.

3.7.1 Measures of Cognitive Ability

In studies predicting reading achievement, Stanovich (1988) affirmed the importance of differentiating and controlling reading performance that can be affected by cognitive abilities. The presence of appropriate control measures allows investigators to confine the possibility that a connection noticed between specific language awareness and reading skills is related to a third variable (Deacon, Wade-Woolley and Kirby, 2007). Because of the substantial relationship found between verbal (Smith, 2004) and non-verbal (Naglieri, 1996) intelligence factors and children's reading achievements, controlling for those is essential when discovering any association between a language measure and reading ability (Deacon and Kirby, 2004). Deacon and colleagues (2007) demonstrated that when subjects are dealing with analogical tasks, analogical thinking involves an element of non-verbal ability, and when they are dealing with a task involving the production of real words, their use of vocabulary involves an element of verbal ability. Verbal and non-verbal abilities may therefore be relevant to morphological and phonological awareness tasks, and to reading measures.

In the current study, the assessment of cognitive functioning was based on children's performances on verbal items from the Peabody Picture Vocabulary Test (Dunn and Dunn, 1981) and non-verbal items from the Raven's Coloured Progressive Matrix Test (Raven, 1981). Both tests have been standardised for the Kuwaiti setting with the study's specified age group of hearing and deaf children. Given the indication of limited language exposure of the deaf group, it was imperative to include a non-verbal ability test, and also to keep the verbal test at the minimum. The Peabody test has been especially useful with deaf children, due to its relative independence from subjects' speech ability in comparison to other verbal intelligence tests. It captures word comprehension abilities and reflects the overall linguistic and cognitive functioning of hearing and deaf children.

3.7.1.1 The Peabody Picture Vocabulary Test

This test was standardised by Abu-Allam and Hady in 1998 on the Kuwaiti setting. The test was intended to provide a measure of the verbal reasoning ability of both the hearing and the deaf children. It consists of 184 test items presented in clear, black-and-white drawings, in ascending order of difficulty. Each item is presented in one of a series of four pictures on the displayed page. The instructions for the test involve the examiner asking the child to point to or to state the number of the correct picture, with the examiner speaking the target word. The starting point of the test depends on the child's age, but first some training has to be administered. A general training rule states that two answers out of four in the second set of items have to be correct without any help, and then the test can begin at the appropriate start item, otherwise the child is tested on the first, simpler, training set. Once more, two items have to be answered correctly, and the test starts with the first very basic set, item 1. The test will then continue until the child makes six mistakes within eight consecutive items. When this point is reached, the last item of the set is known as the 'ceiling'. The number of

incorrect responses is deducted from the ceiling to yield the total score used in the data analysis.

Although the Peabody test was standardised to suit the Kuwaiti setting, it is one of the most culture-loaded tests (Jensen, 1973). When Jensen compared the performance of same-age schoolchildren of two national groups (London vs. California), the internal analysis suggested that one group exhibited a cultural bias in terms of sensitivity to word meanings. For the Arabic version, although an attempt has been made to consider the differentiating features of Arabic culture when adapting from English, the Arabic version still exhibits a different cultural bias. For example, the target words *baṭrīq* 'penguin' do not refer to a creature commonly seen in Kuwait or other Arab regions, and could be replaced by names of animals that are encountered more frequently by Arab children. Likewise, many target words (i.e. *kurawī* 'circle' and *usṭuwānī* 'cylindrical') represent the standard form of Arabic and could be replaced by shared words that are available in the children's dialect. Also, when an item-by-item inspection is carried out for the Arabic version, it reveals insensitivity to the richness of Arabic language, as the items included are based mostly on the same word forms. For example, verbs are often given in the third-person singular masculine present active form, and are never presented with any possible derivations or regular inflections. Although the test is biased in terms of performance distinctions related to cultural experience, its predictive validity was established across different age groups of school attendees in Kuwait.

3.7.1.2 The Raven's Coloured Progressive Matrix Test

This test was introduced to a Kuwaiti population by Al-Qurashi in 1987. The test aimed to assess the non-verbal ability of the hearing and the deaf children. It consists of thirty-six puzzles divided equally into three sets of matrices. The first matrices measure the children's

ability to complete the missing parts. The second and third matrices measure the subject's ability to perceive relationships and abstract thinking, respectively. For each matrix, the child was asked to choose which of six alternative pictures best fits the missing piece of the matrix.

Procedures specified in the manual were considered for examples, questions and scoring guidelines. The researcher recorded the child's responses on separate answer sheets while encouraging them, without indicating whether the answers were correct or not. One point was earned for each correctly matched puzzle, as the test manual dictates.

3.7.2 Measures of Literacy Predictors

Table 3.1 summarises the predictive measures relating to phonological, morphological and dialect awareness. All were administered at the beginning of the school year to examine their contributions to the reading and spelling skills of hearing and deaf children.

Table 3.1

Measures of Literacy Predictors (Phase 1)

Dialect Awareness Measures		
Dialect Discrimination task (DD)	Sentence Correction task (SC)	Word Choice task (WCH)
Phonological Awareness Measures		
Initial Phoneme Deletion task (IPD)		Final Phoneme Deletion task (FPD)
Initial Syllable Addition task (ISA)		Final Syllable Addition task (FSA)
Morphological Awareness Measures		
Judgement of Morphological Relationships task (JMR)		Pseudo-word Production task (PP)

3.7.2.1 Phonological awareness measures

Phonological awareness measures differ in nature and level of difficulty. Different types of English phonological awareness tasks have been classified in a developmental progression based on degrees of difficulty (Yopp, 1988; Adams, 1990). For instance, the size of sound units (Treiman and Zukowski, 1991), the number of sounds in a word (Yopp, 1988; Adams, 1990; Smith, et al., 1998) and the location of the sound in the word (McBride-Chang, 1995) are factors that affect the level of task difficulty. The developmental progression of some phonological awareness tasks has also been classified in the Arabic literature (Tibi, 2010). In such classifications, children's performances with phonemes as small units of sounds were poorer than with syllables as larger units of sounds (Saiegh-Haddad, 2007). Also, their performance in deleting initial phonemes was less proficient than their performance in deleting final phonemes (Saiegh-Haddad, 2003).

The ability to remove a phoneme or a syllable from a given word was examined early on by Rosner (1975), who found this method to be the best indication of reading performance among beginners. The predictive correlation of deletion task with word reading was also conveyed by Yopp (1988). In Yopp's task, children were required to repeat a word, then to say what remains after deleting a given component: a phoneme or syllable. Morais, Cary, Alegria and Bertelson (1979) administered the task with further manipulations that involved carrying out phonemic or syllabic deletion from the beginning or the end of a real word or a pseudo-word. Arabic studies have also deployed initial and final deletion tasks at the phonemic and syllabic levels with monosyllabic and bisyllabic structures (Saiegh-Haddad, 2003; 2004; 2007; Saiegh-Haddad et al., 2010). Although these tasks were found to be reliable in assessing diverse levels of segmentation ability among beginners, none could be used in the present study. This is primarily related to the variation of phonemic

representations and syllabic structures between different Arabic settings. The Palestinian Arabic dialect, which has been a major focus when developing research measures, varies to some extent from other Arabic dialects (Holes, 1995; Ayari, 1996). Remarkably, even if the same context of Palestinian Arabic is examined, research measures must be constructed to allow for the linguistic variation of the regionally different vernaculars (Saiegh-Haddad, 2004; Saiegh-Haddad et al., 2010).

For the purpose of this study, four measures were developed to meet criteria similar to that found in the literature, but in which the diglossic nature of the target dialect – Kuwaiti Arabic – is considered. These tasks – the 'Initial Phoneme Deletion', the 'Final Phoneme Deletion', the 'Initial Syllable Addition' and the 'Final Syllable Addition' – are believed to produce sufficient variation in the children's performance from the minimum level allowed. The two phoneme deletion tasks examined the participants' ability to segment words and carry out phonemic deletion from the beginning and the end of mono-syllabic, bi-syllabic and tri-syllabic words. The initial phoneme deletion and the final phoneme deletion tasks each involved nine items divided evenly into three word types that differed in their lexical status:

(1) the standard words category combined three words that represent the standard form and are also available in the children's dialect.

(2) the dialect words category included three words that only represent the dialect consonantal phonemes in their initial, middle or final position.

(3) the pseudo-words category included three stimuli containing phonemes that may encode both dialect and standard.

Each child was instructed to listen carefully to the given word and repeat it, then to say it with the target phoneme deleted. For example, the researcher said to the child; 'say *gāl* …,

now say *gāl* without the *g* …' in the initial deletion task, and 'say *mawqif* …, now say *mawqif* without the *f* …' in the final deletion task. Following a correct deletion by the child, the remaining part of the stimuli was either a new word or a random non-word. Three practice items were presented for clarification prior to task trials. One point was assigned for successfully deleting every target phoneme from the beginning of nine items, or the end of another nine items.

The two syllable addition tasks were used to test the participants' skills in manipulating parts or segments that are larger than a phoneme at the beginning and the end of a stimulus. The initial syllable addition and the final syllable addition tasks each comprised nine bi-syllabic or tri-syllabic items divided into three equal groups of standard words, dialect words and pseudo-words. For each group, participants were required to listen to three stimuli and repeat them with either an additional initial syllable or an additional final syllable. The stimuli of the standard and the dialect trials were real words before and after adding the given syllable. For the pseudo-word trials, however, the addition of the syllable created other pseudo-words. For example, the initial syllable addition task involved items that were given in each of the three categories:

(1) three standard words starting with the syllable *as (as'ad*, *asmar*, *aswad)*. These words exist in the standard and the dialect forms;

(2) three dialect words starting with the syllable *ish (ishda'wah*, *isḥaggah*, *ishkithir)*. These words uniquely represent the dialect form;

(3) three pseudo-words starting with the syllable *khā (khājir*, *khāmū*, *khātī)*. The syllabic structures of the pseudo-words may resemble both forms and are not specified to either.

An example of the initial addition is the first given item. The child was told: 'Please tell me,

what is *da'wah* when you add *ish* to its beginning?' The addition of the syllable *ish* will create a new word, *ishda'wah* 'how so!' from the real given word *da'wah* 'matter/invitation'. The subsequent task of the final syllable addition involved similar categories and similar sorts of stimuli. Parallel processes were also practiced, but with asking the child to add the target syllable to the end of a given word or pseudo-word. An example of a given pseudo-word is: 'Please tell me, what is *khab* when you add *kar* to its end?' Following a correct addition by the child, the item produced, *khabkar*, is another pseudo-word. In the dialect and standard categories however, the addition created a new word. Two training items were given to promote the children's understanding of each syllabic addition task. One point was awarded for every response out of nine initial additions and nine final additions.

3.7.2.2 Morphological Awareness Measures

Among many approaches towards assessing children's morphological abilities as predictors of reading proficiency, two different response formats have been preferred: judgement and production. The judgement task was designed to tap into children's implicit awareness, while the production task explores their explicit awareness of the morphemic structure of words (Yopp, 1988; Carlisle and Nomanbhoy, 1993; Carlisle, 1995). In terms of implicit awareness, children can recognise the morphological relationships between word-pairs without direct manipulation of their morphemic structure (Carlisle and Nomanbhoy, 1993). Explicitly, however, children can produce conscious responses through a direct morphological decomposition process (Carlisle and Nomanbhoy, 1993; Carlisle and Fleming, 2003; Carlisle and Stone, 2005; Nunes and Bryant, 2006; Deacon, Parrila, and Kirby, 2008). These tasks seemed to be ideal for detecting the implicit and explicit levels of morphological awareness among the study's target age group. However, due to the absence of such measures from the Arabic literature, the production task was adapted from English,

which has an abundance of morphological methods, and the judgement task from Hebrew, which shares the morphemic nature and rules with Arabic (Ratcliffe, 1990; Ravid, 2001). It is vital, however, to administer the production and the judgement tasks using the spoken dialect form, because children's awareness of morphology in the spoken form can determine their later use of morphological rules in the written one (Nunes and Bryant, 2006).

Children's explicit morphological awareness was assessed by adapting the pseudo-words production task from the improved version by Brittain (1970), which was based on Berko's (1958) test of productive use of inflections. Brittain assessed children's ability to inflect pseudo-words such as 'wug' to plurals, past tense, comparatives and so on, by asking them to complete a given sentence with an appropriate form of pseudo-word. The researcher detected a reliable connection between the performance of 7- to 8-year-old children on this task and reading achievement at grade one and two, even after the intelligence variable has been controlled for. As this task was a successful morphological predictor with English beginners (Carlisle and Nomanbhoy, 1993; Carlisle and Fleming, 2003; Deacon et al., 2008), it may offer the potential for investigation in other alphabetic contexts, such as Arabic, which lack the existence of such a tool. Despite the differences between English and Arabic, a generalisable model of literacy growth or problem across the two languages has been implied by Al-Mannai and Everatt (2005), which suggests relevant usage of this tool among Arab beginners.

Brittian's task structure was used as a base on which to construct the pseudo-word production task that required sentence completion with an appropriate pseudo-word form. The use of unfamiliar letter strings, when manipulating pseudo-roots, can reveal the children's morphological skills and their productive application inflectionally and derivationally, after controlling for the influence of cognitive ability. Eight oral dialect

sentences, in which each included three or four different forms derived from one pseudo-root, were presented to each child. The missing forms whose production was sought were four inflected forms that demanded suffixations, and four derived forms that demanded infixations. Five of these forms were nouns and the remainder were verbs, all presented in a random order. In order to assist the children in recognising the concept of pseudo-words, they were shown illustrated cards of pseudo-shapes. The researcher said: 'I am going to tell you some words that resemble real words but are totally made up; they can be pronounced as if they were real words. For example, this illustrated card presents a lovely creature called *kajjām*. Which real word do you think this made-up word is similar to? … Yes, that's true. It's similar to the word *rassām*. Let us now see how we derived different forms from the made-up word *kajjām*. *Ilkajjām* stood up in *ilmakjam* and *kijam* around the jar a beautiful *kajmah*. You can note that I derived a number of words from the made-up word *kajjām*, exactly as we can also derive a number of words from the real word *rassām*: *ilrassām* 'the man who draws' stood up in *ilmarsam* 'the place of drawing' and *risam* 'drew' around the jar a beautiful *rasmah* 'drawing'.' The child was assisted in noticing the derived forms from the same word-root. An additional practice item was given to each child. The analogical process was only explained during the task practice items.

After presenting each sentence with the first, second, and in many cases the third form of the pseudo-root, participants were asked to produce the missing form in the third or fourth order. An example from the stimulus is: *'askūl* was on his way to meet *'askūlah*. They went together to visit the other ….. (*'asākīl*). Figure 3.2 and Figure 3.3 represent the illustrated cards for the given practice item and the given test item respectively. Subsequent to a proper production of the missing form, one point was granted. The maximum score was eight.



Figure 3.2
Practice item of the Pseudo-word Production Task

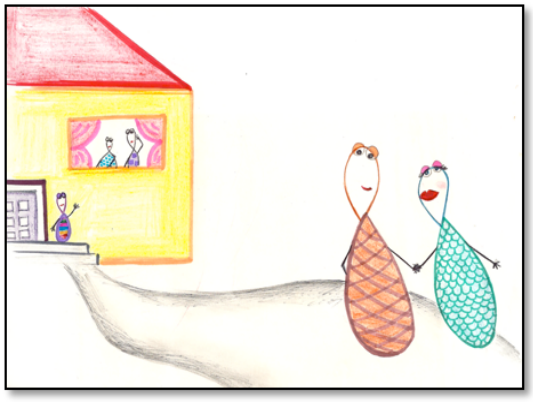


Figure 3.3
Test item of the Pseudo-word Production Task

Implicit morphological awareness was assessed by adapting the framework of a Hebrew task, 'judgement of the morphological relationships', conducted by Ben-Dror et al. (1995b). This task involves more implicit and less conscious skill when children demonstrate their knowledge of morphology indirectly by specifying whether a set of words belongs to a word family or not (Carlisle and Nomanbhoy, 1993; Deacon et al., 2008). Ben-Dror, Bentin and Frost (1995b) examined a group of fifth-grade reading-disabled children with pairs of words that needed to be judged by saying 'yes' if they were morphologically related, and 'no' if they were not. The researchers found a weak performance by the examinees who fell behind the younger control group of second-graders. Prior to Ben-Dror, Carlisle and Nomanbhoy (1993) effectively used a similar version of the 'judgement of word relations' task to evaluate English first graders' sensitivity in identifying members of a word family. The test stimuli included pairs of words presented in a sentence context, each with a base morpheme, either related (e.g., teach–teacher) or unrelated (e.g., doll–dollar). Each sentence was read clearly (e.g., 'A person who makes dolls is a dollar' vs. 'A person who teaches is a teacher'). The child was then instructed to respond by saying 'yes', 'no', or 'not sure'

according to the sentence, if it made sense. Since typically developing first-graders performed well on Carlisle and Nomanbhoy's task, and the reading-disabled fifth-graders performed worse than their controlled match group on Ben-Dror's task, the effectiveness of using the Hebrew task with Arab first-graders can be concluded. This is especially promising if direct judgement on word-pairs were involved, as in the Hebrew task, instead of suggesting sentence judgements, each with three options of yes, no, or not sure, as with English first-graders. The similarity between the morphological paradigms of Arabic and Hebrew that use consistent patterns and permit inflectional and derivational types simultaneously (Ratcliffe, 1990; Ravid, 2001) provides another reason for adapting Ben-Dror's task.

The 'judgement of morphological relationships' task used in this study consisted of eight dialect keywords: four nouns and four verbs. For each keyword, there were four options, of which two were morphologically related: a derivation and an inflection. The additional two words were a rhyme and a semantically related word. All the words were highly familiar to the children, and could be used in their everyday life (e.g. driver, boy, to hold, to drink). In presenting each keyword, the child heard a trial of four word-pairs and was asked to say 'yes' or 'no' following each pair in accordance with his/her judgement, if the pair were morphologically related or not. One example from the eight trials considered is the word *iṣbay* (boy). This stimulus involved the following four word-pairs: *iṣbay / idbay* (boy / Dubai: rhyme), *iṣbay / maṣbanah* (boy / group of communal boys: derivation), *iṣbay / iṣbayyān* (boy / boys: inflection) and *iṣbay / walad* (boy / boy: synonym). The morphologically related word-pairs within each block were ordered randomly to avoid a repetition effect due to the recurring presentations in all the stimuli. Two training trials with feedbacks were given to ensure a good understanding. In the first training trail, for instance,

the child was told: ‘We know that there are many words that ‘go together’ because they have something in common that makes them belong to the same word family. For example, the words *jamīl / jamāl* (beautiful / beauty) have the same root, while *jamīl* / *ḥasan* (beautiful / good-looking) do not share the same root (although their meaning might be connected).’ For scoring the test items, one point was awarded for each correct answer, out of 32 points in total.

3.7.3.3 Measures of Dialect Awareness

Certain dialect measures such as ‘sentence repetition’ and ‘spontaneous speech’ that were developed several decades ago and have been used up to the present day, are based primarily on measuring the dialect density of speakers in the African-American community (Baratz, 1969; McCormick-Piestrup, 1973; Terry et al., 2010). Dialect measures also involved sub-tests of standardised reading trials (Hernandez, 2010) or typical reading and spelling tasks (Treiman, Coswami, Tincoff and Leevers, 1997) to specify and evaluate the occurrence of a dialect feature in literacy production. Noticing the dialectic features and the frequency of their occurrence provides fundamental information about the dialectical profile of children, though it may add little about their explicit awareness of the language variation, or their ability to use the language confidently.

For the purpose of this study, three dialect awareness tasks were developed to assess children’s awareness of the language varieties prior to starting literacy instruction. The first one aimed to examine their general awareness of the existence of standard and dialect forms in their setting. The other two aimed to assess their specific knowledge of the phonological, morphological and grammatical variations between the two language forms when manipulating both forms intentionally to perform the tasks.

The first task of the study was based on Wolfram, Adger and Christian (1999), who developed the 'dialect awareness' task to examine the participant's ability to detect a speaker's ethnic affiliation. Participants were exposed to five minutes of listening extracts from two African-American English-speaking children and two standard American English-speaking children. For each extract, participants were asked to make judgements about the child's use of dialect and to classify the child's ethnic affiliation. A rating on how closely the speech resembled each variation was required from the participants. A prepared sheet with a rating scale from 'Standard English Dialect Use' to 'Non-standard English Dialect Use' was used to measure the listeners' responses. This approach was adopted as it aimed to assess the participants' general awareness of their languages' varieties, which was also an aim in this project. However, the original task was too complex for the young children in this study, who could not be expected to use a rating scale consistently. Therefore, a simpler discrimination of the speaker's group was more appropriate. Baratz's (1969) study involved similar processes but aimed at matching the oral phrases to pictures representing some demographic variations, such as the ethnicity or gender of the speakers. When children listened to the sentences in either language form, they were asked to choose who they thought would have pronounced each sentence by pointing to a picture.

In accordance with these measures, the 'dialect discrimination' task was designed to assess the children's general awareness of the two existing varieties of the Arabic language in the Kuwaiti context. The task was performed with the aid of eight PowerPoint slides, each showing a picture of two girls in addition to a speech bubble placed between them (Figure 3.4). Through presenting the slides, each bubble changed to show eight scenes from a poetic story. The story was based on an attractive Arabic poem, which was written by the well-

known poetic figure, Shawqī, in 1898. A shorter version of the poetic story was narrated by the researcher into the two language forms: standard Arabic and Kuwaiti dialect.

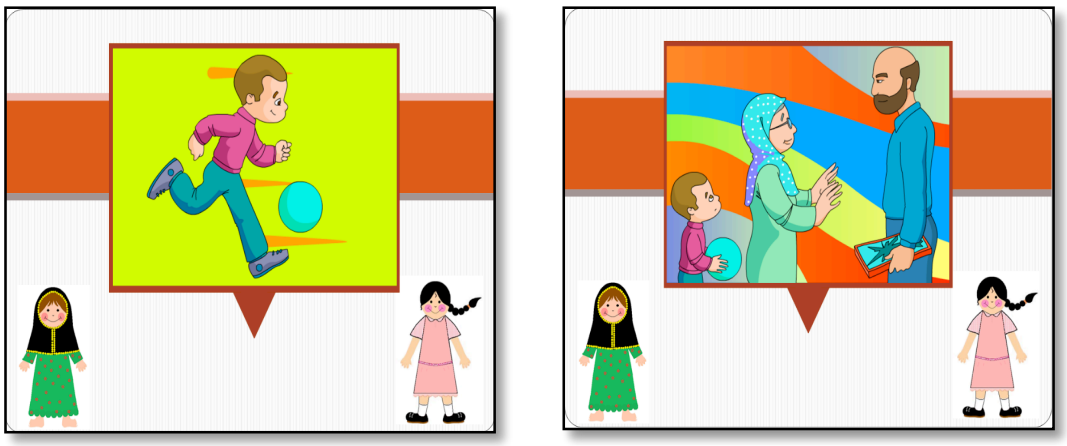


Figure 3.4

Sample Slides from the Dialect Discrimination Task

To start the task, the picture of the two girls was presented. One girl wears a traditional Kuwaiti dress, speaks the local dialect and has a traditional Kuwaiti name (Shaykhah). The other wears a school uniform, speaks standard Arabic and has a classical name (Maryam). To introduce the Arabic-speaking girl, the researcher uses the standard Arabic form and says on behalf of the character: 'My name is Maryam. I love my mother and my father. I go to my school every morning to learn the Arabic language. My youngest sister and I are going to tell you a lovely story.' The Kuwaiti-speaking girl is then introduced, as the researcher, using the Kuwaiti dialect, says on behalf of the other character: 'My name is Shaykhah. I love my mother and my father. I do not go to school because I'm still young. My older sister and I are going to tell you a lovely story.' These four introductory sentences in each form, which include different lexical, phonological and morpho-syntactical features in both forms, were presented clearly. Participants were instructed to respond after listening to each sentence by

either pointing to or naming the girl who they believe would have spoken each sentence. One point was awarded for each correct discrimination.

The following are some examples from the lexical, phonological and morpho-syntactical differences that are included in the task and expected to be picked up by the child when responding as a result of his/her discrimination between language forms.

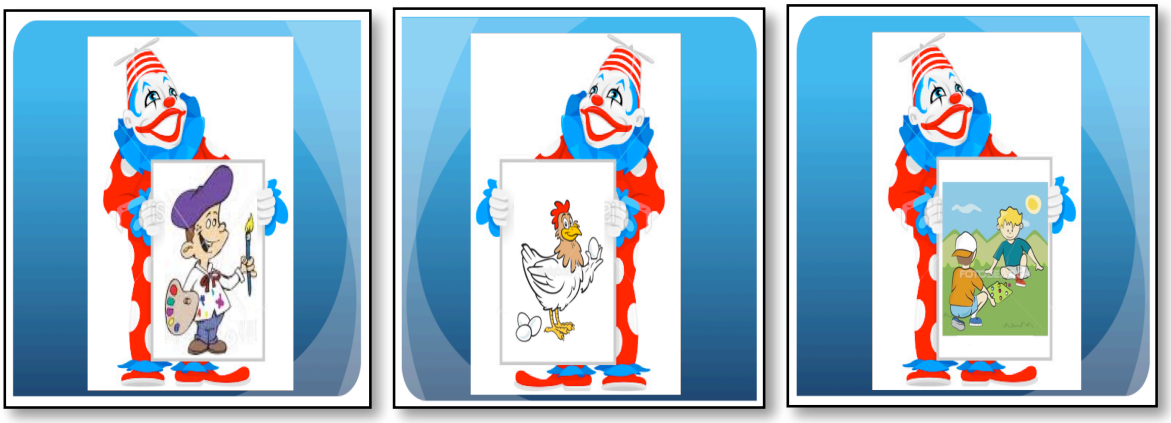
Phonologically, the task includes a number of non-standard phonemes (such as *ch* in *chān* / 'so', and *g* in *gālat* 'she said') that exist in dialect words but not in standard words. It also includes a standard phoneme (*ḍ* as in *lā taḍribhu* 'don't hit him') that most children are not familiar with. The syllabic structure of dialect words, which can be different from the standard form, is also shown in the task items (such as the frequent start with the additional vowel *i* in the dialectical words: *il-ubu* vs. *al-ab* 'the father'). The task also reflects some shared words (such as *jaddatun* vs. *yaddah* 'grandmother') that are different in each form, in terms of the syllabic and phonemic structure. Morphologically, the task involves different inflectional and derivational operations between the standard and the dialect forms (such as the use of a different derivation for the dialect word *'aṣṣab* 'starred', which uses the word pattern *fa''al* instead of the standard word *ghaḍiba* 'starred', which uses the word pattern *fa'ila*). Syntactically, the two forms basically utilise dissimilar word orders that may affect sentence comprehension. The dialect usually follows subject–verb–object word order (such as *il'ubu–sāmaḥ–iwledah* 'the father–forgave–his son'), whereas the standard form has a more flexible word order but typically follows verb–subject–object word order (such as *ikhtaba'a–alwaladu–warā'a aljaddah* / 'hid– the boy– behind the grandmother'). Lexically, the task includes many words from the standard form that vary significantly from the dialect (such as *ikhtaba'a* instead of *inkhash* 'he hid').

The second and the third tasks of the dialect awareness measures focused on children's specific grammatical awareness of the dialect and the standard forms, rather than their general awareness of the language varieties. This is believed to assist in predicting word recognition and reading comprehension achievements (Cain and Oakhill, 2007), both of which are within the scope of this study. The 'sentence correction' and the 'word choice' tasks were based on Siegel and Ryan (1988), who tested children's ability to correct grammatically incorrect sentences by means of the 'error correction' task, or to supply a missing word in a sentence by means of the 'oral-cloze' task. Abu-Rabia, Share and Mansour (2003) adapted these tasks from English to Arabic and used them with groups of reading-disabled and normal readers.

Within the framework of these measures, the test items for the current study were developed to be specifically applicable in the current context of research with Kuwaiti children. The 'sentence correction' task was carried out with the aid of a puppet who makes instrumental grammatical mistakes in eight sentences, so that the child can intervene and express his/her awareness of mistakes productively. Among the eight incorrect sentences, four stimuli considered the person, number, gender and tense aspects in the standard form, and the other four considered the same aspects in the dialect form. Two correct sentences were included, simply to enhance the children's thinking and to keep the tasks stimulating, but these were not counted for the child's overall score.

The task administration involved presenting the children with a set of ten PowerPoint slides showing a clown puppet holding a picture card, and expressing it with either a correct or incorrect sentence presented randomly (Figure 3.5). The child was asked to listen carefully and try to pick out when the clown talked wrongly, as well as correcting him when he made

mistakes. Subsequent to showing each card and the researcher's stating of a sentence, the child was asked whether and why the puppet spoke correctly or incorrectly. As the intended sentences were all wrong, the scoring provided one point for correcting a sentence, subsequent to indicating its faultiness. A training item was presented with the first slide (below): 'This boy is an artist (feminine). The clown talked strangely, didn't he? We don't say *fannānah* (feminine), we say *fannān* (masculine), because he is a boy.'



Practice Sentence Dialect Sentence Standard Sentence

Figure 3.5
Samples of the Sentence Correction Task

An example from a dialect sentence was presented with the second slide: *bāḍ iddiyāyah* 'The hen laid an egg'. To correct this sentence, the masculine verb *bāḍ* should be replaced with the feminine verb *bāḍat* because the subject *iddiyāyah* is feminine. In the dialect form, the singular subject follows the singular verb in terms of femininity and masculinity. An example from a standard sentence was presented with the third slide: *hādhāni alwaladāni yal'abūn* 'These boys are playing'. To correct this sentence, the plural verb *yal'abūn* should be replaced with the dual verb *yal'abān*, because in the standard form the verb follows the

subject in its singularity, duality and plurality. Following a proper correction of each sentence, one point was awarded, giving a possible total of eight.

In comparison to the standard paradigm, some tenses and forms are ignored in the Kuwaiti dialect. Accordingly, the questions that concern these aspects in the standard form are rarely expected to be answered correctly. However, it is important to include one of these cases – the dual form here – to identify children who may have a greater degree of exposure to the standard form. The chance of producing a correct answer to the dual form question has been increased by adding a dual determiner at the beginning of the sentence, although it is possible to have a meaningful sentence without it. To clarify, the sentence 'the boys are playing in the garden' is equivalent in meaning to the sentence 'these boys are playing in the garden', but the latter was used in the stimulus due to the consistency between the demonstrative determiner *hādhāni* 'these' and the subject *alwaladāni* 'the boys', in containing the syllable *āni* at their end, to demonstrate the duality. To correct the verb *yal'abūn* 'are playing', which has a final syllable different from *hādhāni* and *alwaladāni*, the attached *ūn*, which indicates plurality, should be replaced by *āni* to agree with the previous two words in duality form as well as in nominative case.

For the 'word choice' task, each child was presented with a set of eight PowerPoint illustrations, each expressing a sentence. Every child was asked to change the slides independently by clicking on the arrows, while the researcher stated a sentence with a missing word and supplied two choices derived from the same word stem. Listening carefully to each sentence, the child was asked to make a choice between the two given words that would better fit the stated sentence, i.e. be grammatically correct. The sentences were randomly presented in either the standard or the dialect form. The switch between these

was obvious due to the evident differences between the two forms of the language. The person, tense, number and gender aspects were expressed, and had to be selected correctly in accordance with each of the forms' grammatical functions. An example is illustrated below left (Figure 3.6).



Figure 3.6

Sample from Word Choice Task

The child was presented with the following dialectical sentence: 'Can you tell me which word fits better in the following? Amal and Muna … the balloons.' (*miskay* 'hold' / second person feminine singular imperative verb) or (*yimsikūn* 'are holding'/ third person masculine plural imperfect verb). The second choice in this example is the correct one in the dialect form, although it is grammatically wrong when compared to the standard form. The child was awarded one point for each correct selection of the given sentences.

All the measures above were intended as assessments of the children's phonological, morphological and dialect awareness skills. The aim was to investigate their contributions as predictors of literacy outcome measures, as described in the subsequent sections.

3.7.3 Measures of Literacy Outcomes

Table 3.2 presents the outcome measures that were used at the second and third phases with the hearing children in two consecutive school years. For deaf children, these measures were

applied only once, at the second data collection phase. These measures covered reading skills through the word reading, pseudo-word decoding and reading comprehension tasks, as well as spelling skills through the word spelling task.

Table 3.2

Measures of Literacy Outcomes (Phases 2 and 3)

Reading and Spelling measures	
Word Reading Task (R)	Reading Comprehension Task (RC)
Pseudo-words Decoding Task (PD)	Word Spelling Task (S)

3.7.3.1 Reading Measures

Due to particular constraints, the measures in Arabic literature used to assess reading skills in young children are not applicable in this study. These are either curriculum-based tasks intended to monitor the student's response to classroom instruction (Al-Mannai and Everatt, 2005; Abu-Rabia and Taha, 2006; Abu-Rabia, 2007), or tasks designed to observe progress in relation to a particular intervention plan among children at risk (Levin et al., 2008). However, for developing the 'word reading' task as a measure of single word recognition, the same principle found in the literature, i.e. that of including stimuli at different levels of difficulty and frequency, was followed. The selection of the reading task items was initially based on the most common words mentioned in a piece of statistical guidance issued by the Centre for Child Evaluation and Teaching in Kuwait (Mahfodei et al., 2009). But due to the change in the Arabic language curriculum for the first and second grades in the year of data collection, the list was modified to include words found in the present curriculum texts, which included a variety of lengths and levels of complexity.

The reading task consisted of twenty-five words presented in vowelised orthography aimed at assessing different aspects of reading skills in which the influence of the dialect may be responsible for performance levels in the following areas:

1. Reading words containing the glottal stop *hamza*, which has multiple forms in Arabic script and is occasionally not pronounced in spoken Arabic;

2. Reading words which combine the letters:

s and *ṣ* as similar sounds;

t and *ṭ* as similar sounds;

3. Reading words ending with long vowels which are shorter in spoken Arabic;

4. Reading words linking nunations or short vowels at the end of a word which have disappeared from spoken Arabic;

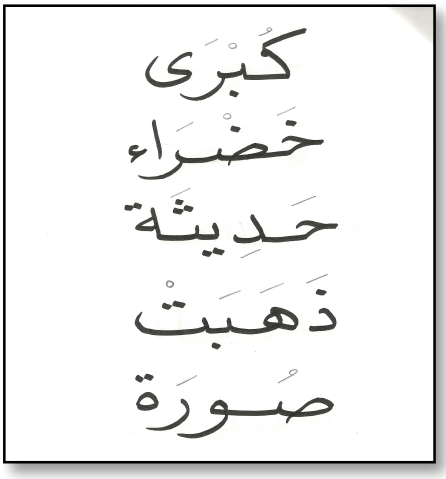
5. Reading words containing double long vowels: *mad almudūd*;

6. Reading words containing double consonants: *shaddah*;

7. Controlling for homophonic letters, i.e. the fact that different orthographic representations produce similar sounds and may change reciprocally as a dialect feature:

gh and *q* as well as *ḍ* and *ẓ*;

8. Controlling for variants of the same letters:



extended *alif* (*alif mamdūda*), shortened *alif* (*alif maqṣūrah*), and small *alif* (*alif ṣaghīra*); open *tā* (*tā maftūḥah*) and closed *tā* (*tā marbūṭah*) if connected or unconnected to the word;

9. Reading words with four syllables and/or attached clitics.

Figure 3.7
Sample of the Word Reading Task Items

These words were printed clearly on five single sheets, each of which included five vowelised words appearing in five rows (Figure 3.7). The child was asked to read the items aloud as accurately as possible, and one point per correct word was credited out of a total of 25.

The second reading measure, 'pseudo-word decoding', was employed as an essential task, as suggested by Gough and Walsh (1991), for assessing competence in decoding without the support of simple visual recognition. The stimuli consisted of nine vowelised pseudo-words divided into three categories according to their increasing length (two to five letters) and to the complexity of their syllabic structures (monosyllabic to trisyllabic). The items were not only based on the abstract grapheme–phoneme conversion application, but followed the analogical patterns of Arabic words, in which the items were derived by single or double letter substitutions of real words. For example, the pseudo-word *fadrashah* may be read by analogy to a real word like *madrasah* 'school' due to their multi-letter correspondence and shared segmentation rules (Figure 3.8).



Figure 3.8

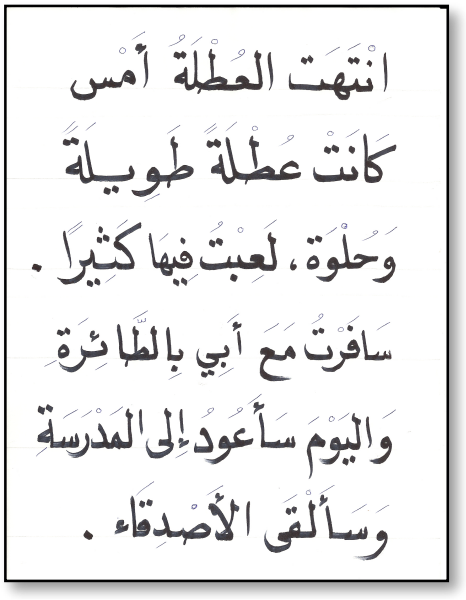
Sample from the Pseudo-word Decoding Task

Children were shown nine PowerPoint slides, each displaying one clearly typed pseudo-word. They were asked to read the items aloud while their performance was recorded. Each child received a zero for incorrect items, and one point for correct ones.

Development of the pseudo-word items was grounded in Arabic reading literature, including a variety of lengths and syllabic structures, and presenting a transparent vowelised orthography. A complete adoption of the measure for the current study was obstructed by the linguistic differences between different Arabic settings. The pseudo-word decoding tasks found in Saiegh-Haddad's work, for example, were typically designed to reflect 'an authentic phonemically diglossic reading task' (Saiegh-Haddad, 2005: 567). This means that the task involves monitoring certain literacy settings and is therefore not applicable to children who have learned different regional dialects.

As with the last in the series of reading measures, attempts to adopt a measure of reading comprehension from Arabic studies were faced with a scarcity of suitable texts. The few available tasks either differed in their proposed nature, or examined different age groups. Two studies investigated the way Kuwaiti children (Aljenaie and Farghal, 2009) and Saudi children (Al-Akeel, 1998) comprehended various word orders, and one study addressed adult readers (Seraye, 2004).

The 'reading comprehension' task developed for the current study aimed to provide a measure of text reading accuracy and comprehension. Children were individually asked to read an unpractised passage, drawn from another context in which Arabic language is taught as a second language (Kaosh et al., 2004). The passage consisted of twenty familiar words, written clearly with full vowelisation on a single sheet. The child was told: 'Please read this passage about "back to school" loudly and I will ask you some questions about what you have read.' An English translation of the text and an image of the text sheet are shown in Figure 3.9.



Reading Comprehension Text

The holiday ended yesterday. It was a long lovely holiday. I played a lot. I travelled with my father by plane. Today, I am going back to school, and I am meeting my friends.

English Translation of the Text

Figure 3.9

Reading Comprehension Task

One point was awarded for every correctly pronounced word and zero points for incorrect or incomplete pronunciation, or for missing the words. In the case of a linguistically acceptable level of word identification, i.e. reading the word without the case ending vowel, the point was also awarded, as long as the target word was preserved. This is because screening the short vowelisation of the ends of words is a measure of syntactic awareness (Abu-Rabia, 2007), which is not an intended target when the single word reading skill is focused upon. For example, if the word *intahati* 'it ended' – as pronounced connectively to the following word– was read as *intahat* 'it ended', the response is considered correct because the target word is preserved, although its final vowel is not supplied. It would similarly be correct if the word *la'ibtu* 'I played' was read without the final vowel as *la'ibt* 'I played', but not if read as *la'ibti* 'you played: feminine' or *la'ibta* 'you played: masculine', where the word is changed due to the alteration of the final vowel. The final vowels in these words account for

inflectional endings, not case endings; it is therefore critical that they are provided by the reader. It is worthy of note that most native speakers follow the common practice of not pronouncing word endings that specify the word's grammatical rule. They instead hold the final consonant and remove its generic vowel, since vowels may also be absent (Brown and Ogilvie, 2009). An example taken from the tested passage is the pronunciation of the word *madrasah* 'school' with a final impartial *h* instead of the six inflectionally possible ending forms, which are: *madrasatu*, *madrasata*, *madrasati*, *madrasatun*, *madrasatan* and *madrasatin*.

Subsequent to reading the passage, the researcher administered a set of four multiple-choice, and four true or false, questions orally. The scripted method was as follows:

'Now you need to answer my questions from what you've just read.

Please tell me which fits best:

I will meet ... my family / my relatives / my kin / my friends.'

(The correct choice was allocated in a random order for the four questions.)

'Please tell me if this is true or false:

I travelled with my father during school days.'

(Two true and two false statements were affirmed.)

The child was allowed to answer the questions after looking back over the text, so the application did not burden the memory. To score one point in these items, the answer had to be correctly chosen from the four choices, or accurately defined as a true or a false statement. A total of twenty-eight points were awarded for this task, if all the words were read correctly and the questions answered properly.

3.7.3.2 Spelling Measure

In the 'word spelling' task, twenty-five words were chosen from the first grade books, in which words of a variety of lengths (monosyllabic–tetrasyllabic) and frequencies (low–high) were to be considered. These words as a group represent a variety of word patterns, from a basic tri-consonantal pattern to affixed ones of both verbal and nominal types. The spelling lists were analogous to the isolated words reading list.

The stimulus list was expected to assign the following errors:

1. Errors in writing the glottal stop *hamza* in its multiple forms;
2. Errors in writing words combining similar sounds;
3. Errors in writing words ending with long vowels;
4. Errors in writing words linking nunations or short vowels;
5. Errors in writing words including double long vowels;
6. Errors in writing words containing a double consonant;
7. Errors in writing words as a result of a homophone;
8. Errors in controlling for different variants of the same letters;
9. Errors in writing words with four syllables and/or attached clitics.

The researcher said each word twice, and the children were then instructed to write it down on a provided pre-numbered response form; if required, the researcher repeated the word one more time. Since there is no possibility of confusing the target word with another homophone word as in the case of English (e.g. 'too' vs. 'two'), there was no need to include the dictated word in a sentence to specify it. Children achieved one point if the word was written correctly, regardless of whether or not the short vowels were supplied.

3.8 Summary and Conclusion

To sum up with a brief statement of the tasks used in the three phases of data collection, a reminder is outlined below of the three employed measures: the control measures (verbal and non-verbal tests), the predictor measures (phonological, morphological and dialect awareness tasks) and the outcome measures (spelling and reading tasks).

The Peabody Picture Vocabulary Test, and the Raven's Coloured Progressive Matrix Test provided measures of verbal and non-verbal reasoning abilities respectively. Both were addressed in the first phase of the study, along with the literacy predictor measures.

Measures of Literacy Predictors (Phase 1, September 2010)

Phonological awareness measures

1. Initial Phoneme Deletion task: assesses the ability to delete small units of sound from the beginning of a dialect word, standard word and pseudo-word.
2. Final Phoneme Deletion task: assesses the ability to delete small units of sound from the end of a dialect word, standard word and pseudo-word.
3. Initial Syllable Addition task: assesses the ability to add larger units of sound to the beginning of a dialect word, standard word and pseudo-word.
4. Final Syllable Addition task: assesses the ability to add larger units of sound to the end of a dialect word, standard word and pseudo-word.

Morphological awareness measures

1. Judgement of Morphological Relationship task: explores the implicit perception of morphological relationships without manipulating the morphemic structure of a word.
2. Pseudo-word Production task: explores the explicit consciousness of the morphemic structures through direct manipulation, to produce a new form of the given pseudo-word.

Dialect awareness measures

1. Dialect Discrimination task: assesses general awareness of the two existing varieties of the Arabic language in the study context.

2. Sentence Correction task: assesses specific awareness of the grammatical functions of the standard and dialect forms in a productive context.

3. Word Choice task: assesses general awareness of the grammatical functions of the standard and dialect forms.

Measures of Literacy Outcomes (Phase 2, May 2011 and Phase 3, May 2012)

Reading and Spelling measures

1. Word Reading task: provides a measure of single word recognition within a variety of word lengths and patterns.

2. Pseudo-words Decoding task: provides a measure of grapheme-to-phoneme conversion ability.

3. Reading Comprehension task: provides a measure of word reading accuracy and text comprehension.

4. Word Spelling task: assesses spelling abilities with various word patterns. It also investigates spelling errors when speech interference occurs.

The quantitative analysis of the longitudinal results of the relations between literacy predictor measures and literacy outcome measures is provided next, in Chapter 4, for the hearing and the deaf participants. Analysing the data of the hearing children provides an evaluation and validation of the phonological, morphological and dialect awareness measures as well as the spelling and reading measures, and establishes the base for measuring the deaf children's performance.

Chapter 4

Results

The purpose of the present study is to test for the predictive effects of phonological, morphological and dialect awareness on early literacy abilities of hearing and orally educated deaf Kuwaiti children. This chapter aims to present the analysis of results obtained through all research phases for both studied groups. It is organised into three main parts. The first part identifies the general outline and strategies followed in conducting the statistical analyses. The second part concerns analysis of the data collected for the hearing participants through the three-phase longitudinal study. The third part concerns analysis of the data collected for the deaf participants in two specific phases: the start and the end of schooling year.

The second and third parts are each divided into three sections. Section one presents the preliminary descriptive analyses for all the measures utilised in the study. Section two involves the data screening process and the correlation analyses. Section three reports the regression analyses that explore which of the independent measures can predict individual differences in Arabic literacy skills. A summary account of the main findings is provided at the end of the chapter.

Prior to reporting the results, the section below provides an overview of the planned strategies for conducting statistical analyses.

4.1 Analysing Issues and Strategies

Several broad strategies will be employed to analyse the data collected in each phase of the research process. This section briefly outlines the general principles for processing the descriptive statistics and undertaking the main analyses.

1. Through the descriptive account of the data, the significance of the statistical values of skewness and kurtosis will be identified by calculating the Z-scores of skewness and kurtosis, as follows: $Z_{Skewness} = \frac{S-0}{SE_{Skewness}}$ and $Z_{Kurtosis} = \frac{K-0}{SE_{Kurtosis}}$.

where S = Skewness statistic, K = Kurtosis statistic, and SE is the Standard Error calculated for each statistic, consistent with Field and Miles (2010: 119, 120). When the calculated Z-score is greater than 1.96 then the significance is at the .05 level, if it is greater than 2.58 it is at the .01 level, and if it is above 3.29 then the significance of the skewness or kurtosis is at the .001 level.

2. Since normality is a generally essential assumption for making inferences when running regressions (Kleinbaum, Kupper, Muller and Nizam, 1998), skewed data will be transformed only to approximate normality prior to performing correlational analyses. It should, however, be remarked that departures from normality can arguably be discounted when regression analyses are conducted. Arbuckle (1997: 239) states that 'a departure from normality that is big enough to be significant could still be small enough to be harmless.' Lumley and colleagues (2002: 154) explained that the basic limitation on linear regression for inference about relationships is not a distributional one; rather, the significance of associations between variables in the model is the critical one. They specifically affirmed that 'the normality is not required to fit a linear regression; but normality of the coefficient estimates $\hat{\beta}$ is needed to compute confidence intervals and perform tests'. Studies showed that the form of the marginal distributions may restrict the range of values assumed by the product

moment correlation coefficient (Carroll, 1961), and destructively affect factor analyses outcomes (Olsson, 1979). In the case of violating the normality assumption, however, regressions analyses conducted with large sample sizes, i.e. more than 30 or 40 cases, should not be affected (Pallant, 2007).

3. In order to scrutinise the reliability and construct validity of the measures, an analysis of the internal reliability of the measures (Cronbach's α) will be used (Santos, 1999). To demonstrate whether the task items relate to a single construct in an assessment, all test items measuring particular constructs are expected to correlate with each other at an acceptable level. The Cronbach's alpha will be examined, and a general principle for rejecting a measurement tool is calculation of the alpha value at less than 0.6 (Nunnally and Bernstein, 1994; Kent, 2001). Obtaining an alpha value lower than this limit will lead to conducting an item analysis to eliminate the least effective distractor item and improve the test's reliability via a stepwise process (Dörnyei and Taguchi, 2010). It is also possible to combine the items of multiple tasks in a single conceptual variable (Stangor, 2010) to increase the task reliability (Erwin, 1991; Kishton and Widaman, 1994). The process of combining single measures is known as parcelling, since the tasks are already considered as subscales (or parcels) within one instrument (Bandalos, 2002; Nasser and Takahashi, 2003). Nasser and Takahashi (2003) also support the use of a smaller number of parcels, with more items within each, as this results in better normality, validity, continuity and reliability than with fewer items in a larger number of parcels.

4. To control for the fact that when the correct answer is unknown, the discrimination tests may be answered through random guessing in the tasks that involved two or more answer choices, Guilford's (1936) correction for guessing formula will be applied. A test score corrected for guessing commonly takes the form of: $S = R - (W/(k - 1))$, where R is the

number of correct responses, W is the number of incorrect responses, k is the number of answer options on a single item, and S is the score corrected for guessing. In true-false tests, this reduces to the form of: S = R – W (Guilford and Fruchter, 1978: 489). In the context of this thesis, all analyses will be carried out with the raw scores. A sample of the analyses with the corrected scores will be reported in Appendix 10 to compare the consistency of the results.

5. Finally, since there is a degree of interpretation involved in the process of giving scores to a child's writing because children's productions are not yet necessarily distinct, it was vital to establish objectivity prior to giving scores in the spelling outcome task. Therefore, children's writing characteristics were inspected and an outline for accepting or rejecting each outcome was specified. Then, every outcome was marked once, and another marker was asked to give scores to a minimum of ten per cent of the spelling data. Cohen's kappa value was used as an appropriate measure of concordance between two markers. An agreement was indicated between the two markers by the kappa value of .979 (see Appendix 3). To put this into context, Fleiss and colleagues (1981) consider an obtained kappa over .75 to be excellent.

4.2 Results for the Hearing Participants

The analyses are divided into three sections. The first section presents the preliminary descriptive analyses and the reliability statistics for control, predictor and outcome measures. The second section describes data screening for outliers, multicollinearity and normality that precede correlational analyses between predictor and outcome variables. The third section concerns the multiple regression models that explore the predictive power of phonological, morphological and dialect awareness measures on Arabic reading and spelling skills, whilst controlling for children's age and cognitive abilities.

4.2.1 Preliminary Descriptive Analysis

Complete data collection was obtained from the 80 Kuwaiti children who participated longitudinally in the first two research phases. For the third research phase, however, two participants have been withdrawn due to relocations and the resulting difficulty in obtaining updated information about their current schools. The reliabilities, means, standard deviations, skewness and kurtosis of the cognitive ability and literacy predictor measures, conducted at phase 1 (September 2010), are reported first; analogous information about the literacy outcome measures conducted at phase 2 (May 2011) and phase 3 (May 2012) will then follow.

4.2.1.1 Measures of Cognitive Ability

The Peabody Picture Vocabulary Test (Abu-Allam and Hadi, 1998), revised from the English version (Dunn and Dunn, 1981), intended to provide a measure of verbal ability, has a reliability of $\alpha = .89$, according to the test manual for 6; 6-year-olds. By attaining a mean score of 19.59 (SD = 9.71, SE = 1.09), the current study sample reflects the mean value found in the test's manual, which is 19.58 (SD = 7.44, SE = 4.97), for 6-year-olds. The mean value also fits the standardised score of 104 for the age group of 72–74-month-olds in 1981, and falls within the representative sample of the Kuwaiti children, defined between 90 and 109. This indicates that the sample of 80 hearing children adequately reflects the properties of interest depicted by the larger population.

The Raven's Coloured Progressive Matrix Test (Al-Qurashi, 1987), adapted from Raven (1981), aimed to provide a measure of non-verbal reasoning ability, has a Cronbach's α value of .79, as obtained from the respective test manuals for 6–10; 6- year-olds. The study sample attained an average score of 15.16 (SD = 3.75) with a standard error of 0.42. This is lower than the manual results for the Kuwaiti norms for children aged 6–10;6 years who

reached a mean value of 17.50 (SD = 5.40) in 1998. In order to compare the significance of the difference in means between the sample studied and the larger representative population, a one-sample t-test was conducted. The results signified a difference of approximately 2.3 units, $t(79) = -5.58$, $p < .0005$. A reason for the lower mean score obtained by the studied sample when compared to the standardised score can be attributed to the difference between the two groups' age ranges. The standardised score in the manual consists of a wide range of children's ages including children up to 10; 6 year olds, in which the 6-year-olds represent the youngest part of that group, whilst the age range of the study sample was only from 5; 7 to 6; 9 years.

4.2.1.2 Measures of Literacy Predictors

Literacy predictor measures were examined for the sample of hearing participants at a very early stage of the first grade before the start of reading instruction. Firstly, the internal consistencies and reliabilities were investigated carefully for each task within the sets of phonological, morphological and dialect awareness measures.

On examining the reliability of the phonological awareness measures, Cronbach's alpha was found to be .480 for the initial phoneme deletion task. The final phoneme deletion task, in contrast, attained a Cronbach's α value of .740. The process of parcelling/combining the initial phoneme deletion and final phoneme deletion task items into an overall scale measuring the phoneme deletion skill was found to raise the reliability score, based on α values of .480 and .740 respectively, to .671. As the two deletion tasks were combined into one task called 'phoneme deletion', further reliability analysis was conducted. By the removal of three items, the new reliability value for the phoneme deletion task improved from .671 to .700 with 15 items remaining in the task. For the 'initial syllable addition' and the 'final syllable addition' tasks, Cronbach's α value were obtained as .895 and .878

respectively, indicating very good internal consistency levels.

On examining the reliability of the morphological awareness measures, Cronbach's α value obtained for the pseudo-word production task was found to be .592. It was therefore improved to its best level by deleting 1 item out of its 8 to become .624. As for the 'judgement of morphological relationships' task, the reliability score of .786 indicated a good consistency level. For the dialect awareness measures, the reliability of Cronbach's alpha value of the sentence correction task was .620 for the set of 8 items. For the word choice task, Cronbach's alpha value was calculated as .469, with a very small chance of improvement by discarding certain items from the task. Parcelling the word choice task with the sentence correction task was therefore considered as an alternative to dropping the task. The new combined measure was also called 'sentence correction', and Cronbach's α in this case is equivalent to .637, which makes the task's reliability acceptable. As for the dialect discrimination task, the reliability score of .731 required no further improvement to be carried out.

The descriptive statistics of the predictor measures were then inspected. Table 4.1 in the next page presents the central tendency, variability and internal consistency for the phonological, morphological and dialect awareness measures used as literacy predictors at phase 1 (N = 80).

Table 4.1

Cronbach's α, Means, Standard Deviations, Maximum, Skewness, and Kurtosis of the Predictor Measures

	Phon. Phoneme Deletion	Phon. Initial Syllable Addition	Phon. Final Syllable Addition	Morph. Judgement of Morph. Relationships	Morph. Pseudo-word Production	Dialect Dialect Discrimination	Dialect Sentence Correction
Cronbach's α	.700	.895	.878	.786	.624	.731	.637
Mean	1.18	2.53	2.24	23.00	4.16	5.61	11.11
SD	1.76	2.96	2.78	5.04	1.81	2.09	2.35
Max. obtained score	8/15	9/9	9/9	32/32	7/7	8/8	15/16
Skewness	2.158	.978	1.125	-.140	-.275	-.466	-.502
Z-Skewness	8.02	3.46	4.18	-.52	-1.02	-1.73	-1.87
Kurtosis	4.768	-.462	.09	-.759	-.719	-.879	-.197
Z-kurtosis	8.96	-.87	.17	-1.43	-1.35	-1.65	-.37

Inspection of the table reveals that the all the phonological variables had a floor effect, while the variances for the remaining tasks were adequate. However, in terms of kurtosis, phoneme deletion was the only task to show a significant kurtotic effect. Values for all other tasks fell inside the recommended acceptable range and met the assumption of normality.

4.2.1.3 Measures of Literacy Outcomes

For ease of comparison, Table 4.2 presents the Cronbach's α values and descriptive statistics for the outcome measures of word reading, word spelling, pseudo-word decoding and reading comprehension used at both phases: the end of first grade (N = 80) and the end of second grade (N = 78).

Table 4.2

Cronbach's α, Means, Standard Deviations, Maximum, Skewness, and Kurtosis of the First Graders' (N = 80) and Second Graders' (N = 78) Outcome Measures

	Word Reading		Word Spelling		Pseudo-word Decoding		Reading Comprehension	
Grade	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Cronbach's α	.937	.946	.903	.909	.810	.805	.947	.928
Mean	5.36	16.13	4.75	11.67	2.53	6.08	4.49	18.36
SD	5.85	7.63	5.11	6.43	2.37	2.53	5.96	8.47
Max. obtained score	24/25	25/25	20/25	23/25	9/9	9/9	26/28	28/28
Skewness	1.504	-0.634	1.228	-0.228	0.936	-0.624	2.353	-0.782
Z-skewness	5.591	-2.331	4.565	-0.838	3.480	-2.294	8.747	-2.875
Kurtosis	1.672	-0.788	0.704	-1.002	0.277	-0.363	5.446	-0.474
Z-kurtosis	3.143	-1.465	1.323	-1.862	0.521	-0.675	10.237	-0.881

In terms of internal consistencies, substantial Cronbach's alpha values ranging from .805 to .947 were attained in the tasks' reliability analyses, indicating very good construct reliability among all literacy tasks in both data collection phases. Nevertheless, the descriptive analysis revealed that the majority of variables in the first grade had floor effects. The outcome distributions, however, are reversed to exhibit ceiling effects at the second grade, with word spelling being the only measure to show non-significant skewness. Analysis of the kurtosis values also revealed that for the first-grade sample, some of the outcome variables were kurtotic. In the second grade, the kurtosis values improved, but also reversed to become negative, with only word reading and word spelling outcomes remaining significant at the .05 level, which indicates better normality.

When considering the differences between outcome means for the first and the second grade, significant improvements were observed at the .001 level based on a two-tailed paired sample test analysis. The word reading task improved significantly from first grade to second grade: $t(77) = 15.23$, $p < .001$. The word spelling outcome results also improved similarly, with $t(77) = 12.09$, $p < .001$. The first-graders also demonstrated a significant improvement in the second grade in the pseudo-word decoding task: $t(77) = 13.71$, $p < .001$. Finally, yet importantly, the reading comprehension outcome results have also improved by $t(77) = 16.81$, $p < .001$.

For the sake of comparison between the improvements in the outcome measures, Cohen's D values were calculated for each measure. Cohen's D is simply the mean difference between the two sample scores divided by their pooled standard deviation (Cohen, 1988). The values attained are 1.16 for word reading, 2.88 for word spelling, 2.27 for pseudo-word decoding, and 5.16 for reading comprehension tasks. These indicate a large improvement in all the tasks over the one-year interval, with a better improvement in the reading comprehension task than the rest of the outcome measures.

4.2.1.4 Summary of the Preliminary Analysis

In view of the statistical descriptive and reliability analyses of the measures, which were displayed in tables 4.1 and 4.2, the following conclusions can be drawn:

1. The control for the effect of alternative explanations for the relation between the predictors and the outcomes is based on the employment of two cognitive measures. The Peabody verbal measure is found to be representative of the study sample and adequately reflects the properties of the larger Kuwaiti population. The Raven non-verbal measure,

however, indicates a lower performance in the study sample, when compared with the larger Kuwaiti population, assumingly due to the age range differences between the groups.

2. The study introduced four tasks to represent different levels of phonological awareness, in which one, initial phoneme deletion, showed poor internal consistency. This led to the process of combining the initial phoneme deletion task and the final phoneme deletion task into a single measure known as 'phoneme deletion' to represent phonological awareness at the phonemic level. An acceptable level of reliability was initially attained, and was further improved to reach a good level by discarding items that reduced reliability. Thus, one combined measure of phonemic awareness and two separate measures of syllabic awareness, all with good to excellent reliability levels, now represent the phonological awareness skill.

3. The study included two separate tasks to represent the morphological awareness measure, and both attained adequate levels of reliability. One task, judgement of morphological relationships, taps into the implicit judgement level of morphological awareness, and the other task, pseudo-word production, taps into the explicit production level of morphological awareness.

4. The study included three tasks to represent the dialect awareness measure, in which one, the word choice task, displayed a poor internal consistency between its items. This was managed by combining the task items with the sentence correction items, as both assess the children's grammatical awareness of the standard and dialect language forms. The reliability value of the combined measure reached an acceptable level, thus the dialect awareness measure was reduced to two tasks. The first one, the dialect discrimination task, assessed general consciousness of the existence of two language varieties, and the other, the sentence

correction task, assessed awareness of the more specific linguistic functions of the standard and dialect forms.

5. The study employed four measures of reading and spelling skills: word reading, word spelling, pseudo-word decoding and reading comprehension. All these measures yielded high levels of internal consistency at the first and the second administrations, thus demonstrating that reliable assessments of the intended skills were taking place. Statistical analysis conducted with the 't' test revealed a significant improvement in the level of literacy ability from the first to the second grade.

6. Multiple tasks had some significant skewness and kurtosis values which needed to be constrained to reduce the non-normality of the data, prior to implementing the factor analysis procedure. Data screening was undertaken to test for outliers and to ensure that values were within the expected ranges.

4.2.2 Data Screening

Prior to processing the data for the correlation analyses, the skewness and kurtosis values of the tasks were reviewed. Z-skewness and Z-kurtosis values were calculated, their significance was assessed, and the variables that were not normally distributed were analysed. As the non-normality of the data may be related to the presence of outliers, those were detected first. But since the presence of outliers may convey significant explanations rather than being considered as errors or noise to be deleted (Hogg, 1979; Ben-Gal, 2005), it was decided to use a model that accommodates them, rather than deleting them.

To achieve normality in distribution, transforming the data via the square root, logarithm or inverse functions was considered as a possible approach. However, the use of transformations was deemed to be problematic for several reasons. Many statisticians (Tabachnick and Fidell, 2001; Erceg-Hurn and Mirosevich, 2008; Field, 2009) point out the associated difficulty, and the caution necessary when attempting to interpret the results, as these are based on transformed rather than original data. Erceg-Hurn and Mirosevich (2008) included the typical failure to restore normality and deal with outliers, as well as reducing the level of comparative statistical power when using transformed data.

A winsorising technique, which tends to preserve the basic sample size, was employed as an alternative to minimising the disclosed effects (Yale and Forsythe, 1976; Nevitt and Tam, 1998). This technique is based on winsorising the raw scores, instead of discarding them, by replacing the highest 5% scores and the lowest 5% scores of the data with the 5th and 95th percentiles respectively, based on a 90% winsorisation. Winsorising mainly involves pulling the mean towards the centre of the distribution (Dixon, 1960) making it more robust (Lance, 2011). It has been asserted that the 'winsorised mean pays more attention to the central portion of a distribution' (Wilcox, 2005: 28), and that its standard deviation is 'a more useful statistic' (Howell, 2010: 99) since it provides an 'estimation of more accurate standard errors than if classic methods are used' (Erceg-Hurn and Mirosevich, 2008: 595).

Several alternatives for transformations such as square roots, logarithms, inverse logarithms and winsorisation were explored in handling the research data. The winsorisation was found to be the most advantageous for reducing the skewness and kurtosis to acceptable levels for analytic purposes, while the scale was kept constant throughout the study. The winsorised distribution of the variables in the study was checked against the raw, the square rooted and

the transformed variables, and the key findings are presented in the Appendix 6. After winsorising the raw data, Pearson's correlation coefficients were applied in order to analyse the construct validity of the tasks intended to measure the same aspect.

4.2.3 Construct Validity

In order to measure the strength of the association between variables, inter-correlations between the tasks were considered first (Kline, 2000). Pearson's product moment coefficients were calculated for the inter-correlations between the tasks measuring the same aspects, to evaluate the construct validity of the measures (Westen and Rosenthal, 2003). Next, to grasp whether a single factor that explains the relationships between correlated variables in each construct can be identified, factor analysis was employed within each measure of awareness, where appropriate. Determining the number of factors to use in each set was considered in light of the relative factor importance (Eigenvalue) table, which indicates the cumulative amount of variance elucidated by each component (DeVellis, 2012).

4.2.3.1 Phonological Awareness Measures

The inter-correlations between the phonological tasks are shown in Table 4.3.

Table 4.3

Inter-correlations between Phonological Awareness Tasks following Winsorisation

	Phoneme Deletion	Initial Syllable Addition	Final Syllable Addition
Phoneme Deletion	-		
Initial Syllable Addition	.312**	-	
Final Syllable Addition	.260*	.788**	-

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

The positive and significant correlation between the three phonological awareness measures assessed by Pearson's coefficients, above, allow for combining them into a smaller number of variables that can be entered into the regression analysis for a more efficient prediction validity. The principal component analysis was used to extract one variable or more from the measures entered with a common underlying variance. Based on Eigenvalues larger than one, the principal components analysis generates one factor that is more heavily correlated with the two syllable addition tasks, as shown in Table 4.4.

Table 4.4

Communalities of the Phonological Factor Analysis

	Initial	Extraction
Phoneme Deletion	1.000	.284
Initial Syllable Addition	1.000	.860
Final Syllable Addition	1.000	.805

Extraction Method: Principal Component Analysis

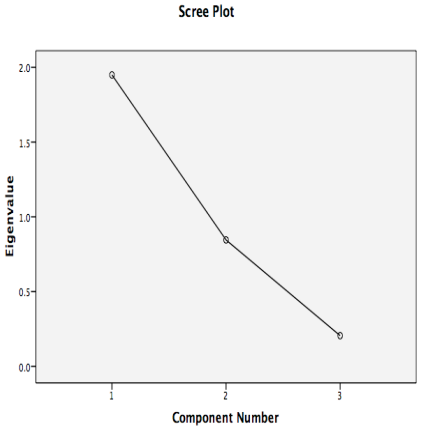


Figure 4.1

The Scree Plot–Phonological Awareness

Since the proportion of variance shared between the phoneme deletion task and the latent variable extracted is about 28% (which is considered very low and is below the minimum communality criterion of 50%), and based on the scree plot (Figure 4.1) obtained in the analysis which allows for the extraction of more than one component, it is thus justifiable to extract two components out of three variables to use in the regression models (Larose, 2006). The two factors attained after running the second principal components analysis accounted for 65% and 28% respectively (with a total of 93%) of the total variance in the latent variable (see Table 4.5).

Table 4.5

Total Variance Explained by Phonological Factor Analysis

	Initial Eigen Values			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.949	64.979	64.979	1.949	64.979	64.979
2	.845	28.179	93.158	.845	28.179	93.158
3	.205	6.842	100.000			

Extraction Method: Principal Component Analysis

Table 4.6

Component Matrix of Phonological Factor Analysis

	Component	
	1	2
Phoneme Deletion	.533	.845
Initial Syllable Addition	.927	-.183
Final Syllable Addition	.897	-.313

Extraction Method: Principal Component Analysis

The factor loadings for each variable on the rotated components extracted are presented in Table 4.6. It can be concluded that the first component is most affected by the syllable addition tasks; nevertheless, phoneme deletion also plays a significant role in the loading of the first component. The second component is predominantly affected by the loading of the phoneme deletion task; hence the first component will be referred to as the syllabic factor, and the second as the phonemic factor.

4.2.3.2 Morphological Awareness Measures

The correlation between the judgement of morphological relationships task and the pseudo-word production task, following winsorisation, was only .150 ($p > .05$). A possible explanation for the weak inter-correlation between the two morphological tasks could be the nature of the awareness measured. The judgement of morphological relationships task is

designed to measure the children's implicit awareness of morphological structures, and does not imply any conscious manipulation. Performance on the pseudo-word production task, in contrast, needs an explicit morphological awareness in order to analyse the word's structure and produce the required word form from it. It is therefore possible to notice an inconsistency between implicit and explicit levels of awareness, and between judgement and production performances in individual responses. Due to the lack of significant correlation between the morphological awareness measures, the principal components analysis was not conducted. Therefore, it is unreasonable for the two tasks' scores to be reduced to a single measure to be used in the main predictive analysis. Thus, the two original scores will be used separately.

4.2.3.3 Dialect Awareness Measures

The correlation of .415 between the dialect discrimination task and the sentence correction task following winsorisation is significant ($p < .001$ level). The positive and significant correlation between the dialect awareness measures allows for the use of principal component analysis as a reduction method to extract one variable from the measures entered which have a common underlying variance.

Table 4.7

Total Variance Explained by the Dialect Factor Analysis

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.415	70.772	70.772	1.415	70.772	70.772
2	.585	29.228	100.000			

Extraction Method: Principal Component Analysis

Table 4.7 shows the proportion of total variance, as explained by the underlying factor after extraction. One factor was extracted, explaining about 71% of the total variance in the latent variable. Both dialect awareness variables entered into the analysis also shared more than 70% common variance with the extracted component (see Table 4.8), hence making it possible for this variable to be used in the main analysis as the dialectic factor.

Table 4.8

Communalities of the Dialect Factor Analysis

	Initial	Extraction
Sentence Correction	1.000	.708
Dialect Discrimination	1.000	.708

Extraction Method: Principal Component Analysis

4.2.3.4 Summary of Data Screening and Construct Validity Analyses

1. In order to achieve normality in the distribution of data, transformation was applied via the winsorising technique, which tends to accommodate outliers while keeping the basic sample size unchanged. Skewness and kurtosis were reduced to acceptable levels, while the scale was kept constant throughout the study.

2. In order to analyse the construct validity among each of the awareness measures, correlations between the tasks were considered. In order to grasp whether a single factor can explain the relationships between correlated variables in each construct, factor analyses were undertaken within each awareness measure, where applicable, to determine the number of extracted factors within each set.

3. The significant correlations between the phonological awareness measures allowed for extracting two variables to be employed in the main analysis. One factor was more heavily affected by the syllable addition tasks, and therefore named the ‘syllabic factor’. The other was mainly affected by the phoneme deletion task and was therefore named the ‘phonemic factor’.

4. The weak correlation between the morphological awareness tasks led to utilisation of the two original measures separately in the main analysis. The significant correlation between the dialect measures allowed for one variable to be extracted and used in the main analyses as the ‘dialectic factor’.

As the analyses of the construct validity aspects illustrated the underlying constructs between tasks within each awareness measure, better measures were obtained for conducting the main regression analyses. The longitudinal relations between literacy predictor measures and literacy outcome measures in the first and second grades could therefore be conducted for the hearing participants.

4.2.4 Main Analysis for the Hearing Participants

A basic step prior to conducting the main regression analyses is to identify the predictors that share significant correlations with the outcome measures. This is because it is not possible for those lacking such correlations to be related as predictors and outcomes (Baron and Kenny, 1986). The correlations between the literacy predictor measures and the literacy outcome measures at the end of first and second grades were assessed using Pearson’s product moment coefficients.

Table 4.9

Correlations Between the Literacy Predictor and Outcome Measures in First- and Second-grade Hearing Children following Winsorisation and Factor Analyses

	Word Reading		Word Spelling		Pseudo-word Decoding		Reading Comprehension	
Grade	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Syllabic Factor	.326**	.457**	.391**	.410**	.355**	.334**	.403**	.365**
Phonemic Factor	0.055	-0.097	-0.07	-0.133	0.006	-.224*	-0.068	-0.172
Morph. Relationships	0.071	.332**	.252*	.353**	0.045	.345**	0.195	.317**
Pseudo-word Production	0.045	0.087	0.139	0.138	0.069	0.048	0.099	0.109
Dialectic Factor	0.131	.333**	0.217	.276*	0.181	.253*	.248*	.305**

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

The correlation matrix displayed in Table 4.9 shows that phonological awareness represented by the syllabic factor revealed significant positive correlations with all the outcome variables at least at the level of 0.05 with r-values ranging from .326 to .457 across both age groups. A significant correlation exists between the judgement of morphological relationships task and children's spelling ability in the first grade. Additionally, the morphological judgement task also correlated significantly with all the outcome measures among second-graders. Likewise, the dialectic factor was observed to show statistically significant correlations with all the outcome measures among second-graders, but only with the reading comprehension skill of first-grade children.

This study investigates three specific hypotheses. The first is that phonological, morphological and dialect awareness each predict literacy outcomes independently of age

and cognitive ability. Secondly, phonological and morphological awareness make contributions to the prediction of the literacy outcomes that are independent of each other. Thirdly, dialect awareness contributes to reading and spelling skills depending on the levels of phonological and morphological awareness demonstrated by the children. That is, besides the proposed direct predictive ability of dialect awareness in relation to literacy skills, dialect awareness may bridge or mediate the relationship between the phonological and morphological awareness predictor variables and the literacy outcome variables.

Based on these hypotheses, a series of hierarchical multiple regression models, which allow for considering multiple explanatory variables, were performed in order to test the predictive value of phonological, morphological and dialect awareness measures for each single outcome variable among first- and second-graders. Factor scores acquired during the factor analysis process were used throughout in performing the regressions, with word reading, word spelling, pseudo-word decoding and reading comprehension as dependent variables.

In building the regression model for each outcome variable, age was entered into the model as a first step, cognitive abilities were controlled for in the second step, and phonological, morphological or dialect awareness was entered separately as the main predictor variable in the third step. The rationale behind this hierarchical 'separate blocks' order was to test whether phonological, morphological and dialect awareness are predictors of reading and spelling beyond the well-established prediction role of cognitive abilities, and to monitor the possible effects of age on the dependent variables. Cohen and Cohen (1983) demonstrated that the demographic characteristics are the typical variables for first-step entry.

The predictor variables that achieve significance in the first hypothesis will then be investigated further in the second hypothesis analyses. To test the second hypothesis, hierarchical regression models are used as they specifically determine the R-squared values of the variables when each block of variables is added gradually to the multiple regression (Howitt and Cramer, 2005). Therefore, the relative contribution of each block of independent variables is 'assessed in terms of what it adds to the prediction of the dependent variable, after the previous variables have been controlled for' (Pallant, 2010: 149). For each regression model, the R^2 changes, degrees of freedom, F values, standardised partial regression weights (β), t values and p values are reported. Through all the regression models, multicollinearity was not a challenge, as the largest correlation among predictors was .577, no value of the variance inflation factor was greater than 10, and no tolerance value was lower than .1. Given these calculations, it was appropriate to use regression analysis (Field, 2009).

The following section reports the results of the hierarchical multiple regression models that examined the three research hypotheses, i.e. the phonological, morphological and dialect awareness effects on the reading and spelling achievements of first- and second-grade children. The first set of regression analyses was performed in order to determine whether the predictor variables account for variance in the criterion variables, i.e. word reading, word spelling, pseudo-word decoding and reading comprehension in grade one. The second set of regression series examined whether the same set of independent variables predicts the same set of criterion variables among second-graders.

4.2.4.1. First Research Hypothesis

The first research hypothesis proposed that children's performance on phonological, morphological and dialect awareness measures predict their performance on reading and spelling measures, independently of their age and cognitive ability.

Based on the order of control variables and independent variables described above, prediction models of children's performances in the area of word reading ability at the end of the first grade (phase 2) and then at the end of the second grade (phase 3) were conducted. The results are presented respectively in Tables 4.10 and 4.11.

Table 4.10

Predicting Word Reading in First Grade (N = 80)

		R^2	(df)	F Value	β	t Value	p Value
	Chronological Variable	.018	(1,78)	1.439			
1	Age				0.135	1.199	0.234
	Cognitive Abilities	.061	(2,76)	2.531			
2	Peabody				0.163	1.458	0.149
	Raven				0.169	1.480	0.143
	Phonological Awareness	.096*	(2,74)	4.295			
3	Syllabic Factor				0.299	2.672	0.009
	Phonemic Factor				0.137	1.282	0.204
	or *Morphological Awareness*	.006	(2,74)	0.224			
3	Morph. Relationships				.055	.479	.633
	Pseudo-word Production				-.064	-.530	.598
	or *Dialect Awareness*	.002	(1,75)	0.198			
3	Dialectic Factor				.052	.445	.658

For the end of the first grade, the multiple regression analysis above shows a significant prediction of the phonological awareness factor, specifically the syllabic factor, contributing

towards word reading skills and performance. This prediction is based on a standardised β coefficient of .299 being significant at the 1% level, after controlling for age and cognitive abilities in the first and second steps.

At the end of grade two (Table 4.11), the standardised coefficients of beta showed that all of the predictor variables as well as the Peabody cognitive ability variable contributed significantly towards the variance in word reading. The strongest significant prediction of phonological awareness related once more to the syllabic factor (β = .398, p < 001), which was revealed after taking into consideration the effects of age and cognitive abilities.

Table 4.11

Predicting Word Reading in Second Grade (N = 78)

	R^2	(df)	F Value	β	t Value	p Value
Chronological Variable	.022	(1,76)	1.676			
1 Age				.147	1.295	.199
Cognitive Ability	.108*	(2,74)	4.567			
Peabody				.284	2.583	.012
2						
Raven				.139	1.232	.222
Phonological Awareness	.142**	(2,72)	7.027			
Syllabic Factor				.398	3.732	.000
3						
Phonemic Factor				-.026	-.255	.800
or *Morphological Awareness*	.089*	(2,72)	4.120			
Morph. Relationships				.306	2.835	.006
3						
Pseudo-word Production				-.091	-.800	.426
or *Dialect Awareness*	.052*	(1,73)	4.679			
3 Dialectic Factor				.244	2.163	.034

Morphological awareness demonstrated a significant β value of .306 at the 1% significance level. Dialect awareness also contributed to the prediction of the word reading outcome, with

a β-coefficient of .244 being significant at the 5% level. The verbal ability measured by the Peabody test produced an additional significant β coefficient value of .284 ($p < .05$).

The second regression model represents the effects of the independent variables on the participants' word spelling skills as a criterion variable at grades one and two. Tables 4.12 and 4.13 report the results.

Table 4.12

Predicting Word Spelling in the First Grade (N = 80)

	R^2	(df)	F Value	β	t Value	p Value
Chronological Variable	.009	(1,78)	0.742			
1 Age				.097	.862	.392
Cognitive Ability	.077*	(2,76)	3.186			
Peabody				.235	2.110	.038
2 Raven				.120	1.059	.293
Phonological Awareness	.111**	(2,74)	5.132			
Syllabic Factor				.351	3.184	.002
3 Phonemic Factor				-.027	-.259	.797
or *Morphological Awareness*	.052	(2,74)	2.243			
Morph. Relationships				.232	2.079	.041
3 Pseudo-word Production				.012	.105	.917
or *Dialect Awareness*	.016	(1,75)	1.328			
3 Dialectic Factor				.134	1.152	.253

Standardised β coefficients, obtained from the second and third steps of the model, revealed distinct predictive validities for first-graders' word spelling performance. The syllabic factor expresses a β value of .351 being significant at the 1% level, while the β coefficient of the judgement of morphological relationships task is .232 at $p < .05$. The Peabody verbal test

also showed a positive significant predictive ability in relation to the spelling outcome (β = .235, p < .05).

For the data collected in phase 3 with second-graders, the multiple regression analysis (Table 4.13) again shows a significant prediction of phonological awareness, specifically the syllabic factor, contributing towards spelling performance with a β coefficient value of .372 (p = .001). Morphological awareness measured by the judgement of morphological relationships task contributed to the prediction with a β-coefficient of .332, significantly at the 1% level. In addition, verbal ability measured by the Peabody test produced a standardised β coefficient value of .221 near the 5% significance level.

Table 4.13

Predicting Word Spelling in the Second Grade (N = 78)

	R^2	(df)	F Value	β	t Value	p Value
Chronological Variable	.008	(1,76)	0.621			
1 Age				.090	.788	.433
Cognitive Ability	.066	(2,74)	2.657			
Peabody				.221	1.952	.055
2						
Raven				.113	.971	.335
Phonological Awareness	.124**	(2,72)	5.577			
Syllabic Factor				.372	3.327	.001
3						
Phonemic Factor				-.021	-.197	.844
or *Morphological Awareness*	.104*	(2,72)	4.557			
Morph. Relationships				.332	2.995	.004
3						
Pseudo-word Production				.0001	.0001	.999
or *Dialect Awareness*	.039	(1,73)	3.197			
3 Dialectic Factor				.210	1.788	.078

When the independent variables are regressed on the pseudo-word decoding abilities of children at the end of the first grade, the results attained denote one significant standardised β coefficient of .335 at the level of .01 for the syllabic factor. Simply put, an increase of one standard deviation in the syllabic factor will result in an increase of .335 standard deviations in first-graders' decoding abilities. It is additionally vital to recognise that the .533 proportion of variance in the syllabic factor is also explained by the phoneme deletion task, while its communalities with the initial and final syllable addition tasks are .927 and .897 respectively (see Table 4.6). Therefore, phonological awareness is a predictor of pseudo-word decoding skill, as shown in Table 4.14.

Table 4.14

Predicting Pseudo-word Decoding in the First Grade (N = 80)

	R^2	(df)	F Value	B	t Value	p Value
Chronological Variable	.002	(1,78)	0.146			
1 Age				.043	.382	.704
Cognitive Ability	.052	(2,76)	2.105			
2 Peabody				.217	1.913	.060
2 Raven				.052	.452	.653
Phonological Awareness	.106*	(2,74)	4.653			
3 Syllabic Factor				.335	2.972	.004
3 Phonemic Factor				.084	.776	.440
or *Morphological Awareness*	.001	(2,74)	0.530			
3 Morph. Relationships				.033	.284	.777
3 Pseudo-word Production				-.025	-.200	.842
or *Dialect Awareness*	.012	(1,75)	0.926			
3 Dialectic Factor				.114	.962	.339

Predicting pseudo-word decoding ability at the end of the second grade showed the predictive value of the syllabic factor with β coefficient of .283 ($p < .05$) and of the judgement of morphological relationships task with β coefficient of .322 ($p < .01$), as presented in Table 4.15.

Table 4.15

Predicting Pseudo-word Decoding in the Second Grade (N = 78)

		R^2	(df)	F Value	β	t Value	p Value
Chronological Variable		.005	(1,76)	0.368			
1	Age				.069	.607	.546
Cognitive Ability		.052	(2,74)	2.037			
2	Peabody				.122	1.066	.290
	Raven				.184	1.566	.122
Phonological Awareness		.093*	(2,72)	3.926			
3	Syllabic Factor				.283	2.460	.016
	Phonemic Factor				-.140	-1.276	.206
or *Morphological Awareness*		.097*	(2,72)	4.131			
3	Morph. Relationships				.322	2.866	.005
	Pseudo-word Production				-.069	-.578	.565
or *Dialect Awareness*		.041	(1,73)	3.281			
3	Dialectic Factor				.214	1.811	.074

Setting the reading comprehension measure as the outcome variable, the multiple regression results are presented in Tables 4.16 and 4.17. With respect to the standardised β coefficients at the end of the first grade, all the variables except two were non-significant. Participants' ages (sorted chronologically) played a role in predicting their reading comprehension, as the β value for this variable equals .225, significant at the 5% level. The syllabic factor is the

second significant predictor, which despite being in the third step of the regression after controlling for age and cognitive ability retained a β coefficient of .369, significant at the .001 level.

Table 4.16

Predicting Reading Comprehension in the First Grade (N = 80)

	R^2	(df)	F Value	β	t Value	p Value
Chronological Variable	.051*	(1,78)	4.170			
1 Age				.225	2.042	.045
Cognitive Ability	.055	(2,76)	2.330			
Peabody				.175	1.588	.116
2						
Raven				.136	1.212	.229
Phonological Awareness	.122**	(2,74)	5.820			
Syllabic Factor				.369	3.410	.001
3						
Phonemic Factor				.021	.202	.840
or *Morphological Awareness*	.022	(2,74)	0.951			
Morph. Relationships				.153	1.368	.175
3						
Pseudo-word Production				-.043	-.363	.717
or *Dialect Awareness*	.014	(1,75)	1.222			
3 Dialectic Factor				.128	1.106	.272

By the end of the second grade, most predictor variables were significant in relation to reading comprehension skill (Table 4.17). The syllabic factor remained the dominant predictor, with a standardised β coefficient of .322 ($p < .01$). The judgement of morphological relationships and the dialectic factor were also significant predictors, with β

coefficient values of .303 ($p < .01$) and .231 ($p = .05$) respectively. The Peabody intelligence test also revealed a significant β coefficient of .257 ($p < .05$).

Table 4.17

Predicting Reading Comprehension in the Second Grade (N = 78)

		R^2	(df)	F Value	β	t Value	p Value
	Chronological Variable	.015	(1,76)	1.168			
1	Age				.123	1.081	.283
	Cognitive Ability	.074	(2,74)	3.017			
2	Peabody				.257	2.285	.025
	Raven				.070	.608	.545
	Phonological Awareness	.099*	(2,72)	4.377			
3	Syllabic Factor				.322	2.865	.005
	Phonemic Factor				-.071	-.661	.510
	or *Morphological Awareness*	.085*	(2,72)	3.728			
3	Morph. Relationships				.303	2.731	.008
	Pseudo-word Production				-.042	-.361	.719
	or *Dialect Awareness*	.047*	(1,73)	3.986			
3	Dialectic Factor				.231	1.997	.050

From the findings presented thus far, it can be concluded that the syllabic factor is a significant predictor of literacy outcomes, and that this is consistently the case throughout the analyses within this study for both grade levels. The judgement of morphological relationships task was found to be a significant predictor, mainly for the spelling outcome in the first grade, and for all of the outcome measures in the second grade. Dialect awareness measured by the dialectic factor contributed significantly to the word reading and reading comprehension outcome tasks in the second grade sample. The Peabody verbal ability test

was also found to be a significant predictor of the word spelling skills of first- and second-grade children, but a predictor of word reading and reading comprehension of second-graders only. Finally, chronological age played a significant role in predicting reading comprehension among first-grade children.

4.2.4.2. Second Research Hypothesis

The second research hypothesis proposed that phonological and morphological awareness make contributions to the prediction of literacy outcomes that are independent of each other.

The independent contributions of predictors can be evaluated by defining the significance of the R^2 change, which is also known as the coefficient of determination (Rawlings, Pantula and Dickey, 1998), of each of the models entered into the regression. This coefficient is a measure of the proportion of variance explained in the criterion variable by the model's independent variable. As each of the regression models in Tables 4.10 to 4.17 above was inspected for the significant predictor variables of each outcome measure, further hierarchical regression models were built in order to test whether these predictors contributed to the outcomes independently of each other.

For the majority of first-grade outcome measures, the phonological syllabic factor was the only significant predictor; hence, it can be concluded that its contribution is independent of the other factors, as these did not contribute to the variance in the outcome significantly. An exception is the word spelling outcome measure, in which the judgement of morphological relationships task was found to be a significant predictor alongside the syllabic factor. Therefore, two hierarchical regression analyses were run with each of these predictors being

controlled by the other, after controlling for chronological age and cognitive ability. The results are illustrated in Table 4.18.

Table 4.18

Unique Predictions of Word Spelling in the First Grade (N = 80)

	R^2	(df)	F Value	β	t Value	p Value
Chronological Variable	.009	(1,78)	0.742			
1 Age				.097	.862	.392
Cognitive Ability	.077*	(2,76)	3.186			
Peabody				.235	2.110	.038
2						
Raven				.120	1.059	.293
Additional Steps in First Regression						
3 Morph. Relationships	.052*	(1,75)	4.535	.125	1.103	.274
4 Syllabic Factor	.071*	(1,74)	6.692	.304	2.587	.012
Additional Steps in Second Regression						
3 Syllabic Factor	.111**	(1,75)	10.325	.304	2.587	.012
4 Morph. Relationships	.013	(1,74)	1.216	.125	1.103	.274

The results of the first regression model, where the syllabic factor was controlled by age, cognitive ability, and the judgement of morphological relationships task, show that performance in the syllabic factor significantly predicted 7.1% of the word spelling outcome beyond the predictions of the preceding variables. However, the judgement task did not attain a significant prediction value when controlled by the rest of the variables in the model. The phonological syllabic factor is therefore an independent predictor of children's ability, whereas the morphological judgement task contributes to the prediction of the spelling outcome but is not independent of the phonological measure.

Tables 4.19 to 4.22 represent the regression analyses run for the second-graders based on the same procedure of entering the independent variables into the regression models alternately to find the unique contributors to the variances of the outcome measures. The independent variables that showed significant predictions independently of age and cognitive abilities are those chosen to be entered for the analyses of the second hypothesis.

Table 4.19

Unique Predictions of Word Reading in the Second Grade (N = 78)

	R^2	(df)	F Value	β	t Value	p Value
Chronological Variable	.022	(1,76)	1.676			
1 Age				.147	1.295	.199
Cognitive Ability	.108*	(2,74)	4.567			
Peabody				.284	2.583	.012
2 Raven				.139	1.232	.222
Additional Steps in First Regression						
3 Morph. Relationships	.082**	(1,73)	7.637	.176	1.619	.110
4 Dialect Factor	.037	(1,72)	3.571	.132	1.200	.234
5 Syllabic Factor	.062*	(1,71)	6.418	.294	2.533	.014
Additional Steps in Second Regression						
3 Syllabic Factor	.142***	(1,73)	14.171	.294	2.533	.014
4 Dialect Factor	.015	(1,72)	1.512	.132	1.200	.234
5 Morph. Relationships	.025	(1,71)	2.621	.176	1.619	.110
Additional Steps in Third Regression						
3 Syllabic Factor	.142***	(1,73)	14.171	.294	2.533	.014
4 Morph. Relationships	.026	(1,72)	2.712	.176	1.619	.110
5 Dialect Factor	.014	(1,71)	1.439	.132	1.200	.234

The results of the hierarchical regression models represented in Table 4.19 reveal that phonological awareness measured by the syllabic factor is the only predictor variable that contributes to children's word reading skills at the second grade independently of the other factors included in the model. A total of 6.2% of the outcome was recorded as the percentage of variation in the reading outcome predicted by the syllabic factor beyond the predictions of the other variables.

The results obtained for the prediction of the spelling outcome in the second grade, as presented in Table 4.20, indicate that both the phonological syllabic factor and the morphological judgement task are significant unique predictors of word spelling in second-grade learners, uniquely accounting for 6.4% and 4.4% of the variance in the outcome variable respectively.

Table 4.20

Unique Predictions of Word Spelling in the Second Grade (N = 78)

	R^2	(df)	F Value	β	t Value	p Value
Chronological Variable	.008	(1,76)	0.621			
1 Age				.090	.788	.433
Cognitive Ability	.066	(2,74)	2.657			
2 Peabody				.221	1.952	.055
2 Raven				.113	.971	.335
Additional Steps in First Regression						
3 Morph. Relationships	.104**	(1,73)	9.241	.231	2.047	.044
4 Syllabic Factor	.064*	(1,72)	6.064	.287	2.462	.016
Additional Steps in Second Regression						
3 Syllabic Factor	.124***	(1,73)	11.263	.287	2.462	.016
4 Morph. Relationships	.044*	(1,72)	4.191	.231	2.047	.044

Considering the pseudo-word decoding outcome measure in the second grade, 5% of its variance was uniquely and independently accounted for by the judgement of morphological relationships task, as shown in Table 4.21. The syllabic factor, however, failed to attain a significant value for the prediction of pseudo-word decoding when the judgement task's contribution was controlled for.

Table 4.21

Unique Predictions of Pseudo-word Decoding in the Second Grade (N = 78)

		R^2	(df)	F Value	β	t Value	p Value
Chronological Variable		.005	(1,76)	0. 368			
1	Age				.069	.607	.546
Cognitive Ability		.052	(2,74)	2.037			
2	Peabody				.122	1.066	.290
	Raven				.184	1.566	.122
Additional Steps in First Regression							
3	Morph. Relationships	.093**	(1,73)	8.001	.245	2.086	.041
4	Syllabic Factor	.030	(1,72)	2.623	.196	1.620	.110
Additional Steps in Second Regression							
3	Syllabic Factor	.073*	(1,73)	11.263	.196	1.620	.110
4	Morph. Relationships	.050*	(1,72)	4.191	.245	2.086	.041

In reference to the reading comprehension outcome, Table 4.22 in the next page shows that the variance explained is shared between the predictors, and is not uniquely accounted for by any particular one of them.

It can be concluded that with the series of hierarchical regressions concerning literacy experiences attained by the end of the first grade, phonological awareness was predominant

in explaining unique variances in children's word reading (9.6%), word spelling (7.1%), pseudo-word decoding (10.6%) and reading comprehension (12.2%) skills, after controlling for age and cognitive abilities, as well as controlling for morphological awareness in the case of word spelling. The results of this series also reveal that cognitive abilities predict a significant proportion of children's spelling skill (7.7%) and that their chronological age accounts for the additional variance of reading comprehension skill (5.1%) at the end of grade one.

Table 4.22

Unique Predictions of Reading Comprehension in the Second Grade (N = 78)

	R^2	(df)	F Value	B	t Value	p Value
Chronological Variable	.015	(1,76)	1.168			
1 Age				.123	1.081	.283
Cognitive Ability	.074	(2,74)	3.017			
2 Peabody				.257	2.285	.025
2 Raven				.070	.608	.545
Additional Steps in First Regression						
3 Morph. Relationships	.084**	(1,73)	7.415	.208	1.822	.073
4 Dialect Factor	.033	(1,72)	2.961	.141	1.222	.226
5 Syllabic Factor	.030	(1,71)	2.815	.205	1.678	.098
Additional Steps in Second Regression						
3 Syllabic Factor	.094**	(1,73)	8.382	.205	1.678	.098
4 Dialect Factor	.017	(1,72)	1.566	.141	1.222	.226
5 Morph. Relationships	.036	(1,71)	3.320	.208	1.822	.073
Additional Steps in Third Regression						
3 Syllabic Factor	.094**	(1,73)	8.382	.205	1.678	.098
4 Morph. Relationships	.037	(1,72)	3.420	.208	1.822	.073
5 Dialect Factor	.016	(1,71)	1.494	.141	1.222	.226

For the regressions series conducted to examine literacy experiences achieved by the end of second grade, the pattern of findings was slightly different, as phonological awareness was a unique predictor only for children's word reading skills (6.2%) and word spelling skills (6.4%). Morphological awareness also emerged as a significant unique predictor of word spelling (4.4%) and pseudo-word decoding (5%). Regression analyses additionally revealed that a significant 10.8% of unique variance in word reading ability at the end of grade two literacy instruction was explained by the children's cognitive ability.

4.2.4.3. Third Research Hypothesis

The third research hypothesis proposed that dialect awareness contributes to reading and spelling skills depending on the levels of phonological and morphological awareness demonstrated by the children. That is, besides the proposed direct predictive ability of dialect awareness in relation to literacy skills, dialect awareness may bridge or 'mediate' the relationship between the phonological and morphological awareness predictor variables and the literacy outcome variables. The notion of mediation is thought to have been introduced by Woodworth in 1928 (Baron and Kenny, 1986; Wu and Zumbo, 2008) whose functionalist approach to psychology asserts that an active organism or processor intervenes between stimulus and response, as against the behaviourist who argues that a simple stimulus–response formula can explain behaviour, no matter how complex it is.

In order to 'identify the intermediary process that leads from the manipulated independent variable to the outcome or dependent variable', mediational analyses are suggested (Muller, Judd and Yzerbyt, 2005: 852). Other terms for the mediation effect include 'indirect effect', 'intermediate endpoint effect', or 'intervening effect' (MacKinnon et al., 2002). MacKinnon

and colleagues (2002) simply illustrated the mediational process as a model in which the independent variable is supposed to cause the intervening/mediator variable which, in turn, causes the dependent variable.

Modelling mediation has been empirically studied by a number of scholars (Judd and Kenny, 1981; James and Brett, 1984), and Baron and Kenny's (1986) framework has become the most widely used approach among such analyses. Based on the four procedures or steps presented by Baron and Kenny (1986), examining the third research hypothesis with the second-grade children is required since direct predictions of dialect awareness in relation to word reading and reading comprehension skills were detected.

The proposed mediational model, which uses multiple regression as the primary analysis technique, suggests that the effect of phonological or morphological predictors on literacy outcomes may be mediated by dialect awareness. According to Baron and Kenny (1986), dialect awareness will have a partial mediational effect if the predictive validities of phonological or morphological awareness in relation to literacy outcomes were reduced significantly after controlling for dialect awareness. Furthermore, dialect awareness will show maximum evidence of mediational effect if phonological or morphological variables were found not to affect literacy outcome after dialect awareness is controlled for. However, the complete mediation condition is unlikely to be revealed by research due to the predictable continuous effect of other potential factors (Baron and Kenny, 1986).

To provide further clarification, Figure 4.2 assumes a specific unmediated effect of phonological and morphological awareness on literacy outcome, labelled as path 'c'; Figure 4.3 proposes a mediational model of phonological and morphological awareness on literacy

outcomes by dialect awareness, and the path labelled ‘c´’ was expected to specify a lower estimated effect.

Figure 4.2

Unmediated Path between Literacy Predictors and Literacy Outcomes

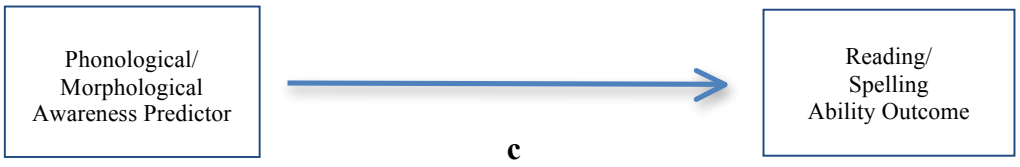
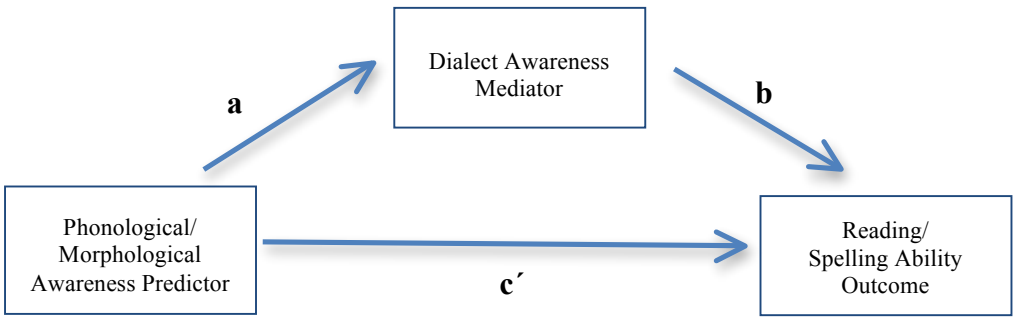


Figure 4.3

Proposed Mediation Path between Literacy Predictors, Dialect Mediator and Literacy Outcomes



In order to examine dialect awareness as a mediator variable in the presented model (Figure 4.3), Baron and Kenny’s (1986) framework for mediation analysis is followed in its four

steps. In the winsorised data the sum of phonological factors, the sum of morphological tasks and the dialectic factor were employed to condense the variables into just three awareness elements.

Step 1: assumes positive significant correlational effects between the predictor variables and the outcome variables.

To complete this step, Table 4.23 aims to outline the revealed significant Pearson's product correlation coefficients between the predictor and the outcome measures among second-grade children.

Table 4.23

Pearson's Correlations between the Phonological and Morphological Predictors, the Dialect Mediator and the Outcome Variables of Second-grade Children (N = 78)

	1	2	3	4	5	6	7
1. Phonological Awareness	---						
2. Morphological Awareness	0.165	---					
3. Dialect Awareness	.298*	.313**	---				
4. Word Reading 2	.320**	.327**	.333**	---			
5. Word Spelling 2	.257*	.362**	.276*	.856***	---		
6. Pseudo-word Decoding 2	0.123	.325**	.253*	.827***	.803***	---	
7. Reading Comprehension 2	0.185	.321**	.305**	.899***	.875***	.819**	---

* Correlation is significant at the 0.05 level (two-tailed)

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

*** Correlation is significant at the 0.001 level (2-tailed)

A potential mediation effect can be suggested between phonological and morphological awareness and reading and spelling outcomes by the dialect mediator, due to the presence of many positive and significant correlations between them.

Step 2: assumes that the predictor variable positively and significantly correlates with the mediator variable.

To accomplish this step, a regression analysis for the first possible mediational effect, consisting of phonological awareness as predictor and dialect awareness as criterion variable, was run based on the raw data. A positive significant correlation between the predictor and the mediator variables, estimating the path labelled 'a', was confirmed, with a β value of .313 ($p < .01$).

Step 3: assumes that the mediator variable positively and significantly correlates with the outcome variables, simultaneously controlling the effects of predictor variable.

This step is premised on finding a significant estimation of the path labelled 'b' between dialect awareness and reading outcome, while the effect of phonological awareness is controlled for. A regression model comprising phonological awareness and dialect awareness as predictors, and the word reading measure as an outcome, was constructed. The regression analysis revealed a positive and significant predictive validity for path 'b', with a β value of .262 ($p < .05$).

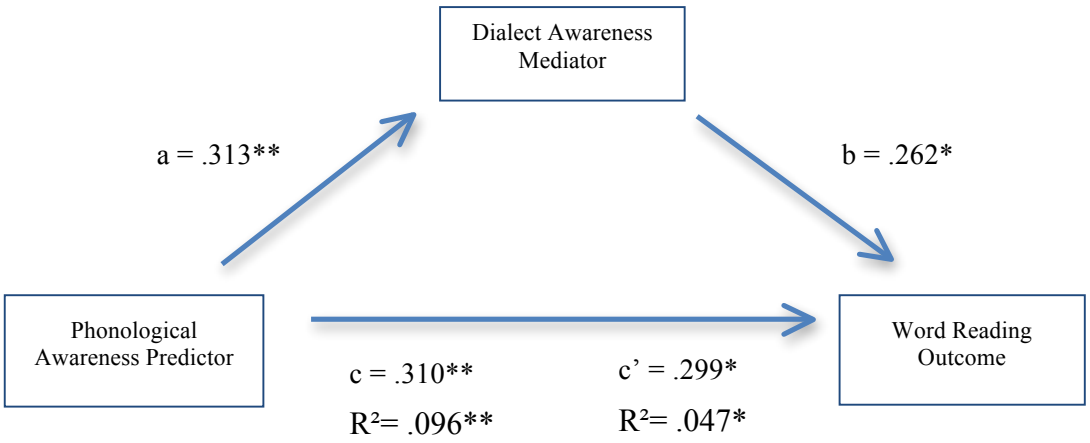
Step 4: establishes a mediational presence possibility by controlling the mediator in the equation.

Ending with this step allows the mediator's effect to become evident, since it is controlled in the regression model for the predictor–outcome relationship. The regression model constructed for reading outcome revealed a significant reduction in the effect of phonological

awareness on word reading outcome when controlling for dialect/mediator (path c´). Figure 4.4 displays the predictive validities of the paths and their significance.

Figure 4.4

Established Mediation Model between Phonological Predictor, Dialect Mediator and Word Reading Outcome



The same procedures are followed again with all the possible meditational effects of dialect awareness observed in Pearson's correlations table, with morphological awareness as the predictor variable and word reading, word spelling, pseudo-word decoding and reading comprehension as the outcome variables. Appendix 12 illustrates the established mediation models.

No meditational effects were identified in predicting word spelling or pseudo-word decoding, while in the word reading outcome, path c was reduced from .327 ($p < .01$) to c' as .243 ($p < .05$). Similar results were obtained for the reading comprehension task, with a reduction of c from .321 ($p < .01$) to .247 ($p < .05$) for c'.

4.2.5 Summary of the Main Analysis

1. The first research hypothesis, which proposed that phonological, morphological and dialect awareness each predict literacy outcomes independently of age and cognitive ability, revealed a significant superiority of phonological awareness as the predominant predictor of Arabic literacy skills. This result remained consistent across all outcome measures and through grade levels one and two. Morphological awareness was a predictor of first-graders' spelling skills, as well as all the second graders' outcome measures after controlling for their age and cognitive abilities, though their dialect awareness predicted their word reading and reading comprehension abilities.

2. The second research hypothesis, which proposed that phonological and morphological awareness contribute to the prediction of literacy outcomes that are independent of each other, was partially supported. Phonological awareness, measured by the syllabic factor, uniquely and independently accounted for a significant proportion of the variances in first-grade children's literacy skills beyond the predictions of all the other measured variables; whereas for the second-graders' literacy skills, phonological awareness only predicted word reading and word spelling independently of the other factors. Analyses also revealed a significant unique prediction of morphological awareness in the variances of word spelling and pseudo-word decoding outcomes for second-grade children.

3. The third research hypothesis, which proposed that dialect awareness contributes to reading and spelling depending on levels of phonological and morphological awareness, revealed the findings as follows. Among the second-grade children where direct predictions of the effects of dialect awareness on word reading and reading comprehension skills were detected, testing the hypothesis was based on the mediation route. Via the mediational

model, a significant reduction in the effect of phonological awareness on word reading skill was detected when controlling for the dialect/mediator, suggesting the mediational effect of dialect awareness. In addition, a significant reduction in the effect of morphological awareness on word reading and reading comprehension were evident. These results revealed a partial acceptance of the third research hypothesis in terms of the effects of dialect awareness on phonological and morphological awareness predictions of the outcome variables when second-grade children were targeted.

4.3 Results for the Deaf Participants

Following a similar approach to the quantitative analyses conducted with the hearing children's data, this section, which concerns the deaf participants, is divided into three parts. The first part displays preliminary descriptive statistics for all the predictor and outcome measures employed in the study. The second part demonstrates data screening for the multicollinearity, normality and outliers that preceded the correlation analyses between the independent predictor variables and the dependent outcome variables. The third part reports the series of regression models constructed to investigate the possible predictive ability of the employed measures.

4.3.1 Preliminary Descriptive Analysis

The complete data was gathered for 34 Kuwaiti deaf children (16 boys and 18 girls) from first to third grade who participated longitudinally in the two research phases. Their ages ranged from 70 to 112 months (M = 93.35, SD = 10.608) with an average age of 7 years and 6 months (90 months) in the first phase of the study (September 2010).

4.3.1.1 Measures of Cognitive Ability

The Peabody Picture Vocabulary Test was used to assess children's verbal reasoning abilities. The deaf children attained a mean score of 9.29 (SD = 3.85, SE = .66). This result reflects the mean value found in the test's manual for average 3; 6- to 3; 9-year-olds. For this particular verbal age, there was no α value for reliability as the minimum tested chronological age was 4 years old, with α= .780. The sample of the 34 deaf children had a lower verbal ability in comparison to the measured verbal capability of the hearing group, whose scores were representative of the Kuwaiti population. Such variance between the two groups is expected, since a lack of language exposure disadvantages deaf children by limiting their vocabulary development.

Through a test of their non-verbal reasoning ability using the Raven's Coloured Progressive Matrix Test (α = 0.79), the deaf children obtained a mean score of 15.56 (SD = 4.49, SE = .77). This outcome shows a lower mean value than the test manual reports for the average age of 7 years and 6 months, given that the standard error is not stated in the manual. However, when the results were compared to those of the hearing sample, which obtained a mean score of 15.16 (SD = 3.75), the results between the two groups were found to be very similar.

4.3.1.2 Measures of Literacy Predictors

These comprise the measures of phonological, morphological and dialect awareness, which were given to the deaf children at the beginning of the school year. Table 4.24 summarises the descriptive statistics for the predictor measures applied at phase 1.

Table 4.24

Means, Standard Deviations, Maximum, Skewness and Kurtosis of the Predictor Measures among Deaf Children (N = 34)

	Phon. Phoneme Deletion	Phon. Initial Syllable Addition	Phon. Final Syllable Addition	Morph. Judgement of Morph. Relationships	Morph. Pseudo-word Production	Dialect Dialect Discrimination	Dialect Sentence Correction
Mean	0.53	2.61	1.18	18.38	1.15	4.56	5.94
SD	0.83	2.31	1.60	4.29	1.52	1.48	3.08
Max. obtained score	3/15	8/9	7/9	32/32	6/7	7/8	15/16
Skewness	1.45	0.84	1.71	0.75	1.61	-0.12	1.19
Z-skewness	3.59	2.09	4.23	1.86	3.99	-0.30	2.96
Kurtosis	1.26	-0.29	3.82	1.75	2.18	-0.79	1.28
Z-kurtosis	1.60	-0.38	4.84	2.23	2.77	-1.00	1.63

Out of all the predictor variables, only the judgement of morphological relationships and the dialect discrimination tasks were normally distributed in terms of skewness. The rest of the variables exhibited floor effects significantly at the .05 as well as the .001 levels. In terms of the kurtosis levels, both the morphological awareness tasks and the phonological final syllable addition task were positively statistically significant. For the rest of the predictor variables, the values were within acceptable levels that met the criteria of normality.

4.3.1.3 Measures of Literacy Outcomes

The results of the descriptive statistics for the outcome measures of word reading, word spelling, pseudo-word decoding and reading comprehension applied at phase 2 are presented in Table 4.25.

Table 4.25

Means, Standard Deviations, Maximum, Skewness and Kurtosis of the Outcome Measures among Deaf Children (N = 34)

	Word Reading	Word Spelling	Pseudo-word Decoding	Reading Comprehension
Mean	4.97	3.06	2.18	5.32
SD	6.93	3.58	2.72	7.95
Max. obtained score	23/25	16/25	9/9	23/28
Skewness	1.39	1.85	1.20	1.45
Z-skewness	3.47	4.60	3.00	3.61
Kurtosis	0.68	4.07	0.44	0.54
Z-kurtosis	0.87	5.17	0.55	0.69

Considering the statistical descriptive analyses of the measures used with the deaf sample, all the outcome measures were found to have significant skewness values indicating floor effects. Yet, only the spelling task showed a positive significant kurtosis value, as all the others were at normal kurtosis levels.

In order to understand better these descriptive results, some form of comparison with the hearing children is essential in order to draw more definitive conclusions. Since the different study groups had differing ages and sample sizes, it was nearly impossible to find a method to statistically compare them. Table 4.26 is an attempt to illustrate the mean and standard

deviation differences, in order to derive some general ideas about their performance differences, bearing in mind that the deaf children represented a smaller sample size and an older age group.

Table 4.26

Means and Standard Deviation Comparisons between the Deaf and the Hearing Children's Scores

	Deaf 1st– 3rd Grades		Hearing 1st Grade		Hearing 2nd Grade	
	Mean	SD	Mean	SD	Mean	SD
Predictor Measures						
Phoneme Deletion	0.53	0.83	1.18	1.76	-	-
Initial Syllable Addition	2.61	2.31	2.53	2.96	-	-
Final Syllable Addition	1.18	1.6	2.24	2.78	-	-
Morph. Relationships	18.38	4.29	23	5.04	-	-
Pseudo-word Production	1.15	1.52	4.16	1.81	-	-
Dialect Discrimination	4.56	1.48	5.61	2.09	-	-
Sentence Correction	5.94	3.08	11.11	2.35	-	-
Outcome Measures						
Word Reading	4.97	6.93	5.36	5.85	16.13	7.63
Word Spelling	3.06	3.58	4.75	5.11	11.67	6.43
Pseudo-word Decoding	2.18	2.72	2.53	2.37	6.08	2.53
Reading Comprehension	5.32	7.95	4.49	5.96	18.36	8.47

The table shows that the deaf children's results in the predictor variables are comparable with the first-grade children's results in terms of mean scores. The differences were mainly demonstrated in the morphological awareness tasks and the dialectical sentence correction task, where the hearing sample's scores were noticeably higher than the deaf sample's. For

the outcome measures, however, it can be seen that all the mean scores between the deaf and first-grade hearing participants were indeed very similar, especially when compared to the results for the second-grade participants.

4.3.2 Main Analysis for the Deaf Participants

The same procedures followed with the hearing sample were followed for the deaf sample to test for the significant predictors of literacy outcome measures. However, the current sample size of 34 children has some implications for the analyses. For example, the sample size of 34 is not sufficient for undertaking the statistical factor analyses, where the most lenient requirement specifies 50 participants as an absolute minimum sample size (Barrett and Kline, 1981). Therefore, the same factors emerged from analysing the results of the hearing children, which included extracting one or more latent variable from the observed intra-correlations between the literacy predictor measures, were considered. As for multiple regression testing, Green (1991) recommended a minimum sample size of 31 cases for three predictor variables. This makes the current sample of 34 deaf children reasonable for running the analyses. Regression analyses were therefore performed to find out if any independent variable was sufficient to predict deaf children's performances on the reading and spelling measures.

The three particular hypotheses of the study were tested within the participating group of orally educated deaf children. The first hypothesis is that children's performances on phonological, morphological and dialect awareness measures predict their performance on the literacy outcome measures, independently of age and cognitive ability. The second is that children's phonological and morphological awareness make contributions to the prediction of the literacy outcomes which are independent of each other. The third hypothesis is that

dialect awareness contributes to reading and spelling depending on levels of phonological and morphological awareness. According to these hypotheses, a set of multiple regression analyses was run to examine the predictive value of predictor variables on each of the outcome variables used with the deaf group.

4.3.2.1. First Research Hypothesis

The first research hypothesis proposed that deaf children's performances in relation to phonological, morphological and dialect awareness measures predict their performance in reading and spelling measures, independently of age and cognitive ability.

A hierarchical multiple regression model of deaf children's performances when testing their word reading ability was constructed first. The outcome is shown in Table 4.27.

Table 4.27

Predicting Word Reading in Deaf Children (N = 34)

	R^2	(df)	F Value	β	t Value	p Value
Chronological Variable	.015	(1,32)	0.501			
1 Age				.094	.578	.568
Cognitive Ability	.113	(2,30)	1.936			
Peabody				.193	1.109	.277
2						
Raven				.101	.577	.569
Phonological Awareness	.225*	(2,28)	4.870			
Syllabic Factor				.484	3.067	.005
3						
Phonemic Factor				-.068	-.437	.665
or *Morphological Awareness*	.212*	(2,28)	4.489			
Morph. Relationships				.432	2.712	.011
3						
Pseudo-word Production				.089	.559	.581
or *Dialect Awareness*	.122*	(1,29)	4.697			
3 Dialectic Factor				.358	2.167	.039

The significant prediction validity of the phonological awareness factor, specifically the syllabic factor based on a standardised β coefficient of .484 being significant at the 1% level, is observed. Morphological awareness then revealed a β coefficient of .432 being significant at the 5% level, demonstrated by the judgement of morphological relationships task. The dialectic factor also conveyed a significant β value of .358 ($p < .05$) after controlling for the age and cognitive ability of the deaf children.

In predicting performance on the word spelling level, the second performed regression model presented the complete predictive validity of all independent measures.

Table 4.28

Predicting Word Spelling in Deaf Children (N = 34)

		R^2	(df)	F Value	β	t Value	p Value
	Chronological Variable	.013	(1,32)	0.417			
1	Age				.026	.187	.853
	Cognitive Ability	.207*	(2,30)	3.983			
2	Peabody				.181	1.226	.230
	Raven				.293	1.983	.057
	Phonological Awareness	.318**	(2,28)	9.630			
3	Syllabic Factor				.562	4.216	.000
	Phonemic Factor				-.134	-1.027	.313
	or *Morphological Awareness*	.355***	(2,28)	11.692			
3	Morph. Relationships				.520	4.072	.000
	Pseudo-word Production				.194	1.514	.141
	or *Dialect Awareness*	.227**	(1,29)	11.908			
3	Dialectic Factor				.490	3.451	.002

Phonological awareness expressed by the syllabic factor revealed a β value of .562 being significant at the 0.1% level. Morphological awareness expressed by the judgement of morphological relationships task followed with a β coefficient of .520 at the 1% level. The dialectic factor came last with a β coefficient of .490, also at the 1% level. These values were achieved despite the significance of the controlling cognitive abilities measure in the model, which accounted for 20.7% of the variance in the word spelling outcome. Table 4.28 summarises the results attained by the deaf children in a more precise manner.

To explore potential predictive relations with pseudo-word decoding ability within the deaf children, another regression model was performed.

Table 4.29

Predicting Pseudo-word Decoding in Deaf Children (N = 34)

		R^2	(df)	F Value	β	t Value	p Value
Chronological Variable		.001	(1,32)	0.017			
1	Age				-.062	-.347	.731
Cognitive Ability		.185*	(2,30)	3.405			
2	Peabody				.343	1.788	.085
	Raven				.105	.547	.588
Phonological Awareness		.031	(2,28)	0.561			
3	Syllabic Factor				.177	1.021	.316
	Phonemic Factor				.056	.327	.746
or *Morphological Awareness*		.089	(2,28)	1.710			
3	Morph. Relationships				.295	1.769	.088
	Pseudo-word Production				.013	.081	.936
or *Dialect Awareness*		.123*	(1,29)	5.134			
3	Dialectic Factor				.360	2.266	.031

The results denoted a unique significant prediction with a standardised β coefficient of .360 ($p < .05$) by the dialectic factor. As reported in Table 4.29, neither phonological awareness factors nor morphological awareness tasks demonstrated predictive validity in relation to the pseudo-word decoding outcome measure. The cognitive abilities results contributed to 18.5% of the variance in the pseudo-word decoding performance.

When reading comprehension was regressed as the dependent variable against the three employed predictors, the regression model revealed a contrast with pseudo-word decoding as a dependent variable. Table 4.30 reviews the findings.

Table 4.30

Predicting Reading Comprehension in Deaf Children (N = 34)

		R^2	(df)	F Value	β	t Value	p Value
Chronological Variable		.019	(1,32)	0.614			
1	Age				.087	.553	.585
Cognitive Ability		.146	(2,30)	2.617			
2	Peabody				.235	1.392	.175
	Raven				.131	.777	.443
Phonological Awareness		.230*	(2,28)	5.318			
3	Syllabic Factor				.475	3.113	.004
	Phonemic Factor				-.124	-.833	.412
or *Morphological Awareness*		.242	(2,28)	5.719			
3	Morph. Relationships				.500	3.311	.003
	Pseudo-word Production				-.024	-.158	.876
or *Dialect Awareness*		.054	(1,29)	1.988			
3	Dialectic Factor				.238	1.410	.169

Dialect awareness played no significant role in predicting reading comprehension of the deaf children, though phonological and morphological awareness variables did. The β value for the syllabic factor in this case equals .475, significant at the 1% level, whereas for the judgement of morphological relationships task a β coefficient of .500 was achieved, significantly at the 5% level.

In light of the regression analyses, it can be concluded that apart from the ability to decode pseudo-words, phonological awareness measured by the syllabic factor is a significant predictor of deaf children's literacy outcomes throughout the analyses. A similar conclusion was also reached with deaf children's morphological awareness. The judgement of morphological relationships task was found to be a significant predictor for word reading, word spelling and reading comprehension outcome measures, but not for the pseudo-word decoding task. The ability to decode pseudo-words was, however, uniquely and exceptionally predicted by dialect awareness presented in the dialectic factor, which also contributed to the variances in the word reading and word spelling measures.

4.3.2.2. Second Research Hypothesis

Data analysis turned subsequently to the second research hypothesis, which anticipated that phonological and morphological awareness make contributions to the prediction of the literacy outcomes in the Arabic language that are independent of each other.

The same procedures were followed to measure the independence of each of the significant predictors considered in the first hypothesis analyses. Via outlining the significance of R^2 changes within each of the models entered into the regression analyses, the second hypothesis can be verified. The R^2 change is an indicator of the change in the regression

Table 4.31

Unique Prediction of Word Reading in Deaf Children (N = 34)

	R^2	(df)	F Value	β	t Value	p Value
Chronological Variable	.015	(1,32)	0.501			
1 Age				.054	.352	.727
Cognitive Ability	.113	(2,30)	1.936			
Peabody				.202	1.241	.225
2 Raven				.078	.475	.638
Additional Steps in First Regression						
3 Morph. Relationships	.204**	(1,29)	8.876	.286	1.798	.083
4 Dialect Factor	.039	(1,28)	1.730	.143	.887	.383
5 Syllabic Factor	.085*	(1,27)	4.211	.332	2.052	.050
Additional Steps in Second Regression						
3 Syllabic Factor	.221**	(1,29)	9.822	.332	2.052	.050
4 Dialect Factor	.042	(1,28)	1.943	.143	.887	.383
5 Morph. Relationships	.065	(1,27)	3.233	.286	1.798	.083
Additional Steps in Third Regression						
3 Syllabic Factor	.221**	(1,29)	9.822	.332	2.052	.050
4 Morph. Relationships	.092*	(1,28)	4.578	.286	1.798	.083
5 Dialect Factor	.016	(1,27)	.788	.143	.887	.383

model which results from embracing a new set of predictors after controlling for the predictors entered previously. The results obtained are presented in Tables 4.31 to 4.33

In Table 4.31, phonological awareness represented by the syllabic factor accounted for 8.5 % of the variation in the word reading dependent variable significantly at the 5% level, beyond

the variances explained by the judgement of morphological relationships task and the dialectic factor. This makes phonological awareness the only unique predictor of deaf children's word reading abilities among the three predictors attained in the first hypothesis results. Nevertheless, although morphological awareness was not an independent predictor of dialect awareness, it still predicted deaf children's word reading skill independently of their phonological awareness.

Table 4.32

Unique Prediction of Word Spelling in Deaf Children (N = 34)

	R^2	(df)	F Value	β	t Value	p Value
Chronological Variable	.013	(1,32)	0.417			
1 Age				.113	.646	.523
Cognitive Abilities	.207*	(2,30)	3.983			
2 Peabody				.305	1.730	.094
2 Raven				.267	1.449	.158
Additional Steps in First Regression						
3 Morph. Relationships	.320***	(1,29)	20.194	.358	3.138	.004
4 Dialect Factor	.084*	(1,28)	6.256	.240	2.083	.047
5 Syllabic Factor	.097**	(1,27)	9.334	.355	3.055	.005
Additional Steps in Second Regression						
3 Syllabic Factor	.300***	(1,29)	18.170	.355	3.055	.005
4 Dialect Factor	.098*	(1,28)	7.227	.240	2.083	.047
5 Morph. Relationships	.102**	(1,27)	9.848	.358	3.138	.004
Additional Steps in Third Regression						
3 Syllabic Factor	.300***	(1,29)	18.170	.355	3.055	.005
4 Morph. Relationships	.155***	(1,28)	13.422	.358	3.138	.004
5 Dialect Factor	.045*	(1,27)	4.337	.240	2.083	.047

Referring to Table 4.32 to assess the variance in deaf children's word spelling performance, 9.7% of variance was explained by the syllabic factor ($p < .01$), 10.2% by the morphological awareness model ($p < .001$), and 4.5% by the dialect factor significantly at the .05 level, controlling for each of the other predictor measures. Hence, phonological, morphological and dialect awareness, measured by the syllabic factor, the judgement task and the dialect factor, are unique predictors of word spelling, operating independently of each other.

When the results from the first hypotheses were analysed, the dialect awareness model uniquely accounted for a variance of 13.2% in the pseudo-word decoding task ($p < .05$). The proceeded models of phonological and morphological awareness were both ineffective in accounting for a significant degree of variance within this outcome variable, and therefore no further regressions were required.

Table 4.33

Unique Prediction of Reading Comprehension in the Deaf Children Grade (N = 34)

		R^2	(df)	F Value	β	t Value	p Value
Chronological Variable		.019	(1,32)	.614			
1	Age				.067	.463	.647
Cognitive Ability		.146	(2,30)	2.617			
2	Peabody				.259	1.705	.099
	Raven				.100	.652	.520
Additional Steps in First Regression							
3	Morph. Relationships	.242**	(1,29)	11.810	.374	2.601	.015
4	Syllabic Factor	.094*	(1,28)	5.262	.341	2.294	.030
Additional Steps in Second Regression							
3	Syllabic Factor	.215**	(1,29)	10.047	.341	2.294	.030
4	Morph. Relationships	.121*	(1,28)	6.763	.374	2.601	.015

Concluding with Table 4.33, the phonological and morphological awareness models remained independent predictors by explaining 9.4% ($p < .05$) and 12.1% ($p < .05$) of variance in reading comprehension, respectively.

To conclude, the phonological and morphological awareness measures, each exhibited a significant degree of variance in word reading, word spelling and reading comprehension outcome measures, and therefore their separate contribution toward Arabic literacy is asserted.

4.3.2.3. Third Research Hypothesis

The third research hypothesis proposed that dialect awareness contributes to reading and spelling abilities depending on the levels of phonological and morphological awareness.

This hypothesis is tested on the basis of the mediational analysis presented by Baron and Kenny (1986). Following the mediation route in this context to investigate the effect of dialect awareness is only permissible after making specific predictions of the effect of dialect awareness in relation to Arabic literacy ability. Adopting the framework of Baron and Kenny (1986) for mediation analysis, the sum of phonological factors, the sum of morphological tasks, and the dialectic factor were used to condense the variables into just three elements of awareness.

First, significant positive correlational effects between the predictor variables and the outcome variables were assumed. Table 4.34 outlines the significant Pearson's product correlation coefficients between the predictor and the outcome measures following winsorisation. A potential mediation effect can be suggested between the morphological awareness and the word reading and word spelling outcomes by the dialect mediator, due to the presence of positive and significant correlations between them. However, phonological

awareness was excluded from the analyses at this point as it is not significantly correlated to the dialect mediator.

Table 4.34

Pearson's Correlations between the Predictors, the Mediator and the Outcome Variables of Deaf Children (N = 34)

	1	2	3	4
1. Morphological Awareness	---			
2. Dialect Awareness	.420*	---		
3. Word Reading	.390*	.400*	---	
4. Word Spelling	.473**	.540**	.794**	---

* Correlation is significant at the 0.05 level (two-tailed)

** Correlation is significant at the 0.01 level (two-tailed)

Secondly, the predictor variable is assumed to positively and significantly correlate with the mediator variable. A regression analysis consisting of morphological awareness as predictor and dialect awareness as criterion variable was undertaken in order to test this assumption. A positive significant correlation between the predictor and the mediator variables estimating the path labelled 'a' was confirmed, with a β value of .420 ($p < .05$).

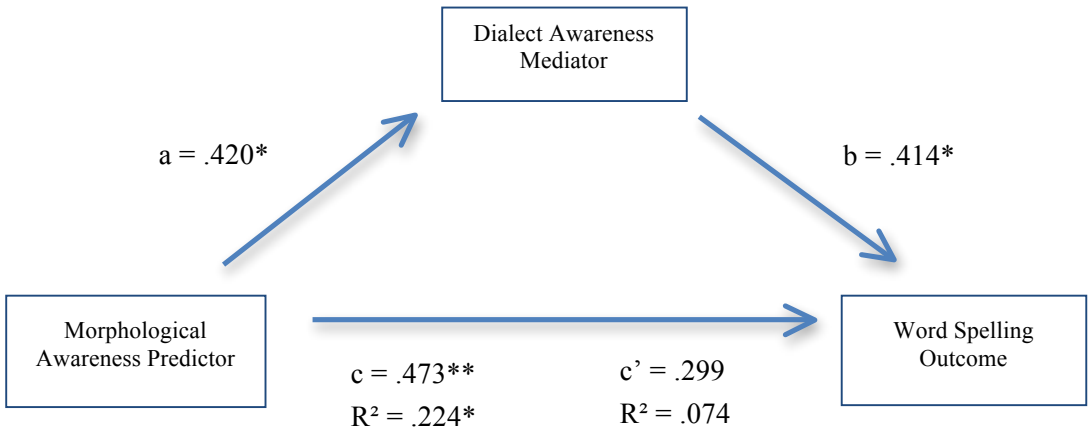
Thirdly, the mediator variable is expected to positively and significantly correlate with the outcome variables simultaneously with controlling the effects of the predictor variable. This step is premised on finding a significant estimate predicting the effect of dialect awareness on reading or spelling outcomes, while the effect of morphological awareness is controlled for. A regression model comprising morphological awareness and dialect awareness as predictors, and the word reading measure as an outcome, was conducted. To follow the same

prediction estimate path as with the word spelling outcome, another regression model assigning the same predictors was constructed. The first regression eliminated the possibility of establishing a mediational model with the word reading measure, as the estimate of the prediction value attained was not significant. Nevertheless, the second regression analysis involving word spelling as the outcome variable provided a positive and significant predictive validity for path 'b', with a β value of .414 significant at the 5% level (see Appendix 14).

The final component of the framework establishes a mediational presence possibility, controlling the mediator in the equation by revealing the effect of the mediator, which is controlled in the regression model for the predictor–outcome relationship. The regression model conducted for this path 'c'' showed a significant reduction in the effect of morphological awareness on the word spelling outcome when controlling for the dialect mediator. Figure 4.5 displays the predictive validities of each path and their significance.

Figure 4.5

Established Mediation Model between Morphological Predictor, Dialect Mediator and Word Spelling Outcome for Deaf Children



Applying Baron and Kenny's (1986) method to analyse the mediation effects, the results of the model with morphological awareness as the predictor variable, dialect awareness as the mediator variable and the word spelling measure as the outcome variable, verified that dialect awareness mediates the connection between morphological awareness and spelling ability. Entering dialect awareness and morphological awareness into the mediation model simultaneously resulted in a significant reduction of path c′ value from .473 ($p < .01$) to a non-significant value of .299. An increase of one standard deviation from the mean of the morphological awareness measure is associated with an increase of .420 standard deviations from the mean of the dialect awareness measure ($p < .05$). Moreover, when the dialect awareness measure increased by one standard deviation, the spelling test measure increased by .414 standard deviations ($p < .05$). When dialect awareness was entered into the model as a mediator, the variance explained in the outcome variable by morphological awareness decreased from $R^2 = .224$, significant at the 5% level, to $R^2 = .074$, which is non-significant. This means that about 15% of the variance in deaf children's spelling ability that is explained by morphological awareness is determined by their dialect awareness. Hence, it can be concluded that a partial mediation effect of the dialectic factor was found in the prediction of morphological awareness measure in relation to the spelling outcome. This indicates that the indirect effects between predictor and outcome variables are influenced by the inclusion of the dialect mediator. Thus, the dialect awareness of deaf children contributes to their spelling ability, depending on their levels of morphological awareness.

4.3.3 Summary of the Main Analysis

1. The first hypothesis stated that phonological, morphological and dialect awareness predict literacy outcome measures independent of children's age and cognitive ability. The analysis has shown that both the phonological syllabic factor and the morphological judgement task

were significant predictors of deaf children's word reading, word spelling and reading comprehension abilities. The dialect awareness factor also impressively predicted all the outcome measures except for reading comprehension ability, after controlling for the deaf children's age and cognitive ability. This supports the hypotheses under test, which is therefore generally accepted.

2. The second hypothesis was that phonological and morphological awareness measures contribute to the prediction of literacy outcomes independently of each other. The phonological syllabic factor was found to be a unique predictor of variances in word reading, word spelling and reading comprehension. Likewise, morphological awareness measured by the judgement task also showed a unique significant prediction of the variance in the word reading, word spelling and the reading comprehension outcomes. These results lead to the acceptance of the second hypothesis. Furthermore, dialect awareness was found to be a unique predictor for deaf children's word spelling and pseudo-word decoding abilities.

3. The third hypothesis proposed that dialect awareness contributes to reading and spelling depending on levels of phonological and morphological awareness. The mediational analysis route was followed to test this hypothesis since specific dialect awareness predictions were evident. The results showed a significant reduction in morphological awareness prediction in relation to the word spelling outcome when the dialect mediator factor was controlled for. Therefore, the effects of dialect awareness as a partial mediator, enhancing deaf children's spelling skill through their morphological awareness, were noticeable. Accordingly, the third hypothesis is partially accepted.

4.4 Summary of Results

To conclude this section, the main differences between the results of the two study samples are reported as a general summary, despite the small sample size of the deaf children's group and the age differences between the hearing and the deaf children.

In terms of the two groups' phonological awareness performance and its predictive validity in relation to the outcome measures, very similar results were attained. The syllabic factor was found to be the predominant predictor in relation to all the outcome variables and across both grade levels for the hearing group, after controlling for age and cognitive ability. This was also the case for the deaf group children, except that no predictive validity was documented for phonological awareness concerning the pseudo-word decoding outcome. The syllabic factor also displayed uniqueness and independence of other predictors in all the outcome measures it predicted across all the groups, except for the deaf children's pseudo-word decoding ability.

The results of the morphological awareness analyses varied slightly between the study samples. Morphological awareness predicted word spelling independently of age and cognitive abilities in the first-grade hearing children, as well as predicting all the outcome measures in their second grade. Unique predictions were detected for the variances in word spelling and pseudo-word decoding in the second-grade sample. On the other hand, morphological awareness was a significant predictor of word reading, word spelling and reading comprehension among the deaf participants, uniquely accounting for variances in the measures of the latter two.

Finally, the analyses of dialect awareness revealed significant predictions in relation to hearing children's word reading and reading comprehension performance in the second

grade, after controlling for their age and cognitive ability. Mediational analyses also showed significant effects of dialect awareness on prediction of phonological awareness in relation to the word reading outcome, as well as prediction of morphological awareness in relation to the word reading and reading comprehension skills of second-graders. For the deaf sample, dialect awareness significantly predicted word reading, word spelling and pseudo-word decoding after controlling for age and cognitive ability. An independent contribution to the variances in word spelling and pseudo-word decoding was also found for the dialectic factor among deaf children. A mediational effect of dialect awareness on the prediction of morphological awareness towards the word spelling outcome of the deaf children was also identified.

In conclusion, the hearing and deaf participants in this study showed similar results in terms of the prediction analyses, mostly in testing for the first hypothesis. Differences emerged with analysis of the predictors that contributed to the outcome measures independently, and with the results of the mediational analyses.

In the following chapter, the results of the statistical analyses presented in this chapter will be discussed.

Chapter 5

Discussion

The purpose of this study is to probe the longitudinal relationship between phonological, morphological and dialect awareness, and literacy development, in early learning stages among hearing and orally educated deaf Kuwaiti children. The study has utilised several adopted and designed measures to assess literacy predictors and outcomes, similar to those that have been used efficiently in previous related studies. For the hearing group, the predictor measures of phonological, morphological and dialect awareness were addressed at the first phase of the study prior to the start of reading instruction at first grade, to determine whether children's performance at this period of time was predictively related to aspects of their literacy abilities measured in the second and third phases of the study, i.e. at the end of grades one and two. Concurrently, the predictor measures were administered to the deaf group during the first phase of the study in order to examine their predictive relationship with literacy skills measured at the end of the second phase. In analysing data sets, controls for age and the effects of verbal and non-verbal intelligence were taken into account for both groups.

This chapter evaluates and interprets the research findings in the light of previous findings made by other investigators. It commences with a statement of the first research hypothesis and then discusses the findings with respect to hearing children at grades one and two, then with regard to the deaf children. The discussion progresses in the same manner to address the findings related to the second and third hypotheses respectively. The key conclusions reached in the study are presented subsequently. This chapter finally states the limitations and puts forward recommendations for the way ahead.

5.1 The Predictive Role of Phonological Awareness in Literacy Development

This study has examined the predictive role of phonological awareness in Arabic literacy development among hearing and orally educated deaf children. The principal hypothesis stated that children's phonological awareness skills, as measured orally by the phoneme deletion and syllable addition tasks, would longitudinally predict the variation in their reading and spelling abilities, independent of the variables of age and cognitive ability. This hypothesis was constructed despite the challenging dual linguistic context in which Kuwaiti children are raised. It relied firstly on the fact that the Kuwaiti dialect is based on the standard Arabic form and similar in many aspects, and the same principles may therefore apply to both. Secondly, the hypothesis emerged from investigations across different languages with varying linguistic affinities which demonstrated a significant connection between phonological awareness and literacy skills of hearing (Bradley and Bryant, 1983; Wagner and Torgesen, 1987; Goswami and Bryant, 1990; Hanson, 1991; Wagner et al., 1994; 1997; Byrne, 1996; Burgess and Lonigan, 1998; Badian, 1998) and deaf skilled readers (Perfetti and Sandak, 2000; Nielsen and Luetke-Stahlman, 2002; Luetke-Stahlman and Nielsen, 2003; Colin, Magnan, Ecalle and Leybaert, 2007). Arabic prediction research has also led to the expectation that phonological awareness among the hearing group would make a significant contribution to literacy ability after controlling for age and intelligence variables (Al-Mannai, 2006; Mahfoudhi et al., 2010; Taibah and Haynes, 2011).

The results obtained in the present study were not only consistent with these expectations, but also demonstrated that phonological awareness was a major predictor of first- and second-grade literacy skills through all the assessment measures deployed with the hearing group. Additional consistency with previous Arabic studies (Tibi, 2010; Taibah and Haynes, 2011) is recognised in the tendency of beginning readers to show mastery with large

phonological units rather than small ones. Although the present study employed stimuli of gradually decreasing grain sizes, from syllabic to phonemic levels, prediction power was consistently related to the syllabic factor. The principal component analyses that were undertaken to reduce the dimensions of the four phonological measures formed one latent variable, which was predominantly loaded by the syllabic tasks, and another one, which was mostly affected by the phonemic tasks. The syllabic factor in the current study, which represented the awareness of large phonological units, was found to be the best predictor, explaining the performance of approximately 10%, 11%, 11% and 12% of first-graders and 14%, 12%, 9%, and 10% of second- graders with respect to outcome measures of word reading, word spelling, pseudo-word decoding and reading comprehension. Concurring results were obtained by Al-Mannai (2006), who identified rhyming ability as a sensitive predictor of all literacy outcome measures among young readers. Those comprised word reading, non-word reading, word spelling and non-word spelling, explaining approximately 12%, 10%, 14% and 10% of them respectively.

In studies conducted by Al-Mannai (2006), Mahfoudhi et al. (2010), and Elbeheri et al. (2011), the phonemic measures showed predictive validity with older children from second grade and above. In the current study however, the phonemic factor did not play a role in predicting any of the outcome measures despite following the hearing children from their pre-school level through the second grade, and recruiting deaf children up to the third grade. The contribution of phonemic awareness in literacy learning was only presented through its significant loading within the syllabic factor, but not by the phonemic factor on its own. The implicit, but not overt, role of phonemic awareness in literacy learning can be interpreted in the light of the type of assessment measures utilised.

While previous Arabic prediction studies have relied on employing standard items with non-dialectic phonemes, the current study is the only one so far which has aimed at avoiding such a partial account, when the criteria for selecting its categories for assessment have been determined. The phonemic awareness measures required items that start or end with phonemes specific to the spoken dialect, and items with shared phonemes and phonemes specific to the standard form of Arabic. Such measures can reasonably be assumed to assess Arab children's phonological abilities, and practicably deliver results which take account of the expected interference of the learners' diglossic setting. As this was apparent with all the phonological predictor measures, assessing the learners' literacy abilities was restricted to stimuli consisting of standard or shared phonemes, since these representations are the only ones utilised in the written form of Arabic. Arabic prediction studies which detected a phonemic awareness among second-graders and above only assessed children's knowledge of the standard Arabic form, rather than their whole phonological experience. The assessment of phonological awareness also took place at a later literacy stage, after considerable exposure to the Arabic literary form, in contrast to the current study, which studied children at an early stage of their literacy development. It is thus more likely to detect an association between phonemic awareness and literacy ability when children have undergone increased exposure to reading and classroom instruction. It is also understood that the basic process of learning to read Arabic is attributable to children's awareness of large phonological units (i.e., syllables and rime); they then gradually progress towards more precise skills of phonemic manipulation as their literacy skills develop.

Together with previous Arabic prediction research, the present study shows the development trajectory of beginning Arab readers, and how this can usefully be examined. This study has considered reading ability in a diglossic context, and its results indicate how reading

development starts with the deployment of large syllabic representations. The sequence of this process is reported in the literature, which shows how the task of acquiring the more demanding and less available phonemic representations is left until later stages of literacy.

This developmental trajectory is consistent with the proposed grain-size reading theory propounded by Ziegler and Goswami (2005; 2006), who assumed that the awareness of smaller grains (i.e. phonemes) would only occur after formal instruction has begun. The progression of awareness, proceeding from large to small units, is argued to be universally present across languages, but with varying degrees of accomplishment (Goswami, 2010), and also varying according to the phonological complexity and the orthographic consistency of the language (Ziegler and Goswami, 2005). That is, the orthographic aspect of the language is expected to demonstrate an impact on the phonological development of its readers. The nature of Arabic orthography, in which the pronounceable units mostly represent syllabic combinations of consonant–vowel structures rather than a single phonemic segment, is understood to be responsible for the apparent predictive relationship between syllabic factor and literacy achievement measures. Saiegh-Haddad (2003; 2005; 2007) has consistently reported empirical findings about Arab children's difficulty in isolating phonemes from their attached vowels, and has described the association between Arabic consonants and their subsequent vowels as 'coherent' (Saiegh-Haddad, 2003).

The phonological awareness skills of the orally educated deaf group showed almost identical patterns to those of their hearing peers, but with a higher accuracy of prediction in relation to literacy measures. However, an exception was observed with the pseudo-word decoding measure, which had no predictive relationship with the phonological awareness skill of deaf children. Such an observation raises the controversial issue of whether deaf children adopt the phonological route (Hanson, 1991; Perfetti and Sandak, 2000; Nielsen and Luetke-

Stahlman, 2002; Luetke-Stahlman and Nielsen, 2003; Colin et al., 2007) or an alternative strategy (Leybaert, 1993; Miller, 1997; Izzo, 2002; Kyle and Harris, 2006; Miller and Abu-Achmed, 2010; Miller, 2010; Kargin et al., 2012) to continue their reading development with sufficient success.

Assuming that the sampled deaf children relied on the phonological route of grapheme–phoneme conversion entails that their decoding of pseudo-words, which have pronounceable letter strings but no lexical representations, is straightforward and feasible. Although it can be argued that pseudo-words may express morphological and semantic structures if constructed to do so (e.g. stimuli constructed by Berko (1958) to test children's ability to inflect morpheme bases with affixes, as pluralising 'wug' to 'two wugs'), their phonological skills still account for the degree to which they have access to, or use of, abstract phonological representations. Siegel (1998) showed that even though the pseudo-word 'dake' may be read by analogy with the real word 'cake', its segmentation into the onset 'd' and the rime 'ake' is necessary for correct reading. Although difficulty in pseudo-word decoding is a characteristic of poor segmentation ability (Tunmer and Nesdale, 1985; Share and Stanovich, 1995) and a symptom of general phonological weakness (Liberman, Shankweiler and Liberman, 1989), it cannot, however, be simply presumed that deafness blocks access to the phonology of the language (Hanson, 1989). But the absence of predictive association between phonological awareness and pseudo-word decoding skill may demonstrate that the deaf children in the study do not specifically follow the phonological route for their literacy acquisition. It can also be said that their achievement level of phonological awareness may be insufficient to support their reading process. Given the observed floor effects on performance, it is also potential that the phonological measures did not capture the deaf children's reading skills sufficiently.

It is even possible that the intensive therapy sessions received by the deaf children on a daily basis in schools provided them with a means of learning Arabic phonology in a readable, intelligible and understandable medium. Their attention seemed to be constantly drawn to the fine and clear points of language, as they became gradually more aware of the units that make up real words rather than pseudo-words. This may especially be the case if it is considered that the recruited deaf children are chronologically older, and have already developed some reading proficiency, or are relying on their word-specific knowledge rather than segmenting phonemes as with the beginning readers in the hearing group. So since pseudo-words have no lexical entry (Rathvon, 2004), their visual representations could not be restored and recognised as real words are (Fiebach, Friederici, Muller and Von Cramon, 2002). Beech and Harris (1997) and Barca et al. (2013) have shown experimental evidence that it is very demanding for deaf learners to process pseudo-words. These studies suggested that deaf learners rely mostly on their lexical knowledge of words when reading, rather than their phonological decoding skills. However, when visual recognition and phonological information were consistent, the phonological decoding of deaf readers improved remarkably (Sterne and Goswami, 2000; Dyer et al., 2003; Kyle and Harris, 2006). Gough and Walsh (1991) asserted that the relationship between phonological decoding and word-specific knowledge is greater than is often estimated.

5.2 The Predictive Role of Morphological Awareness in Reading Development

The predictive contribution of morphological awareness in the Arabic literacy development of hearing and orally educated deaf children was examined. The proposed hypothesis stated that children's morphological awareness, assessed orally by a judgement of word relationships task and a pseudo-word production task, would longitudinally predict variation in literacy measures, independent of learners' age and cognitive ability. It was further

hypothesised that the variance explained by the learners' morphological awareness would be independent of the effect of their phonological awareness.

This hypothesis was based on evidence obtained from Arabic and Hebrew developmental and predictive studies (Frost, 1994; 1995; Ravid and Malenky, 2001; Levin et al., 2001; Ravid, 2002; Deutsch and Frost, 2002; Abu-Rabia et al., 2003; Ravid and Schiff, 2006; Abu-Rabia, 2007; Mahfoudhi et al. 2010), all of which demonstrated the essential role of morphology in the reading acquisition of hearing readers. Although Arabic predictive studies (Abu-Rabia et al., 2003; Abu-Rabia, 2007; Mahfoudhi et al. 2010) have never targeted beginning readers, but only recruited children from the third grade and above, these studies assessed children's morphological awareness through materials presented in the shallow form of Arabic, with full vowelisation. Since third-grade children are expected to read in the deep, unvowelised form of Arabic, the rationale for inspecting the morphological awareness of beginning readers who are basically exposed to the vowelised form is clearly established. For orally educated deaf children, into whom Arabic research also suffers from a shortage of investigations, the expectation of detecting the predictive role of morphological awareness is based on a series of studies reviewed by Williams (2004). These studies demonstrated that deaf children in their emergent reading stage proceed on almost the same developmental trajectory as that established for the hearing children.

The longitudinal data obtained from the current study were generally consistent with these expectations. The results for hearing children at the first grade showed a predictive connection between the judgement of morphological relationships task and the word spelling measure, after controlling for age and cognitive ability. For second- graders with the same controlled variables, the judgement task predicted their performance on all literacy measures

of word reading, word spelling, pseudo-word decoding and reading comprehension. Furthermore, the second-graders' performance on the judgement task uniquely contributed to explaining 4.4% and 5% of the variances in the word spelling and the pseudo-word decoding measures respectively, over and beyond the variances of age, cognitive ability and phonological awareness. The morphological awareness skills of the orally educated deaf group showed almost identical prediction patterns to those of the hearing group. Apart from the measure of pseudo-word decoding ability, the morphological judgement measure revealed significance on all outcome tasks after controlling for the deaf children's age and cognitive variables and phonological awareness. It uniquely accounted for 15.5% of the learners' word spelling ability and 12.1 % of their reading comprehension ability.

Such results are also reasonably consistent with the related studies reported within Semitic language studies. In a sole study involving beginning Hebrew readers (Levin, Ravid and Rapaport, 2001), morphological awareness significantly correlated with children's writing skill at kindergarten, and then predicted 10% of the variance of their vowel-writing skill at first grade. Arabic studies which focused on third-graders and above detected the predictive power of morphological awareness skill on reading comprehension (Abu Rabia, 2007; Mahfoudhi et al., 2010), and uniquely explained 8–9% of its variance (Mahfoudhi et al., 2010). Morphological awareness also uniquely predicted 34% of variance in word reading skill (Abu-Rabia, 2007), and was generally found to be a key discriminator of reading levels (Abu-Rabia et al., 2003).

Looking at the results collectively obtained from the present and the aforementioned studies, though they are limited and vary by methodology, a broad trajectory is evident, in which the contribution of morphological awareness to Arabic literacy is clearly significant. Prior to this

understanding, the significant correlation observed between morphological awareness and the writing skill of Hebrew learners at kindergarten (Levin et al., 2001), relates to the preparatory stage at which the relationship between Semitic readers' morphological awareness and literacy development begins. The results obtained by the current study with first-grade hearing children, which specifically shows a predictive link between morphological awareness and spelling skill, support the assumption of the early presence and development of such a relationship. As with the second-graders, where their morphological awareness explained the unique variance in the same measure of spelling skill, besides predicting their word reading, pseudo-word decoding and reading comprehension skills, the results confirm the assumed developmental role of morphological awareness in Arabic literacy learning. The results reported by other Arabic studies which recruited children from the third grade, and detected a unique variance of morphological awareness skill in relation to word reading (Abu-Rabia, 2007) and reading comprehension (Mahfoudhi et al., 2010) abilities can further be incorporated to reflect the progressive path by which morphological awareness contributes to Arabic literacy acquisition. Furthermore, the current study results with the deaf group, which included children up to the third grade, point to further evidence along the assumed developmental path. Morphological awareness predicted the deaf children's performances with most literacy tasks, and uniquely predicted their spelling and reading comprehension capability.

In fact, detecting the prediction efficiency of morphological awareness with the children studied when they get older, at grade two, may be expected within a population immersed in a diglossic setting. Since the morphological awareness measures were aimed at appraising children's oral language expertise, while the outcome measures assessed their competence in the standard variety of the language, it is likely to initially detect a limited relationship between both language forms, according to the degree of resemblance between them. It is

therefore accepted that the prediction power of morphological awareness measures increases to include more literacy skills as children progress in their literacy learning. It is unlikely, however, to detect a learning effect other than what children may acquire or develop gradually and indirectly. This is because morphological awareness is not explicitly taught in Kuwait before the intermediate learning stage.

Referring once more to the analysis outcomes of both groups, of hearing and deaf children, it is noticeable that the prediction pattern between morphological awareness and literacy outcome skill appeared to be restricted to the morphological judgement task, but not to the morphological production task. In fact, the judgement and production tasks were essentially designed to tap into two different constructs respectively: implicit, indirectly expressed awareness, and explicit, precisely articulated awareness. More specifically, the judgement task required the child to only implicitly recognise the structure of a word, and to determine its relations to a group of other words with no further manipulation. The production task came through this recognition and additionally examined the learners' ability to produce words, by explicitly applying morphological principles to generate the new requested word form (Carlisle, 2003; Kirby et al., 2012). Since the inter-correlation between the two morphological tasks revealed weak, and the process of reducing their dimensions into one morphemic factor by running the principal component analyses was not possible, the aim of measuring different constructs is seemingly achieved.

The performance of the hearing children on the morphological production task was not inhibited by ceiling or floor effects. This reveals that they almost reached a mature and acceptable level of morphological awareness that allows them to recognise the meanings of unfamiliar words, or to construct new appropriate words that fulfil certain communicative purposes. Their performance is also consistent with the early root awareness reported within

the reading research of Semitic learners of pre-school age (Clark and Berman, 1984; Berman, 2000; Ravid, 2002). However, such recognition and production seem not to meet the intellectually demanding requirements of reading and spelling in Arabic. Learning to read in Arabic, which has complex orthographic characteristics, was found to be cognitively more challenging compared to other languages including Hebrew (Ibrahim, Eviatar and Aharon-Peretz, 2007; Ibrahim and Eviatar, 2012; Ibrahim, Khateb and Taha, 2013). The explicitness of the production task, and learners' ability to manipulate the morphological components in it, may be linked to their literacy skills in later grades, when learners can better recognise Arabic orthographic rules and patterns. According to Carlisle (2004), orthographic regularities, which are explicitly understood by the children as they become more engaged in literacy and language learning, help them to process the morphologically opaque words.

It was also noticeable throughout the analysis outcomes that the prediction pattern of morphological awareness emerged early on with learners' spelling ability rather than other reading skills. Morphological awareness was a significant predictor of the word spelling skill of first-graders, and also uniquely accounted for the same skill among the second-graders and the deaf group. Separating reading ability away from an early relationship with morphological awareness might be related to the practice of exposing children at their early reading stage to the vowelised form of written Arabic. This means that in reading practice, beginners will rely on the phonological route of grapheme–phoneme conversion, as long as the vowels are provided. In spelling practice, however, there is an opportunity to rely either on the phonetic spelling conventions, or alternatively on the morphological rules, in order to spell correctly. According to the results obtained in the present study, both spelling routes seem to have been followed by the examined groups. Phonological awareness accounted for 6.4% and 13.6% of the variance in the spelling skill of the second-grade hearing children and

the group of the deaf children, while morphological awareness accounted for 4.4% and 15.5% of spelling variance among the same groups respectively. Considering the uniqueness of phonological awareness skill in predicting the literacy outcomes of the first-graders, it is clearly not sufficient to account for all the variances involved in the spelling and reading abilities of children in higher grades. Morphological awareness takes on more importance as children's literacy skills become more advanced. Such an early and remarkable function of morphological awareness in relation to spelling skills was similarly reported in English studies (Treiman, 1993; Treiman, Cassar and Zukowski, 1994; Treiman and Cassar, 1996), and was likewise found to increase along with grade level (Carlisle, 1995; Singson et al., 2000).

The finding of the present study, which showed that children employ their phonological and morphological awareness throughout the process of learning to spell, can provide supportive evidence for the 'repertoire theory' of spelling development (Apel et al., 2004; Kelman and Apel, 2004). This theory suggests that children varyingly utilise multiple linguistic factors (phonology, morphology, orthography) in order to develop their spelling abilities over time. In their pre-schooling emergent literacy stage they use orthographic cues to spell, but also rely to some extent on their phonological and morphological awareness. Then at first grade, they rely more heavily on their phonological and orthographic knowledge to spell, in addition to using their morphological knowledge, the importance of which grows as the learner moves to a stage of intermediate spelling development in their third grade. This theory almost contradicts the 'stage theory', which posits that morphological awareness does not play a role in children's spelling skill until the relatively late grades, when the phoneme–grapheme conversion is completely acquired (Deacon, Kirby and Casselman-Bell, 2009).

Morphological awareness was also shown to be a unique predictor for the pseudo-word decoding ability of second-grade hearing children. Although at first glance such a finding seems unusual, because pseudo-words are conventionally used in identifying the ability to analyse the sequence of sounds and syllables, evidence has shown that performance on morphological awareness tasks tends to affect decoding skills (Carlisle, 2000; Singson et al., 2000; Deacon and Kirby, 2004; Nagy et al., 2006; Burgoyne et al., forthcoming). Moreover, a number of findings have revealed the effect of morphological awareness on pseudo-word reading but not on real-word reading (Casalis and Louis-Alexandre, 2000; Deacon and Kirby, 2004). Consistently with the currently obtained results, Singson et al. (2000) and Mahony et al. (2000) found that morphological awareness, which was also assessed by means of a judgement task, contributes to 4–5% of pseudo-word reading skill over and above phonological awareness and vocabulary knowledge. Studies by Deacon and Kirby (2004), as well as by Nagy and colleagues (2006) also detected a prediction relationship between morphological awareness and pseudo-word reading, after controlling for intelligence and phonological awareness variables. Deacon and Kirby (2004) stated that it is likely that morphological awareness plays a role in pseudo-word reading ability because pseudo-words can potentially represent morphemes in their orthographic units. That is, reading a pseudo-word can be facilitated if it is appended to a real prefix or suffix (Nunes and Bryant, 2009; Burgoyne, Nunes, Bryant and Buckley, forthcoming).

In the English language, morphological processing generally does not disturb the orthographic pattern of the word's base form. For the Arabic language, decomposing a word into its component morphemes is more challenging for learners. This is because most base words consist of two abstract entities, root and word-pattern morphemes, intertwined in an overlapping non-sequential manner. However, there are usually three root letters, and pattern

letters have specific distributional properties, providing a clear and distinct solution for analysing a written word into its root and word-pattern morphemes (Velan et al., 2005).

Along with the above mechanism in word parsing, most inflectional morphemes (for gender, number, etc.), and clitic units (conjunction, preposition, etc.) with morpho-syntactic characteristics, are linearly attached to their base words. This means that reading an Arabic word may be facilitated by decomposing morphemic units, and also pre- or post-positional clitics, if present. This decomposing technique might also help learners to process pseudo-words, which are constructed by changing one or two letters of real words.

There is also a view that a bi-consonantal unit, called the etymon, conveys semantic information of an Arabic word (Boudelaa and Marslen-Wilson, 2001), though the dominant view is that meanings are expressed by tri-consonantal roots. Readers may possibly rely on these fine-grained units in order to analyse written pseudo-words. This possibility underpins the argument that 'pseudo-words can be read by analogy to real words, especially by older children who have developed some reading proficiency' (Rathvon, 2004: 138). Rathvon's account is validated by one result apparent in the current study: the unique predictive relationship between morphological awareness and pseudo-word decoding skills was revealed when children moved to the second grade and found that the orthographic scheme of Arabic made the language more accessible.

As with the relationship between morphological awareness and literacy abilities of deaf children, it revealed consistency and higher prediction efficiency, when compared to the performance revealed by the hearing group. This chiefly indicates that the deaf children rely on their morphological awareness, in order to compensate for their limited phonological capacity. However, an exception to the predictive pattern appeared with pseudo-word

decoding ability, which showed no connection to morphological awareness, as with other literacy skills. This account suggests once more a lack of morphological development for the deaf children, as was the case with their phonological development. The mean values obtained for the deaf children's morphological skills (judgement and production) were lower than those attained by their younger hearing peers at the first grade. In fact, a recent research study conducted in the context of Arabic learning acquisition (Friedmann and Haddad-Hanna, 2013) also reported a low level of morpho-syntactic ability within an examined group of orally educated deaf learners. The researchers related this to the lack of first-language input, as the spoken dialect in Arab diglossic communities makes it difficult for deaf learners to acquire their second language, i.e. standard Arabic.

5.3 The Predictive Role of Dialect Awareness in Literacy Development

The predictive role of dialect awareness in Arabic literacy learning among hearing and orally educated deaf children has been examined in the current study. The hypothesis posited that dialect awareness skills, as measured orally by dialect discrimination, sentence correction and word choice tasks, would longitudinally predict children's variation in literacy ability, independent of their age and cognitive ability. Since learning to read is driven by a multitude of interdependent processes (Holden et al., 2009; Kello and Van Orden, 2009), this study further predicted that children's dialect awareness may reflect variability in terms of literacy skills, depending on learners' particular levels of phonological and morphological awareness.

This hypothesis relied primarily on findings from linguistic contexts similar to that of the Arabic language, which showed that awareness of language varieties was a contributory factor for effective literacy learning (Fogel and Ehri, 2000; Terry, 2006; 2012; Pittas, 2011).

The hypothesis was also supported by Arabic diglossic research, which has established a link between areas of linguistic variation and poor literacy performance (Saiegh-Haddad, 2003; 2004; 2005; 2007; Abu-Rabia and Taha, 2006), or a link between exposure to literary Arabic prior to formal education and success in literacy attainment (Feitelson et al., 1993; Abu-Rabia, 2000; Khamis-Dakwar et al., 2011). The Arabic spoken dialects investigated were found to specifically influence the awareness of standard phonological (Saiegh-Haddad, 2003; 2004; 2007; Saiegh-Haddad et al., 2010) and morpho-syntatic representations (Kamis-Dakwar et al., 2011), and to greatly hinder the general attainment of Arabic literacy skills (Ayari, 1996; Maamourie, 2009). Although no Arabic study has examined the contribution of dialect awareness to reading and spelling ability in terms of phonological and morphological awareness, a study in a similar bi-dialectical context has shown dialect awareness to be significant in assisting children's reading and spelling skills, which are enhanced by phonological and morphological skills (Pittas, 2011). The role of dialect awareness in predicting the literacy ability of deaf children has also not been researched. But given a parallel start between hearing and deaf children in their early literacy development (Williams, 2004), it is expected that orally educated deaf children will follow the same course of development as their hearing peers.

The results of the present study have largely met the hypothetical expectations, and also presented an interesting pattern concerning the prediction effect of dialect awareness on literacy outcomes. The analyses uncovered no statistically significant influence of dialect awareness on the literacy achievement of first-grade hearing children, while the prediction effect was shown to be present with the second-graders as well as with the deaf learners, after controlling for their age and cognitive ability. More specifically, the dialectic factor contributed significantly to about 5% of the variance in both word reading and reading

comprehension skills for second-grade hearing children, while for the deaf children the dialectic factor contributed to 12% and 23% of the variances in word reading and word spelling respectively.

Displaying no connection between the dialect awareness and literacy skills of first- graders could possibly be related to their insufficient ability, and/or their lack of experience of the standard literary form of Arabic. In particular, first graders' dialect awareness, or their ability to manipulate the language forms to effectively map on to their reading and spelling skills is limited. By contrast, older children from the second grade, and the deaf children, who had been formally exposed to the standard written form of Arabic for a year or so, gained enhanced awareness of language forms, and started to appreciate how their spoken language is presented in the orthographic system they were learning. It seems that children only gradually develop an awareness of language varieties as they progress in their learning. This is especially marked in the studied context, where there are no clear instructional approaches, or even pedagogical interest among educators in raising children's awareness of this range of linguistic ability.

Two theories in the field of language variation and literacy achievement may account for the current findings. The linguistic awareness hypothesis (Charity, Scarborough and Griffin, 2004; Terry, Connor, Thomas-Tate and Love, 2010) proposes that children's ability to use the formal and informal varieties of the language reflects their dialect awareness. Dialect awareness in turn is expected to be connected to literacy skills through other aspects of emergent metalinguistic awareness. More specifically, when children become familiar with their language and easily perform dialect-shifting or code-switching in different situations, they will normally demonstrate skills of phonological and morphological awareness. Since

phonological and morphological awareness are auxiliary tools for mapping speech on to written strings, a low level of dialect awareness, or inflexibility in using appropriate clues where relevant in situations, will present an obstacle to children's literacy learning. For example, if the child says *māy* 'water' knowing that the word *mā'* 'water' ends with a reformed *y*, then the presence of a written form will reflect his/her stored knowledge. Thus, mismatch representations between speech and print that affects reading attainment may rarely or never occur.

In contrast to the linguistic awareness hypothesis, the linguistic interference hypothesis (Terry, 2012) proposes that the association of dialect variation with literacy skills is independent, although phonological and morphological awareness may contribute to literacy achievement. This theory considers that the main challenge for a dialect speaker is to learn how to map speech on to orthographic strings that do not match well. For example, if the child says *māy* 'water' for *mā'* 'water', and s/he is unaware of the presence of original *'* , then the mismatching representations would arise between speech and print frequently, and have a negative impact on reading attainment.

Although the linguistic awareness and the linguistic interference hypotheses diverge in considering how phonological/morphological awareness, dialect variation and literacy learning are associated in the early stages of learning to read, Terry (2012) has asserted that both independent and mediated effects of the dialect variable on literacy skills can occur simultaneously. In the context of the current study, both hypotheses are supported. Consistently with the indirect effect proposed by the linguistic awareness hypothesis, dialect awareness mediated the hearing children's performance on phonological and morphological awareness skills in relation to literacy outcome measures. A significant reduction was evident in the effect of phonological awareness on word reading skill, when controlling for

the dialect/mediator. A significant reduction in the effect of morphological awareness on word reading and reading comprehension was also noted. The mediational analyses conducted with the deaf children, moreover, showed that dialect awareness had a partial mediator role, affecting word spelling skills through morphological awareness skills.

Consistently with the direct effect proposed by the linguistic interference hypothesis, the data obtained from deaf children highlights a unique and independent contribution of dialect awareness towards 12% of variance in the skill of decoding pseudo-words. This predictive association is comparable to the relationship that is evident between dialectic words and pseudo-words: neither require the mapping of visual representations to readily available lexical representations. Abutalebi, Abutalebi, Keim, Brambati, Tettamanti, Cappa, De Bleser, and Perani (2007) show that because the spoken dialects do not have a written form, the printed dialect words can only be read through a grapheme–phoneme conversion process when readers are first exposed to them. Incidentally, when readers are confronted with printed pseudo-words, the same grapheme–phoneme conversion pathway is responsible for the reading process. On this account, the sampled deaf children may not be aware of the presence of the dialectic variety in the way Abdel-Fattah (2005) assumed, or at least, the spoken dialect may be indistinct for them since their learning instruction and training sessions only focused on the standard variety of Arabic. In accordance with Terry's (2012) hypothesis of linguistic interference, deaf children need to learn how to map between speech and orthographic representations in order to overcome the mismatch challenge presented by the dialectic variety.

Certainly, it should be acknowledged that some of the study findings might be prone to committing a statistical error, which results from the relatively small number of deaf children involved in the study (Cohen, 1988). Therefore, more research is needed to supplement these

findings, to determine whether they can be replicated, and whether a causal link between phonological, morphological and dialect awareness and Arabic reading achievement can be established in the context studied.

5.4 Concluding Remarks

Put briefly, the outcomes of the current study reveal that for two groups, the hearing and the orally educated deaf children, there was a significant predictive relationship between phonological, morphological and dialect awareness skills and literacy outcome measures, beyond the effects of age and cognitive ability. The prediction association was mostly consistent and similar across both groups, indicating that the orally educated deaf children are almost on a par with their hearing counterparts in relation to many of their educational needs. However, the exception observed with the prediction pattern of the deaf children highlights an important developmental difference with regard to the deaf children. Since the pseudo-word decoding skill of the deaf children was predicted neither by their levels of phonological awareness, nor by their levels of morphological awareness, but rather by their levels of dialect awareness, this may reveal that the deaf children are at a disadvantage with regard to such literacy-related competences. According to Hoover and Gough (1990), familiarity with the language, and understanding speech-to-print mapping, are essential factors in the process of learning to read. This means that although phonological and morphological awareness are necessary skills for deaf learners, as the prediction pattern indicated along most outcome measures, those are not sufficient skills for their reading needs and development. Deaf readers apparently need to develop their dialect awareness skills, in order to proficiently map the spoken language of Arabic on to its writing system. Other factors, such as word-specific knowledge, are also critical in delivering the optimal literacy level for deaf children.

Generally speaking, the evidence obtained on Arabic reading acquisition and development in the current study highlights the importance of phonological, morphological and dialect awareness as key components involved in cognitive–linguistic processing of reading and spelling among hearing and orally educated deaf children. These findings are common to studies of the universal reading process, which suggests that the developmental trend of phonological awareness progresses from large to small units, and in morphological awareness from implicit to explicit levels, so that dialect awareness improves with progress in literacy learning and contributes to levels of phonological and morphological competence.

Besides the emergence of language-general patterns, language-specific properties for learning Arabic were also defined in this study. The pattern of phonological awareness prediction, which depends on syllabic composition, reflects the phonological properties of pronounceable Arabic units. Likewise, the pattern of morphological awareness prediction, which relies on implicit sensitivity, also mirrors the non-linear composition of the root-pattern structure of Arabic words. The diglossic setting of Arabic, in which the spoken dialect is considerably divergent from the standard written form, influences children's learning abilities by reducing their phonological and morphological skills, which are basic elements for progress and success in reading.

5.5 Significance

This study has made theoretical, methodological and empirical contributions to the literature. While the importance of phonological and morphological awareness for reading has been investigated among Arab children in certain contexts, no study has investigated Kuwaiti children's abilities prior to the start of formal instructions, and no Arabic research has been conducted to investigate such abilities among deaf children in their emergent literacy stage. The study has addressed the dearth of research in this area, and examined the contribution of

phonological and morphological awareness to the literacy skills of hearing and orally educated deaf children who are immersed in the diglossic setting of acquiring the Kuwaiti dialect at home but receiving school instruction in the standard form of Arabic. As this language-learning setting diverges substantially from that of monolingual learners, the present study is the first Arabic prediction study which has employed dialectic items in its assessment tools, in addition to standard and shared items. The study has practically examined children's phonological and morphological skills, which are derived from their everyday speech, and also considered their possible exposure to the literary form, by including standard items in assessment measures. Accounting for the linguistic divergence between Arabic orality and literary can contribute to capturing an in-depth insight into children's emergent literacy skill, and, therefore, their specific educational needs. The present study has also aimed to avoid some of the methodological limitations found in other Arabic predictive studies, with regard to constructing the assessment items and formulating the test instructions.

Methods that have been adapted and designed to assess phonological, morphological and dialect awareness, and evaluated for the assessment of hearing children and also orally educated deaf children, have psychometric and theoretical validity. Since these have proved reliable and strong as independent predictors of literacy, the research has clear implications for the education of hearing and deaf children. Evaluation by combining a longitudinal study and a study comparing groups (of younger and older children; of hearing and deaf children) has provided a well-conceived and well-designed technique.

5.6 Limitations

The outcomes of the present study provide vital information regarding early predictors of literacy skills, and engender an understanding of developmental patterns of continuity and change over three time phases. The outcomes are, however, mainly relational conclusions between predictors and outcomes, which do not imply causality. Besides this major limitation, other limitations should also be considered.

One limitation concerns the generalisability issue. Since the current study was designed to address oral language predictors for Kuwaiti children, researchers in other Arabic-speaking regions should seek to develop predictor measures that are representative of their regions' oral diversity. However, the measurement tools used in this study can be adapted and employed throughout the Gulf states where the Gulf dialects are close to each other and widely understood. Different studies conducted within diverse spoken contexts of Arabic would explore how literacy acquisition may differ according to the variation of spoken dialects.

Another limitation concerns the period in which the hearing children were examined for their oral language skills. Although they were examined at first grade before the start of reading instruction, it would be preferable if they were recruited from the kindergarten stage, where there is no formal obligatory exposure to literary Arabic. That, however, is perceived as a research barrier due to the requirement of following the recruited children through three academic years instead of two. This needs more time, longer processes to obtain investigation permissions, and more follow-up efforts. These processes may lead to engaging a smaller number of participants through the subsequent research phase, since kindergarteners are distributed randomly to primary schools and a considerable number of them move to private schools.

A further limitation concerns the small sample size of deaf children, and the variability observed in their chronological ages. Although this issue was inevitable due to the small number of deaf children who met the research criteria, findings related to deaf literacy acquisition cannot be generalised to other Arabian contexts. However, the study is representative of Kuwaiti society, which proportionately includes a small number of deaf individuals. The deaf participants' data was also not inspected for their individual differences in using cochlear implants and/or hearing aids. Although this form of data may have some significance with regard to interpreting the results obtained, one recent research finding showed no significant differences between cochlear implanted and hearing-aided children, in terms of hearing threshold levels and language level (Hammer, 2010).

The final limitation concerns the measurement of verbal intelligence. The Peabody picture vocabulary test may be biased against different Arab nations in relation to their cultural, linguistic and experiential background. Since the verbal intelligence quotient is used to gauge spoken language capabilities, neither the Peabody test, nor any other available standardised measure, is sufficiently powered to assess the early verbal cognitive functioning of Arab children. Apart from a sub-group of shared lexicons found in these measures, all the utilised items represent the literary form of Arabic but not the spoken dialect form.

5.7 Recommendations

Since the present study has gathered a range of evidence that points toward the validity of the proposed hypotheses, and the analyses have explored the efficiency of the illustrated paradigm for combining phonological, morphological and dialect awareness as valid predictors of Arabic literacy learning, this research points in several new directions for investigation.

An intervention study should be conducted to support these findings and to warrant the causal claim about the study's conclusions. The findings of this study can then be translated into intervention objectives such as enhancing Arabic learners' mastery of dialect awareness by improving preparation for beginning readers. Balanced pedagogical planning in which phonological awareness, and more specifically syllabic awareness, holds the robust first place, and morphological awareness the second, is crucial for the beginning stages of learning to read.

Future studies investigating the phonological abilities of beginning Arabic readers are recommended to assess large phonological units that are not polarised around small phonemic units. This is based on the current reviewed results and on the evidence obtained from developmental studies, which shows that Arabic readers are not sensitive to the phonemic structures of words, and often experience segmentation difficulties. The need for such studies is also reinforced by the orthographic nature of the Arabic language, where pronunciation mostly requires each sound to be accompanied by a particular vowel. Studies assessing the morphological awareness of Arabic readers must recognise that the vowelised version of Arabic rarely allows the reader to rely on the morphological properties of the word. Arabic readers can use their morphological awareness if the word is presented without vowels in a meaningful context, or if presented in isolation but with no homographic alternatives. Otherwise, assessing morphological awareness through the vowelised version of Arabic should include significant statistical control to account for the effect of phonological variance.

Since the present study was limited to quantitative analyses of scholastic and curriculum-based performances, any attempt to investigate and analyse children's ability to convert

speech into print within free-writing contexts, or children's spelling errors when speech interference occurs, is imperative for the purpose of intervention planning. For deaf children who greatly vary in their oral experience and literacy ability, conducting in-depth case studies as an alternative to group projects is necessary for gaining further insight into their individual needs, and the requirements for appropriate educational support.

Further research and replication studies are essential for various age groups and populations with language-based learning difficulties. This would assist in better assessment of the long-term social and educational implications of the diglossic situation of Arabic. Improving diagnostic practice would support the development of a more responsive curriculum and more effective instructional activities for different groups of learners.

The current study has examined the linguistic abilities of hearing and deaf children through assessing their performance of some aspects of metalinguistic skills, i.e. phonological, morphological and dialect awareness. Future studies that include other language-sensitive areas (e.g. morpho-syntactic and semantic skills) and other groups of beginning readers (e.g. deaf signers, the learning-disabled) would assist further in clarifying the association between Arabic spoken dialects and literacy skills.

References

Abdel-Fattah, M. (2005). Arabic sign language: A perspective. *Journal of Deaf Studies and Deaf Education*, 10, 212–221.

Abu-Allam, R. M. & Hady, F. A. (1998). *Picture Vocabulary Test*. (1st ed.). Kuwait: Center for Child Evaluation and Teaching.

Abu-Rabia, S. (1996). The role of vowels and context in reading of highly skilled native Arabic readers, *Journal of Psycholinguistic Research*, 25, 629–641.

Abu-Rabia, S. (1997). Reading in Arabic orthography: The effect of vowels and context on reading accuracy of poor and skilled native Arabic readers in reading paragraphs, sentences and isolated words. *Journal of Psycholinguistic Research*, 26, 465–482.

Abu-Rabia, S. (1998). Reading Arabic texts: Effects of text type, reader type, and vowelisation. *Reading and Writing: An Interdisciplinary Journal*, 10, 106–119.

Abu-Rabia, S. (2000). Effects of exposure to literary Arabic on reading comprehension in a diglossic situation. *Reading and Writing*, 13 (1-2), 147–157.

Abu-Rabia, S. (2001). The role of vowels in reading Semitic scripts: Data from Arabic and Hebrew. *Reading and Writing: An Interdisciplinary Journal*, 14, 39–59.

Abu-Rabia, S. (2002). Reading in a root-based morphology language: The case of Arabic. *Journal of Research in Reading*, 25, 320–330.

Abu-Rabia, S. (2007). The role of morphology and short vowelisation in Reading Arabic of normal and dyslexic readers in Grades 3, 6, 9, and 12. *Journal of Psycholinguistic Research*, 36(2), 89–106.

Abu-Rabia, S. & Taha, H. (2004). Reading and spelling error analysis of native Arabic dyslexic readers. Reading and Writing: *An Interdisciplinary Journal*, 17, 651–689.

Abu-Rabia, S. & Taha, H. (2006). Phonological errors predominate in Arabic spelling across grades 1–9, *Journal of Psycholinguistic Research*, *35*(2), 167–188.

Abu-Rabia, S., Share, D. & Mansour, M. A. (2003). Word recognition and basic cognitive processes among reading-disabled and normal readers in Arabic. *Reading and Writing*, 16, 423–442.

Abutalebi, J., Keim, R., Brambati, S., Tettamanti, M., Cappa, S., De Bleser, R. & Perani, D. (2007). Late acquisition of literacy in a native language. *Human Brain Mapping*, 28, 19–33.

Adams, M. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.

Al-Akeel, A. (1998). The acquisition of Arabic language comprehension by Saudi children. *PhD Thesis*, University of Newcastle upon Tyne, UK.

Al-Mannai, H. (2006). Cognitive predictors of early Arabic literacy: informing the

development of dyslexia assessment in Bahrain. *PhD Thesis*: University of Surrey.

Al-Mannai, H. & Everatt, J. (2005). Phonological processing skills as predictors of literacy amongst Arabic speaking Bahraini children. *Dyslexia*, 11(4): 269–291.

Al-Qenaie, Sh. (2011). Kuwaiti Arabic: A Socio-Phonological Perspective. *PhD Thesis*, University of Durham.

Al-Qurashi, A. (1987). Raven's coloured progressive matrices test: user guide. Kuwait: Dar Alqalam.

Al-Wer, E. (1991). Phonological Variation in the Speech of Women from Three Urban Areas in Jordan. *PhD Thesis*. University of Essex.

Al-Wer, E. (1997). Arabic between reality and ideology, *International Journal for Applied Linguistics*, 7(2): 252–265.

Alexander, P. (2005). The path to competence: A lifespan developmental perspective on reading. *Journal of Literacy Research*, 37(4), 413–436.

Alhawary, M. (2011). *Modern Standard Arabic Grammar: A Learner's Guide*. Malden, MA: Wiley-Blackwell.

Aljenaie K. (2010). Verbal inflection in the acquisition of Kuwaiti Arabic. *Journal of Child Language*, 37(4), 841–63.

Aljenaie, K. & Farghal, M. (2009). Comprehension of three word orders in Kuwaiti Arabic child language. *Language Sciences,* 31, 494–506.

Allen, T. E., Clark, M. D., Del Giudice, A., Koo, D., Lieberman, A., Mayberry, R. & Miller, P. (2009). Phonology and reading: A response to Wang, Trezek, Luckner, and Paul. *American Annals of the Deaf,* 145, 338–345. doi:10.1353/aad.0.0109.

Alotaiby, F., Foda, S. & Alkharashi, I. (2010). Clitics in Arabic language: a statistical study. *In Proceedings of Pacific Asia Conference on Language, Information and Computation 24* (pp. 595–602), Sendai: Japan.

Altoma, S. (1969). *The problem of diglossia in Arabic: A comparative study of classical and Iraqi Arabic* , Cambridge Mass.: Harvard University Press.

Andrews, L. (1998). *Language exploration and awareness: A resource book for teachers* (2nd ed.). Mahwah, NJ: Arlbaum.

Apel, K. & Thomas-Tate, S. (2009). Morphological awareness skills of fourth-grade African American students. *Language, Speech, and Hearing Services in Schools*, 40, 312–324.

Apel, K., Masterson, J. J., & Niessen, N. L. (2004). Spelling assessment frameworks. In Stone, C., Silliman, E., Ehren, B. & Apel, K. (Eds.), *Handbook of language and literacy: Development and disorders* (pp. 644–660). New York: Guilford Press.

Aram, D., Korat, O. & Hassunah-Arafat, S. (2013). The contribution of early home literacy activities to first grade reading and writing achievements in Arabic. *Reading and Writing*, 26(9), 1517–1536.

Arbuckle, J.L. (1997). *Amos users' guide, version 3.6*. Chicago: SmallWaters.

Assink, E., Vooijs, C. & Knuijt, P. (2000). Prefixes as access units in visual word recognition: A comparison of Italian and Dutch data. *Reading and Writing*, 12, 149–168.

Ayari, S. (1996). Diglossia and illiteracy in the Arab world. *Language, Culture and Curriculum, 9,* 243–252.

Ayyad H. & Bernhardt B. M. (2009). Phonological development of Kuwaiti Arabic: preliminary data. *Clinical Linguistics and Phonetics*, 23(11), 794–807.

Azzam, R. (1989). Orthography and reading of the Arabic language. In Aaron, P. G. & Joshi, R. M. (Eds.), *Reading and writing disorders in different orthographic systems* (pp. 203–218). Dordrecht, The Netherlands: Kluwer Academic.

Azzam, R. (1993). The nature of Arabic reading and spelling errors of young children: A descriptive study. *Reading and Writing: An Interdisciplinary Journal*, 5, 355–385.

Bachra, B. (2001). *The phonological structure of the verbal roots in Arabic and. Hebrew*. Leiden: E.J. Brill.

Badian, N. A. (1998). A validation of the role of pre-school phonological and orthographic skills in the prediction of reading. *Journal of Learning Disabilities*, 31, 472–482.

Bandalos, D. L. (2002). The effects of item parceling on goodness-of-fit and parameter estimate bias in structural equation modeling. *Structural Equation Modeling*, 9, 78–102.

Baratz, J. (1969). A bi-dialectal task for determining language proficiency in economically disadvantaged Negro children. *Child Development,* 40, (3), 889–901.

Barca, L., Pezzulo, G., Castrataro, M., Rinaldi, P., Caselli, M. (2013). Visual Word Recognition in Deaf Readers: Lexicality Is Modulated by Communication Mode. *PLoS ONE*, 8(3): e59080. doi:10.1371/journal.pone.0059080

Baron, R. M. & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173–1182.

Barrett, P. T. & Kline. P. (1981). The observation to variable ratio in factor analysis. *Personality Study in Group Behavior, 1*, 23–33.

Bat-El, O. (2011). Semitic Templates. In Van Oostendorp, M., Ewen, C., Hume, E., & Rice, K. (eds.), *The Blackwell Companion to Phonology*, Vol. 5, 2586–608. Malden, Mass & Oxford, Blackwell.

Beech J. R. & Harris, M. (1997). The prelingually deaf young reader: A case of reliance on direct lexical access? *Journal of Research in Reading*, 20, 105–121.

Beeston, A. F. L. (1970). *The Arabic Language Today*. London: Hutchinson University Library.

Beland, R., & Mimouni, Z. (2001). Arabic-French bilingual aphasic patients. *Cognition*, 82, 77–126.

Ben-Dror, I., Bentin, S. & Frost, R. (1995b). Semantic, phonologic, and morphologic skill in reading disabled and normal children: Evidence from perception and production of spoken Hebrew. *Reading Research Quarterly*, 30, 876–893.

Ben-Dror, I., Frost, R. & Bentin, S. (1995a). Orthographic representation and phonemic segmentation in skilled readers. *Psychological Science, 6,* 176–181.

Berko, J. (1958). The child's acquisition of English morphology. *Word*, 14, 150–177.

Berman, R. (1997). Pre-school knowledge of language: What five year olds know about language structure and language use. In Pontecorvo, C. (Ed.), *Writing development: an interdisciplinary view* (pp. 61–76). Amsterdam: Benjamins.

Berman, R. (2000). Children's innovative verbs vs nouns: Structured elicitations and spontaneous coinages, in Menn, L. & Bernstein-Ratner, N. (eds.), *Methods in studying language production* (pp. 69–93). Mahwah, NJ: Lawrence Erlbaum Associates.

Biadsy, F., Hirschberg, J. & Habash, N. (2009). Spoken Arabic Dialect Identification Using Phonotactic Modeling. In *Proceedings of EACL 2009 Workshop on Computational Approaches to Semitic Languages*, Athens, Greece.

Blau, J. (1981). *The renaissance of modern Hebrew and modern standard Arabic: Parallels and differences in the revival of two Semitic languages*. Berkeley, CA: University of California Press.

Bollard, P., Chute, P., Popp, A. & Parisier, S. (1999). Specific language growth in young children using the CLARION cochlear implant. *Annals of Otology, Rhinology, and Laryngology Supplement*, 177, 119–123.

Boudelaa, S. & Marslen-Wilson, W.D. (2001). Morphological units in the Arabic mental lexicon. *Cognition*, 81 (1), 65–92.

Boudelaa, S., Pulvermüller, F., Hauk, O., Shtyrov, Y. & Marslen-Wilson, W. (2009). Arabic Morphology in the Neural Language System, *Journal of Cognitive Neuroscience*, 22(5), 998–1010.

Bradley, L. & Bryant, P. (1983). Categorizing sounds and learning to read: a causal connection. *Nature*, 301, 419–421.

Branum-Martin L., Fletcher, J. & Stuebing, K. (2012). Classification and Identification of Reading and Math Disabilities: The Special Case of Comorbidity. *Journal of Learning Disabilities*. Doi:10.1177/0022219412468767.

Breadmore, H. L. (2007). Inflectional morphology in the literacy of deaf children. *Ph.D. Thesis*, University of Birmingham.

Brittain, M. (1970). Inflectional performance and early reading achievement. *Reading Research Quarterly*, 6(1), 34–48.

Brown, K. & Ogilvie, S. (2009). Introduction. In K. Brown and S. Ogilvie (Eds.), *Concise Encyclopaedia of Languages of the World*, Oxford, UK: Elsevier Ltd.

Burgess, S. R. & Lonigan, C. J. (1998). Bidirectional relations of phonological sensitivity and prereading abilities: evidence from a pre-school sample. *Journal of Experimental Child Psychology*, 70, 117–141.

Burgoyne, K. Nunes, T., Bryant, P., & Buckley, S. (forthcoming). Morphological Awareness and its Relationship to Word Reading in Children with Down Syndrome.

Byrne, B. (1996). The learnability of the alphabetic principle: Children's initial hypotheses about how print represents spoken language. *Applied Psycholinguistics*, 17(4), 401–426.

Byrne, B. & Fielding-Barnsley, R. (1990). Acquiring the alphabetic principle: A case for teaching recognition of phoneme identity. *Journal of Educational Psychology*, 82(4), 805–812.

Cain, K. & Oakhill, J. (2004). Reading comprehension difficulties. In Nunes, T. & Bryant, P. (Eds.), *Handbook of children's literacy* (pp. 313–338). Dordrecht, the Netherlands: Kluwer Academic.

Cain, K. & Oakhill, J. (2007). Reading comprehension difficulties: Correlates, causes and consequences. In Cain, K. & Oakhill, J. (Eds.), *Children's Comprehension Investigating orthographic and Problems in Oral and Written Language: A Cognitive Perspective*, (pp. 41–75), Guildford Press.

Campbell, R., Burden, V. & Wright, H. (1992). Spelling and speaking in prelingual deafness: Isolated alphabetic spelling skills. In Sterling, C. & Robson, C. (Eds.), *Psychology, spelling, and education* (pp. 185–199). Clevedon: Multilingual Matters Ltd.

Campbell, R. & Wright, H. (1988). Deafness, spelling and rhyme: How spelling supports written word and picture rhyming skills in deaf subjects. *Quarterly Journal of Experimental Psychology*, 40A, 771–788.

Campbell, R. & Wright, H. (1990). Deafness and immediate memory for pictures: Dissociations between 'Inner Speech' and the 'Inner Ear' ? *Journal of Experimental and Child Psychology*, 50, 259–286.

Campbell, T., Dollaghan, C., Needleman, H. & Janosky, J. (1997). Reducing bias in language assessment: Processing-dependent measures. *Journal of Speech and Hearing Research*, 40, 519–525.

Carlisle, J. & Nomanbhoy, D. (1993). Phonological and morphological awareness in first graders. *Applied Psycholinguistics*, 14, 177–195.

Carlisle, J. F. (1988). Knowledge of derivational morphology and spelling ability in fourth, sixth and eighth grades. *Applied Psycholinguistics*, 9(3), 247–266.

Carlisle, J. F. (1995). Morphological Awareness and Early Reading Achievement. In Feldman, L. (Ed.) *Morphological Aspects of Language Processing* (pp. 189–209), New Jersey: Lawrence Erlbaum Associates.

Carlisle, J. F. (2000). Awareness of the structure and meaning of morphologically complex words: Impact on reading. *Reading and Writing*, 12, 169–190.

Carlisle, J. F. (2003). Morphology matters in learning to read: A commentary. *Reading Psychology*, 24, 291–332.

Carlisle, J. F. (2004). Morphological processes that influence learning to read. In A. Stone, E. Silliman, B. Ehren, & K. Apel (Eds.), *Handbook of language and literacy: Development and disorders* (pp. 318–339). New York: Guilford Press.

Carlisle, J. F. & Fleming, J. (2003). Lexical processing of morphologically complex words in the elementary years. *Scientific Studies of Reading, 7*(3), 239–253.

Carlisle, J. F., & Stone, C.A. (2005). Exploring the role of morphemes in word reading. *Reading Research Quarterly, 40(*4), 428–449.

Carroll, J. B. (1961). The Nature of the Data, or How to Choose a Correlation Coefficient, *Psychometrika*, 26, 347–372.

Casalis, S. & Louis-Alexandre, M. F. (2000). Morphological analysis, phonological analysis and learning to read French: A longitudinal study. *Reading and Writing*: An Interdisciplinary Journal, 12, 303–335.

Chang, C., Shu, H., Zhou, A., Wat, C., & Wagner, R. (2003). Morphological awareness uniquely predicts young children's chinese character recognition, *Journal of Educational Psychology, 95*, 743–751.

Charity, A. H., Scarborough, H. S. & Griffin, D. M. (2004). Familiarity with School English in African American Children and its Relation to Early Reading Achievement, *Child Development*, 75(5), 1340–1356.

Charlier, B. L. & Leybaert, J. (2000). The rhyming skills of deaf children educated with phonetically augmented speechreading. *The Quarterly Journal of Experimental Psychology*, 53, 349–375.

Cheng, A., Grant, G. & Niparko, J. (1999). Meta-analysis of pediatric cochlear implant literature. *The Annals of Otology, Rhinology and Laryngology*, 108(4), 124–128.

Clark, E. V. & Berman, R. A. (1984). Structure and use in acquisition of word formation. *Language*, 60, 542–590.

Clark, M. D., Gilbert, G. & Anderson, M. L. (2011). Morphological knowledge and decoding skills of deaf readers. *Psychology*, 2(2), 109–116.

Clark, M. R. (2006). Language Learning and Language Change in Children with Specific Language Impairment Who Speak African American English. *Ph.D. Thesis*, The University of Texas at Austin.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd ed.)*. Hillsdale, NJ: Erlbaum.

Cohen, J. & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum.

Colin, S., Magnan, A., Ecalle, J. & Leybaert, J. (2007). Relation between deaf children's phonological skills in kindergarten and word recognition performance in first grade. *Journal of Child Psychology and Psychiatry*, 48(2), 139–146.

Conrad, R. (1979). *The deaf schoolchild.* London: Harper Row.

Coulmas, F. (1992). On the relationship between writing system, written language, and text processing. In Stein, D. (Ed.), *Cooperating with Written Texts: The Pragmatics and Comprehension of Written Texts* (pp.15–30), Berlin: Mouton de Gruyter.

Crystal, D. (1980). *A First Dictionary of Linguistics and Phonetics*. London: Deutsch.

Deacon, S. & Kirby, J. (2004). Morphological awareness: just 'more phonological'? the roles of morphological and phonological awareness in reading development, *Applied Psycholinguistics, 25*, 223–238.

Deacon, S. H., Kirby, J. R. & Casselman-Bell, M. (2009). How robust is the contribution of morphological awareness to general spelling outcomes? *Reading Psychology*, 30, 301–318.

Deacon, S. H., Parrila, R. & Kirby, J. R. (2008). A review of the evidence on morphological processing in dyslexics and poor readers: A strength or weakness? In G. Reid, A. Fawcett, F. Manis, & L. Siegel (Eds.), *The SAGE Handbook of Dyslexia.* (pp. 212–237). Los Angeles: SAGE Publications.

Deacon, S. H., Wade-Woolley, L. & Kirby, J. (2007). Crossover: The role of morphological awareness in French immersion children's reading. *Development Psychology,* 43, 732–746.

Deutsch, A. & Frost. R. (2002). Lexical organization and lexical access in a non-concatenated morphology. In Shimron, J. (Ed.), *Language processing and Acquisition in Languages of Semitic, Root-Based, Morphology* (pp. 165–186). Amsterdam, Philadelphia: John Benjamins.

DeVellis, R. (2012). *Scale Development: Theory and Application*. Thousand Oaks, CA: Sage Publications.

Dixon, W. J. (1960). Simplified Estimation from Censored normal Samples. *The Annals of Mathematical Statistics,* 31, 385–391.

Donaldson, M. (1979). *Children's minds*. Donaldson, M. (1978) Children's Minds. London: Croom Helm Ltd.

Dörnyei, Z. & Taguchi, T. (2010). *Questionnaires in Second Language Research: Construction, Administration, and Processing* (2nd ed.). Abingdon: Routledge.

Dunn, L. M. & Dunn, L. M. (1981). *Peabody Picture Vocabulary Test-Revised*. Circle Pines, MN: American Guidance Services.

Dyer, A., MacSweeney, M., Szczerbinski, M., Green, L. & Campbell, R. (2003). Predictors of reading delay in deaf adolescents: the relative contribution of rapid automatized naming speed and phonological awareness and decoding. *Journal of Deaf Studies and Deaf Education*, 8 (3), 215–228.

Ehri, L., Nunes, S., Willows, D., Schuster, B., Yaghoub-Zadeh, Z. & Shanahan, T. (2001). Phonemic Awareness Instruction Helps Children Learn to Read: Evidence From the National Reading Panel's Meta-Analysis. *Reading Research Quarterly,* 36(3), 250–287.

Eid, M. (1990). Arabic linguistics: The current scene. In Eid, M. (ed.), *Perspectives on Arabic linguistics I*, 3–37. Amsterdam & Philadelphia: John Benjamins.

El-Imam, Y. A. (2004). Phonetization of Arabic: rules and algorithms. In *Computer Speech and Language,* 18 (pp. 339–373).

Elbeheri, G., Everatt, J., Mahfoudhi, A., Abu Al-Diyar, M. & Taibah, N. (2011). Orthographic processing and reading comprehension among Arabic speaking mainstream and LD children. *Dyslexia*, 17(2),123–42.

Elbro, C. & Arnbak, E. (1996). The role of morpheme recognition and morphological awareness in dyslexia. *Annals of Dyslexia*, 46, 209–240.

Erceg-Hurn, D. M. & Mirosevich, V. M. (2008). Modern robust statistical methods: an easy way to maximise the accuracy and power of your research. *American Psychologist*, 63, 591–601.

Erwin, T. D. (1991). *Assessing student learning and development*. San Francisco: Jossey-Bass.

Estee-Wale, R. S. (2004). Deafness, discourse and identity: critical issues in deaf education, *Durham theses*, Durham University. Available at Durham E-Theses Online: http://etheses.dur.ac.uk/3058.

Everatt, J. & Elbeheri, G. (2008). Dyslexia in transparent orthographies: Variability in transparency. In Reid, G., Fawcett, A., Manis, F. and Siegel, L. (Eds.) *The Sage Handbook of Dyslexia* (pp. 427–438). London: Sage.

Eviatar, Z. & Ibrahim, R. (2000). Bilingual is as bilingual does: Metalinguistic abilities of Arabic–speaking children. *Applied Psycholinguistics,* 21(4), 451–471.

Farran, L. K. (2010). The Relationship between Language and Reading in Bilingual English-Arabic Children, *Early Childhood Education Dissertations.* Paper 13. http://digitalarchive.gsu.edu/ece_diss/13.

Farran, L., Bingham, G. & Matthews, M. (2012). The relationship between language and

reading in bilingual English-Arabic children, *Reading and Writing*, 25, 2153–2181.

Fayol, M., Thevenin, M. G., Jarousse, J. P. & Totereau, C. (1999). From learning to teaching French written morphology. In Nunes, T. (Ed.), *Learning to read: An integrated view from research and practice* (pp. 43–64). Dordrecht (the Netherland): Kluwer.

Feitelson, D., Goldstein, Z., Iraqi, U. & Share, D. (1993). Effects of listening to story reading on aspects of literacy acquisition in a diglossic situation. *Reading Research Quarterly, 28*(1), 70–79.

Ferguson, C. A. (1959). Diglossia. *Word, 15*, 325–340.

Fiebach, C.J., Friederici, A.D., Muller, K., & Von Cramon, D.Y. (2002). fMRI evidence for dual routes to the mental lexicon in visual word recognition. *Journal of Cognitive Neuroscience*, 14, 11–23.

Field, A. (2009). *Discovering Statistics Using SPSS* (3rd Edition). London: Sage.

Field, A. & Miles, J. (2010). *Discovering Statistics Using SAS.* London: Sage Publications.

Fischer, W. (1997). Classical Arabic. In Hetzron, R. (ed.), *The Semitic Languages* (pp. 378–219). NewYork, NY: Routledge.

Fleiss, L., Cohen, J. & Everitt, B. (1981). *Statistical methods for rates and proportions*. New York: Wiley.

Fogel, H. & Ehri, L. (2000). Teaching Elementary Students who speak Black English Vernacular to write in Standard English: Effects of Dialect Transformation Practice. *Contemporary Educational Psychology,* 25, 212–235.

Friedmann, N. & Haddad-Hanna, M. (2013). The Comprehension of Sentences Derived by Syntactic Movement in Palestinian Arabic-Speaking Children with Hearing Impairment, *Applied Psycholinguistics*, 1– 41. doi:10.1017/S0142716412000483.

Friedmann, N. & Szterman, R. (2006). Syntactic movement in orally-trained children with hearing impairment. *Journal of Deaf Studies and Deaf Education*, 11, 56–75.

Frost, R. (1994). Prelexical and postlexical strategies in reading: Evidence from a deep and a shallow orthography. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 20(1), 116–129.

Frost, R. (1995). Phonological computation and missing vowels: Mapping lexical involvement in reading. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 21, 398–408.

Gaustad, M. (2000). Morphographic analysis as a word identification strategy for deaf readers. *Journal of Deaf Studies and Deaf Education*, 5, 61–80. doi:10.1093/deafed/5.1.60.

Geers, A. E. (2003). Predictors of reading skill development in children with early cochlear implantation. *Ear and Hearing*, *24,* 59S–68S.

Geers, A. E. (2004). Speech, language, and reading skills after early cochlear implantation. *Archives of Otolaryngology - Head and Neck Surgery*, 130, 634–638.

Geudens, A. (2006). Phonological awareness and learning to read a first language: controversies and new perspectives. In Van der Craats, I., Kurvers, J. & Young-Scholten, M. (eds.), *Low-Educated Second Language and Literacy Acquisition*. Utrecht: LOT. 25–44.

Goldin-Meadow, S. & Mayberry, R. (2001). How do profoundly deaf children learn to read? *Learning Disabilities Research and Practice*, 16 (4), 221–228.

Goswami, U. (2010). A psycholinguistic grain size view of reading acquisition across languages. In Brunswick, N., McDougall, S. and Mornay-Davies, P. (Eds). *The Role of Orthographies in Reading and Spelling*. Hove: Psychology Press.

Goswami, U. & Bryant, P. (1990). *Phonological skills and learning to read*. United Kingdom: Erlbaum.

Gough, P. G. & Walsh, M. A. (1991). Chinese, phoenicians and the orthographic cipher of English. In: Brady, S. & Shankweiler, D. (Eds.), *Phonological processes in literacy* (pp. 199–209). Hillsdale, NJ: Erlbaum.

Green, S. B. (1991). How many subjects does it take to do a regression analysis? *Multivariate Behavioral Research, 26,* 499–510.

Guilford, J. (1936). The determination of item difficulty when chance is a factor. *Psychometrika*, 1, 259–264.

Guilford, J. & Fruchter, B. (1978). *Fundamental statistics in psychology and education* (6th ed.). New York: McGraw Hill.

Gunderson, L., D'Silva, R. & Chen, L. (2009). Second Language Reading Disability. In McGill-Franzen, A. & Allington, R. (Eds.), *Handbook of reading disability research* (13–24). New York: Routledge.

Habash, N. (2007). Arabic Morphological Representations for Machine Translation. In Van den Bosch, A. & Soudi, A. (eds.) *Arabic Computational Morphology: Knowledge-based and Empirical Methods*. Springer.

Habash, N. (2010). *Introduction to Arabic Natural Language Processing*. Morgan & Claypool Publishers.

Habash, N., Diab, M., Rambow, O. (2012). *Conventional Orthography for Dialectal Arabic*. Technical Report CCLS-12-02, Columbia University Center for Computational Learning Systems. Available at <http://www.lrec-conf.org/proceedings/lrec2012/pdf/579_Paper.pdf> [Accessed 12th August 2013].

Habash, N., Soudi, A. & Buckwalter, T. (2007). On Arabic Transliteration. In Van den Bosch, A. & Soudi, A. (eds.) *Arabic Computational Morphology: Knowledge-based and Empirical Methods*. Springer.

Hammer, A. (2010). The acquisition of verbal morphology in cochlear-implanted and

specific language impaired children. *PhD Thesis*, LOT: Utrecht The Netherlands.

Hanson, V. (1982). The use of orthographic structure by deaf adults: Recognition of finger-spelled words. *Applied Psycholinguistics,* 3, 343–356.

Hanson, V. L. (1991). Phonological processing without sound. In Brady, S. & Shankweiler, D. (Eds.), *Phonological processes in literacy: A tribute to I. Y. Liberman* (pp. 153–161). Hillsdale, NJ: Lawrence Erlbaum Associates.

Hanson, V. L. & Fowler, C. A. (1987). Phonological coding in word reading: Evidence from hearing and deaf readers. *Memory and Cognition*, 15, 199–207.

Hanson, V. L. & McGarr, N. S. (1989). Rhyme generation by deaf adults. *Journal of Speech and Hearing Research*, 32, 2–11.

Harris, G. & Beech, J. (1998). Implicit phonological awareness and early reading development in prelingually deaf children. *Journal of Deaf Studies and Deaf Education,* 3, 205–216.

Harris, M. & Moreno, C. (2004). Deaf children's use of phonological coding: Evidence from reading, spelling and working memory. *Journal of Deaf Studies and Deaf Education*, 9, 253–268.

Hart, B. & Risley, T. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore: Paul H. Brookes Publishing.

Hernandez, M. (2010). Predicting Kindergarten Reading Outcomes from Initial Language and Literacy Skills: Does Dialect Density Matter? *MA thesis*, The Florida State University.

Ho, C. (1997). Phonological skills are important in learning to read Chinese, *Developmental Psychology,* 33 (6), 946–951.

Holden, J. G., Van Orden, G. C. & Turvey, M. T. (2009). Dispersion of response times reveals cognitive dynamics. *Psychological Review, 116*, 318–342.

Holes, C. (1987) *Language Variation and Change in a Modernising Arab State: the case of Bahrain*, London: Kegan Paul International.

Holes, C. (1988). *Colloquial Arabic of the Gulf and Saudi Arabia*. London: Routledge.

Holes, C. (1989). Towards a dialect geography of Oman. *Bulletin of the School of Oriental and African Studies*, 52, 446–462.

Holes, C. (1990). *Gulf Arabic*. Routledge: London.

Holes, C. (1995). *Modern Arabic: structures, functions, and varieties*. London: Longman.

Holes, C. (1998). Retention and loss of the passive verb in the Arabic dialects of northern Oman and eastern Arabia. *Journal of Semitic Studies* 43(2), 347–362.

Holes, C. (2004). *Modern Arabic: Structures, Functions and Varieties*. Washington, D.C.:

Georgetown University Press.

Hoover, W. A. & Gough, P. B. (1990). The simple view of reading. Reading and writing. *An interdisciplinary journal*, 2, 127–160.

Howell, D. C. (2010). *Fundamental Statistics for the Behavioral Sciences*, (7th ed.), Wadsworth Publishing Company.

Howitt, D. & Cramer, C. (2005). *Introduction to SPSS in Psychology*, 3th Edition. London: Pearson.

Ibrahim, M. (1986). Standard and prestige language: a problem in Arabic sociolinguistics. *Anthropological Linguistics*, 28, 115–126.

Ibrahim, R. & Eviatar, Z. (2012). The contribution of the two hemispheres to lexical decision in different languages. *Behavioral and Brain Functions*, 8(3), 1–7.

Ibrahim, R., Eviatar. Z., & Aharon Peretz, J. (2002). The Characteristics of Arabic Orthography Slow Its Processing. *Neuropsychology*, 16(3), 322–326. doi:10.1037/0894-4105.

Ibrahim, R., Eviatar. Z., & Aharon Peretz, J. (2007). Metalinguistic awareness and reading performance: A cross language comparison. *The Journal of Psycholinguistic Research, 36,* 297–317. doi:10.1007/s10936-006-9046-3

Ibrahim, R., Khateb, A. & Taha, H. (2013). How Does Type of Orthography Affect Reading in Arabic and Hebrew as First and Second Languages?. Open *Journal of Modern Linguistics*, 3(1), 40–46.

Izzo, A. (2002). Phonemic awareness and reading ability: An investigation with young readers who are deaf. *American Annals of the Deaf*, 147, 18–28.

James, L. R. & Brett, J. M. (1984). Mediators, moderators, and test for mediation. *Journal of Applied Psychology*, 69, 307–321.

Jensen, A. R. (1973). The differences are real. *Psychology Today*, 7, 80–86.

Judd, C. M. & Kenny, D. A. (1981). Process analysis: estimating mediation in treatment evaluation. *Evaluation Review*, 5, 602–619.

Kaosh, K., Matar, A. & Mahmoud, K. (2004). *My Arabic Book 1: Reading and Exercises*: Kitabi fee Al-Arabi 1, Al-Qir'a wa Al-Thamreen. Islamic School of Ottawa, Canada.

Kargin, T., Guldenoglu, I., Miller, P., Hauser, P., Rathmann, C., Kubus, O. & Superegon, E. (2012). Differences in word processing skills of deaf and hearing individuals reading in different orthographies. *Journal of Development and Physical Disabilities*, 24, 65–83.

Kaye, A. S. (2003). Semitic Linguistics in the New Millennium. *Journal of the American Oriental Society*, 123(4), 819–34.

Kello, C. T. & Van Orden, G. (2009). Soft-assembly of sensorimotor function. *Nonlinear dynamics, psychology, and life sciences*, 13(1), 57–78.

Kelman, M. & Apel, K. (2004). The effects of a multiple linguistic, prescriptive approach to spelling instruction: A case study. *Communication Disorders Quarterly*, 25(2), 56–66.

Kent, R. A. (2001). *Data Construction and Data Analysis for Survey Research.* Hampshire: Palgrave Publishers Ltd.

Khamis-Dakwar, R. (2005). Children's attitudes towards the diglossia situation in Arabic and its impact on learning. *Language, Communities and Education*, 1, 75–86.

Khamis-Dakwar, R., Froud, K. & Gordon, P. (2011). Acquiring diglossia: mutual influences of formal and colloquial Arabic on children's grammaticality judgments. *Journal of Child Language*, 1–29.

Kirby, J., Deacon, H., Bowers, P., Izenberg, L., Wade-Woolley, L. & Parrila, P. (2012). Children's morphological awareness and reading ability, *Reading and Writing*, 25(2), 389–410.

Kishton, J. M. & Widaman, K. F. (1994). Unidimensional versus domain representative parceling of questionnaire items: An empirical example. *Educational and Psychological Measurement*, 54, 757–765.

Kleinbaum, D., Kupper, L., Muller, K. & Nizam, A. (1998). *Applied Regression Analysis and Multivariable Methods* (3rd ed.), Pacific Grove, CA: Duxbury.

Kline, P. (2000). *The handbook of psychological testing* (2nd Ed.), Routledge.
Ku, Y. M. & Anderson, R. C. (2003). Development of morphological awareness in Chinese and English. *Reading and Writing*, 16, 399–422.

Kyle, F. & Harris, M. (2006). Concurrent correlates and predictors of reading and spelling achievement in deaf and hearing children. *Journal of Deaf Studies and Deaf Education,* 11(3), 273–288.

Lance, M. (2011). Approximate Vs. Monte Carlo Critical Values For The Winsorized T-Test. *PhD Thesis*, Wayne State University, Paper 173.

Lane, H. & Baker, D. (1974). Reading achievement of the deaf: Another look. *The Volta Review*, 76, 489–499.

Larose D. (2006). *Data Mining Methods and Models*. Hoboken. New Jersey: John Wiley and Sons.

Lass, R. (1984). *Phonology: An Introduction to Basic Concepts*. Cambridge: CUP.

Levin, I. Ravid, D. & Rapaport, S. (2001). Morphology and spelling among Hebrew-speaking children: From kindergarten to first grade. *Journal of Child Language*, 28, 741–772.

Levin, I., Saiegh-Haddad, E., Hindi, N. and Ziv, M. (2008). Early literacy in Arabic: An intervention study among Israeli Palestinian kindergartners. *Applied Psycholinguistics*, 29(3), 413–436.

Lewis, S. (1996). The reading achievements of a group of severely and profoundly hearing-impaired school leavers educated within a natural aural approach. *Journal of British Association of Teachers of the Deaf*, 20(1*)*, 1–7.

Leybaert, J. (1993). The roles of phonological codes. In M. Marschark, & Clark, M. (Eds.), *Psychological perspectives on deafness*, 2, 269–309. New York: Lawrence Erlbaum Associates.

Leybaert, J. (2000). Phonology acquired through the eyes and spelling in deaf children. *Journal of Experimental Child Psychology*, 75, 291–318.

Leybaert, J. & Alegria, J. (1995) Spelling development in deaf and hearing children: Evidence for use of morpho-phonological regularities in French. *Reading and Writing: An Interdisciplinary Journal*, 7:89–109.

Li, G. (2010). *Phonological Processing Abilities and Reading Competence: Theory and Evidence*. Bern, Switzerland: Peter Lang AG.

Liberman, I.Y., Shankweiler, D. & Liberman, A.M. (1989). The alphabetic principle and learning to read. In Shankweiler, D. & Liberman, I. (Eds.), *Phonology and reading disability: Solving the reading puzzle* (pp.1–33). Ann Arbor, MI: U. of Michigan Press.

Luetke-Stahlman, B. & Nielsen, D. (2003). The contribution of phonological awareness and receptive and expressive English to the reading ability of deaf students with varying degrees of exposure to accurate English. *Journal of Deaf Studies and Deaf Education*, 8, 464–484.

Lumley, T., Diehr, P., Emerson, S. & Chen, L. (2002). The Importance of the Normality Assumption in Large Public Health Data Sets. *Annual Review of Public Health*, 23,151–69.

Maamouri, M. (1977). Illiteracy in Tunisia. In Gorman, T.P (Ed.), *Language and Literacy: Current Issues and Research* (pp. 203–226). London: International Institute for adult Literacy methods.

Maamouri, M. (1998). Language education and human development: Arabic diglossia and its impact on the quality of education in the Arab region. *Discussion paper prepared for The World Bank Mediterranean Development Forum, Marrakesh.* Philadelphia: University of Pennsylvania, International Literacy Institute.

Maamouri, M. (2005). *Arabic literacy.* Philadelphia, PA: The University of Pennsylvania.

Maamouri, M. (2009). Arabic literacy. Lemma, 11,16. In Versteegh, K. (Ed.), *Encyclopedia of Arabic Language and Linguistics*, Vol. 2, Brill Academic Publishers, Leiden: The Netherlands.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparisons of methods to test mediation and other intervening variable effects. *Psychological Methods*, 7(1), 83–104.

Mahfoudhi, A., Elbeheri, G. and Hense, Ch. (2009). *The guide of the most common letters, words and morphological patterns found in in the public schools' books in Kuwait, from the first to the fifth grade*. Kuwait: Center for Child Evaluation and Teaching.

Mahfoudhi, A., Elbeheri, G., Al-Rashidi, M. & Everatt, J. (2010). The role of morphological awareness in reading comprehension among typical and Learning Disabled native Arabic speakers. *Journal of Learning Disabilities*, 43, 500–514.

Mahony, D., Singson, M. & Mann, V. (2000). Reading ability and sensitivity to morphological relations. *Reading and Writing*, 12, 191–218.

Marschark, M. & Harris, M. (1996). Success and failure in learning to read: The special case (?) of deaf children. In Cornoldi, C. and Oakhill, J. (Eds.), *Reading comprehension difficulties: Processes and intervention* (pp. 279–300). Mawah, NJ: Lawrence Erlbaum.

McBride-Chang, C. (1995). Phonological processing, speech perception, and reading disability: An integrative review. *Educational Psychologist*, 30, 109–121.

McCormick-Piestrup, A. (1973). *Black Dialect Interference and Accommodation of Reading Instruction in First Grade.* University of California: Monographs of the Language-Behavior Research Laboratory.

Miller, P. (1997). The effect of communication mode on the development of phonemic awareness in prelingually deaf students. *Journal of Speech, Language, and Hearing Research*, 40 (5): 1151–63.

Miller, P. (2000). Syntactic and semantic processing in deaf and hearing readers. *American Annals of the Deaf*, 145, 436–448.

Miller, P. (2002). Communication Mode and the Processing of Printed Words: Evidence from Readers with Prelingually Acquired Deafness. *Journal of Deaf Studies and Deaf Education*, 7, 312–329.

Miller, P. (2005). Reading comprehension and its relation to the quality of functional hearing: Evidence from readers with different functional hearing abilities. *American Annals of the Deaf*, 150, 305–323. doi:10.1353/aad.2005.0031.

Miller, P. (2010). Phonological, orthographic, and syntactic awareness and their relation to reading comprehension in prelingually deaf individuals: What can we learn from skilled readers? *Journal of Development and Physical Disabilities*, *22,* 549–580.

Miller, P., & Abu-Achmed, R. (2010). The development of orthographic knowledge in prelingually deafened individuals: New insight from Arab readers. *Journal of Development and Physical Disabilities, 22,* 11–31.

Moog, J. S. & Geers, A. E. (1985). EPIC: A program to accelerate academic progress in profoundly hearing-impaired children. *The Volta Review*, 87, 259–277.

Moog, J. S. & Geers, A. E. (1999). Speech and language acquisition in young children after cochlear implantation. *Otolaryngologic Clinics of North America,* 32:1127–1141.

Morais, J., Cary, L., Alegria, J. & Bertelson, P. (1979). Does awareness of speech as a sequence of phonemes rise spontaneously? *Cognition*, 7, 323–331.

Most, T., Levin, I. & Sarsour, M. (2008). The effect of Modern Standard Arabic orthography on speech production by Arab children with hearing loss. *Journal of Deaf Studies and Deaf Education,* 13 (3), 417–431.

Muller, D., Judd, C.M., & Yserbyt, V.y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology, 89*, 852–863.

Naglieri, J. (1996). An Examination of the Relationship between Intelligence and Reading Achievement Using the MAT-SF and MAST. *Journal of Psychoeducational Assessment*, 14 (1), 65–69.

Nagy, W. E., Berninger, V. W. & Abbott, R. B. (2006). Contributions of morphology beyond phonology to literacy outcomes of upper elementary and middle-school students. *Journal of Educational Psychology*, 98(1), 134–147.

Nasser, F. & Takahashi, T. (2003). The effect of using item parcels on ad hoc goodness-of-fit indexes in confirmatory factor analysis: An example using Sarason's Reactions to Tests. *Applied Measurement in Education*, 16, 75–97.

Nevitt, T. & Tam, H. (1998). A comparison of robust and nonparametric estimators under the simple linear regression model. *Multiple Linear Regression Viewpoints*, 25, 54–69.

Newman, D. (2006). The Phonetics of Arabic. *Arabic Phonetics: Sound Descriptions* (pp. 1–6), Durham University. Available at <http://www.dur.ac.uk/daniel.newman/phon5.pdf> [Accessed 12th September 2012].

Nielsen, D. & Luetke-Stahlman, B. (2002). Phonological awareness: One key to the reading proficiency of deaf children. *American Annals of the Deaf, 147,* 11–19.

NIH, National Institutes of Health (1995). Cochlear implants in adults and children. *NIH Consensus Statement*, May 15-17; 13(2): 1–30, Washington, D.C.

Nunes, T. & Bryant, P. (2006). *Improving literacy through teaching morphemes.* London: Routledge.

Nunes, T. & Bryant, P. (2009). *Children's reading and spelling. Beyond the first steps.* Oxford: Blackwell.

Nunes, T., Bryant, P. & Bindman, M. (1997a). Morphological Spelling Strategies. Developmental Stages and Processes. *Developmental Psychology,* 33(4), 637–649.

Nunes, T., Bryant, P. & Bindman, M. (1997b). Learning to spell regular and irregular verbs. *Reading and Writing: An Interdisciplinary Journal,* 9, 427–449.

Nunes, T., Bryant, P. & Bindman, M. (2006). The effects of learning to spell on children's awareness of morphology. *Reading and Writing,* 19(7), 767–787.

Nunes, T., Bryant, P. & Olsson, L. (2003). Learning Phonological and Morphological

spelling rules: An intervention study. *Scientific Studies of Reading,* 7(3), 289–307.

Nunes, T., Burman, D., Evans, D. & Bell, D. (2010). Writing a Language you Can't Hear. In Brunswick, N., McDougall, S. & deMornay Davies, P., *Reading and Dyslexia in Different Orthographies*. Psychology Press.

Nunnally, J. C. & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.

Olsson, U. (1979). On the Robustness of Factor Analysis Against Crude Classifications of the Observations. *Multivariate Behavioral Research*, 14, 485–500.

Pallant J. (2007). *SPSS survival manual, a step by step guide to data analysis using SPSS for windows*. 3 ed. Sydney: McGraw Hill.

Palmer, S. (2000). Assessing the benefits of phonics intervention on hearing impaired children's word reading, *Deafness & Education International*, 2(3), 165–178.

Perfetti, C. (2003). The Universal Grammar of reading. *Scientific Studies of Reading*, 7, 3–24.

Perfetti, C. A. & Dunlap, S. (2008). Learning to read: General principles and writing system variations. In Koda, K. & Zehler, A. (eds.) *Learning to read across languages* (pp. 13–38). Mahwah, NJ: Erlbaum.

Perfetti, C. A. & Sandak, R. (2000). Reading optimally builds on spoken language: Implications for deaf readers. *Journal of Deaf Studies and Deaf Education*, 5, 32–50.

Perfetti, C. A. & Zhang, S. (1995). Very early phonological activation in Chinese reading. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 21, 24–33.

Pittas, E. (2011). Predicting Greek Cypriot children's reading and spelling from morphological and dialect awareness, *D.Phil Thesis*, University of Oxford.

Price, C. J., Wise, R. J. & Frackowiak, R. S. (1996). Demonstrating the implicit processing of visually presented words and pseudowords. *Cerebral Cortex*, 6: 62–70.

Public School Guide, Kuwait Government Online (2011). Available at: < http://www.e.gov.kw/MOE_en/Pages/EServices/SchoolSearch.aspx> [Accessed 10th September 2011].

Radovanovic Z, Shah, N. & Behbehani, J. (1999). Prevalence and correlates to consanguinity in Kuwait. *Annals Saudi Medicine,* 19 (3), 206–210.

Ratcliffe, R. (1990). The broken plural system of Moroccan Arabic: Diachronic and cognitive perspective. In Parkinson, D. & Benmamoun, E. (ed.). *Perspectives on Arabic linguistics: papers from the thirteenth and Fourteenth Annual Symposia on Arabic Linguistics*. Amsterdam/. Philadelphia: John Benjamins Publishing. 87–110.

Rathvon, n. (2004). *Early reading assessment: A practioner's handbook*. New York: Guilford.

Raven, J. (1981). *Manual for Raven's Progressive Matrices and Mill Hill Vocabulary Scales*. London: H. K. Lewis.

Ravid, D. (2001). Learning to spell in Hebrew: Phonological and morphological factors. *Reading and writing: An Interdisciplinary Journal*, 14, 459–485.

Ravid, D. (2002). A developmental perspective on root perception in Hebrew and Palestinian Arabic. In Shimron, J. (Ed.), *Language Processing and Acquisition in Languages of Semitic, Root-Based, Morphology* (pp. 293–320). Amsterdam, Philadelphia: John Benjamins,.

Ravid, D. & Malenky, D. (2001). Awareness of linear and non-linear morphology in Hebrew: A developmental study. *First Language*, 21, 25–56.

Ravid, D. & Nir, M. (2000). On the development of the category of adjective in Hebrew. In Beers, M. & van den Bogaerde, B. Bol, G., de Jong, J. & Rooijmans, C. (Eds.), *From sound to sentence: Studies on first language acquisition* (pp. 113–124). Groningen: Center for Language and Cognition.

Ravid, D. & Schiff, R. (2006). Roots and patterns in Hebrew language development: Evidence from written morphological analogies. *Reading and Writing*, 19, 789–818.

Rawlings, J. O., Pantula, S. G. & Dickey, D. A. (1998). *Applied Regression Analysis: A Research Tool* (2nd ed.). Raleigh: Springer-Verlag Inc.

Rodekohr, R. K. & Haynes, W. O. (2001). Differentiating dialect from disorder: A comparison of two processing tasks and a standardized language test. *Journal of Communication Disorders*, 34, 255–272.

Roman, A. A., Kirby, J. R., Parrila, R. K., Wade-Woolley, L. & Deacon, S. H. (2009). Toward a comprehensive view of the skills involved in word reading in Grades 4, 6, and 8. *Journal of Experimental Child Psychology*, 102, 96–113.

Rosner, J. (1975) *Helping children overcome learning disabilities*. New York: Walker.

Ryding, K. C. (2005). *A Reference Grammar of Modern Standard Arabic*, Cambridge University Press, Cambridge.

Saiegh-Haddad, E. (2003). Linguistic distance and initial reading acquisition: The case of Arabic diglossia. *Applied Psycholinguistics*, 24, 431–451.

Saiegh-Haddad, E. (2004). The impact of phonemic and lexical distance on the phonological analysis of words and pseudowords in a diglossic context. *Applied Psycholinguistics*, 25, 495–512.

Saiegh-Haddad, E. (2005). Correlates of reading fluency in Arabic: Diglossic and orthographic factors, *Reading and Writing: An Interdisciplinary Journal, 18*, 559–582.

Saiegh-Haddad, E. (2007). Linguistic constraints on children's ability to isolate phonemes in Arabic. *Applied Psycholinguistics*, 28, 607–625.

Saiegh-Haddad, E. & Geva, E. (2008). Morphological awareness, phonological awareness, and reading in English-Arabic bilingual children. Reading and Writing: *An Interdisciplinary Journal*, 21, 481–504.

Saiegh-Haddad, E., Levin, I., Hende, N. & Ziv, M. (2010). The Linguistic Affiliation Constraint and phoneme recognition in diglossic Arabic, *Journal of Child Language*, 38, 297–315.

Santos, J. A. (1999). Cronbach's Alpha: A Tool for Assessing the Reliability of Scales. *Journal of Extention, 37* (2), 1–5.

Sayah, M. (2002). Linguistic Issues and Policies in Tunisia. In, Kamal, S. (ed.), *French in and out of France. Language Policies, Intercultural Antagonisms and Dialogue*. Bern: Peter Lang, 411–431.

Seraye, A. M. (2004). The role of short vowels and context in the reading of arabic, comprehension and word recognition of highly skilled readers. *PhD Thesis*, University of Pittsburgh.

Shaaban, Kh. A. (1978). Code-switching in the Speech of Educated Arabs. *Journal of the Linguistic Association of the Southwest III*, 1: 7–19.

Shaalan, S. (2009). Considerations for developing and adapting language and literacy assessments in Arabic-speaking countries. In Grigorenko, E. (ed.), *Multicultural Psycheducational Assessment* (pp. 287–314). New York: Springer.

Shah, N., Shah, M. & Radovanovic, Z. (1999). Social class and morbidity differences among Kuwaiti children. *Journal of Health and Population in Developing Countries*, 2(1), 58–69.

Share, D. L. (2008). On the Anglocentricities of current reading research and practice: The perils of over-reliance on an 'outlier' orthography. *Psychological Bulletin, 134*(4), 584–615.

Share, D. L. & Stanovich, K. E. (1995). Cognitive processes in early reading development: Accommodating individual differences into a model of acquisition. *Issues in Education,* 1, 1–57.

Share, D.L. & Blum, P. (2005). Syllable splitting in literate and preliterate Hebrew speakers: Onsets and rimes or bodies and codas? *Journal of Experimental Child Psychology*, 92, 182–202.

Shawqi, A. (1898). *Al-Shawqiat*. Dar Al-Awda, Beirut.

Siegel, L. S. & Ryan, E. B. (1988). Development of grammatical-sensitivity, phonological, and short-term memory skills in normally achieving and learning disabled children. *Developmental Psychology*, 24(1), 28–37.

Singson, M., Mohany, D. & Mann, V. (2000). The relation between reading ability and morphological skills: Evidence from derivational suffixes. *Reading and Writing*, 12, 219–252.

Sligh, A. C. & Conners, F. A. (2003). Relation of dialect to phonological processing: African

American Vernacular English vs. Standard American English. *Contemporary Educational Psychology*, 28, 205–228.

Smith, D. R. (2004). Making the Reading Connection. *Statewide Evaluation Conference*. Corpus Christi, TX: Pearson Education, Inc.

Smith, S. B., Simmons, D. C. & Kame'enui, E. J. (1998). Phonological awareness: Research bases. In Simmons, D. C. & Kame'enui, E. J. (Eds.), *What reading research tells us about children with diverse learning needs: Bases and basics* (pp. 61–128). Mahwah, NJ: Lawrence Erlbaum.

Spencer L. J., Tomblin, J. B. & Gantz, B. J. (1997). Reading skills in children with multichannel cochlear-implant experience. *The Volta Review*, 99,193–202.

Stangor, C. (2010). *Research Methods for the Behavioral Sciences* (4th ed.). Boston, MA: Houghton Mifflin.

Stanovich, K. E. (1988). Explaining the differences between the dyslexic and the garden-variety poor reader: The phonological-core variable-difference model. *Journal of Learning Disabilities*, 21, 590–612.

Stanovich, K. E. & Siegel, L. S. (1994). Phenotypic performance profile of children with reading disabilities: A regression-based test of the phonological-core variable- difference model. *Journal of Educational Psychology*, 86(1), 24–53.

Sterne, A. & Goswami, U. (2000). Phonological awareness of syllables, rhymes and phonemes in deaf children. *Journal of Child Psychology and Psychiatry*, 41(5), 609–625.

Stevens, J. (1996). *Applied multivariate statistics of the social sciences*. Mahwah, NJ: Erlbaum.

Suleiman, S.M. (1986). *Jordanian Arabic between diglossia and bilingualism: Linguistic analysis*. Amsterdam & Philadelphia: John Benjamins.

Tabachnick, B. G. & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston, MA: Allyn and Bacon.

Tabachnick, B. G. & Fidell, L. S. (2001). *Using multivariate statistics*. Needham Heights, MA: Allyn and Bacon.

Taibah, N. & Haynes, Ch. (2011). Contributions of phonological processing skills to reading skills in Arabic speaking children. *Reading and Writing*, 24:1019–1042.

Taouk, M. & Coltheart, M. (2004). The cognitive processes involved in learning to read in Arabic. *Reading and Writing: An Interdisciplinary Journal*, 17, 27–57.

Taqi, H. (2010). Two ethnicities, three generations: phonological variation and change in Kuwait. *PhD Thesis*, Newcastle University.

Terry, N. P. (2006). Relations between dialect variation, grammar, and early spelling skills. *Reading and Writing: An Interdisciplinary Journal*, 19, 907–931.

Terry, N. P. (2012). Examining relationships among dialect variation and emergent literacy skills. *Communication Disorders Quarterly*, 33(2), 67–77.

Terry, N. P. & Connor, C. M. (2010). African American English and spelling: how do second graders spell dialect-sensitive features of words? *Learning Disability Quarterly,* 33(3), 199–210.

Terry, N., Connor, C., Thomas-Tate, S. & Love, M. (2010). Examining relationships among dialect variation, literacy skills and school context in first grade. *Journal of Speech, Language, and Hearing Research,* 53, pp. 126–145.

Tibi, S. (2010). Developmental Hierarchy Of Arabic Phonological Awareness Skills. International Journal of Special Education, 25 (1), 27–33.

Treiman, R. (1993). *Beginning to spell: A study of first-grade children*. New York: Oxford University Press.

Treiman, R. (2004). Spelling and Dialect: Comparisons between speakers of African American vernacular English and White speakers. *Psychological Bulletin and Review,* 11(2), 338–342.

Treiman, R. & Zukowski, A. (1991). Levels of phonological awareness. In Brady, S. A. & Shankweiler, D. P (Eds.), *Phonological processes in literacy: A tribute to Isabelle Y. Liberman* (pp. 97–117). Hillsdale, NJ: Lawrence Erlbaum Associates.

Treiman, R., & Cassar, M. (1996). Effects of morphology on children's spelling of final consonant clusters. *Journal of Experimental Child Psychology*, 63, 141–170.

Treiman, R., Cassar, M. & Zukowski, A. (1994). What types of linguistic information do children use in spelling? The case of flaps. *Child Development*, 65, 1310–1329.

Treiman, R., Coswami, U., Tincoff, R. & Leevers, H. (1997). Effects of Dialect on American and British Children's Spelling. *Child Development,* 68 (2), 229–245.

Trybus, R. & Karchmer, M. (1977). School achievement scores of hearing impaired children: National data on achievement status and growth patterns. *American Annals of the Deaf*, 122, 62–69.

Tunmer, W. E. & Nesdale, A. R. (1985). Phonemic segmentation skill and beginning reading. *Journal of Educational Psychology. Vol, 77*, 417–427.

Tur-Kaspa, H. & Dromi, E. (1998). Spoken and written language assessment of orally trained children with hearing loss: syntactic structures and deviations. *Volta review, 100,* 186–202.

Tur-Kaspa, H. & Dromi, E. (2001). Grammatical deviations in the spoken and written language of Hebrew-speaking children with hearing impairments. *Language, Speech and Hearing Services in Schools, 32*(2), 79–89.

Tye-Murray, N., Spencer, L. & Woodworth, G. (1995). Acquisition of speech by children who have prolonged cochlear implant experience. Journal of Speech & Hearing Research,

38(2), 327–337.

Tymms, P., Brien, D., Merrell, C., Collins, J. & Jones, P. (2003). Young deaf children and the prediction of reading and mathematics. *Journal of Early Childhood Research,* 1,197–212.

Verhoeven, L. & Carlisle, J. F. (2006). Introduction to the special issue: Morphology in word identification and word spelling. *Reading and Writing: An Interdisciplinary Journal*, 19, 643–650.

Verhoeven, L. & Perfetti, C. A. (2003). The role of morphology in learning to read. *Scientific Studies of Reading,* 7, 209–217.

Wagner, D. A. (1993). *Literacy, Culture, and Development: Becoming literate in Morocco*. USA: Cambridge University Press.

Wagner, R. K. & Torgesen, J. K. (1987). The nature of phonological processing and its causal role in the acquisition of reading skills. *Psychological Bulletin*, 101(2), 192–212.

Wagner, R. K., Torgesen, J. K. & Rashotte, C. A. (1994). Development of reading- related phonological processing abilities: new evidence of bidirectional causality from a latent variable longitudinal study. *Developmental Psychology*, 30(1), 73–87.

Wagner, R. K., Torgesen, J. K., Rashotte, C. A., Hecht, S. A., Barker, T. A., Burgess, S. R., Donahue, J. & Garon, T. (1997). Changing relations between phonological processing abilities and word-level reading as children develop from beginning to skilled readers: a 5-year longitudinal study. *Developmental Psychology*, 33(3), 468–479.

Washington, J. A. & Craig, H. K. (1994). Dialectal forms during discourse of urban, African American pre-schoolers living in poverty. *Journal of Speech and Hearing Research*, 37, 816–832.

Washington, J. A. & Craig, H. K. (1999). Performance of at-risk, African American pre-schoolers on the Peabody Picture Vocabulary Test-Ill. *Language, Speech, and Hearing Services in Schools*, 30, 75–82.

Wendorf, L. A. (2010). Outcomes of conventional amplification for pediatric unilateral hearing loss. *Independent Studies and Capstones*, Paper 591. Program in Audiology and Communication Sciences, Washington University School of Medicine. Available at <http://digitalcommons.wustl.edu/pacs_capstones/591>.

Westen, D. & Rosenthal, R. (2003). Quantifying construct validity: Two simple measures. *Journal of Personality and Social Psychology*, 84, 608–618.

Westerlund, M. & Lagerberg, D. (2008). Expressive vocabulary in 18-month-old children in relation to demographic factors, mother and child characteristics, communication style and shared reading. *Child: Care, Health, and Development,* 34, 257–266.

White, L. (1987). Against comprehensible input: The input hypothesis and the development of L2 competence. *Applied Linguistics,* 8, 95–110.

Wilcox, R. R. (2005). New methods for comparing groups: strategies for increasing the probability of detecting true differences. *Current Directions in Psychological Science,* 14(5), 272–275.

Williams, C. L. (2004). Emergent literacy of deaf children. *Journal of Deaf Studies and Deaf Education*, 9, 352–365.

Wimmer, H. & Goswami, U. (1994). The influence of orthographic consistency on reading development: Word recognition in English and German children. *Cognition,* 51, 91–103.

Wolf, M. & Vellutino, F. (1993). A psycholinguistic account of reading. In Gleason, J. & Ratner, N. (Eds.), *Psycholinguistics* (pp. 352–390). Orlando, Florida: Holt, Rinehart, and Winston , Inc.

Wolfram, W. (2004). Dialect awareness in community perspective. In Bender, M. (ed.), *Linguistic diversity in the south: Changing Codes, Practices, and Ideology.* University of Georgia Press, Athens.

Wolfram, W., Adger, C. & Christian, D. (1999). *Dialects in schools and communities*. Mahwah, NJ: Erlbaum.

Wu, A. D. & Zumbo, B. D. (2008). Understanding and using mediators and moderators. *Social Indicators Research*, 87, 367–392.

Yale, C. & Forsythe, A. (1976). Winsorized regression. *Technometrics*, 18, 291–300.
Yopp, H. (1988). The validity and reliability of phonemic awareness tests. *Reading Research Quarterly*, 23, 160–177.

Ziegler, J. C. & Goswami, U. (2005). Reading acquisition, developmental dyslexia, and skilled reading across languages: A psycholinguistic grain size theory. *Psychological Bulletin*, 131, 3–29.

Ziegler, J. C. & Goswami, U. (2006). Becoming literate in different languages: Similar problems, different solutions. *Developmental Science, 9,* 429–453.

Appendixes

Table of Contents

Appendix 1 – The Pilot Study 250

Appendix 2 – Pre-literacy and Literacy Measures 251

Literacy Predictor Measures 251

Literacy Outcome Measures 254

Appendix 3 – Kappa Values 255

Appendix 4 – Reliabilities and Improvements (Hearing Sample) 256

Predictor Variables Analysis 256

Phonological Awareness 256

Morphological Awareness 263

Dialect Awareness 266

First Outcome Variables Analysis 270

Reliability of the Reading Task (R) 270

Reliability of the Spelling Task (S) 271

Reliability of the Pseudoword Decoding Task (PSD) 273

Reliability of the Reading Comprehension Task (RC) 273

Second Outcome Variables Analysis 275

Reliability of the Reading Task (R2) 275

Reliability of the Spelling Task (S2) 276

Reliability of the Pseudoword Decoding Task (PSD2) 277

Reliability of the Reading Comprehension Task (RC2) 277

Appendix 5 – General Descriptive Statistics 279

Age & Cognitive Ability Variables 279

Cognitive Ability: Raven's One-Sample T-test 279

Predictor Variables 280

First Outcome Variables 281

Second Outcome Variables 281

Paired Sample Test for First and Second Outcome Variable Differences 281

Appendix 6 – Results of Skewness Analysis 282

Winsorized Data Statistics 282

Appendix 7 – Pearson's Correlations Statistics 283

Age & Cognitive Ability Variables 283

Construct Validity 283
Concurrent Validity – with the factors obtained in the next appendix 285

Appendix 8 – Factor Analysis 287

Appendix 9 – Regression Analysis for the First Research Hypothesis 291

First Phase Analysis 291

Predictors of the Reading Measure (R) 291
Predictors of the Spelling Measure (S) 297
Predictors of the Pseudoword Decoding Measure (PSD) 303
Predictors of the Reading Comprehension Measure (RC) 309

Second Phase Analysis 315

Predictors of the Reading Measure (R2) 315
Predictors of the Spelling Measure (S2) 321
Predictors of the Pseudoword Decoding Measure (PSD2) 327
Predictors of the Reading Comprehension Measure (RC2) 333

Appendix 10 – Regression Analysis with Correction of Guessing Formula 338

Predictive Abilities of Morphological Awareness 339

Appendix 11 – Regression Analysis for the Second Research Hypothesis 347

First Phase Analysis 347
Second Phase Analysis 352

Appendix 12 – Mediational Analyses Models for the Third Research Hypothesis 373

Appendix 13 – Deaf Sample Analysis 376

General Descriptive Statistics 376

Age & Cognitive Ability Variables 376
Predictor Variables 376
Outcome Variables 377

Pearson's Correlations Statistics 377
Regression Analyses for the Fisrt Research Hypothesis 378

Predictors of the Reading Measure (R) 378
Predictors of the Spelling Measure (S) 383
Predictors of the Pseudoword Decoding Measure (PSD) 388
Predictors of the Reading Comprehension Measure (RC) 393

Regression Analyses for the Second Research Hypothesis 398
Appendix 14 – Mediational Analyses Models for the Third Research Hypothesis 417

Appendix 1 – The Pilot Study

In order to improve the suitability of the study tools, a pilot study was conducted with a group of eight second-graders prior to running the large-scale longitudinal study. The pilot produced several notes on the proposed tasks and procedures, which were considered as follows:

- The instructions and practice trials given to introduce the task were found to be challenging when presented in standard Arabic. Therefore, it was decided to give the task instructions in the spoken dialect in order to facilitate the participants' proper understanding of tasks.

- The order of the tasks seemed to produce misperceptions of the next task's instructions. This has led to modifying the intended tasks' order to avoid any confusion with the previous task's instructions.

- A very poor performance was detected in the dialect discrimination task where children needed to pick up the odd word format in the sentence (standard vs. dialect and vice versa). The task was therefore redesigned into a simpler structure, i.e. of identifying the language form in each sentence.

- The reading comprehension task was too long for children at this level. Accordingly, the reading passage has been shortened to only 20 words.

- The word identification task, which was constructed of a series of un-vowelised words to monitor participants' root awareness when read, was replaced with another task of vowelized words. This step was fundamental after spotting a general difficulty with decoding words without vowels. The former task of reading un-vowelised words was at a higher level of phonology and has not yet been tested previously among the first-graders.

- The reading and spelling task items were replaced by a new set of items due to the thorough change in the Arabic curricula for the current year. Consequently, no comparison can be held between this year's and last year's first-graders in terms of reading and spelling performance.

The purpose of conducting the pilot was achieved and practicality of the study instruments was assessed. The obtained information was incorporated into the main study design.

Appendix 2 – Pre-literacy and Literacy Measures

Consonant Characters	Transliterated	Romanisation
أَلِف	ʾalif	a
بَاء	bāʾ	b
تَاء	tāʾ	t
ثَاء	thāʾ	th
جِيم	jim	j
حَاء	ḥāʾ	ḥ
خَاء	khāʾ	kh
دَال	dāl	d
ذَال	zāl	z
رَاء	rāʾ	r
زَاي	zāy	z
سِين	sin	s
شِين	shin	sh
صَاد	ṣād	ṣ
ضَاد	ḍād	ḍ
طَاء	tāʾ	t
ظَاء	ẓāʾ	ẓ
عَينٍ	ain	ʻ
غَين	ghain	gh
فَاء	fāʾ	f
افقَ	qāf	q
كَاف	kāf	k
لاَم	lām	l
مِيم	mim	m
نُون	nūn	n
هَاء	hāʾ	h
وَاو	w yāw	w
يَاء	yāʾ	y
هَمزَة	hamza	ʼ

Long Vowels	Romanisation
mad alif	ā
mad wāw	ū
mad yāʾ	ī
Short Vowels	Romanisation
fatḥa	a
ḍamma	u
kasra	i

Literacy Predictor Measures

Phonological awareness measures:

Initial Phoneme Deletion

Standard word	Dialect word	Pseudoword
Kamāl	Chabrīt	Nikāsh
qidam	Firīj	mijrin
juzur	Gāl	ḥagal

Final Phoneme Deletion

Standard word	Dialect word	Pseudoword
ʻasīr	Maynūn	markaf
furush	Diyāy	Firī l
mawqif	gumar	Jawhad

Initial Syllable Addition

Standard word (as)	Dialect word (ish)	Pseudoword (khā)
ʻad	Da'wah	jir
mar	ḥaggah	mu
wad	kithir	Tï

Final Syllable Addition

Standard word (ūn)	Dialect word (īn)	Pseudoword (kar)
muslim	Rāyiḥ	jam
Nā'im	Bardān	ṭar
yafham	Gāʻid	khab

Morphological awareness measures:

Judgement of Morphological Relationships (nouns)

Iṣbay / idbay	Daftar / kashkūl	Shirīfah / sharaf	Sāyig / sawwāg
Isbay / maṣbanah	Daftar / daftirī	Shirīfah / srirīfāt	Sāyig / suwwāg
Isbay / isbayyān	Daftar / aṣfar	Shirīfah / ḍiʻīfah	Sāyig / bāyig
Isbay / walad	Daftar / difātir	Shirīfah / ṭāhirah	Sāyig / draiwil

Judgement of Morphological Relationships (verbs)

Shirab / zaqq	Yithāwash/tihāwash	Yaḥrig / iḥrigaw	Yishīl / shālaw
Shirab / shirbaw	Yithāwash/yithāwishūn	Yaḥrig / yaḥrigūn	Yishīl / yishīlūn
Shirab / kitab	Yithāwash/yitnāqash	Yaḥrig / yashrig	Yishīl / yimīl
Shirab / yishrab	Yithāwash/ yitrāgaʻ	Yaḥrig / yishib	Yishīl / yirfaʻ

Pseudoword Production

(Illkajjām) wigaf fī (ilmakjam) wu (kijam) ḥawalain iljarrah (kajmah) ḥilwah.

Halkhawāt iththalāthah yiḥibbūn (ilfanāwī) . kil waḥdah minhum (fannat) (ifniyah) ḥilwah uṣārat ‘induhum firqah ……(finā’iyyah).

Hādhā ashshay aldhaki (qarasa) alkitāb khūsh (qirāsah)
Gāl ḥag ‘ummah : yībī lī wāyid kutub ‘ashān abī ……(aqrishum).

(shannūn) khallaṣ min (shann) ishshijar wa (tashnīn) ishshāri‘ ,
wa rāḥ ḥag irraṣīf ‘ashān ham ba‘ad ……(yishinnah).

halḥilwah tiḥibb illi‘ib, wihyah titmashshá ligat wāyid (fuwar)
chān itḥiṭ (furah) waḥdah ‘alá rāshā , wamiskat bīdainhā …… (furtain).

hadhūlah albintain (rikīmtain) , hādhī rikīmat hādhī , gālat luhum
waḥdah : maykhālif aṣīr (rikīmatkum) ? galū laha eī yiṣīr , khanṣīr
killinah thalāth …….. (rikīmāt).

fī yawm min ilayyām ilbāridah rāḥ hādhā (ilkharūs) lisghayyir ib‘īd
‘an albājī chan yūgaf winādīhim : sā‘dūnī yā …….. (khirsān).

hāthā ashshay il‘ajīb gā‘id (yizayyiṭ) ishshabak min iṣṣibḥ yizayyiṭ yizayyiṭ
tawwah alḥīn khallaṣ min (ilzzyāṭah), ‘ad ihwa shinū shighlah ? …….. (zayyāṭ).

hadhailah iththintain khawāt. gālat luhum umhūm: (zal‘) ilḥalāw mū zain ḥag asnānkum. min ilyūm urāyiḥ lā ……. (tizli‘ūn) ḥalāw wāyed.

(‘askūl) kān rāyiḥ yishūf (‘askūlah) . uhmah ithnainhum rāḥaw ma‘a
ba‘aẓ ‘ashān yizūrūn bājī …….. (il‘asākīl).

Dialect awareness measures:

Dialect Discrimination

S	Sa’aḥkī lakum qiṣṣata waladin ladayhi jaddatun tar’afu bihi wa taḥnū ‘alayhi .
S	Hādhā huwa alwaladu alldhī in ghaḍiba al’ahlu jamī‘an ‘alayhi fa’inna Jaddatahu lā taghḍab .
D	Fī yuwm min il’ayyām kān ilwalad yil‘ab kurah ibghurfat ilga‘dah .
D	Chān marrah waḥdah yaksir bilghalaṭ iljāmah lim‘alligah biṭṭūfah .
S	Khāfa alwaladu min abīhi wa dhahaba ilá jaddatihi .
D	Chān iyī l’ubu im‘aṣṣib yabī yiṭigg iwlidah ṭagg .
S	Ikhtaba’a alwaladu warā’a aljaddah , faqālat aljaddatu lil’abi : Lā taḍribhu faqad kunta mithlahu ṣaghīran .
D	Chān il’ubu yisāmiḥ iwlidah ‘uma yiṭiggah walā yiziffah .

Sentence Correction

Standard	Dialect
Hadhihi wardatun jamīl	Hādhā ilwalad fannānah
Sa'aktubu darsī ams	Bāchir rikabnā ilbāṣ
Alkaʻkatu ṭaʻmuki ladhīdhun	Iddiyāyah bāẓ
Hādhāni alwaladāni yalʻabūn	Ishshiyar lūnik akhẓar

Word Choice

Standard
Alwaladu (lāʻibu / lāʻibīn) kurat alqadam
(sammāʻu / sammāʻatu) alṭṭabībi sawdā'
Khurṭūm alfīl (ṭawīl / ṭiwāl)
Alwurūdu (tafattaḥa / tafattaḥat)
Laylá (tusāʻidu / tusāʻidun) ʻummahā

Dialect
Ilbāb lownah (adʻam / daʻmah)
Innās (istānas / istānisaw) ibwagthum
Iddirīshah (itbaṭṭilat / itbaṭṭal)
Amal u muná (yimsikūn / miskay) ittifāfīkh
(ḥiṭṭ bālik / ḥiṭṭī bālich) lamman tiṭūfīn ishshāri'

Literacy Outcome Measures

Reading

Samā'	Kubrá	Buyūt	ġalṭatī	Yuṣallī
Lu'lu'	khaḍrā'	rakaḍa	Qūwah	ṭāwūs
Akala	hadīthah	nazāfah	Alladhī	naqifu
ḥā'iṭ	ṣūrah	aġṣān	Juyūsh	ṣāda
Shāṭi'	dhahabat	mustawṣif	taḥyā	As'aluki

Spelling

Mā'	aḥlā	Nabāt	istiṭāʻah	ʻamalī
Suaāl	Asmā'	yaḍrib	Jaddatī	Dāwūd
Yaqra'	Hadīyah	Uhāfiẓu	Allatī	aaḍaʻu
ṭā'ir	dhurah	ġish	Yadʻū	ʻāda
Hādi'	bint	ṣūṣ	Hādhā	Uḥibbuki

Pseudoword Decoding

kaj	Thalá	Ashfarā
muq	kafab	Ablām
lis	fawkh	fadrasha

Reading Comprehension

Al-ʻawda ilá al-madrasah Intahat al-ʻuṭlatu ams . kānat ʻuṭlatan ṭawīlatan wa ḥulwah . laʻibtu fīhā kathīran . Sāfartu maʻa abī biṭṭāʼirah . walyawma saʼaʻūdu ilá al-madrasah wasaʼalqá al-aṣdiqāa .

✓ or x
Kānat alʻuṭlatu ṭawīlah
Lam alʻab ṭiwāla alʻuṭlah
Sāfartu bilqaṭār
Sāfartu maʻa abī khilāl ayyām almadrasah

Multiple choice
Intahat alʻuṭlatu (ams / ashshahr almaḍī / alʼusbūʻ almaḍī / alarbiʻāʼu almaḍi)
Sāfartu maʻa …(ʻummī /abī / akhī / sadīqī)
Sāfartu biwasiṭat… (aṭṭāʼirah / assayyārah / alqaṭār / assafīnah)
Saʼuqābilu …. (ahlī / aqāribī / ʻāʼilatī / aṣdiqāʼī)

Appendix 3 – Kappa Values

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Second Marker * First Marker	200	100.0%	0	.0%	200	100.0%

Second Marker * First Marker Crosstabulation

Count

		First Marker		
		0	1	Total
Second Marker	0	172	0	172
	1	1	27	28
Total		173	27	200

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Measure of Agreement	Kappa	.979	.021	13.847	.000
N of Valid Cases		200			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Appendix 4 – Reliabilities and Improvements (Hearing Sample)

Predictor Variables Analysis

Phonological Awareness

Reliability of the Initial Phoneme Deletion Task (IPD)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.480	9

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IPD_F1	.38	.541	.308	.405
IPD_F3	.44	.654	.359	.432
IPD_A1	.34	.429	.484	.294
IPD_F2	.40	.597	.254	.432
IPD_A2	.39	.620	.136	.479
IPD_A3	.35	.559	.179	.472
IPD_P1	.45	.732	.000	.487
IPD_P2	.44	.680	.215	.458
IPD_P3	.43	.728	-.080	.523

Reliability of the Final Phoneme Deletion Task (FPD)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.740	9

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
FPD_F1	.75	1.861	.376	.724
FPD_F2	.80	1.884	.494	.705
FPD_F3	.81	2.078	.250	.740
FPD_A1	.76	1.778	.512	.699
FPD_A2	.81	1.800	.695	.677
FPD_A3	.76	1.930	.319	.734
FPD_P1	.80	1.934	.419	.716
FPD_P2	.73	1.873	.317	.738
FPD_P3	.78	1.847	.457	.709

Reliability of the Phoneme Deletion Task (PD)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.671	18

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IPD_F1	1.25	3.152	.094	.678
IPD_F3	1.31	3.154	.363	.658
IPD_A1	1.21	2.828	.357	.645
IPD_F2	1.28	3.215	.061	.678
IPD_A2	1.26	3.183	.078	.678
IPD_A3	1.22	3.037	.173	.670
IPD_P1	1.33	3.311	.000	.674
IPD_P2	1.31	3.281	.043	.674
IPD_P3	1.30	3.327	-.071	.683
FPD_F1	1.20	2.820	.340	.648
FPD_F2	1.25	2.924	.349	.648
FPD_F3	1.26	2.981	.322	.652
FPD_A1	1.21	2.777	.408	.637
FPD_A2	1.26	2.778	.583	.622
FPD_A3	1.21	2.929	.258	.660
FPD_P1	1.25	2.899	.379	.644
FPD_P2	1.18	2.880	.247	.663
FPD_P3	1.22	2.708	.515	.623

Reliability of the Phoneme Deletion Task (PD) Improved

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.683	17

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IPD_F1	1.23	3.164	.098	.690
IPD_F3	1.29	3.169	.363	.671
IPD_A1	1.19	2.838	.362	.658
IPD_F2	1.25	3.228	.064	.690
IPD_A2	1.24	3.196	.082	.690
IPD_A3	1.20	3.048	.178	.683
IPD_P1	1.30	3.327	.000	.686
IPD_P2	1.29	3.296	.044	.686
FPD_F1	1.18	2.830	.345	.661
FPD_F2	1.23	2.936	.353	.661
FPD_F3	1.24	2.994	.325	.665
FPD_A1	1.19	2.787	.413	.651
FPD_A2	1.24	2.791	.585	.636
FPD_A3	1.19	2.939	.263	.672
FPD_P1	1.23	2.911	.382	.657
FPD_P2	1.15	2.889	.253	.676
FPD_P3	1.20	2.744	.491	.641

Reliability of the Phoneme Deletion Task (PD) Further Improved

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.690	16

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IPD_F1	1.18	3.083	.080	.700
IPD_F3	1.24	3.069	.372	.678
IPD_A1	1.14	2.778	.329	.671
IPD_A2	1.19	3.116	.061	.700
IPD_A3	1.15	2.965	.166	.693
IPD_P1	1.25	3.228	.000	.693
IPD_P2	1.24	3.196	.048	.694
FPD_F1	1.13	2.718	.363	.666
FPD_F2	1.18	2.830	.368	.667
FPD_F3	1.19	2.914	.306	.674
FPD_A1	1.14	2.677	.432	.656
FPD_A2	1.19	2.686	.604	.641
FPD_A3	1.14	2.854	.254	.682
FPD_P1	1.18	2.804	.398	.663
FPD_P2	1.10	2.775	.271	.681
FPD_P3	1.15	2.635	.511	.645

Reliability of the Phoneme Deletion Task (PD) Further Improved (15 items remaining)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.700	15

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IPD_F3	1.16	2.948	.319	.691
IPD_A1	1.06	2.692	.277	.690
IPD_A2	1.11	2.962	.074	.710
IPD_A3	1.08	2.830	.160	.705
IPD_P1	1.18	3.083	.000	.704
IPD_P2	1.16	3.075	-.010	.707
FPD_F1	1.05	2.580	.367	.677
FPD_F2	1.10	2.673	.391	.675
FPD_F3	1.11	2.785	.294	.686
FPD_A1	1.06	2.515	.463	.662
FPD_A2	1.11	2.531	.635	.647
FPD_A3	1.06	2.692	.277	.690
FPD_P1	1.10	2.673	.391	.675
FPD_P2	1.03	2.607	.299	.689
FPD_P3	1.08	2.501	.514	.656

Reliability of the Initial Syllable Addition Task (ISA)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.895	9

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
ISA_F1	2.36	7.297	.673	.883
ISA_F2	2.23	6.708	.780	.873
ISA_F3	2.14	6.829	.669	.882
ISA_A1	2.25	7.304	.526	.893
ISA_A2	2.25	7.000	.665	.882
ISA_A3	2.19	6.838	.691	.880
ISA_P1	2.20	6.871	.684	.881
ISA_P2	2.25	6.924	.701	.879
IAS_P3	2.34	7.518	.516	.893

Reliability of the Final Syllable Addition Task (FSA)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.878	9

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
FSA_F1	1.94	6.211	.556	.871
FSA_F2	2.06	6.414	.590	.868
FSA_F3	1.94	6.034	.643	.863
FSA_A1	1.98	6.303	.541	.872
FSA_A2	2.00	6.000	.724	.856
FSA_A3	1.98	6.151	.617	.866
FSA_P1	1.98	6.075	.656	.862
FSA_P2	2.04	6.315	.606	.867
FSA_P3	2.00	6.101	.670	.861

Morphological Awareness

Reliability of the Judgment of Morphological Relationships Task (JMR)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.786	32

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
JMR_Na1D	22.16	25.454	-.053	.793
JMR_Na2I	22.31	23.964	.265	.781
JMR_Na3R	22.15	24.939	.090	.787
JMR_Na4S	22.18	24.020	.327	.779
JMR_Nb1D	22.24	24.234	.231	.782
JMR_Nb2I	22.31	23.964	.265	.781
JMR_Nb3R	22.26	23.209	.466	.772
JMR_Nb4S	22.14	24.475	.233	.782
JMR_Nc1S	22.24	23.930	.305	.779
JMR_Nc2I	22.19	23.977	.328	.778
JMR_Nc3R	22.25	24.063	.266	.781
JMR_Nc4D	22.19	24.129	.287	.780
JMR_Nd1R	22.36	24.614	.113	.788
JMR_Nd2D	22.73	24.050	.259	.781
JMR_Nd3I	22.18	24.728	.136	.786
JMR_Nd4S	22.66	24.201	.206	.784
JMR_Va1D	22.34	24.277	.190	.785
JMR_Va2I	22.33	23.615	.340	.778
JMR_Va3R	22.23	23.949	.308	.779
JMR_Va4S	22.36	24.006	.243	.782
JMR_Vb1D	22.25	23.278	.458	.772
JMR_Vb2I	22.29	22.992	.502	.770
JMR_Vb3R	22.28	23.949	.282	.780
JMR_Vb4S	22.29	24.537	.144	.787
JMR_Vc1D	22.28	23.012	.505	.770
JMR_Vc2I	22.26	23.487	.398	.775
JMR_Vc3R	22.31	23.483	.374	.776
JMR_Vc4S	22.20	23.884	.342	.778
JMR_Vd1S	22.28	23.392	.414	.774
JMR_Vd2D	22.28	23.847	.306	.779
JMR_Vd3R	22.30	23.833	.299	.779
JMR_Vd4I	22.21	24.347	.216	.783

Reliability of the Pseudoword Production Task (PP)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.592	8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PP_V1	3.61	2.569	.251	.575
PP_V2	3.50	2.481	.353	.540
PP_N3	3.94	2.692	.235	.577
PP_N4	3.39	2.544	.398	.530
PP_N5	4.16	3.277	-.148	.624
PP_N6	3.54	2.505	.317	.552
PP_V7	3.65	2.408	.359	.537
PP_N8	3.53	2.379	.417	.518

Reliability of the Pseudoword Production Task (PP) - Improved

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.624	7

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PP_V1	3.59	2.600	.268	.610
PP_V2	3.47	2.506	.375	.574
PP_N3	3.91	2.739	.241	.615
PP_N4	3.36	2.614	.385	.574
PP_N6	3.51	2.557	.319	.592
PP_V7	3.62	2.465	.356	.580
PP_N8	3.50	2.430	.418	.559

Dialect Awareness

Reliability of the Word Choice Task (WCH)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.469	8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
WCH_V1	6.45	.681	.359	.355
WCH_V2	6.34	.885	.282	.420
WCH_V3	6.33	.855	.492	.378
WCH_V4	6.33	1.007	-.028	.497
WCH_N1	6.40	.825	.194	.443
WCH_N2	6.34	.859	.358	.398
WCH_N3	6.55	.732	.136	.508
WCH_N4	6.38	.896	.114	.473

Reliability of the Sentence Correction Task (SC)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.620	8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SC_F1	3.03	2.835	.410	.564
SC_F2	3.25	2.620	.435	.551
SC_F3	3.40	2.597	.457	.544
SC_F4	3.79	3.537	.018	.636
SC_A1	3.28	2.784	.320	.588
SC_A2	3.34	2.961	.208	.623
SC_A3	3.13	2.718	.414	.559
SC_A4	3.49	3.012	.206	.620

Reliability of the Sentence Correction Task (SC) - Parceled

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.637	16

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
WCH_V1	10.26	5.082	.205	.627
WCH_V2	10.15	5.370	.156	.633
WCH_V3	10.14	5.259	.361	.621
WCH_V4	10.14	5.588	-.093	.648
WCH_N1	10.21	5.157	.216	.626
WCH_N2	10.15	5.243	.302	.622
WCH_N3	10.36	5.019	.172	.635
WCH_N4	10.19	5.243	.190	.629
SC_F1	10.33	4.501	.500	.580
SC_F2	10.55	4.453	.400	.594
SC_F3	10.70	4.415	.424	.588
SC_F4	11.09	5.524	-.006	.643
SC_A1	10.58	4.653	.296	.615
SC_A2	10.64	4.816	.215	.630
SC_A3	10.42	4.577	.376	.599
SC_A4	10.79	4.954	.175	.636

Reliability of the Dialect Discrimination Task (DD)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.731	8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
DD_F1	4.74	4.019	.178	.742
DD_F2	5.05	3.744	.193	.754
DD_A1	5.14	3.209	.503	.686
DD_A2	4.94	3.173	.579	.670
DD_F3	4.79	3.562	.457	.699
DD_A3	4.89	3.190	.608	.665
DD_F4	4.85	3.623	.344	.719
DD_A4	4.90	3.256	.550	.677

First Outcome Variables Analysis

Reliability of the Reading Task (R)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.937	25

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
R_1	5.19	35.192	.450	.937
R_2	5.60	36.724	.454	.936
R_3	4.84	36.366	.350	.938
R_4	5.55	35.643	.627	.934
R_5	5.52	35.620	.577	.935
R_6	5.60	36.775	.437	.937
R_7	5.52	35.189	.685	.934
R_8	5.46	34.935	.636	.934
R_9	5.45	35.111	.583	.935
R_10	5.40	34.699	.619	.934
R_11	5.40	34.294	.701	.933
R_12	5.31	34.445	.612	.934
R_13	5.43	34.450	.695	.933
R_14	5.50	35.367	.593	.935
R_15	5.55	35.491	.669	.934
R_16	5.51	34.531	.820	.932
R_17	5.48	36.455	.320	.938
R_18	5.60	36.142	.657	.935
R_19	5.48	34.734	.699	.933
R_20	5.35	35.294	.472	.937
R_21	5.45	34.453	.725	.933
R_22	5.41	34.701	.630	.934
R_23	5.36	34.107	.706	.933
R_24	5.40	34.597	.640	.934
R_25	5.54	35.391	.663	.934

Reliability of the Spelling Task (S)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.903	25

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
W_1	4.19	23.268	.534	.899
W_2	4.71	25.271	.406	.902
W_3	4.64	25.095	.280	.903
W_4	4.69	25.104	.379	.902
W_5	4.75	26.089	.000	.904
W_6	4.73	25.569	.312	.903
W_7	4.51	23.924	.473	.900
W_8	4.69	24.825	.496	.900
W_9	4.55	24.554	.344	.903
W_10	4.39	23.531	.495	.900
W_11	4.53	23.012	.719	.894
W_12	4.50	23.722	.513	.899
W_13	4.61	23.810	.638	.896
W_14	4.34	22.606	.687	.894
W_15	4.50	23.443	.582	.897
W_16	4.70	24.947	.499	.900
W_17	4.49	23.114	.653	.895
W_18	4.59	23.714	.619	.897
W_19	4.64	24.082	.611	.897
W_20	4.61	25.278	.198	.905
W_21	4.64	24.158	.585	.898
W_22	4.48	22.885	.698	.894
W_23	4.51	24.202	.404	.902
W_24	4.46	23.163	.620	.896
W_25	4.58	24.146	.478	.900

Reliability of the Pseudoword Decoding Task (PSD)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.810	9

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
RP_1_1	2.04	4.695	.439	.801
RP_1_2	2.12	4.491	.534	.788
RP_1_3	2.30	4.542	.557	.784
RP_2_4	2.50	5.063	.473	.796
RP_2_5	2.25	4.747	.423	.803
RP_2_6	2.46	4.783	.592	.782
RP_3_7	2.47	4.835	.582	.784
RP_3_8	2.50	4.911	.584	.785
RP_3_9	2.35	4.762	.469	.796

Reliability of the Reading Comprehension Task (RC)

Case Processing Summary

		N	%
Cases	Valid	80	100.0
	Excluded[a]	0	.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.947	28

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
RC_1	4.66	36.530	.671	.945
RC_2	4.61	35.709	.753	.944
RC_3	4.49	35.772	.576	.946
RC_4	4.63	36.516	.581	.946
RC_5	4.65	36.003	.777	.944
RC_6	4.65	36.306	.695	.945
RC_7	4.68	37.311	.483	.947
RC_8	4.64	36.740	.550	.946
RC_9	4.50	35.671	.606	.946
RC_10	4.61	35.810	.728	.944
RC_11	4.55	36.301	.524	.947
RC_12	4.31	35.888	.489	.948
RC_13	4.13	36.693	.366	.949
RC_14	4.70	37.048	.662	.945
RC_15	4.58	35.513	.727	.944
RC_16	4.65	36.711	.586	.946
RC_17	4.25	36.266	.421	.949
RC_18	4.39	35.962	.491	.948
RC_19	4.70	37.327	.566	.946
RC_20	4.71	37.676	.500	.947
RC_MC_1	4.70	36.668	.794	.944
RC_MC_2	4.68	35.994	.878	.943
RC_MC_3	4.68	35.994	.878	.943
RC_MC_4	4.70	36.770	.758	.945
RC_TF_1	4.69	36.268	.855	.944
RC_TF_2	4.69	36.420	.806	.944
RC_TF_3	4.69	36.395	.814	.944
RC_TF_4	4.70	36.922	.706	.945

Second Outcome Variables Analysis

Reliability of the Reading Task (R2)

Case Processing Summary

		N	%
Cases	Valid	78	97.5
	Excluded[a]	2	2.5
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.946	25

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
R2_1	15.33	54.667	.559	.945
R2_2	15.42	54.741	.477	.946
R2_3	15.22	56.640	.339	.947
R2_4	15.46	52.356	.817	.942
R2_5	15.46	52.719	.762	.943
R2_6	15.83	54.400	.529	.945
R2_7	15.55	52.978	.686	.944
R2_8	15.67	53.550	.598	.945
R2_9	15.36	54.025	.639	.944
R2_10	15.28	55.374	.497	.946
R2_11	15.42	53.000	.745	.943
R2_12	15.31	54.865	.555	.945
R2_13	15.47	53.785	.595	.945
R2_14	15.55	53.290	.641	.944
R2_15	15.51	52.747	.732	.943
R2_16	15.62	52.941	.683	.944
R2_17	15.71	54.444	.477	.946
R2_18	15.49	53.552	.624	.944
R2_19	15.58	52.949	.685	.944
R2_20	15.40	54.606	.513	.946
R2_21	15.58	52.221	.791	.942
R2_22	15.45	53.056	.718	.943
R2_23	15.44	53.885	.600	.945
R2_24	15.38	53.409	.714	.943
R2_25	15.59	53.518	.602	.945

Reliability of the Spelling Task (S2)

Case Processing Summary

		N	%
Cases	Valid	78	97.5
	Excluded[a]	2	2.5
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.909	25

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
S2_1	10.88	38.129	.597	.904
S2_2	11.42	40.195	.180	.911
S2_3	11.41	40.011	.209	.911
S2_4	11.27	36.927	.701	.901
S2_5	11.65	41.424	-.047	.911
S2_6	11.62	40.889	.151	.910
S2_7	11.05	37.400	.623	.903
S2_8	11.21	37.412	.604	.903
S2_9	11.13	36.659	.734	.900
S2_10	10.92	37.994	.587	.904
S2_11	11.03	36.986	.706	.901
S2_12	11.28	38.413	.447	.907
S2_13	11.32	37.987	.534	.905
S2_14	11.10	38.145	.482	.906
S2_15	11.04	36.999	.698	.901
S2_16	11.49	39.448	.365	.908
S2_17	11.09	37.278	.633	.903
S2_18	11.10	38.431	.434	.907
S2_19	11.05	37.348	.632	.903
S2_20	10.95	39.062	.371	.908
S2_21	11.01	37.026	.706	.901
S2_22	11.23	37.634	.569	.904
S2_23	11.32	37.961	.539	.905
S2_24	11.19	38.131	.481	.906
S2_25	11.23	38.855	.364	.908

Reliability of the Pseudoword Decoding Task (PSD2)

Case Processing Summary

		N	%
Cases	Valid	78	97.5
	Excluded[a]	2	2.5
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.805	9

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PSD2_1	5.26	5.466	.426	.794
PSD2_2	5.22	5.393	.533	.784
PSD2_3	5.33	5.134	.530	.782
PSD2_4	5.67	5.030	.499	.786
PSD2_5	5.27	5.342	.482	.788
PSD2_6	5.44	5.366	.351	.806
PSD2_7	5.58	4.767	.621	.768
PSD2_8	5.45	4.796	.634	.767
PSD2_9	5.41	5.206	.440	.794

Reliability of the Reading Comprehension Task (RC2)

Case Processing Summary

		N	%
Cases	Valid	78	97.5
	Excluded[a]	2	2.5
	Total	80	100.0

Case Processing Summary

		N	%
Cases	Valid	78	97.5
	Excluded[a]	2	2.5
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.928	20

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
RC2_1	12.38	31.642	.660	.924
RC2_2	12.24	32.291	.627	.924
RC2_3	12.24	32.317	.622	.924
RC2_4	12.26	32.115	.652	.924
RC2_5	12.28	32.023	.647	.924
RC2_6	12.40	31.256	.730	.922
RC2_7	12.50	32.149	.542	.926
RC2_8	12.54	32.771	.429	.929
RC2_9	12.32	31.961	.631	.924
RC2_10	12.27	32.069	.649	.924
RC2_11	12.53	32.460	.485	.927
RC2_12	12.12	33.714	.476	.927
RC2_13	12.19	33.196	.483	.927
RC2_14	12.54	31.473	.668	.923
RC2_15	12.40	32.372	.517	.927
RC2_16	12.44	31.730	.628	.924
RC2_17	12.19	32.391	.672	.924
RC2_18	12.24	32.239	.639	.924
RC2_19	12.63	31.639	.656	.924
RC2_20	12.54	31.265	.707	.923

Appendix 5 – General Descriptive Statistics

Age & Cognitive Ability Variables

Descriptive Statistics

	N	Mean		Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Statistic	Std. Error	Statistic	Std. Error
Age	80	73.25	.437	3.906	-.210	.269	-1.119	.532
Peabody	80	19.59	1.086	9.709	1.449	.269	3.033	.532
Raven	80	15.16	.419	3.747	.361	.269	.212	.532

Cognitive Ability: Raven's One-Sample T-test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Raven	80	15.16	3.747	.419

One-Sample Test

	Test Value = 17.50					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Raven	-5.580	79	.000	-2.338	-3.17	-1.50

Predictor Variables

Descriptive Statistics

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
PD	80	1.1750	1.75582	2.158	.269	4.768	.532
ISA	80	2.525	2.96381	0.978	0.269	-0.462	0.532
FSA	80	2.2375	2.77532	1.125	0.269	0.091	0.532
JMR	80	23.0000	5.03909	-.140	.269	-.759	.532
JMR_Corrected	80	.4375	.31494	-.140	.269	-.759	.532
PP	80	4.1625	1.81026	-.275	.269	-.719	.532
WCH	80	7.3000	1.01133	-2.371	.269	8.716	.532
SC	80	3.8125	1.88997	-.311	.269	-.835	.532
SC_Parceled	80	11.1125	2.35460	-.502	.269	-.197	.532
DD	80	5.6125	2.08972	-.466	.269	-.879	.532
DD_Corrected	80	.4031	.52243	-.466	.269	-.879	.532

First Outcome Variables

Descriptive Statistics

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
R	80	5.3625	5.84666	1.504	.269	1.672	.532
S	80	4.7500	5.10770	1.228	.269	.704	.532
PSD	80	2.5250	2.36523	.936	.269	.277	.532
RC	80	4.4875	5.95977	2.353	.269	5.446	.532

Second Outcome Variables

Descriptive Statistics

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
R2	78	16.1282	7.62831	-.634	.272	-.788	.538
S2	78	11.6667	6.43179	-.228	.272	-1.002	.538
PSD2	78	6.0769	2.52658	-.624	.272	-.363	.538
RC2	78	18.3590	8.47452	-.782	.272	-.474	.538

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	R - R2	-10.78205	6.21403	.70360	-12.18310	-9.38100	-15.324	77	.000
Pair 2	S - S2	-6.92308	5.05751	.57265	-8.06337	-5.78278	-12.090	77	.000
Pair 3	PSD - PSD2	-3.55128	2.28858	.25913	-4.06728	-3.03529	-13.705	77	.000
Pair 4	RC - RC2	-13.80769	7.25609	.82159	-15.44369	-12.17170	-16.806	77	.000

Paired Sample Test for First and Second Outcome Variable Difference

Appendix 6 – Results of Skewness Analysis

The winsrorised distribution of the variables in the study was checked against the raw data, the square rooted data, and the transformed variables which were already winsorised, in terms of their skewness. The following are the key findings:

1. When considering the significance of the skewness of raw data, 6 out of 10 variables were significantly skewed at the .001 level.
2. After applying the winsorization technique to the data, the skewness of the variables has decreased but the significance was nevertheless unchanged.
3. On the other hand, when the variables were transformed using the square root method, 2 variables of which the significance was at the .001 level has decreased to the .01 level. 4 other variables, which were again significantly skewed at the .001 level, have became normally distributed with no significant skewness. While on the negative side, 2 variables which were previously normal became significantly skewed at the .01 level, and one became significant at the .001 level.
4. When the square root transformation was applied to the already winsorised data, only 3 out of the 10 variables remained skewed, one at the .001 significance level and 2 at the .01 level. However, these skewed variables were normally distributed with the raw and winsorised data sets.

In terms of the kurtosis observed in the variables under test, 3 out of 10 variables showed significant kurtosis values, in both the positive and negative directions. When the winsorised data is checked, all the kurtosis values became insignificant.

With the square root transformation applied on its own, the significant kurtosis values of some variables became insignificant, but two other variables which were normal showed significant kurtosis after being transformed, one at the .05 level and one at .001 level. These results are similar when the descriptive statistics are presented for the data that is both winsorised and transformed, except that only two of the three significant kurtosis values became insignificant, the third remain significant at the .01 level.

Winsorized Data Statistics

Descriptive Statistics

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Age_win	80	73.2500	3.90553	-.210	.269	-1.119	.532
Peabody_win	80	19.2875	8.73404	.846	.269	.155	.532
Raven_win	80	15.1125	3.62129	.169	.269	-.275	.532

PD_win	80	.9906	1.22697	1.117	.269	.090	.532
ISA_win	80	2.5250	2.96381	.978	.269	-.462	.532
FSA_win	80	2.2250	2.74485	1.094	.269	-.025	.532
JMR_win	80	23.0000	5.03909	-.140	.269	-.759	.532
PP_win	80	4.1625	1.81026	-.275	.269	-.719	.532
SC_win	80	11.1125	2.35460	-.502	.269	-.197	.532
DD_win	80	5.6125	2.08972	-.466	.269	-.879	.532
R_win	80	5.1188	5.20862	1.177	.269	.401	.532
S_win	80	4.6969	4.96295	1.123	.269	.264	.532
PSD_win	80	2.5250	2.36523	.936	.269	.277	.532
RC_win	80	3.7063	3.67419	1.076	.269	.188	.532
Valid N (listwise)	80						

Appendix 7 – Pearson's Correlations Statistics

Age & Cognitive Ability Variables

Correlations

		Age_win	Peabody_win	Raven_win
Age_win	Pearson Correlation	1	.052	.212
	Sig. (2-tailed)		.649	.059
	N	80	80	80
Peabody_win	Pearson Correlation	.052	1	.181
	Sig. (2-tailed)	.649		.109
	N	80	80	80
Raven_win	Pearson Correlation	.212	.181	1
	Sig. (2-tailed)	.059	.109	
	N	80	80	80

Construct Validity

Phonological Awareness Tasks

Correlations

		PD_win	ISA_win	FSA_win
PD_win	Pearson Correlation	1	.312**	.260*
	Sig. (2-tailed)		.005	.020
	N	80	80	80
ISA_win	Pearson Correlation	.312**	1	.788**
	Sig. (2-tailed)	.005		.000
	N	80	80	80

FSA_win	Pearson Correlation	.260*	.788**	1
	Sig. (2-tailed)	020	000	
	N	80	80	80

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

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

Morphological Awareness Tasks

Correlations

		JMR_win	PP_win
JMR_win	Pearson	1	150
	Sig. (2-tailed)		185
	N	80	80
PP_win	Pearson	.150	1
	Sig. (2-tailed)	.185	
	N	80	80

Dialect Awareness Tasks

Correlations

		SC_win	DD_win
SC_win	Pearson	1	415**
	Sig. (2-tailed)		000
	N	80	80
DD_win	Pearson	.415**	1
	Sig. (2-tailed)	.000	
	N	80	80

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

Predictor Variables Intra-correlations

Correlations

		Age	Peabody	Raven	FAC_SA	FAC_PD	JMR	PP	FAC_Dialect
Age	Pearson Correlation	1	.087	.218	.096	.109	.151	.068	.072
	Sig. (2-tailed)		.444	.052	.399	.336	.183	.551	.524
	N	80	80	80	80	80	80	80	80
Peabody	Pearson Correlation	.087	1	.163	.191	-.010	.024	.365**	.336**
	Sig. (2-tailed)	.444		.149	.090	.930	.832	.001	.002
	N	80	80	80	80	80	80	80	80

Raven	Pearson Correlation	.218	.163	1	.294**	.098	.172	.108	.124
	Sig. (2-tailed)	.052	.149		.008	.389	.128	.340	.275
	N	80	80	80	80	80	80	80	80
FAC_SA	Pearson Correlation	.096	.191	.294**	1	.000	.393**	.195	.345**
	Sig. (2-tailed)	.399	.090	.008		1.000	.000	.083	.002
	N	80	80	80	80	80	80	80	80
FAC_PD	Pearson Correlation	.109	-.010	.098	.000	1	-.217	-.094	.097
	Sig. (2-tailed)	.336	.930	.389	1.000		.054	.409	.390
	N	80	80	80	80	80	80	80	80
JMR	Pearson Correlation	.151	.024	.172	.393**	-.217	1	.150	.141
	Sig. (2-tailed)	.183	.832	.128	.000	.054		.185	.213
	N	80	80	80	80	80	80	80	80
PP	Pearson Correlation	.068	.365**	.108	.195	-.094	.150	1	.577**
	Sig. (2-tailed)	.551	.001	.340	.083	.409	.185		.000
	N	80	80	80	80	80	80	80	80
FAC_Dialect	Pearson Correlation	.072	.336**	.124	.345**	.097	.141	.577**	1
	Sig. (2-tailed)	.524	.002	.275	.002	.390	.213	.000	
	N	80	80	80	80	80	80	80	80

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

Concurrent Validity – with the factors obtained in the next appendix

Predictor Tasks Against First Grade Outcome Tasks

Correlations

		R_win	S_win	PSD_win	RC_win
FAC_SA_Win	Pearson Correlation	.326**	.391**	.355**	.403**
	Sig. (2-tailed)	.003	.000	.001	.000
	N	80	80	80	80
FAC_PD_Win	Pearson Correlation	.055	-.070	.006	-.068
	Sig. (2-tailed)	.628	.537	.961	.551
	N	80	80	80	80

JMR_win	Pearson Correlation	.071	.252*	.045	.195
	Sig. (2-tailed)	.531	.024	.694	.083
	N	80	80	80	80
PP_win	Pearson Correlation	.045	.139	.069	.099
	Sig. (2-tailed)	.693	.218	.546	.383
	N	80	80	80	80
FAC_Dialect_ Win	Pearson Correlation	.131	.217	.181	.248*
	Sig. (2-tailed)	.248	.053	.108	.027
	N	80	80	80	80

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

Predictor Tasks Against First Grade Outcome Tasks

Correlations

		R2_Win	S2_Win	PSD2_Win	RC2_Win
FAC_SA_Win	Pearson Correlation	.457**	.410**	.334**	.365**
	Sig. (2-tailed)	.000	.000	.003	.001
	N	78	78	78	78
FAC_PD_Win	Pearson Correlation	-.097	-.133	-.224*	-.172
	Sig. (2-tailed)	.397	.245	.049	.132
	N	78	78	78	78
JMR_win	Pearson Correlation	.332**	.353**	.345**	.317**
	Sig. (2-tailed)	.003	.002	.002	.005
	N	78	78	78	78
PP_win	Pearson Correlation	.087	.138	.048	.109
	Sig. (2-tailed)	.446	.228	.674	.340
	N	78	78	78	78
FAC_Dialect_ Win	Pearson Correlation	.333**	.276*	.253*	.305**
	Sig. (2-tailed)	.003	.015	.025	.007
	N	78	78	78	78

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

Appendix 8 – Factor Analysis

Phonological Awareness Factor (First)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.540
Bartlett's Test of Sphericity	Approx. Chi-Square	83.646
	df	3
	Sig.	.000

Communalities

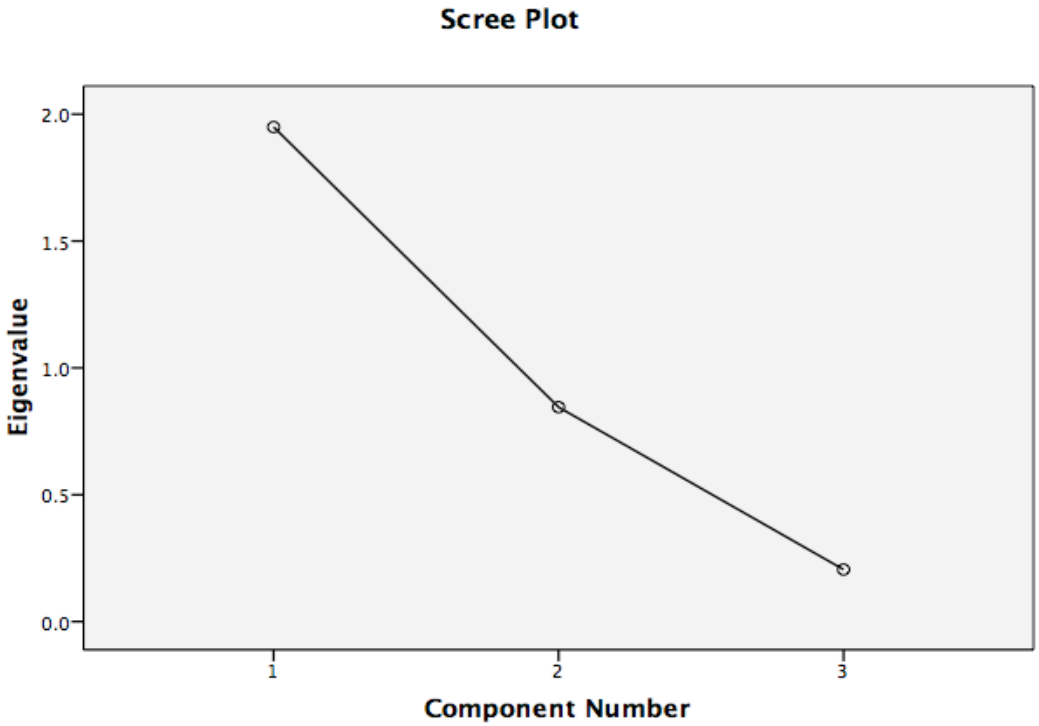
	Initial	Extraction
PD	1.000	.284
ISA	1.000	.860
FSA	1.000	.805

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.949	64.979	64.979	1.949	64.979	64.979
2	.845	28.179	93.158			
3	.205	6.842	100.000			

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component
	1
PD	.533
ISA	.927
FSA	.897

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Phonological Awareness Factor (Second)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.540
Bartlett's Test of Sphericity	Approx. Chi-Square	83.646
	df	3
	Sig.	.000

Communalities

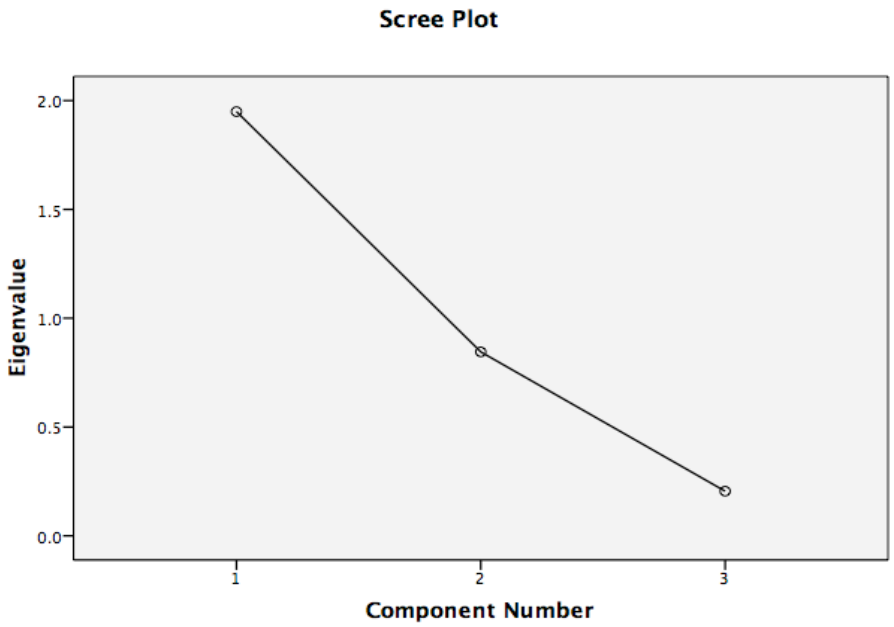
	Initial	Extraction
ISA	1.000	.893
FSA	1.000	.903
PD	1.000	.998

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.949	64.979	64.979	1.949	64.979	64.979
2	.845	28.179	93.158	.845	28.179	93.158
3	.205	6.842	100.000			

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component	
	1	2
ISA	.927	-.183
FSA	.897	-.313
PD	.533	.845

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

Dialect Awareness Factor

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	14.683
	df	1
	Sig.	.000

Communalities

	Initial	Extraction
SC	1.000	.708
DD	1.000	.708

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.415	70.772	70.772	1.415	70.772	70.772
2	.585	29.228	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
SC	.841
DD	.841

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Appendix 9 – Regression Analysis for the First Research Hypothesis

First Phase Analysis

Predictors of the Reading Measure (R)

PhonologyModel Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.135[a]	.018	.006	5.830	.018	1.439	1	78	.234	
2	.282[b]	.079	.043	5.719	.061	2.531	2	76	.086	
3	.419[c]	.175	.119	5.486	.096	4.295	2	74	.017	1.783

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: R

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.903	1	48.903	1.439	.234[a]
	Residual	2651.585	78	33.995		
	Total	2700.488	79			
2	Regression	214.508	3	71.503	2.186	.097[b]
	Residual	2485.980	76	32.710		
	Total	2700.488	79			
3	Regression	473.067	5	94.613	3.143	.013[c]
	Residual	2227.420	74	30.100		
	Total	2700.488	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: R

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-9.394	12.320		-.762	.448		
	Age	.201	.168	.135	1.199	.234	1.000	1.000
2	(Constant)	-9.726	12.088		-.805	.424		
	Age	.125	.169	.084	.741	.461	.950	1.053
	Peabody	.098	.067	.163	1.458	.149	.971	1.030
	Raven	.263	.178	.169	1.480	.143	.932	1.073
3	(Constant)	-4.892	11.730		-.417	.678		
	Age	.095	.163	.063	.582	.562	.941	1.063
	Peabody	.075	.065	.124	1.141	.257	.948	1.055
	Raven	.122	.177	.078	.688	.494	.862	1.160
	FAC_SA	1.747	.654	.299	2.672	.009	.891	1.122
	FAC_PD	.799	.623	.137	1.282	.204	.981	1.020

a. Dependent Variable: R

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.135[a]	.018	.006	5.830	.018	1.439	1	78	.234	
2	.282[b]	.079	.043	5.719	.061	2.531	2	76	.086	
3	.291[c]	.085	.023	5.779	.006	.224	2	74	.800	1.667

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: R

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.903	1	48.903	1.439	.234[a]
	Residual	2651.585	78	33.995		
	Total	2700.488	79			
2	Regression	214.508	3	71.503	2.186	.097[b]
	Residual	2485.980	76	32.710		
	Total	2700.488	79			
3	Regression	229.442	5	45.888	1.374	.244[c]
	Residual	2471.045	74	33.393		
	Total	2700.488	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: R

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-9.394	12.320		-.762	.448		
	Age	.201	.168	.135	1.199	.234	1.000	1.000
2	(Constant)	-9.726	12.088		-.805	.424		
	Age	.125	.169	.084	.741	.461	.950	1.053
	Peabody	.098	.067	.163	1.458	.149	.971	1.030
	Raven	.263	.178	.169	1.480	.143	.932	1.073
3	(Constant)	-9.954	12.278		-.811	.420		
	Age	.118	.172	.079	.686	.495	.936	1.068
	Peabody	.112	.073	.186	1.541	.128	.847	1.180
	Raven	.255	.182	.163	1.403	.165	.912	1.097
	JMR	.064	.133	.055	.479	.633	.938	1.067
	PP	-.207	.390	-.064	-.530	.598	.846	1.182

a. Dependent Variable: R

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.135[a]	.018	.006	5.830	.018	1.439	1	78	.234	
2	.282[b]	.079	.043	5.719	.061	2.531	2	76	.086	
3	.286[c]	.082	.033	5.750	.002	.198	1	75	.658	1.669

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: R

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.903	1	48.903	1.439	.234[a]
	Residual	2651.585	78	33.995		
	Total	2700.488	79			
2	Regression	214.508	3	71.503	2.186	.097[b]
	Residual	2485.980	76	32.710		
	Total	2700.488	79			
3	Regression	221.055	4	55.264	1.672	.165[c]
	Residual	2479.433	75	33.059		
	Total	2700.488	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: R

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-9.394	12.320		-.762	.448		
	Age	.201	.168	.135	1.199	.234	1.000	1.000
2	(Constant)	-9.726	12.088		-.805	.424		
	Age	.125	.169	.084	.741	.461	.950	1.053
	Peabody	.098	.067	.163	1.458	.149	.971	1.030
	Raven	.263	.178	.169	1.480	.143	.932	1.073
3	(Constant)	-9.273	12.195		-.760	.449		
	Age	.123	.170	.082	.723	.472	.949	1.054
	Peabody	.088	.071	.146	1.231	.222	.871	1.148
	Raven	.258	.179	.165	1.439	.154	.928	1.078
	FAC_Dialect	.307	.689	.052	.445	.658	.881	1.134

a. Dependent Variable: R

Predictors of the Spelling Measure (S)

Phonology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.097[a]	.009	-.003	5.116	.009	.742	1	78	.392	
2	.293[b]	.086	.050	4.978	.077	3.186	2	76	.047	
3	.444[c]	.197	.143	4.728	.111	5.132	2	74	.008	1.918

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: S

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.427	1	19.427	.742	.392[a]
	Residual	2041.573	78	26.174		
	Total	2061.000	79			
2	Regression	177.355	3	59.118	2.385	.076[b]
	Residual	1883.645	76	24.785		
	Total	2061.000	79			
3	Regression	406.794	5	81.359	3.640	.005[c]
	Residual	1654.206	74	22.354		
	Total	2061.000	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: S

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.551	10.811		-.421	.675		
	Age	.127	.147	.097	.862	.392	1.000	1.000
2	(Constant)	-4.993	10.522		-.474	.637		
	Age	.066	.147	.050	.449	.655	.950	1.053
	Peabody	.124	.059	.235	2.110	.038	.971	1.030
	Raven	.164	.155	.120	1.059	.293	.932	1.073
3	(Constant)	-1.975	10.109		-.195	.846		
	Age	.058	.140	.044	.412	.682	.941	1.063
	Peabody	.096	.056	.183	1.710	.091	.948	1.055
	Raven	.040	.153	.029	.262	.794	.862	1.160
	FAC_SA	1.794	.564	.351	3.184	.002	.891	1.122
	FAC_PD	-.139	.537	-.027	-.259	.797	.981	1.020

a. Dependent Variable: S

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.097[a]	.009	-.003	5.116	.009	.742	1	78	.392	
2	.293[b]	.086	.050	4.978	.077	3.186	2	76	.047	
3	.372[c]	.138	.080	4.899	.052	2.243	2	74	.113	1.829

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: S

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.427	1	19.427	.742	.392[a]
	Residual	2041.573	78	26.174		
	Total	2061.000	79			
2	Regression	177.355	3	59.118	2.385	.076[b]
	Residual	1883.645	76	24.785		
	Total	2061.000	79			
3	Regression	285.019	5	57.004	2.375	.047[c]
	Residual	1775.981	74	24.000		
	Total	2061.000	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: S

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.551	10.811		-.421	.675		
	Age	.127	.147	.097	.862	.392	1.000	1.000
2	(Constant)	-4.993	10.522		-.474	.637		
	Age	.066	.147	.050	.449	.655	.950	1.053
	Peabody	.124	.059	.235	2.110	.038	.971	1.030
	Raven	.164	.155	.120	1.059	.293	.932	1.073
3	(Constant)	-7.121	10.409		-.684	.496		
	Age	.029	.146	.023	.202	.841	.936	1.068
	Peabody	.122	.062	.233	1.986	.051	.847	1.180
	Raven	.117	.154	.086	.758	.451	.912	1.097
	JMR	.235	.113	.232	2.079	.041	.938	1.067
	PP	.035	.331	.012	.105	.917	.846	1.182

a. Dependent Variable: S

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.097[a]	.009	-.003	5.116	.009	.742	1	78	.392	
2	.293[b]	.086	.050	4.978	.077	3.186	2	76	.047	
3	.319[c]	.102	.054	4.968	.016	1.328	1	75	.253	1.800

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: S

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.427	1	19.427	.742	.392[a]
	Residual	2041.573	78	26.174		
	Total	2061.000	79			
2	Regression	177.355	3	59.118	2.385	.076[b]
	Residual	1883.645	76	24.785		
	Total	2061.000	79			
3	Regression	210.131	4	52.533	2.129	.086[c]
	Residual	1850.869	75	24.678		
	Total	2061.000	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: S

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.551	10.811		-.421	.675		
	Age	.127	.147	.097	.862	.392	1.000	1.000
2	(Constant)	-4.993	10.522		-.474	.637		
	Age	.066	.147	.050	.449	.655	.950	1.053
	Peabody	.124	.059	.235	2.110	.038	.971	1.030
	Raven	.164	.155	.120	1.059	.293	.932	1.073
3	(Constant)	-3.978	10.537		-.378	.707		
	Age	.061	.147	.046	.413	.681	.949	1.054
	Peabody	.101	.062	.191	1.633	.107	.871	1.148
	Raven	.152	.155	.112	.983	.329	.928	1.078
	FAC_Dialect	.686	.595	.134	1.152	.253	.881	1.134

a. Dependent Variable: S

Predictors of the Pseudoword Decoding Measure (PSD)

Phonology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.043[a]	.002	-.011	2.378	.002	.146	1	78	.704	
2	.233[b]	.054	.017	2.345	.052	2.105	2	76	.129	
3	.400[c]	.160	.103	2.240	.106	4.653	2	74	.012	1.746

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: PSD

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.823	1	.823	.146	.704[a]
	Residual	441.127	78	5.655		
	Total	441.950	79			
2	Regression	23.976	3	7.992	1.453	.234[b]
	Residual	417.974	76	5.500		
	Total	441.950	79			
3	Regression	70.671	5	14.134	2.817	.022[c]
	Residual	371.279	74	5.017		
	Total	441.950	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: PSD

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.610	5.025		.121	.904		
	Age	.026	.069	.043	.382	.704	1.000	1.000
2	(Constant)	.416	4.957		.084	.933		
	Age	.008	.069	.013	.113	.910	.950	1.053
	Peabody	.053	.028	.217	1.913	.060	.971	1.030
	Raven	.033	.073	.052	.452	.653	.932	1.073
3	(Constant)	2.276	4.789		.475	.636		
	Age	-.002	.067	-.003	-.030	.976	.941	1.063
	Peabody	.042	.027	.170	1.558	.124	.948	1.055
	Raven	-.028	.072	-.044	-.380	.705	.862	1.160
	FAC_SA	.793	.267	.335	2.972	.004	.891	1.122
	FAC_PD	.198	.254	.084	.776	.440	.981	1.020

a. Dependent Variable: PSD

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.043[a]	.002	-.011	2.378	.002	.146	1	78	.704	
2	.233[b]	.054	.017	2.345	.052	2.105	2	76	.129	
3	.236[c]	.056	-.008	2.375	.001	.053	2	74	.948	1.626

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: PSD

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.823	1	.823	.146	.704[a]
	Residual	441.127	78	5.655		
	Total	441.950	79			
2	Regression	23.976	3	7.992	1.453	.234[b]
	Residual	417.974	76	5.500		
	Total	441.950	79			
3	Regression	24.577	5	4.915	.871	.504[c]
	Residual	417.373	74	5.640		
	Total	441.950	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: PSD

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.610	5.025		.121	.904		
	Age	.026	.069	.043	.382	.704	1.000	1.000
2	(Constant)	.416	4.957		.084	.933		
	Age	.008	.069	.013	.113	.910	.950	1.053
	Peabody	.053	.028	.217	1.913	.060	.971	1.030
	Raven	.033	.073	.052	.452	.653	.932	1.073
3	(Constant)	.331	5.046		.066	.948		
	Age	.006	.071	.010	.083	.934	.936	1.068
	Peabody	.055	.030	.226	1.838	.070	.847	1.180
	Raven	.031	.075	.048	.409	.684	.912	1.097
	JMR	.016	.055	.033	.284	.777	.938	1.067
	PP	-.032	.160	-.025	-.200	.842	.846	1.182

a. Dependent Variable: PSD

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.043[a]	.002	-.011	2.378	.002	.146	1	78	.704	
2	.233[b]	.054	.017	2.345	.052	2.105	2	76	.129	
3	.256[c]	.066	.016	2.346	.012	.926	1	75	.339	1.624

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: PSD

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.823	1	.823	.146	.704[a]
	Residual	441.127	78	5.655		
	Total	441.950	79			
2	Regression	23.976	3	7.992	1.453	.234[b]
	Residual	417.974	76	5.500		
	Total	441.950	79			
3	Regression	29.074	4	7.268	1.320	.270[c]
	Residual	412.876	75	5.505		
	Total	441.950	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: PSD

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.610	5.025		.121	.904		
	Age	.026	.069	.043	.382	.704	1.000	1.000
2	(Constant)	.416	4.957		.084	.933		
	Age	.008	.069	.013	.113	.910	.950	1.053
	Peabody	.053	.028	.217	1.913	.060	.971	1.030
	Raven	.033	.073	.052	.452	.653	.932	1.073
3	(Constant)	.816	4.976		.164	.870		
	Age	.006	.069	.010	.083	.934	.949	1.054
	Peabody	.044	.029	.180	1.502	.137	.871	1.148
	Raven	.028	.073	.045	.387	.700	.928	1.078
	FAC_Dialect	.271	.281	.114	.962	.339	.881	1.134

a. Dependent Variable: PSD

Predictors of the Reading Comprehension Measure (RC)

Phonology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.225[a]	.051	.039	5.844	.051	4.170	1	78	.045	
2	.325[b]	.106	.070	5.747	.055	2.330	2	76	.104	
3	.477[c]	.227	.175	5.413	.122	5.820	2	74	.004	1.936

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: RC

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	142.409	1	142.409	4.170	.045[a]
	Residual	2663.578	78	34.148		
	Total	2805.987	79			
2	Regression	296.284	3	98.761	2.991	.036[b]
	Residual	2509.704	76	33.022		
	Total	2805.987	79			
3	Regression	637.401	5	127.480	4.350	.002[c]
	Residual	2168.586	74	29.305		
	Total	2805.987	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: RC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-20.694	12.348		-1.676	.098		
	Age	.344	.168	.225	2.042	.045	1.000	1.000
2	(Constant)	-21.068	12.146		-1.735	.087		
	Age	.275	.170	.180	1.621	.109	.950	1.053
	Peabody	.107	.068	.175	1.588	.116	.971	1.030
	Raven	.217	.179	.136	1.212	.229	.932	1.073
3	(Constant)	-16.769	11.574		-1.449	.152		
	Age	.258	.161	.169	1.606	.113	.941	1.063
	Peabody	.075	.064	.122	1.161	.249	.948	1.055
	Raven	.058	.175	.037	.332	.741	.862	1.160
	FAC_SA	2.200	.645	.369	3.410	.001	.891	1.122
	FAC_PD	.124	.615	.021	.202	.840	.981	1.020

a. Dependent Variable: RC

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.225[a]	.051	.039	5.844	.051	4.170	1	78	.045	
2	.325[b]	.106	.070	5.747	.055	2.330	2	76	.104	
3	.358[c]	.128	.069	5.750	.022	.951	2	74	.391	1.905

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: RC

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	142.409	1	142.409	4.170	.045[a]
	Residual	2663.578	78	34.148		
	Total	2805.987	79			
2	Regression	296.284	3	98.761	2.991	.036[b]
	Residual	2509.704	76	33.022		
	Total	2805.987	79			
3	Regression	359.153	5	71.831	2.172	.066[c]
	Residual	2446.835	74	33.065		
	Total	2805.987	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: RC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-20.694	12.348		-1.676	.098		
	Age	.344	.168	.225	2.042	.045	1.000	1.000
2	(Constant)	-21.068	12.146		-1.735	.087		
	Age	.275	.170	.180	1.621	.109	.950	1.053
	Peabody	.107	.068	.175	1.588	.116	.971	1.030
	Raven	.217	.179	.136	1.212	.229	.932	1.073
3	(Constant)	-22.440	12.218		-1.837	.070		
	Age	.249	.171	.163	1.456	.150	.936	1.068
	Peabody	.118	.072	.192	1.625	.108	.847	1.180
	Raven	.184	.181	.115	1.016	.313	.912	1.097
	JMR	.181	.133	.153	1.368	.175	.938	1.067
	PP	-.141	.388	-.043	-.363	.717	.846	1.182

a. Dependent Variable: RC

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.225[a]	.051	.039	5.844	.051	4.170	1	78	.045	
2	.325[b]	.106	.070	5.747	.055	2.330	2	76	.104	
3	.346[c]	.120	.073	5.738	.014	1.222	1	75	.272	1.877

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: RC

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	142.409	1	142.409	4.170	.045[a]
	Residual	2663.578	78	34.148		
	Total	2805.987	79			
2	Regression	296.284	3	98.761	2.991	.036[b]
	Residual	2509.704	76	33.022		
	Total	2805.987	79			
3	Regression	336.531	4	84.133	2.555	.046[c]
	Residual	2469.456	75	32.926		
	Total	2805.987	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: RC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-20.694	12.348		-1.676	.098		
	Age	.344	.168	.225	2.042	.045	1.000	1.000
2	(Constant)	-21.068	12.146		-1.735	.087		
	Age	.275	.170	.180	1.621	.109	.950	1.053
	Peabody	.107	.068	.175	1.588	.116	.971	1.030
	Raven	.217	.179	.136	1.212	.229	.932	1.073
3	(Constant)	-19.943	12.171		-1.639	.105		
	Age	.269	.170	.177	1.588	.117	.949	1.054
	Peabody	.082	.071	.134	1.152	.253	.871	1.148
	Raven	.204	.179	.128	1.138	.259	.928	1.078
	FAC_Dialect	.760	.688	.128	1.106	.272	.881	1.134

a. Dependent Variable: RC

Second Phase Analysis

Predictors of the Reading Measure (R2)

Phonology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.147[a]	.022	.009	7.59502	.022	1.676	1	76	.199	
2	.359[b]	.129	.094	7.26180	.108	4.567	2	74	.013	
3	.521[c]	.271	.221	6.73402	.142	7.027	2	72	.002	1.528

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: R2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.707	1	96.707	1.676	.199[a]
	Residual	4384.011	76	57.684		
	Total	4480.718	77			
2	Regression	578.424	3	192.808	3.656	.016[b]
	Residual	3902.294	74	52.734		
	Total	4480.718	77			
3	Regression	1215.736	5	243.147	5.362	.000[c]
	Residual	3264.982	72	45.347		
	Total	4480.718	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: R2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-4.980	16.325		-.305	.761		
	Age	.288	.223	.147	1.295	.199	1.000	1.000
2	(Constant)	-4.099	15.624		-.262	.794		
	Age	.158	.221	.080	.714	.477	.929	1.077
	Peabody	.222	.086	.284	2.583	.012	.973	1.028
	Raven	.284	.231	.139	1.232	.222	.919	1.088
3	(Constant)	.553	14.655		.038	.970		
	Age	.151	.206	.077	.731	.467	.919	1.088
	Peabody	.177	.081	.226	2.194	.031	.951	1.052
	Raven	.067	.223	.033	.301	.765	.849	1.177
	FAC_SA	3.017	.809	.398	3.732	.000	.890	1.123
	FAC_PD	-.195	.766	-.026	-.255	.800	.980	1.021

a. Dependent Variable: R2

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.147[a]	.022	.009	7.59502	.022	1.676	1	76	.199	
2	.359[b]	.129	.094	7.26180	.108	4.567	2	74	.013	
3	.467[c]	.219	.164	6.97371	.089	4.120	2	72	.020	1.633

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: R2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.707	1	96.707	1.676	.199[a]
	Residual	4384.011	76	57.684		
	Total	4480.718	77			
2	Regression	578.424	3	192.808	3.656	.016[b]
	Residual	3902.294	74	52.734		
	Total	4480.718	77			
3	Regression	979.168	5	195.834	4.027	.003[c]
	Residual	3501.550	72	48.633		
	Total	4480.718	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: R2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.980	16.325		-.305	.761		
	Age	.288	.223	.147	1.295	.199	1.000	1.000
2	(Constant)	-4.099	15.624		-.262	.794		
	Age	.158	.221	.080	.714	.477	.929	1.077
	Peabody	.222	.086	.284	2.583	.012	.973	1.028
	Raven	.284	.231	.139	1.232	.222	.919	1.088
3	(Constant)	-9.638	15.201		-.634	.528		
	Age	.122	.212	.062	.575	.567	.926	1.080
	Peabody	.247	.089	.316	2.779	.007	.838	1.194
	Raven	.166	.227	.082	.734	.465	.879	1.138
	JMR	.477	.168	.306	2.835	.006	.931	1.074
	PP	-.382	.477	-.091	-.800	.426	.835	1.197

a. Dependent Variable: R2

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.147[a]	.022	.009	7.59502	.022	1.676	1	76	.199	
2	.359[b]	.129	.094	7.26180	.108	4.567	2	74	.013	
3	.426[c]	.182	.137	7.08776	.052	4.679	1	73	.034	1.613

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: R2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.707	1	96.707	1.676	.199[a]
	Residual	4384.011	76	57.684		
	Total	4480.718	77			
2	Regression	578.424	3	192.808	3.656	.016[b]
	Residual	3902.294	74	52.734		
	Total	4480.718	77			
3	Regression	813.466	4	203.367	4.048	.005[c]
	Residual	3667.252	73	50.236		
	Total	4480.718	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: R2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.980	16.325		-.305	.761		
	Age	.288	.223	.147	1.295	.199	1.000	1.000
2	(Constant)	-4.099	15.624		-.262	.794		
	Age	.158	.221	.080	.714	.477	.929	1.077
	Peabody	.222	.086	.284	2.583	.012	.973	1.028
	Raven	.284	.231	.139	1.232	.222	.919	1.088
3	(Constant)	-1.464	15.298		-.096	.924		
	Age	.145	.216	.074	.672	.503	.928	1.077
	Peabody	.160	.089	.206	1.814	.074	.873	1.146
	Raven	.251	.226	.123	1.113	.269	.915	1.093
	FAC_Dialect	1.837	.849	.244	2.163	.034	.882	1.134

a. Dependent Variable: R2

Predictors of the Spelling Measure (S2)

Phonology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.090[a]	.008	-.005	6.44769	.008	.621	1	76	.433	
2	.273[b]	.075	.037	6.31154	.066	2.657	2	74	.077	
3	.446[c]	.199	.143	5.95402	.124	5.577	2	72	.006	1.411

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: S2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.803	1	25.803	.621	.433[a]
	Residual	3159.530	76	41.573		
	Total	3185.333	77			
2	Regression	237.506	3	79.169	1.987	.123[b]
	Residual	2947.828	74	39.836		
	Total	3185.333	77			
3	Regression	632.910	5	126.582	3.571	.006[c]
	Residual	2552.423	72	35.450		
	Total	3185.333	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: S2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.763	13.859		.055	.956		
	Age	.149	.189	.090	.788	.433	1.000	1.000
2	(Constant)	1.366	13.579		.101	.920		
	Age	.061	.192	.037	.319	.751	.929	1.077
	Peabody	.146	.075	.221	1.952	.055	.973	1.028
	Raven	.195	.201	.113	.971	.335	.919	1.088
3	(Constant)	5.078	12.958		.392	.696		
	Age	.055	.182	.033	.302	.764	.919	1.088
	Peabody	.110	.071	.167	1.548	.126	.951	1.052
	Raven	.023	.197	.013	.117	.907	.849	1.177
	FAC_SA	2.379	.715	.372	3.327	.001	.890	1.123
	FAC_PD	-.134	.677	-.021	-.197	.844	.980	1.021

a. Dependent Variable: S2

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.090[a]	.008	-.005	6.44769	.008	.621	1	76	.433	
2	.273[b]	.075	.037	6.31154	.066	2.657	2	74	.077	
3	.423[c]	.179	.122	6.02838	.104	4.557	2	72	.014	1.498

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: S2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.803	1	25.803	.621	.433[a]
	Residual	3159.530	76	41.573		
	Total	3185.333	77			
2	Regression	237.506	3	79.169	1.987	.123[b]
	Residual	2947.828	74	39.836		
	Total	3185.333	77			
3	Regression	568.751	5	113.750	3.130	.013[c]
	Residual	2616.583	72	36.341		
	Total	3185.333	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: S2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.763	13.859		.055	.956		
	Age	.149	.189	.090	.788	.433	1.000	1.000
2	(Constant)	1.366	13.579		.101	.920		
	Age	.061	.192	.037	.319	.751	.929	1.077
	Peabody	.146	.075	.221	1.952	.055	.973	1.028
	Raven	.195	.201	.113	.971	.335	.919	1.088
3	(Constant)	-4.557	13.140		-.347	.730		
	Age	.030	.184	.018	.162	.872	.926	1.080
	Peabody	.144	.077	.219	1.880	.064	.838	1.194
	Raven	.075	.196	.043	.382	.704	.879	1.138
	JMR	.436	.145	.332	2.995	.004	.931	1.074
	PP	.000	.413	.000	.000	1.000	.835	1.197

a. Dependent Variable: S2

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.090[a]	.008	-.005	6.44769	.008	.621	1	76	.433	
2	.273[b]	.075	.037	6.31154	.066	2.657	2	74	.077	
3	.337[c]	.113	.065	6.21990	.039	3.197	1	73	.078	1.410

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: S2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.803	1	25.803	.621	.433[a]
	Residual	3159.530	76	41.573		
	Total	3185.333	77			
2	Regression	237.506	3	79.169	1.987	.123[b]
	Residual	2947.828	74	39.836		
	Total	3185.333	77			
3	Regression	361.170	4	90.293	2.334	.064[c]
	Residual	2824.163	73	38.687		
	Total	3185.333	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: S2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.763	13.859		.055	.956		
	Age	.149	.189	.090	.788	.433	1.000	1.000
2	(Constant)	1.366	13.579		.101	.920		
	Age	.061	.192	.037	.319	.751	.929	1.077
	Peabody	.146	.075	.221	1.952	.055	.973	1.028
	Raven	.195	.201	.113	.971	.335	.919	1.088
3	(Constant)	3.277	13.425		.244	.808		
	Age	.052	.189	.031	.274	.785	.928	1.077
	Peabody	.101	.078	.154	1.303	.197	.873	1.146
	Raven	.171	.198	.099	.862	.391	.915	1.093
	FAC_Dialect	1.333	.745	.210	1.788	.078	.882	1.134

a. Dependent Variable: S2

Predictors of the Pseudoword Decoding Measure (PSD2)

Phonology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.069[a]	.005	-.008	2.53701	.005	.368	1	76	.546	
2	.238[b]	.057	.019	2.50310	.052	2.037	2	74	.138	
3	.387[c]	.149	.090	2.40965	.093	3.926	2	72	.024	1.697

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: PSD2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.371	1	2.371	.368	.546[a]
	Residual	489.168	76	6.436		
	Total	491.538	77			
2	Regression	27.890	3	9.297	1.484	.226[b]
	Residual	463.648	74	6.266		
	Total	491.538	77			
3	Regression	73.478	5	14.696	2.531	.036[c]
	Residual	418.061	72	5.806		
	Total	491.538	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: PSD2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.772	5.453		.508	.613		
	Age	.045	.074	.069	.607	.546	1.000	1.000
2	(Constant)	3.145	5.385		.584	.561		
	Age	.006	.076	.009	.076	.940	.929	1.077
	Peabody	.032	.030	.122	1.066	.290	.973	1.028
	Raven	.125	.080	.184	1.566	.122	.919	1.088
3	(Constant)	3.566	5.244		.680	.499		
	Age	.012	.074	.019	.168	.867	.919	1.088
	Peabody	.020	.029	.077	.687	.494	.951	1.052
	Raven	.079	.080	.117	.992	.325	.849	1.177
	FAC_SA	.712	.289	.283	2.460	.016	.890	1.123
	FAC_PD	-.350	.274	-.140	-1.276	.206	.980	1.021

a. Dependent Variable: PSD2

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.069[a]	.005	-.008	2.53701	.005	.368	1	76	.546	
2	.238[b]	.057	.019	2.50310	.052	2.037	2	74	.138	
3	.392[c]	.154	.095	2.40347	.097	4.131	2	72	.020	1.734

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: PSD2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.371	1	2.371	.368	.546[a]
	Residual	489.168	76	6.436		
	Total	491.538	77			
2	Regression	27.890	3	9.297	1.484	.226[b]
	Residual	463.648	74	6.266		
	Total	491.538	77			
3	Regression	75.619	5	15.124	2.618	.031[c]
	Residual	415.919	72	5.777		
	Total	491.538	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: PSD2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.772	5.453		.508	.613		
	Age	.045	.074	.069	.607	.546	1.000	1.000
2	(Constant)	3.145	5.385		.584	.561		
	Age	.006	.076	.009	.076	.940	.929	1.077
	Peabody	.032	.030	.122	1.066	.290	.973	1.028
	Raven	.125	.080	.184	1.566	.122	.919	1.088
3	(Constant)	1.121	5.239		.214	.831		
	Age	-.007	.073	-.010	-.089	.929	.926	1.080
	Peabody	.038	.031	.146	1.230	.223	.838	1.194
	Raven	.082	.078	.122	1.051	.297	.879	1.138
	JMR	.166	.058	.322	2.866	.005	.931	1.074
	PP	-.095	.165	-.069	-.578	.565	.835	1.197

a. Dependent Variable: PSD2

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.069[a]	.005	-.008	2.53701	.005	.368	1	76	.546	
2	.238[b]	.057	.019	2.50310	.052	2.037	2	74	.138	
3	.312[c]	.097	.048	2.46539	.041	3.281	1	73	.074	1.664

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: PSD2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.371	1	2.371	.368	.546[a]
	Residual	489.168	76	6.436		
	Total	491.538	77			
2	Regression	27.890	3	9.297	1.484	.226[b]
	Residual	463.648	74	6.266		
	Total	491.538	77			
3	Regression	47.834	4	11.958	1.967	.108[c]
	Residual	443.705	73	6.078		
	Total	491.538	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: PSD2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.772	5.453		.508	.613		
	Age	.045	.074	.069	.607	.546	1.000	1.000
2	(Constant)	3.145	5.385		.584	.561		
	Age	.006	.076	.009	.076	.940	.929	1.077
	Peabody	.032	.030	.122	1.066	.290	.973	1.028
	Raven	.125	.080	.184	1.566	.122	.919	1.088
3	(Constant)	3.912	5.321		.735	.465		
	Age	.002	.075	.003	.027	.978	.928	1.077
	Peabody	.014	.031	.053	.445	.658	.873	1.146
	Raven	.115	.079	.170	1.464	.148	.915	1.093
	FAC_Dialect	.535	.295	.214	1.811	.074	.882	1.134

a. Dependent Variable: PSD2

Predictors of the Reading Comprehension Measure (RC2)

Phonology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.123[a]	.015	.002	8.46529	.015	1.168	1	76	.283	
2	.299[b]	.089	.052	8.24918	.074	3.017	2	74	.055	
3	.434[c]	.188	.132	7.89665	.099	4.377	2	72	.016	1.647

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: RC2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	83.698	1	83.698	1.168	.283[a]
	Residual	5446.250	76	71.661		
	Total	5529.949	77			
2	Regression	494.330	3	164.777	2.421	.073[b]
	Residual	5035.619	74	68.049		
	Total	5529.949	77			
3	Regression	1040.243	5	208.049	3.336	.009[c]
	Residual	4489.705	72	62.357		
	Total	5529.949	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: RC2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-1.278	18.196		-.070	.944		
	Age	.268	.248	.123	1.081	.283	1.000	1.000
2	(Constant)	-.764	17.748		-.043	.966		
	Age	.168	.251	.077	.671	.505	.929	1.077
	Peabody	.223	.098	.257	2.285	.025	.973	1.028
	Raven	.159	.262	.070	.608	.545	.919	1.088
3	(Constant)	2.494	17.186		.145	.885		
	Age	.173	.241	.079	.718	.475	.919	1.088
	Peabody	.181	.094	.208	1.913	.060	.951	1.052
	Raven	-.028	.261	-.013	-.109	.914	.849	1.177
	FAC_SA	2.717	.948	.322	2.865	.005	.890	1.123
	FAC_PD	-.594	.898	-.071	-.661	.510	.980	1.021

a. Dependent Variable: RC2

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.123[a]	.015	.002	8.46529	.015	1.168	1	76	.283	
2	.299[b]	.089	.052	8.24918	.074	3.017	2	74	.055	
3	.418[c]	.175	.118	7.96089	.085	3.728	2	72	.029	1.672

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: RC2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	83.698	1	83.698	1.168	.283[a]
	Residual	5446.250	76	71.661		
	Total	5529.949	77			
2	Regression	494.330	3	164.777	2.421	.073[b]
	Residual	5035.619	74	68.049		
	Total	5529.949	77			
3	Regression	966.890	5	193.378	3.051	.015[c]
	Residual	4563.059	72	63.376		
	Total	5529.949	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR, PP
d. Dependent Variable: RC2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-1.278	18.196		-.070	.944		
	Age	.268	.248	.123	1.081	.283	1.000	1.000
2	(Constant)	-.764	17.748		-.043	.966		
	Age	.168	.251	.077	.671	.505	.929	1.077
	Peabody	.223	.098	.257	2.285	.025	.973	1.028
	Raven	.159	.262	.070	.608	.545	.919	1.088
3	(Constant)	-7.407	17.353		-.427	.671		
	Age	.130	.242	.060	.535	.594	.926	1.080
	Peabody	.235	.101	.271	2.316	.023	.838	1.194
	Raven	.022	.259	.010	.085	.933	.879	1.138
	JMR	.524	.192	.303	2.731	.008	.931	1.074
	PP	-.197	.545	-.042	-.361	.719	.835	1.197

a. Dependent Variable: RC2

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.123[a]	.015	.002	8.46529	.015	1.168	1	76	.283	
2	.299[b]	.089	.052	8.24918	.074	3.017	2	74	.055	
3	.370[c]	.137	.089	8.08762	.047	3.986	1	73	.050	1.603

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: RC2

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	83.698	1	83.698	1.168	.283[a]
	Residual	5446.250	76	71.661		
	Total	5529.949	77			
2	Regression	494.330	3	164.777	2.421	.073[b]
	Residual	5035.619	74	68.049		
	Total	5529.949	77			
3	Regression	755.054	4	188.763	2.886	.028[c]
	Residual	4774.895	73	65.410		
	Total	5529.949	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: RC2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-1.278	18.196		-.070	.944		
	Age	.268	.248	.123	1.081	.283	1.000	1.000
2	(Constant)	-.764	17.748		-.043	.966		
	Age	.168	.251	.077	.671	.505	.929	1.077
	Peabody	.223	.098	.257	2.285	.025	.973	1.028
	Raven	.159	.262	.070	.608	.545	.919	1.088
3	(Constant)	2.011	17.456		.115	.909		
	Age	.155	.246	.071	.629	.531	.928	1.077
	Peabody	.158	.101	.182	1.567	.121	.873	1.146
	Raven	.125	.258	.055	.484	.630	.915	1.093
	FAC_Dialect	1.935	.969	.231	1.997	.050	.882	1.134

a. Dependent Variable: RC2

Appendix 10 – Regression Analysis with Correction of Guessing Formula

The regression analyses with the correction for guessing formula applied to the judgment of morphological relationships predictor task, show a very clear consistency with the main analysis of the raw data. The analyses where done with morphological awareness and the outcome measures of first grade children as a sample to show the consistency. The results are presented below:

Predictive Abilities of Morphological Awareness

Corrected for Guessing JMR is Predicting First Grade Word Reading

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.135[a]	.018	.006	5.830	.018	1.439	1	78	.234	
2	.282[b]	.079	.043	5.719	.061	2.531	2	76	.086	
3	.291[c]	.085	.023	5.779	.006	.224	2	74	.800	1.667

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR_Corrected, PP
d. Dependent Variable: R

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.903	1	48.903	1.439	.234[a]
	Residual	2651.585	78	33.995		
	Total	2700.488	79			
2	Regression	214.508	3	71.503	2.186	.097[b]
	Residual	2485.980	76	32.710		
	Total	2700.488	79			
3	Regression	229.442	5	45.888	1.374	.244[c]
	Residual	2471.045	74	33.393		
	Total	2700.488	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR_Corrected, PP
d. Dependent Variable: R

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-9.394	12.320		-.762	.448		
	Age	.201	.168	.135	1.199	.234	1.000	1.000
2	(Constant)	-9.726	12.088		-.805	.424		
	Age	.125	.169	.084	.741	.461	.950	1.053
	Peabody	.098	.067	.163	1.458	.149	.971	1.030
	Raven	.263	.178	.169	1.480	.143	.932	1.073
3	(Constant)	-8.933	12.274		-.728	.469		
	Age	.118	.172	.079	.686	.495	.936	1.068
	Peabody	.112	.073	.186	1.541	.128	.847	1.180
	Raven	.255	.182	.163	1.403	.165	.912	1.097
	JMR_Corrected	1.021	2.132	.055	.479	.633	.938	1.067
	PP	-.207	.390	-.064	-.530	.598	.846	1.182

a. Dependent Variable: R

Corrected for Guessing JMR is Predicting First Grade Word Spelling

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.097[a]	.009	-.003	5.116	.009	.742	1	78	.392	
2	.293[b]	.086	.050	4.978	.077	3.186	2	76	.047	
3	.372[c]	.138	.080	4.899	.052	2.243	2	74	.113	1.829

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR_Corrected, PP
d. Dependent Variable: S

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.427	1	19.427	.742	.392[a]
	Residual	2041.573	78	26.174		
	Total	2061.000	79			
2	Regression	177.355	3	59.118	2.385	.076[b]
	Residual	1883.645	76	24.785		
	Total	2061.000	79			
3	Regression	285.019	5	57.004	2.375	.047[c]
	Residual	1775.981	74	24.000		
	Total	2061.000	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR_Corrected, PP
d. Dependent Variable: S

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.551	10.811		-.421	.675		
	Age	.127	.147	.097	.862	.392	1.000	1.000
2	(Constant)	-4.993	10.522		-.474	.637		
	Age	.066	.147	.050	.449	.655	.950	1.053
	Peabody	.124	.059	.235	2.110	.038	.971	1.030
	Raven	.164	.155	.120	1.059	.293	.932	1.073
3	(Constant)	-3.364	10.406		-.323	.747		
	Age	.029	.146	.023	.202	.841	.936	1.068
	Peabody	.122	.062	.233	1.986	.051	.847	1.180
	Raven	.117	.154	.086	.758	.451	.912	1.097
	JMR_Corrected	3.757	1.807	.232	2.079	.041	.938	1.067
	PP	.035	.331	.012	.105	.917	.846	1.182

a. Dependent Variable: S

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.043[a]	.002	-.011	2.378	.002	.146	1	78	.704	
2	.233[b]	.054	.017	2.345	.052	2.105	2	76	.129	
3	.236[c]	.056	-.008	2.375	.001	.053	2	74	.948	1.626

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR_Corrected, PP
d. Dependent Variable: PSD

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.823	1	.823	.146	.704[a]
	Residual	441.127	78	5.655		
	Total	441.950	79			
2	Regression	23.976	3	7.992	1.453	.234[b]
	Residual	417.974	76	5.500		
	Total	441.950	79			
3	Regression	24.577	5	4.915	.871	.504[c]
	Residual	417.373	74	5.640		
	Total	441.950	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR_Corrected, PP
d. Dependent Variable: PSD

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.610	5.025		.121	.904		
	Age	.026	.069	.043	.382	.704	1.000	1.000
2	(Constant)	.416	4.957		.084	.933		
	Age	.008	.069	.013	.113	.910	.950	1.053
	Peabody	.053	.028	.217	1.913	.060	.971	1.030
	Raven	.033	.073	.052	.452	.653	.932	1.073
3	(Constant)	.580	5.045		.115	.909		
	Age	.006	.071	.010	.083	.934	.936	1.068
	Peabody	.055	.030	.226	1.838	.070	.847	1.180
	Raven	.031	.075	.048	.409	.684	.912	1.097
	JMR_Corrected	.249	.876	.033	.284	.777	.938	1.067
	PP	-.032	.160	-.025	-.200	.842	.846	1.182

a. Dependent Variable: PSD

Corrected for Guessing JMR is Predicting First Grade Reading Comprehension

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.225[a]	.051	.039	5.844	.051	4.170	1	78	.045	
2	.325[b]	.106	.070	5.747	.055	2.330	2	76	.104	
3	.358[c]	.128	.069	5.750	.022	.951	2	74	.391	1.905

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR_Corrected, PP
d. Dependent Variable: RC

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	142.409	1	142.409	4.170	.045[a]
	Residual	2663.578	78	34.148		
	Total	2805.987	79			
2	Regression	296.284	3	98.761	2.991	.036[b]
	Residual	2509.704	76	33.022		
	Total	2805.987	79			
3	Regression	359.153	5	71.831	2.172	.066[c]
	Residual	2446.835	74	33.065		
	Total	2805.987	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR_Corrected, PP
d. Dependent Variable: RC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-20.694	12.348		-1.676	.098		
	Age	.344	.168	.225	2.042	.045	1.000	1.000
2	(Constant)	-21.068	12.146		-1.735	.087		
	Age	.275	.170	.180	1.621	.109	.950	1.053
	Peabody	.107	.068	.175	1.588	.116	.971	1.030
	Raven	.217	.179	.136	1.212	.229	.932	1.073
3	(Constant)	-19.537	12.214		-1.600	.114		
	Age	.249	.171	.163	1.456	.150	.936	1.068
	Peabody	.118	.072	.192	1.625	.108	.847	1.180
	Raven	.184	.181	.115	1.016	.313	.912	1.097
	JMR_Corrected	2.903	2.122	.153	1.368	.175	.938	1.067
	PP	-.141	.388	-.043	-.363	.717	.846	1.182

a. Dependent Variable: RC

Appendix 11 – Regression Analysis for the Second Research Hypothesis

First Phase Analysis

Predicting the Reading Outcome (Syllabic Factor was the only predictor, the rest of the predictors failed to make any contributions, and hence they were removed from the model equation, leaving syllabic addition as the only independent predictor of reading).

Predicting the Spelling Outcome (both the Syllabic factor and the Judgment of Relationships task were significant predictors, so they are entered together as a third and fourth steps alternately after controlling for age and cognitive abilities in the first and second steps, to test for there independence).

SA after controlling for JMR:

Model Summary[e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.097[a]	.009	-.003	5.116	.009	.742	1	78	.392	
2	.293[b]	.086	.050	4.978	.077	3.186	2	76	.047	
3	.372[c]	.138	.092	4.867	.052	4.535	1	75	.036	
4	.458[d]	.210	.156	4.692	.071	6.692	1	74	.012	1.950

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR
d. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_SA
e. Dependent Variable: S

ANOVA[e]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.427	1	19.427	.742	.392[a]
	Residual	2041.573	78	26.174		
	Total	2061.000	79			

2	Regression	177.355	3	59.118	2.385	.076[b]
	Residual	1883.645	76	24.785		
	Total	2061.000	79			
3	Regression	284.754	4	71.189	3.006	.023[c]
	Residual	1776.246	75	23.683		
	Total	2061.000	79			
4	Regression	432.064	5	86.413	3.926	.003[d]
	Residual	1628.936	74	22.013		
	Total	2061.000	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR
d. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_SA
e. Dependent Variable: S

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-4.551	10.811		-.421	.675		
	Age	.127	.147	.097	.862	.392	1.000	1.000
2	(Constant)	-4.993	10.522		-.474	.637		
	Age	.066	.147	.050	.449	.655	.950	1.053
	Peabody	.124	.059	.235	2.110	.038	.971	1.030
	Raven	.164	.155	.120	1.059	.293	.932	1.073
3	(Constant)	-7.080	10.332		-.685	.495		
	Age	.030	.145	.023	.204	.839	.937	1.068
	Peabody	.125	.057	.237	2.180	.032	.971	1.030
	Raven	.117	.153	.086	.766	.446	.912	1.096
	JMR	.237	.111	.233	2.130	.036	.957	1.045

4	(Constant)	-3.254	10.071		-.323	.748		
	Age	.036	.140	.028	.261	.795	.936	1.068
	Peabody	.101	.056	.192	1.804	.075	.944	1.059
	Raven	.029	.151	.021	.190	.849	.866	1.155
	JMR	.127	.115	.125	1.103	.274	.828	1.208
	FAC_SA	1.555	.601	.304	2.587	.012	.771	1.297

a. Dependent Variable: S

JMR after controlling for SA:

Model Summary[e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.097[a]	.009	-.003	5.116	.009	.742	1	78	.392	
2	.293[b]	.086	.050	4.978	.077	3.186	2	76	.047	
3	.443[c]	.197	.154	4.699	.111	10.325	1	75	.002	
4	.458[d]	.210	.156	4.692	.013	1.216	1	74	.274	1.950

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR
e. Dependent Variable: S

ANOVA[e]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.427	1	19.427	.742	.392[a]
	Residual	2041.573	78	26.174		
	Total	2061.000	79			

2	Regression	177.355	3	59.118	2.385	.076[b]
	Residual	1883.645	76	24.785		
	Total	2061.000	79			
3	Regression	405.297	4	101.324	4.590	.002[c]
	Residual	1655.703	75	22.076		
	Total	2061.000	79			
4	Regression	432.064	5	86.413	3.926	.003[d]
	Residual	1628.936	74	22.013		
	Total	2061.000	79			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR
e. Dependent Variable: S

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-4.551	10.811		-.421	.675		
	Age	.127	.147	.097	.862	.392	1.000	1.000
2	(Constant)	-4.993	10.522		-.474	.637		
	Age	.066	.147	.050	.449	.655	.950	1.053
	Peabody	.124	.059	.235	2.110	.038	.971	1.030
	Raven	.164	.155	.120	1.059	.293	.932	1.073
3	(Constant)	-1.685	9.984		-.169	.866		
	Age	.054	.139	.042	.392	.696	.949	1.054
	Peabody	.097	.056	.184	1.729	.088	.949	1.054
	Raven	.037	.151	.027	.243	.809	.868	1.152
	FAC_SA	1.799	.560	.352	3.213	.002	.892	1.121

4	(Constant)	-3.254	10.071		-.323	.748		
	Age	.036	.140	.028	.261	.795	.936	1.068
	Peabody	.101	.056	.192	1.804	.075	.944	1.059
	Raven	.029	.151	.021	.190	.849	.866	1.155
	FAC_SA	1.555	.601	.304	2.587	.012	.771	1.297
	JMR	.127	.115	.125	1.103	.274	.828	1.208

a. Dependent Variable: S

Predicting the Pseudoword Decoding Outcome (Syllabic Factor was the only independent predictor of Pseudoword Decoding, no further regressions are required).

Predicting the Reading Comprehension Outcome (Syllabic Factor was the only independent predictor of Reading Comprehension in addition to the chronological age as a significant control variable, no further regressions are required).

Second Phase Analysis

Predicting the Reading Outcome (the Syllabic Factor, Judgment of Morphological Relationships and Dialect Factor were all significant predictors of the Reading Outcome, hence they will all be tested whether they are independent of each other).

SA after controlling for the other variables

Model Summary[f]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.147[a]	.022	.009	7.59502	.022	1.676	1	76	.199	
2	.359[b]	.129	.094	7.26180	.108	4.567	2	74	.013	
3	.460[c]	.212	.168	6.95652	.082	7.637	1	73	.007	
4	.499[d]	.249	.197	6.83714	.037	3.571	1	72	.063	
5	.558[e]	.311	.253	6.59357	.062	6.418	1	71	.014	1.587

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR
d. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_Dialect, FAC_SA
f. Dependent Variable: R2

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.707	1	96.707	1.676	.199[a]
	Residual	4384.011	76	57.684		
	Total	4480.718	77			
2	Regression	578.424	3	192.808	3.656	.016[b]
	Residual	3902.294	74	52.734		
	Total	4480.718	77			
3	Regression	948.015	4	237.004	4.897	.001[c]
	Residual	3532.703	73	48.393		
	Total	4480.718	77			

4	Regression	1114.968	5	222.994	4.770	.001[d]
	Residual	3365.750	72	46.747		
	Total	4480.718	77			
5	Regression	1393.984	6	232.331	5.344	.000[e]
	Residual	3086.734	71	43.475		
	Total	4480.718	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR
d. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_Dialect, FAC_SA
f. Dependent Variable: R2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-4.980	16.325		-.305	.761		
	Age	.288	.223	.147	1.295	.199	1.000	1.000
2	(Constant)	-4.099	15.624		-.262	.794		
	Age	.158	.221	.080	.714	.477	.929	1.077
	Peabody	.222	.086	.284	2.583	.012	.973	1.028
	Raven	.284	.231	.139	1.232	.222	.919	1.088
3	(Constant)	-10.355	15.137		-.684	.496		
	Age	.125	.212	.063	.588	.558	.926	1.080
	Peabody	.221	.082	.282	2.680	.009	.973	1.028
	Raven	.158	.226	.077	.698	.488	.881	1.135
	JMR	.460	.167	.295	2.764	.007	.946	1.057

4	(Constant)	-7.558	14.951		-.506	.615		
	Age	.117	.208	.059	.560	.577	.926	1.080
	Peabody	.168	.085	.216	1.972	.052	.872	1.147
	Raven	.141	.222	.069	.634	.528	.880	1.137
	JMR	.419	.165	.269	2.540	.013	.929	1.076
	FAC_Dialect	1.562	.827	.207	1.890	.063	.867	1.154
5	(Constant)	-2.636	14.548		-.181	.857		
	Age	.122	.201	.062	.607	.546	.925	1.080
	Peabody	.155	.083	.199	1.878	.064	.868	1.152
	Raven	.027	.219	.013	.125	.901	.843	1.186
	JMR	.274	.169	.176	1.619	.110	.823	1.215
	FAC_Dialect	.993	.828	.132	1.200	.234	.803	1.245
	FAC_SA	2.232	.881	.294	2.533	.014	.719	1.392

a. Dependent Variable: R2

JMR after controlling for the other variables

Model Summary[f]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.147[a]	.022	.009	7.59502	.022	1.676	1	76	.199	
2	.359[b]	.129	.094	7.26180	.108	4.567	2	74	.013	
3	.520[c]	.271	.231	6.69075	.142	14.171	1	73	.000	
4	.534[d]	.286	.236	6.66739	.015	1.512	1	72	.223	
5	.558[e]	.311	.253	6.59357	.025	2.621	1	71	.110	1.587

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect, JMR
f. Dependent Variable: R2

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.707	1	96.707	1.676	.199[a]
	Residual	4384.011	76	57.684		
	Total	4480.718	77			
2	Regression	578.424	3	192.808	3.656	.016[b]
	Residual	3902.294	74	52.734		
	Total	4480.718	77			
3	Regression	1212.789	4	303.197	6.773	.000[c]
	Residual	3267.929	73	44.766		
	Total	4480.718	77			
4	Regression	1280.021	5	256.004	5.759	.000[d]
	Residual	3200.697	72	44.454		
	Total	4480.718	77			
5	Regression	1393.984	6	232.331	5.344	.000[e]
	Residual	3086.734	71	43.475		
	Total	4480.718	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect, JMR
f. Dependent Variable: R2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.980	16.325		-.305	.761		
	Age	.288	.223	.147	1.295	.199	1.000	1.000
2	(Constant)	-4.099	15.624		-.262	.794		
	Age	.158	.221	.080	.714	.477	.929	1.077
	Peabody	.222	.086	.284	2.583	.012	.973	1.028
	Raven	.284	.231	.139	1.232	.222	.919	1.088
3	(Constant)	.996	14.458		.069	.945		
	Age	.145	.203	.074	.713	.478	.929	1.077
	Peabody	.177	.080	.227	2.218	.030	.952	1.051
	Raven	.063	.221	.031	.285	.777	.854	1.171
	FAC_SA	3.023	.803	.399	3.764	.000	.891	1.122
4	(Constant)	1.955	14.429		.135	.893		
	Age	.139	.203	.071	.687	.494	.928	1.077
	Peabody	.148	.083	.189	1.771	.081	.871	1.148
	Raven	.067	.220	.033	.304	.762	.854	1.171
	FAC_SA	2.716	.838	.358	3.240	.002	.812	1.232
	FAC_Dialect	1.029	.837	.137	1.230	.223	.804	1.244
5	(Constant)	-2.636	14.548		-.181	.857		
	Age	.122	.201	.062	.607	.546	.925	1.080
	Peabody	.155	.083	.199	1.878	.064	.868	1.152
	Raven	.027	.219	.013	.125	.901	.843	1.186
	FAC_SA	2.232	.881	.294	2.533	.014	.719	1.392
	FAC_Dialect	.993	.828	.132	1.200	.234	.803	1.245
	JMR	.274	.169	.176	1.619	.110	.823	1.215

a. Dependent Variable: R2

Dialect after controlling for the other variables

Model Summary[f]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.147[a]	.022	.009	7.59502	.022	1.676	1	76	.199	
2	.359[b]	.129	.094	7.26180	.108	4.567	2	74	.013	
3	.520[c]	.271	.231	6.69075	.142	14.171	1	73	.000	
4	.545[d]	.297	.248	6.61363	.026	2.712	1	72	.104	
5	.558[e]	.311	.253	6.59357	.014	1.439	1	71	.234	1.587

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR, FAC_Dialect
f. Dependent Variable: R2

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.707	1	96.707	1.676	.199[a]
	Residual	4384.011	76	57.684		
	Total	4480.718	77			
2	Regression	578.424	3	192.808	3.656	.016[b]
	Residual	3902.294	74	52.734		
	Total	4480.718	77			
3	Regression	1212.789	4	303.197	6.773	.000[c]
	Residual	3267.929	73	44.766		
	Total	4480.718	77			
4	Regression	1331.430	5	266.286	6.088	.000[d]
	Residual	3149.288	72	43.740		
	Total	4480.718	77			
5	Regression	1393.984	6	232.331	5.344	.000[e]
	Residual	3086.734	71	43.475		
	Total	4480.718	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR, FAC_Dialect
f. Dependent Variable: R2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.980	16.325		-.305	.761		
	Age	.288	.223	.147	1.295	.199	1.000	1.000
2	(Constant)	-4.099	15.624		-.262	.794		
	Age	.158	.221	.080	.714	.477	.929	1.077
	Peabody	.222	.086	.284	2.583	.012	.973	1.028
	Raven	.284	.231	.139	1.232	.222	.919	1.088
3	(Constant)	.996	14.458		.069	.945		
	Age	.145	.203	.074	.713	.478	.929	1.077
	Peabody	.177	.080	.227	2.218	.030	.952	1.051
	Raven	.063	.221	.031	.285	.777	.854	1.171
	FAC_SA	3.023	.803	.399	3.764	.000	.891	1.122
4	(Constant)	-3.653	14.568		-.251	.803		
	Age	.127	.201	.065	.631	.530	.926	1.080
	Peabody	.184	.079	.236	2.324	.023	.949	1.054
	Raven	.023	.219	.011	.104	.918	.843	1.186
	FAC_SA	2.519	.851	.332	2.961	.004	.776	1.289
	JMR	.279	.170	.179	1.647	.104	.823	1.215
5	(Constant)	-2.636	14.548		-.181	.857		
	Age	.122	.201	.062	.607	.546	.925	1.080
	Peabody	.155	.083	.199	1.878	.064	.868	1.152
	Raven	.027	.219	.013	.125	.901	.843	1.186
	FAC_SA	2.232	.881	.294	2.533	.014	.719	1.392
	JMR	.274	.169	.176	1.619	.110	.823	1.215
	FAC_Dialect	.993	.828	.132	1.200	.234	.803	1.245

a. Dependent Variable: R2

Predicting the Spelling Outcome (both the Syllabic factor and the Judgment of Relationships task were significant predictors, so they are entered together as a third and fourth steps alternately after controlling for age and cognitive abilities in the first and second steps, to test for there independence).

SA after controlling for JMR:

Model Summary[e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.090[a]	.008	-.005	6.4477	.008	.621	1	76	.433	
2	.273[b]	.075	.037	6.3115	.066	2.657	2	74	.077	
3	.423[c]	.179	.134	5.9870	.104	9.241	1	73	.003	
4	.492[d]	.242	.190	5.7895	.064	6.064	1	72	.016	1.475

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR
d. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_SA
e. Dependent Variable: S2

ANOVA[e]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.803	1	25.803	.621	.433[a]
	Residual	3159.530	76	41.573		
	Total	3185.333	77			
2	Regression	237.506	3	79.169	1.987	.123[b]
	Residual	2947.828	74	39.836		
	Total	3185.333	77			
3	Regression	568.751	4	142.188	3.967	.006[c]
	Residual	2616.583	73	35.844		
	Total	3185.333	77			
4	Regression	771.998	5	154.400	4.606	.001[d]
	Residual	2413.335	72	33.519		
	Total	3185.333	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR
d. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_SA
e. Dependent Variable: S2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.763	13.859		.055	.956		
	Age	.149	.189	.090	.788	.433	1.000	1.000
2	(Constant)	1.366	13.579		.101	.920		
	Age	.061	.192	.037	.319	.751	.929	1.077
	Peabody	.146	.075	.221	1.952	.055	.973	1.028
	Raven	.195	.201	.113	.971	.335	.919	1.088
3	(Constant)	-4.557	13.027		-.350	.728		
	Age	.030	.182	.018	.163	.871	.926	1.080
	Peabody	.144	.071	.219	2.040	.045	.973	1.028
	Raven	.075	.194	.043	.385	.702	.881	1.135
	JMR	.436	.143	.332	3.040	.003	.946	1.057
4	(Constant)	.323	12.753		.025	.980		
	Age	.032	.176	.019	.180	.858	.926	1.080
	Peabody	.118	.069	.179	1.700	.093	.949	1.054
	Raven	-.023	.192	-.014	-.121	.904	.843	1.186
	JMR	.304	.149	.231	2.047	.044	.823	1.215
	FAC_SA	1.834	.745	.287	2.462	.016	.776	1.289

a. Dependent Variable: S2

JMR after controlling for SA:

Model Summary[e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.090[a]	.008	-.005	6.4477	.008	.621	1	76	.433	
2	.273[b]	.075	.037	6.3115	.066	2.657	2	74	.077	
3	.445[c]	.198	.154	5.9147	.124	11.263	1	73	.001	
4	.492[d]	.242	.190	5.7895	.044	4.191	1	72	.044	1.475

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR
e. Dependent Variable: S2

ANOVA[e]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.803	1	25.803	.621	.433[a]
	Residual	3159.530	76	41.573		
	Total	3185.333	77			
2	Regression	237.506	3	79.169	1.987	.123[b]
	Residual	2947.828	74	39.836		
	Total	3185.333	77			
3	Regression	631.529	4	157.882	4.513	.003[c]
	Residual	2553.804	73	34.984		
	Total	3185.333	77			
4	Regression	771.998	5	154.400	4.606	.001[d]
	Residual	2413.335	72	33.519		
	Total	3185.333	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR
e. Dependent Variable: S2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.763	13.859		.055	.956		
	Age	.149	.189	.090	.788	.433	1.000	1.000
2	(Constant)	1.366	13.579		.101	.920		
	Age	.061	.192	.037	.319	.751	.929	1.077
	Peabody	.146	.075	.221	1.952	.055	.973	1.028
	Raven	.195	.201	.113	.971	.335	.919	1.088
3	(Constant)	5.381	12.781		.421	.675		
	Age	.051	.180	.031	.285	.776	.929	1.077
	Peabody	.111	.071	.168	1.565	.122	.952	1.051
	Raven	.020	.195	.012	.104	.917	.854	1.171
	FAC_SA	2.382	.710	.373	3.356	.001	.891	1.122
4	(Constant)	.323	12.753		.025	.980		
	Age	.032	.176	.019	.180	.858	.926	1.080
	Peabody	.118	.069	.179	1.700	.093	.949	1.054
	Raven	-.023	.192	-.014	-.121	.904	.843	1.186
	FAC_SA	1.834	.745	.287	2.462	.016	.776	1.289
	JMR	.304	.149	.231	2.047	.044	.823	1.215

a. Dependent Variable: S2

Predicting the Pseudoword Decoding Outcome (both the Syllabic factor and the Judgment of Relationships task were significant predictors, so they are entered together as a third and fourth steps alternately after controlling for age and cognitive abilities in the first and second steps, to test for there independence).

SA after controlling for JMR:

Model Summary[e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.069[a]	.005	-.008	2.53701	.005	.368	1	76	.546	
2	.238[b]	.057	.019	2.50310	.052	2.037	2	74	.138	
3	.387[c]	.150	.103	2.39248	.093	8.001	1	73	.006	
4	.424[d]	.180	.123	2.36632	.030	2.623	1	72	.110	1.742

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR
d. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_SA
e. Dependent Variable: PSD2

ANOVA[e]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.371	1	2.371	.368	.546[a]
	Residual	489.168	76	6.436		
	Total	491.538	77			
2	Regression	27.890	3	9.297	1.484	.226[b]
	Residual	463.648	74	6.266		
	Total	491.538	77			
3	Regression	73.689	4	18.422	3.218	.017[c]
	Residual	417.850	73	5.724		
	Total	491.538	77			
4	Regression	88.376	5	17.675	3.157	.012[d]
	Residual	403.162	72	5.599		
	Total	491.538	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR
d. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_SA
e. Dependent Variable: PSD2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.772	5.453		.508	.613		
	Age	.045	.074	.069	.607	.546	1.000	1.000
2	(Constant)	3.145	5.385		.584	.561		
	Age	.006	.076	.009	.076	.940	.929	1.077
	Peabody	.032	.030	.122	1.066	.290	.973	1.028
	Raven	.125	.080	.184	1.566	.122	.919	1.088
3	(Constant)	.942	5.206		.181	.857		
	Age	-.006	.073	-.009	-.081	.936	.926	1.080
	Peabody	.031	.028	.120	1.099	.275	.973	1.028
	Raven	.080	.078	.118	1.029	.307	.881	1.135
	JMR	.162	.057	.314	2.829	.006	.946	1.057
4	(Constant)	2.254	5.212		.432	.667		
	Age	-.005	.072	-.008	-.075	.940	.926	1.080
	Peabody	.024	.028	.093	.845	.401	.949	1.054
	Raven	.054	.079	.079	.682	.497	.843	1.186
	JMR	.127	.061	.245	2.086	.041	.823	1.215
	FAC_SA	.493	.304	.196	1.620	.110	.776	1.289

a. Dependent Variable: PSD2

JMR after controlling for SA:

Model Summary[e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.069[a]	.005	-.008	2.53701	.005	.368	1	76	.546	
2	.238[b]	.057	.019	2.50310	.052	2.037	2	74	.138	
3	.361[c]	.130	.083	2.42001	.073	6.169	1	73	.015	
4	.424[d]	.180	.123	2.36632	.050	4.350	1	72	.041	1.742

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR
e. Dependent Variable: PSD2

ANOVA[e]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.371	1	2.371	.368	.546[a]
	Residual	489.168	76	6.436		
	Total	491.538	77			
2	Regression	27.890	3	9.297	1.484	.226[b]
	Residual	463.648	74	6.266		
	Total	491.538	77			
3	Regression	64.018	4	16.004	2.733	.035[c]
	Residual	427.521	73	5.856		
	Total	491.538	77			
4	Regression	88.376	5	17.675	3.157	.012[d]
	Residual	403.162	72	5.599		
	Total	491.538	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR
e. Dependent Variable: PSD2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.772	5.453		.508	.613		
	Age	.045	.074	.069	.607	.546	1.000	1.000
2	(Constant)	3.145	5.385		.584	.561		
	Age	.006	.076	.009	.076	.940	.929	1.077
	Peabody	.032	.030	.122	1.066	.290	.973	1.028
	Raven	.125	.080	.184	1.566	.122	.919	1.088
3	(Constant)	4.361	5.230		.834	.407		
	Age	.003	.074	.004	.038	.970	.929	1.077
	Peabody	.021	.029	.081	.725	.471	.952	1.051
	Raven	.072	.080	.106	.899	.372	.854	1.171
	FAC_SA	.721	.290	.287	2.484	.015	.891	1.122
4	(Constant)	2.254	5.212		.432	.667		
	Age	-.005	.072	-.008	-.075	.940	.926	1.080
	Peabody	.024	.028	.093	.845	.401	.949	1.054
	Raven	.054	.079	.079	.682	.497	.843	1.186
	FAC_SA	.493	.304	.196	1.620	.110	.776	1.289
	JMR	.127	.061	.245	2.086	.041	.823	1.215

a. Dependent Variable: PSD2

Predicting the Reading Comprehension Outcome (the Syllabic Factor, Judgment of Morphological Relationships and Dialect Factor were all significant predictors of the Reading Comprehension outcome, hence they will all be tested whether they are independent of each other).

SA after controlling for the other variables

Model Summary[f]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.123[a]	.015	.002	8.46529	.015	1.168	1	76	.283	
2	.299[b]	.089	.052	8.24918	.074	3.017	2	74	.055	
3	.416[c]	.173	.128	7.91332	.084	7.415	1	73	.008	
4	.454[d]	.206	.151	7.80915	.033	2.961	1	72	.090	
5	.486[e]	.236	.172	7.71252	.030	2.815	1	71	.098	1.641

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR
d. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_Dialect, FAC_SA
f. Dependent Variable: RC2

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	83.698	1	83.698	1.168	.283[a]
	Residual	5446.250	76	71.661		
	Total	5529.949	77			
2	Regression	494.330	3	164.777	2.421	.073[b]
	Residual	5035.619	74	68.049		
	Total	5529.949	77			
3	Regression	958.648	4	239.662	3.827	.007[c]
	Residual	4571.301	73	62.621		
	Total	5529.949	77			
4	Regression	1139.191	5	227.838	3.736	.005[d]
	Residual	4390.758	72	60.983		
	Total	5529.949	77			
5	Regression	1306.661	6	217.777	3.661	.003[e]
	Residual	4223.287	71	59.483		
	Total	5529.949	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, JMR
d. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, JMR, FAC_Dialect, FAC_SA
f. Dependent Variable: RC2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-1.278	18.196		-.070	.944		
	Age	.268	.248	.123	1.081	.283	1.000	1.000
2	(Constant)	-.764	17.748		-.043	.966		
	Age	.168	.251	.077	.671	.505	.929	1.077
	Peabody	.223	.098	.257	2.285	.025	.973	1.028
	Raven	.159	.262	.070	.608	.545	.919	1.088
3	(Constant)	-7.776	17.219		-.452	.653		
	Age	.131	.241	.060	.544	.588	.926	1.080
	Peabody	.221	.094	.255	2.365	.021	.973	1.028
	Raven	.017	.257	.008	.067	.946	.881	1.135
	JMR	.516	.189	.298	2.723	.008	.946	1.057
4	(Constant)	-4.868	17.076		-.285	.776		
	Age	.123	.238	.056	.517	.607	.926	1.080
	Peabody	.167	.098	.193	1.714	.091	.872	1.147
	Raven	.000	.254	.000	.000	1.000	.880	1.137
	JMR	.473	.189	.273	2.510	.014	.929	1.076
	FAC_Dialect	1.624	.944	.194	1.721	.090	.867	1.154
5	(Constant)	-1.055	17.017		-.062	.951		
	Age	.127	.235	.058	.540	.591	.925	1.080
	Peabody	.157	.097	.181	1.625	.109	.868	1.152
	Raven	-.088	.256	-.039	-.343	.732	.843	1.186
	JMR	.361	.198	.208	1.822	.073	.823	1.215
	FAC_Dialect	1.184	.969	.141	1.222	.226	.803	1.245
	FAC_SA	1.729	1.031	.205	1.678	.098	.719	1.392

a. Dependent Variable: RC2

JMR after controlling for the other variables

Model Summary[f]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.123[a]	.015	.002	8.46529	.015	1.168	1	76	.283	
2	.299[b]	.089	.052	8.24918	.074	3.017	2	74	.055	
3	.428[c]	.183	.138	7.86616	.094	8.382	1	73	.005	
4	.448[d]	.201	.145	7.83581	.017	1.566	1	72	.215	
5	.486[e]	.236	.172	7.71252	.036	3.320	1	71	.073	1.641

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect, JMR
f. Dependent Variable: RC2

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	83.698	1	83.698	1.168	.283[a]
	Residual	5446.250	76	71.661		
	Total	5529.949	77			
2	Regression	494.330	3	164.777	2.421	.073[b]
	Residual	5035.619	74	68.049		
	Total	5529.949	77			
3	Regression	1012.967	4	253.242	4.093	.005[c]
	Residual	4516.982	73	61.876		
	Total	5529.949	77			
4	Regression	1109.150	5	221.830	3.613	.006[d]
	Residual	4420.799	72	61.400		
	Total	5529.949	77			

5	Regression	1306.661	6	217.777	3.661	.003[e]
	Residual	4223.287	71	59.483		
	Total	5529.949	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect, JMR
f. Dependent Variable: RC2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-1.278	18.196		-.070	.944		
	Age	.268	.248	.123	1.081	.283	1.000	1.000
2	(Constant)	-.764	17.748		-.043	.966		
	Age	.168	.251	.077	.671	.505	.929	1.077
	Peabody	.223	.098	.257	2.285	.025	.973	1.028
	Raven	.159	.262	.070	.608	.545	.919	1.088
3	(Constant)	3.843	16.998		.226	.822		
	Age	.157	.239	.072	.656	.514	.929	1.077
	Peabody	.183	.094	.211	1.943	.056	.952	1.051
	Raven	-.041	.259	-.018	-.157	.875	.854	1.171
	FAC_SA	2.733	.944	.324	2.895	.005	.891	1.122
4	(Constant)	4.990	16.958		.294	.769		
	Age	.150	.238	.069	.629	.532	.928	1.077
	Peabody	.147	.098	.169	1.501	.138	.871	1.148
	Raven	-.036	.258	-.016	-.139	.890	.854	1.171
	FAC_SA	2.366	.985	.281	2.401	.019	.812	1.232
	FAC_Dialect	1.231	.984	.147	1.252	.215	.804	1.244
5	(Constant)	-1.055	17.017		-.062	.951		
	Age	.127	.235	.058	.540	.591	.925	1.080
	Peabody	.157	.097	.181	1.625	.109	.868	1.152
	Raven	-.088	.256	-.039	-.343	.732	.843	1.186
	FAC_SA	1.729	1.031	.205	1.678	.098	.719	1.392
	FAC_Dialect	1.184	.969	.141	1.222	.226	.803	1.245
	JMR	.361	.198	.208	1.822	.073	.823	1.215

a. Dependent Variable: RC2

Dialect after controlling for the other variables

Model Summary[f]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.123[a]	.015	.002	8.46529	.015	1.168	1	76	.283	
2	.299[b]	.089	.052	8.24918	.074	3.017	2	74	.055	
3	.428[c]	.183	.138	7.86616	.094	8.382	1	73	.005	
4	.469[d]	.220	.166	7.73890	.037	3.420	1	72	.068	
5	.486[e]	.236	.172	7.71252	.016	1.494	1	71	.226	1.641

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR, FAC_Dialect
f. Dependent Variable: RC2

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	83.698	1	83.698	1.168	.283[a]
	Residual	5446.250	76	71.661		
	Total	5529.949	77			
2	Regression	494.330	3	164.777	2.421	.073[b]
	Residual	5035.619	74	68.049		
	Total	5529.949	77			
3	Regression	1012.967	4	253.242	4.093	.005[c]
	Residual	4516.982	73	61.876		
	Total	5529.949	77			
4	Regression	1217.823	5	243.565	4.067	.003[d]
	Residual	4312.126	72	59.891		
	Total	5529.949	77			
5	Regression	1306.661	6	217.777	3.661	.003[e]
	Residual	4223.287	71	59.483		
	Total	5529.949	77			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, JMR, FAC_Dialect
f. Dependent Variable: RC2

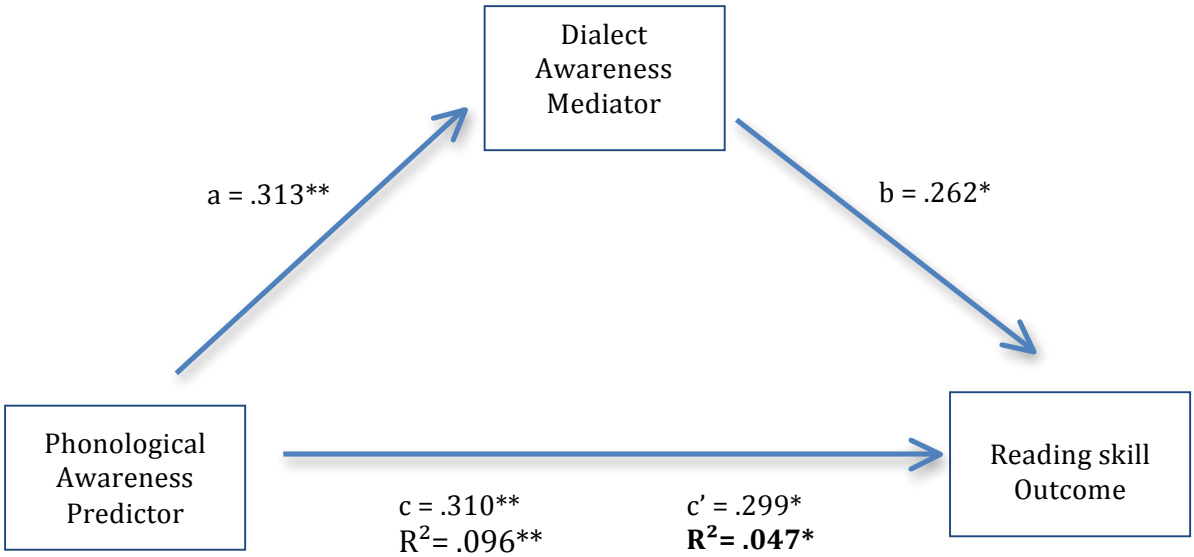
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-1.278	18.196		-.070	.944		
	Age	.268	.248	.123	1.081	.283	1.000	1.000
2	(Constant)	-.764	17.748		-.043	.966		
	Age	.168	.251	.077	.671	.505	.929	1.077
	Peabody	.223	.098	.257	2.285	.025	.973	1.028
	Raven	.159	.262	.070	.608	.545	.919	1.088
3	(Constant)	3.843	16.998		.226	.822		
	Age	.157	.239	.072	.656	.514	.929	1.077
	Peabody	.183	.094	.211	1.943	.056	.952	1.051
	Raven	-.041	.259	-.018	-.157	.875	.854	1.171
	FAC_SA	2.733	.944	.324	2.895	.005	.891	1.122
4	(Constant)	-2.266	17.046		-.133	.895		
	Age	.133	.236	.061	.565	.574	.926	1.080
	Peabody	.191	.093	.221	2.065	.042	.949	1.054
	Raven	-.093	.257	-.041	-.364	.717	.843	1.186
	FAC_SA	2.071	.995	.246	2.080	.041	.776	1.289
	JMR	.367	.199	.212	1.849	.068	.823	1.215
5	(Constant)	-1.055	17.017		-.062	.951		
	Age	.127	.235	.058	.540	.591	.925	1.080
	Peabody	.157	.097	.181	1.625	.109	.868	1.152
	Raven	-.088	.256	-.039	-.343	.732	.843	1.186
	FAC_SA	1.729	1.031	.205	1.678	.098	.719	1.392
	JMR	.361	.198	.208	1.822	.073	.823	1.215
	FAC_Dialect	1.184	.969	.141	1.222	.226	.803	1.245

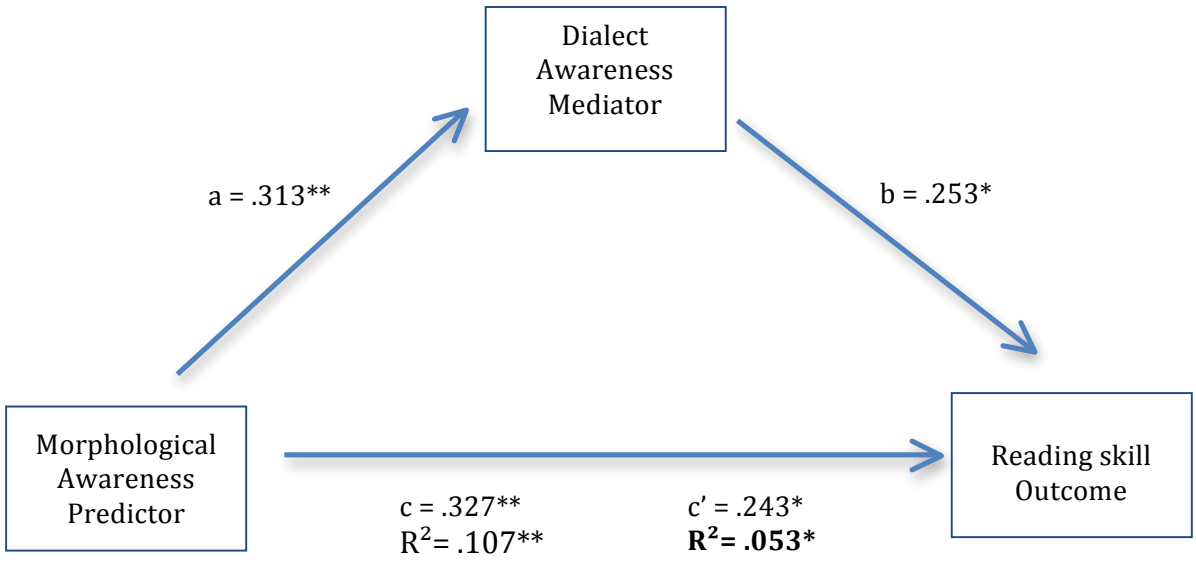
a. Dependent Variable: RC2

Appendix 12 – Mediational Analyses Models for the Third Research Hypothesis

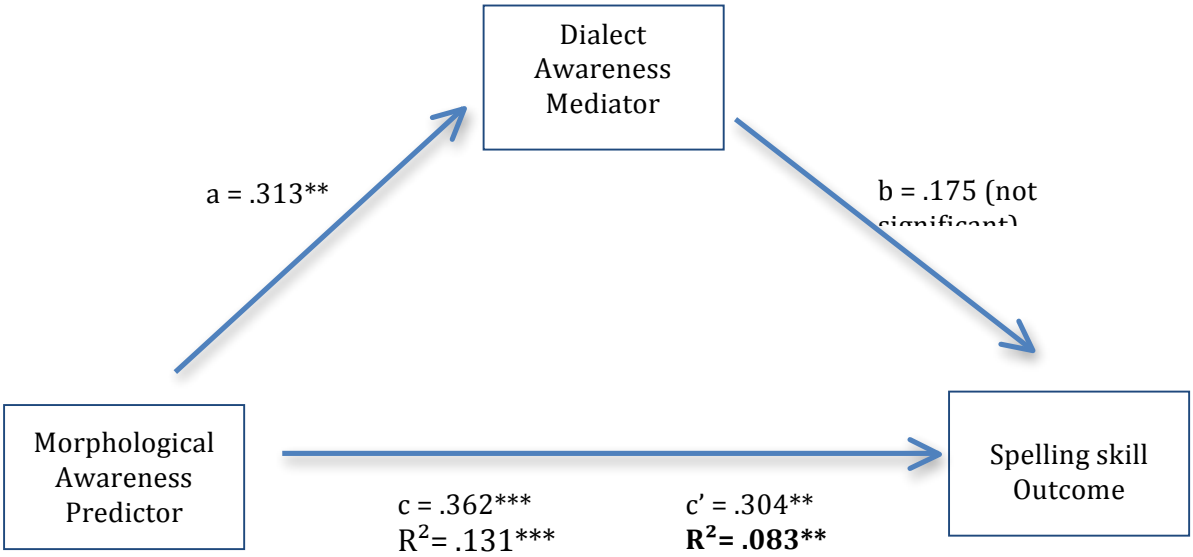
Established Mediation Model between Phonological Predictor, Dialect Mediator and Word Reading Outcome



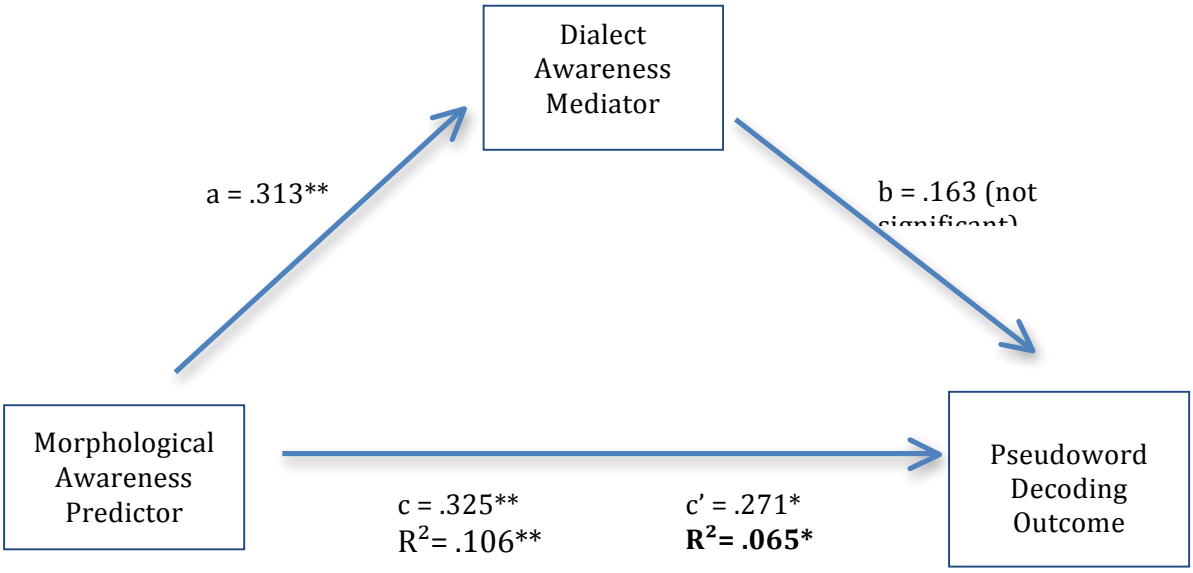
Established Mediation Model between Morphological Predictor, Dialect Mediator and Word Reading Outcome



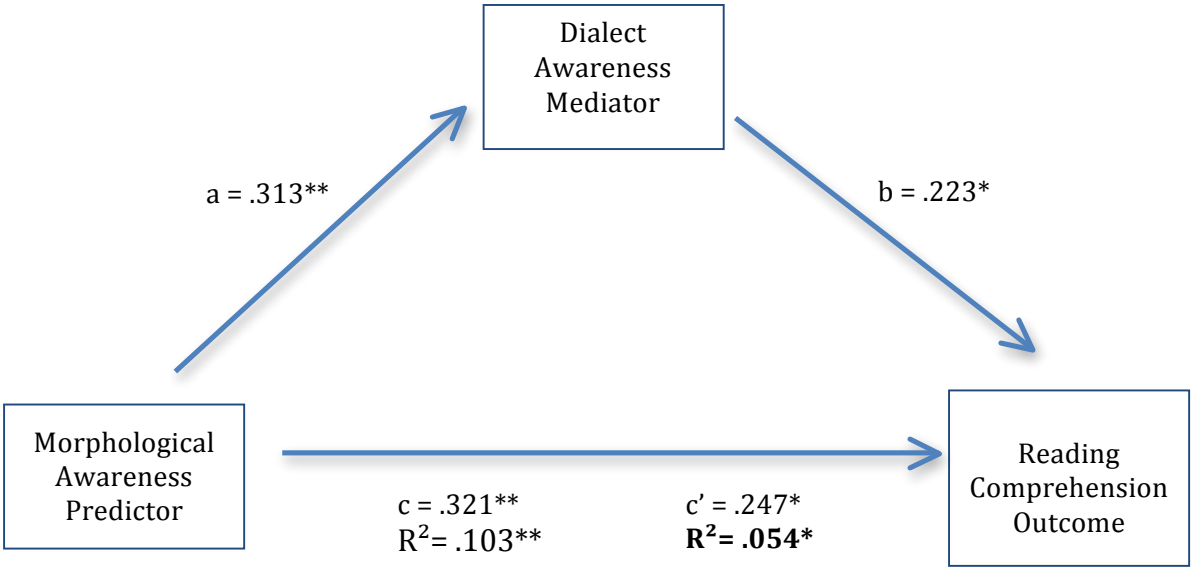
Established Mediation Model between Morphological Predictor, Dialect Mediator and Word Spelling Outcome



Established Mediation Model between Morphological Predictor, Dialect Mediator and Pseudoword Decoding Outcome



Established Mediation Model between Morphological Predictor, Dialect Mediator and Reading Comprehension Outcome



Appendix 13 – Deaf Sample Analysis

General Descriptive Statistics

Age & Cognitive Ability Variables

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Age	34	70	112	93.35	10.608	-.075	.403	-.507	.788
Peabody	34	2	20	9.29	3.850	.838	.403	.707	.788
Raven	34	9	30	15.56	4.487	1.304	.403	2.236	.788
Valid N (listwise)	34								

Predictor Variables

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
ISA	34	.00	8.00	2.6176	2.30959	.844	.403	-.299	.788
FSA	34	.00	7.00	1.1765	1.60436	1.706	.403	3.815	.788
PD	34	.00	3.00	.5294	.82518	1.448	.403	1.257	.788
JMR	34	11.00	32.00	18.382	4.28539	.749	.403	1.754	.788
PP	34	.00	6.00	1.1471	1.52021	1.606	.403	2.179	.788
DD	34	2.00	7.00	4.5588	1.48101	-.122	.403	-.788	.788
SC	34	2.00	15.00	5.9412	3.08409	1.191	.403	1.282	.788
Valid N (listwise)	34								

Outcome Variables

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
R	34	.00	23.00	4.9706	6.93033	1.398	.403	.683	.788
S	34	.00	16.00	3.0588	3.58398	1.854	.403	4.074	.788
PSD	34	.00	9.00	2.1765	2.72442	1.207	.403	.437	.788
RC	34	.00	23.00	5.3235	7.95335	1.453	.403	.544	.788
Valid N (listwise)	34								

Pearson's Correlations Statistics

Correlations

		R	S	PSD	RC
Age	Pearson Correlation	0.124	0.113	0.023	0.137
	Sig. (2-tailed)	0.484	0.523	0.898	0.439
	N	34	34	34	34
Peabody	Pearson Correlation	.347*	.405*	.420*	.389*
	Sig. (2-tailed)	0.045	0.017	0.013	0.023
	N	34	34	34	34
Raven	Pearson Correlation	0.212	.377*	0.22	0.258
	Sig. (2-tailed)	0.229	0.028	0.212	0.141
	N	34	34	34	34
PD	Pearson Correlation	0.024	-0.001	0.159	-0.022
	Sig. (2-tailed)	0.893	0.997	0.368	0.901
	N	34	34	34	34
ISA	Pearson Correlation	.438**	.409*	0.165	.424*
	Sig. (2-tailed)	0.009	0.016	0.351	0.012
	N	34	34	34	34
FSA	Pearson Correlation	.426*	.599**	0.242	.449**
	Sig. (2-tailed)	0.012	0	0.167	0.008
	N	34	34	34	34
JMR	Pearson Correlation	.461**	.586**	0.303	.503**
	Sig. (2-tailed)	0.006	0	0.082	0.002
	N	34	34	34	34
PP	Pearson Correlation	0.185	0.293	0.067	0.086
	Sig. (2-tailed)	0.296	0.092	0.708	0.628
	N	34	34	34	34
DD	Pearson Correlation	0.176	0.251	0.32	0.061
	Sig. (2-tailed)	0.32	0.153	0.065	0.73
	N	34	34	34	34
SC	Pearson Correlation	.452**	.571**	0.311	.405*
	Sig. (2-tailed)	0.007	0	0.073	0.018
	N	34	34	34	34

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

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

Regression Analyses for the Fisrt Research Hypothesis

Predictors of the Reading Measure (R)

Phonology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.124[a]	.015	-.015	6.98328	.015	.501	1	32	.484	
2	.358[b]	.128	.041	6.78762	.113	1.936	2	30	.162	
3	.594[c]	.353	.237	6.05173	.225	4.870	2	28		1.393

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: Reading

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.453	1	24.453	.501	.484[a]
	Residual	1560.517	32	48.766		
	Total	1584.971	33			
2	Regression	202.818	3	67.606	1.467	.243[b]
	Residual	1382.153	30	46.072		
	Total	1584.971	33			
3	Regression	559.516	5	111.903	3.056	.025[c]
	Residual	1025.455	28	36.623		
	Total	1584.971	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: Reading

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-2.605	10.764		-.242	.810		
	Age	.081	.115	.124	.708	.484	1.000	1.000
2	(Constant)	-4.398	10.502		-.419	.678		
	Age	.026	.119	.039	.217	.830	.878	1.140
	Peabody	.557	.336	.309	1.660	.107	.836	1.196
	Raven	.115	.301	.074	.382	.705	.765	1.308
3	(Constant)	-6.447	9.388		-.687	.498		
	Age	.062	.107	.094	.578	.568	.866	1.155
	Peabody	.348	.314	.193	1.109	.277	.761	1.313
	Raven	.156	.270	.101	.577	.569	.757	1.322
	FAC_SA	3.351	1.093	.484	3.067	.005	.930	1.075
	FAC_PD	-.468	1.071	-.068	-.437	.665	.968	1.033

a. Dependent Variable: Reading

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.124[a]	.015	-.015	6.98328	.015	.501	1	32	.484	
2	.358[b]	.128	.041	6.78762	.113	1.936	2	30	.162	
3	.583[c]	.340	.222	6.11372	.212	4.489	2	28	.020	1.787

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.124[a]	.015	-.015	6.98328	.015	.501	1	32	.484	
2	.358[b]	.128	.041	6.78762	.113	1.936	2	30	.162	
3	.583[c]	.340	.222	6.11372	.212	4.489	2	28	.020	1.787

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, Pseudoword Production
d. Dependent Variable: Reading

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.453	1	24.453	.501	.484[a]
	Residual	1560.517	32	48.766		
	Total	1584.971	33			
2	Regression	202.818	3	67.606	1.467	.243[b]
	Residual	1382.153	30	46.072		
	Total	1584.971	33			
3	Regression	538.397	5	107.679	2.881	.032[c]
	Residual	1046.573	28	37.378		
	Total	1584.971	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, Pseudoword Production
d. Dependent Variable: Reading

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-2.605	10.764		-.242	.810		
	Age	.081	.115	.124	.708	.484	1.000	1.000
2	(Constant)	-4.398	10.502		-.419	.678		
	Age	.026	.119	.039	.217	.830	.878	1.140
	Peabody	.557	.336	.309	1.660	.107	.836	1.196
	Raven	.115	.301	.074	.382	.705	.765	1.308
3	(Constant)	-16.219	10.351		-1.567	.128		
	Age	.015	.107	.023	.141	.889	.872	1.147
	Peabody	.582	.302	.323	1.924	.065	.836	1.197
	Raven	.069	.274	.044	.251	.804	.752	1.331
	Judgment of Morph. Relationships	.698	.257	.432	2.712	.011	.931	1.075
	Pseudoword Production	.406	.727	.089	.559	.581	.928	1.077

a. Dependent Variable: Reading

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.124[a]	.015	-.015	6.98328	.015	.501	1	32	.484	
2	.358[b]	.128	.041	6.78762	.113	1.936	2	30	.162	
3	.500[c]	.250	.146	6.40442	.122	4.697	1	29	.039	1.865

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: Reading

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.453	1	24.453	.501	.484[a]
	Residual	1560.517	32	48.766		
	Total	1584.971	33			
2	Regression	202.818	3	67.606	1.467	.243[b]
	Residual	1382.153	30	46.072		
	Total	1584.971	33			
3	Regression	395.488	4	98.872	2.411	.072[c]
	Residual	1189.482	29	41.017		
	Total	1584.971	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: Reading

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-2.605	10.764		-.242	.810		
	Age	.081	.115	.124	.708	.484	1.000	1.000
2	(Constant)	-4.398	10.502		-.419	.678		
	Age	.026	.119	.039	.217	.830	.878	1.140
	Peabody	.557	.336	.309	1.660	.107	.836	1.196
	Raven	.115	.301	.074	.382	.705	.765	1.308
3	(Constant)	-.891	10.041		-.089	.930		
	Age	-.004	.113	-.006	-.032	.975	.865	1.156
	Peabody	.432	.322	.240	1.341	.190	.809	1.236
	Raven	.140	.284	.091	.494	.625	.763	1.310
	FAC_Dialect	2.484	1.146	.358	2.167	.039	.946	1.057

a. Dependent Variable: Reading

Predictors of the Spelling Measure (S)

Phonology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.113[a]	.013	-.018	3.61607	.013	.417	1	32	.523	
2	.469[b]	.220	.142	3.31979	.207	3.983	2	30	.029	
3	.733[c]	.538	.455	2.64501	.318	9.630	2	28	.001	1.566

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: Spelling

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.452	1	5.452	.417	.523[a]
	Residual	418.430	32	13.076		
	Total	423.882	33			
2	Regression	93.252	3	31.084	2.820	.056[b]
	Residual	330.630	30	11.021		
	Total	423.882	33			
3	Regression	227.992	5	45.598	6.518	.000[c]
	Residual	195.890	28	6.996		
	Total	423.882	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: Spelling

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-.518	5.574		-.093	.927		
	Age	.038	.059	.113	.646	.523	1.000	1.000
2	(Constant)	-1.731	5.137		-.337	.738		
	Age	-.013	.058	-.037	-.216	.831	.878	1.140
	Peabody	.284	.164	.305	1.730	.094	.836	1.196
	Raven	.213	.147	.267	1.449	.158	.765	1.308
3	(Constant)	-2.956	4.103		-.720	.477		
	Age	.009	.047	.026	.187	.853	.866	1.155
	Peabody	.168	.137	.181	1.226	.230	.761	1.313
	Raven	.234	.118	.293	1.983	.057	.757	1.322
	FAC_SA	2.013	.477	.562	4.216	.000	.930	1.075
	FAC_PD	-.481	.468	-.134	-1.027	.313	.968	1.033

a. Dependent Variable: Spelling

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.113[a]	.013	-.018	3.61607	.013	.417	1	32	.523	
2	.469[b]	.220	.142	3.31979	.207	3.983	2	30	.029	
3	.758[c]	.575	.499	2.53661	.355	11.692	2	28	.000	2.456

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, Pseudoword Production
d. Dependent Variable: Spelling

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.452	1	5.452	.417	.523[a]
	Residual	418.430	32	13.076		
	Total	423.882	33			
2	Regression	93.252	3	31.084	2.820	.056[b]
	Residual	330.630	30	11.021		
	Total	423.882	33			
3	Regression	243.719	5	48.744	7.576	.000[c]
	Residual	180.163	28	6.434		
	Total	423.882	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, Pseudoword Production
d. Dependent Variable: Spelling

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.518	5.574		-.093	.927		
	Age	.038	.059	.113	.646	.523	1.000	1.000
2	(Constant)	-1.731	5.137		-.337	.738		
	Age	-.013	.058	-.037	-.216	.831	.878	1.140
	Peabody	.284	.164	.305	1.730	.094	.836	1.196
	Raven	.213	.147	.267	1.449	.158	.765	1.308
3	(Constant)	-9.201	4.295		-2.143	.041		
	Age	-.022	.045	-.064	-.485	.632	.872	1.147
	Peabody	.300	.125	.322	2.388	.024	.836	1.197
	Raven	.191	.114	.239	1.684	.103	.752	1.331
	Judgment of Morph. Relationships	.435	.107	.520	4.072	.000	.931	1.075
	Pseudoword Production	.456	.301	.194	1.514	.141	.928	1.077

a. Dependent Variable: Spelling

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.113[a]	.013	-.018	3.61607	.013	.417	1	32	.523	
2	.469[b]	.220	.142	3.31979	.207	3.983	2	30	.029	
3	.669[c]	.447	.371	2.84295	.227	11.908	1	29	.002	2.311

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: Spelling

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.452	1	5.452	.417	.523[a]
	Residual	418.430	32	13.076		
	Total	423.882	33			
2	Regression	93.252	3	31.084	2.820	.056[b]
	Residual	330.630	30	11.021		
	Total	423.882	33			
3	Regression	189.494	4	47.373	5.861	.001[c]
	Residual	234.389	29	8.082		
	Total	423.882	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: Spelling

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-.518	5.574		-.093	.927		
	Age	.038	.059	.113	.646	.523	1.000	1.000
2	(Constant)	-1.731	5.137		-.337	.738		
	Age	-.013	.058	-.037	-.216	.831	.878	1.140
	Peabody	.284	.164	.305	1.730	.094	.836	1.196
	Raven	.213	.147	.267	1.449	.158	.765	1.308
3	(Constant)	.748	4.457		.168	.868		
	Age	-.033	.050	-.099	-.663	.512	.865	1.156
	Peabody	.195	.143	.210	1.368	.182	.809	1.236
	Raven	.231	.126	.290	1.833	.077	.763	1.310
	FAC_Dialect	1.756	.509	.490	3.451	.002	.946	1.057

a. Dependent Variable: Spelling

Predictors of the Pseudoword Decoding Measure (PSD)

Phonology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.023[a]	.001	-.031	2.76593	.001	.017	1	32	.898	
2	.431[b]	.185	.104	2.57886	.185	3.405	2	30	.046	
3	.466[c]	.217	.077	2.61749	.031	.561	2	28	.577	1.549

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: Pseudowords Decoding

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.129	1	.129	.017	.898[a]
	Residual	244.812	32	7.650		
	Total	244.941	33			
2	Regression	45.425	3	15.142	2.277	.100[b]
	Residual	199.516	30	6.651		
	Total	244.941	33			
3	Regression	53.106	5	10.621	1.550	.207[c]
	Residual	191.835	28	6.851		
	Total	244.941	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: Pseudowords Decoding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.626	4.264		.381	.705		
	Age	.006	.045	.023	.130	.898	1.000	1.000
2	(Constant)	.724	3.990		.181	.857		
	Age	-.022	.045	-.084	-.478	.636	.878	1.140
	Peabody	.283	.128	.400	2.221	.034	.836	1.196
	Raven	.054	.114	.088	.469	.643	.765	1.308
3	(Constant)	.422	4.061		.104	.918		
	Age	-.016	.046	-.062	-.347	.731	.866	1.155
	Peabody	.243	.136	.343	1.788	.085	.761	1.313
	Raven	.064	.117	.105	.547	.588	.757	1.322
	FAC_SA	.482	.473	.177	1.021	.316	.930	1.075
	FAC_PD	.151	.463	.056	.327	.746	.968	1.033

a. Dependent Variable: Pseudowords Decoding

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.023[a]	.001	-.031	2.76593	.001	.017	1	32	.898	
2	.431[b]	.185	.104	2.57886	.185	3.405	2	30	.046	
3	.524[c]	.274	.144	2.51992	.089	1.710	2	28	.199	1.636

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, Pseudoword Production
d. Dependent Variable: Pseudowords Decoding

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.129	1	.129	.017	.898[a]
	Residual	244.812	32	7.650		
	Total	244.941	33			
2	Regression	45.425	3	15.142	2.277	.100[b]
	Residual	199.516	30	6.651		
	Total	244.941	33			
3	Regression	67.141	5	13.428	2.115	.093[c]
	Residual	177.800	28	6.350		
	Total	244.941	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, Pseudoword Production
d. Dependent Variable: Pseudowords Decoding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.626	4.264		.381	.705		
	Age	.006	.045	.023	.130	.898	1.000	1.000
2	(Constant)	.724	3.990		.181	.857		
	Age	-.022	.045	-.084	-.478	.636	.878	1.140
	Peabody	.283	.128	.400	2.221	.034	.836	1.196
	Raven	.054	.114	.088	.469	.643	.765	1.308
3	(Constant)	-2.410	4.266		-.565	.577		
	Age	-.023	.044	-.091	-.529	.601	.872	1.147
	Peabody	.290	.125	.410	2.326	.027	.836	1.197
	Raven	.038	.113	.063	.341	.735	.752	1.331
	Judgment of Morph. Relationships	.188	.106	.295	1.769	.088	.931	1.075
	Pseudoword Production	.024	.299	.013	.081	.936	.928	1.077

a. Dependent Variable: Pseudowords Decoding

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.023[a]	.001	-.031	2.76593	.001	.017	1	32	.898	
2	.431[b]	.185	.104	2.57886	.185	3.405	2	30	.046	
3	.555[c]	.308	.213	2.41767	.123	5.134	1	29	.031	1.806

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: Pseudowords Decoding

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.129	1	.129	.017	.898[a]
	Residual	244.812	32	7.650		
	Total	244.941	33			
2	Regression	45.425	3	15.142	2.277	.100[b]
	Residual	199.516	30	6.651		
	Total	244.941	33			
3	Regression	75.433	4	18.858	3.226	.026[c]
	Residual	169.508	29	5.845		
	Total	244.941	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: Pseudowords Decoding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.626	4.264		.381	.705		
	Age	.006	.045	.023	.130	.898	1.000	1.000
2	(Constant)	.724	3.990		.181	.857		
	Age	-.022	.045	-.084	-.478	.636	.878	1.140
	Peabody	.283	.128	.400	2.221	.034	.836	1.196
	Raven	.054	.114	.088	.469	.643	.765	1.308

3	(Constant)	2.108	3.790		.556	.582		
	Age	-.033	.043	-.129	-.777	.443	.865	1.156
	Peabody	.234	.122	.330	1.924	.064	.809	1.236
	Raven	.064	.107	.105	.593	.558	.763	1.310
	FAC_Dialect	.980	.433	.360	2.266	.031	.946	1.057

a. Dependent Variable: Pseudowords Decoding

Predictors of the Reading Comprehension Measure (RC)

Phonology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.137[a]	.019	-.012	8.00024	.019	.614	1	32	.439	
2	.406[b]	.165	.081	7.62416	.146	2.617	2	30	.090	
3	.628[c]	.395	.286	6.71833	.230	5.318	2	28	.011	1.489

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: Reading Comprehension

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.317	1	39.317	.614	.439[a]
	Residual	2048.124	32	64.004		
	Total	2087.441	33			

2	Regression	343.606	3	114.535	1.970	.140[b]
	Residual	1743.835	30	58.128		
	Total	2087.441	33			
3	Regression	823.635	5	164.727	3.650	.011[c]
	Residual	1263.806	28	45.136		
	Total	2087.441	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_PD, FAC_SA
d. Dependent Variable: Reading Comprehension

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-4.282	12.332		-.347	.731		
	Age	.103	.131	.137	.784	.439	1.000	1.000
2	(Constant)	-6.629	11.797		-.562	.578		
	Age	.026	.134	.034	.194	.848	.878	1.140
	Peabody	.698	.377	.338	1.851	.074	.836	1.196
	Raven	.196	.338	.111	.580	.566	.765	1.308
3	(Constant)	-8.924	10.422		-.856	.399		
	Age	.066	.118	.087	.553	.585	.866	1.155
	Peabody	.485	.348	.235	1.392	.175	.761	1.313
	Raven	.233	.300	.131	.777	.443	.757	1.322
	FAC_SA	3.775	1.213	.475	3.113	.004	.930	1.075
	FAC_PD	-.990	1.189	-.124	-.833	.412	.968	1.033

a. Dependent Variable: Reading Comprehension

Morphology

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.137[a]	.019	-.012	8.00024	.019	.614	1	32	.439	
2	.406[b]	.165	.081	7.62416	.146	2.617	2	30	.090	
3	.638[c]	.407	.301	6.64965	.242	5.719	2	28	.008	1.901

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, Pseudoword Production
d. Dependent Variable: Reading Comprehension

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.317	1	39.317	.614	.439[a]
	Residual	2048.124	32	64.004		
	Total	2087.441	33			
2	Regression	343.606	3	114.535	1.970	.140[b]
	Residual	1743.835	30	58.128		
	Total	2087.441	33			
3	Regression	849.341	5	169.868	3.842	.009[c]
	Residual	1238.100	28	44.218		
	Total	2087.441	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, Pseudoword Production
d. Dependent Variable: Reading Comprehension

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.282	12.332		-.347	.731		
	Age	.103	.131	.137	.784	.439	1.000	1.000
2	(Constant)	-6.629	11.797		-.562	.578		
	Age	.026	.134	.034	.194	.848	.878	1.140
	Peabody	.698	.377	.338	1.851	.074	.836	1.196
	Raven	.196	.338	.111	.580	.566	.765	1.308
3	(Constant)	-21.978	11.258		-1.952	.061		
	Age	.020	.117	.026	.169	.867	.872	1.147
	Peabody	.731	.329	.354	2.221	.035	.836	1.197
	Raven	.114	.298	.064	.382	.705	.752	1.331
	Judgment of Morph. Relationships	.927	.280	.500	3.311	.003	.931	1.075
	Pseudoword Production	-.125	.790	-.024	-.158	.876	.928	1.077

a. Dependent Variable: Reading Comprehension

Dialect

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.137[a]	.019	-.012	8.00024	.019	.614	1	32	.439	
2	.406[b]	.165	.081	7.62416	.146	2.617	2	30	.090	
3	.467[c]	.218	.110	7.50160	.054	1.988	1	29	.169	1.879

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: Reading Comprehension

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.317	1	39.317	.614	.439[a]
	Residual	2048.124	32	64.004		
	Total	2087.441	33			
2	Regression	343.606	3	114.535	1.970	.140[b]
	Residual	1743.835	30	58.128		
	Total	2087.441	33			
3	Regression	455.496	4	113.874	2.024	.117[c]
	Residual	1631.946	29	56.274		
	Total	2087.441	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_Dialect
d. Dependent Variable: Reading Comprehension

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.282	12.332		-.347	.731		
	Age	.103	.131	.137	.784	.439	1.000	1.000
2	(Constant)	-6.629	11.797		-.562	.578		
	Age	.026	.134	.034	.194	.848	.878	1.140
	Peabody	.698	.377	.338	1.851	.074	.836	1.196
	Raven	.196	.338	.111	.580	.566	.765	1.308
3	(Constant)	-3.957	11.761		-.336	.739		
	Age	.003	.132	.005	.026	.979	.865	1.156
	Peabody	.602	.377	.292	1.597	.121	.809	1.236
	Raven	.216	.333	.122	.648	.522	.763	1.310
	FAC_Dialect	1.893	1.342	.238	1.410	.169	.946	1.057

a. Dependent Variable: Reading Comprehension

Regression Analyses for the Second Research Hypothesis

Predicting the Reading Outcome (the Syllabic Factor, Judgment of Morphological Relationships and Dialect Factor were all significant predictors of the Reading Outcome, hence they will all be tested whether they are independent of each other).

SA after controlling for the other variables

Model Summary[f]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.124[a]	.015	-.015	6.98328	.015	.501	1	32	.484	
2	.358[b]	.128	.041	6.78762	.113	1.936	2	30	.162	
3	.576[c]	.332	.240	6.04083	.204	8.876	1	29	.006	
4	.609[d]	.371	.259	5.96620	.039	1.730	1	28	.199	
5	.675[e]	.456	.335	5.65099	.085	4.211	1	27	.050	1.680

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships
d. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, FAC_Dialect, FAC_SA
f. Dependent Variable: Reading

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.453	1	24.453	.501	.484[a]
	Residual	1560.517	32	48.766		
	Total	1584.971	33			
2	Regression	202.818	3	67.606	1.467	.243[b]
	Residual	1382.153	30	46.072		
	Total	1584.971	33			
3	Regression	526.713	4	131.678	3.608	.017[c]
	Residual	1058.258	29	36.492		
	Total	1584.971	33			

4	Regression	588.296	5	117.659	3.305	.018[d]
	Residual	996.675	28	35.596		
	Total	1584.971	33			
5	Regression	722.762	6	120.460	3.772	.007[e]
	Residual	862.209	27	31.934		
	Total	1584.971	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships
d. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, FAC_Dialect, FAC_SA
f. Dependent Variable: Reading

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-2.605	10.764		-.242	.810		
	Age	.081	.115	.124	.708	.484	1.000	1.000
2	(Constant)	-4.398	10.502		-.419	.678		
	Age	.026	.119	.039	.217	.830	.878	1.140
	Peabody	.557	.336	.309	1.660	.107	.836	1.196
	Raven	.115	.301	.074	.382	.705	.765	1.308
3	(Constant)	-16.601	10.205		-1.627	.115		
	Age	.020	.106	.030	.186	.854	.877	1.140
	Peabody	.583	.299	.324	1.951	.061	.836	1.197
	Raven	.053	.269	.034	.196	.846	.760	1.316
	Judgment of Morph. Relationships	.734	.246	.454	2.979	.006	.992	1.008

4	(Constant)	-12.382	10.577		-1.171	.252		
	Age	.003	.105	.004	.028	.978	.864	1.157
	Peabody	.502	.301	.279	1.667	.107	.801	1.248
	Raven	.079	.266	.051	.296	.769	.756	1.323
	Judgment of Morph. Relationships	.608	.261	.376	2.327	.027	.860	1.163
	FAC_Dialect	1.509	1.147	.218	1.315	.199	.820	1.220
5	(Constant)	-12.116	10.019		-1.209	.237		
	Age	.036	.101	.054	.352	.727	.843	1.186
	Peabody	.364	.293	.202	1.241	.225	.759	1.318
	Raven	.120	.253	.078	.475	.638	.751	1.332
	Judgment of Morph. Relationships	.463	.258	.286	1.798	.083	.795	1.259
	FAC_Dialect	.990	1.115	.143	.887	.383	.778	1.286
	FAC_SA	2.303	1.122	.332	2.052	.050	.768	1.302

a. Dependent Variable: Reading

JMR after controlling for the other variables

Model Summary[f]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.124[a]	.015	-.015	6.98328	.015	.501	1	32	.484	
2	.358[b]	.128	.041	6.78762	.113	1.936	2	30	.162	
3	.590[c]	.349	.259	5.96674	.221	9.822	1	29	.004	
4	.625[d]	.391	.282	5.87202	.042	1.943	1	28	.174	
5	.675[e]	.456	.335	5.65099	.065	3.233	1	27	.083	1.680

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect, Judgment of Morphological Relationships
f. Dependent Variable: Reading

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.453	1	24.453	.501	.484[a]
	Residual	1560.517	32	48.766		
	Total	1584.971	33			
2	Regression	202.818	3	67.606	1.467	.243[b]
	Residual	1382.153	30	46.072		
	Total	1584.971	33			
3	Regression	552.514	4	138.128	3.880	.012[c]
	Residual	1032.457	29	35.602		
	Total	1584.971	33			
4	Regression	619.512	5	123.902	3.593	.012[d]
	Residual	965.458	28	34.481		
	Total	1584.971	33			
5	Regression	722.762	6	120.460	3.772	.007[e]
	Residual	862.209	27	31.934		
	Total	1584.971	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect, Judgment of Morphological Relationships
f. Dependent Variable: Reading

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-2.605	10.764		-.242	.810		
	Age	.081	.115	.124	.708	.484	1.000	1.000
2	(Constant)	-4.398	10.502		-.419	.678		
	Age	.026	.119	.039	.217	.830	.878	1.140
	Peabody	.557	.336	.309	1.660	.107	.836	1.196
	Raven	.115	.301	.074	.382	.705	.765	1.308
3	(Constant)	-6.473	9.256		-.699	.490		
	Age	.063	.105	.096	.597	.555	.866	1.154
	Peabody	.324	.304	.180	1.063	.296	.786	1.272
	Raven	.165	.265	.107	.623	.538	.762	1.313
	FAC_SA	3.373	1.076	.487	3.134	.004	.932	1.073
4	(Constant)	-3.967	9.285		-.427	.672		
	Age	.039	.105	.059	.370	.714	.843	1.186
	Peabody	.281	.301	.156	.933	.359	.778	1.285
	Raven	.174	.261	.112	.665	.512	.761	1.314
	FAC_SA	2.858	1.121	.412	2.549	.017	.831	1.204
	FAC_Dialect	1.551	1.113	.224	1.394	.174	.844	1.185
5	(Constant)	-12.116	10.019		-1.209	.237		
	Age	.036	.101	.054	.352	.727	.843	1.186
	Peabody	.364	.293	.202	1.241	.225	.759	1.318
	Raven	.120	.253	.078	.475	.638	.751	1.332
	FAC_SA	2.303	1.122	.332	2.052	.050	.768	1.302
	FAC_Dialect	.990	1.115	.143	.887	.383	.778	1.286
	Judgment of Morph. Relationships	.463	.258	.286	1.798	.083	.795	1.259

a. Dependent Variable: Reading

Dialect after controlling for the other variables:

Model Summary[f]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.124[a]	.015	-.015	6.98328	.015	.501	1	32	.484	
2	.358[b]	.128	.041	6.78762	.113	1.936	2	30	.162	
3	.590[c]	.349	.259	5.96674	.221	9.822	1	29	.004	
4	.663[d]	.440	.340	5.62951	.092	4.578	1	28	.041	
5	.675[e]	.456	.335	5.65099	.016	.788	1	27	.383	1.680

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, Judgment of Morphological Relationships
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, Judgment of Morphological Relationships, FAC_Dialect
f. Dependent Variable: Reading

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.453	1	24.453	.501	.484[a]
	Residual	1560.517	32	48.766		
	Total	1584.971	33			
2	Regression	202.818	3	67.606	1.467	.243[b]
	Residual	1382.153	30	46.072		
	Total	1584.971	33			
3	Regression	552.514	4	138.128	3.880	.012[c]
	Residual	1032.457	29	35.602		
	Total	1584.971	33			
4	Regression	697.611	5	139.522	4.403	.004[d]
	Residual	887.360	28	31.691		
	Total	1584.971	33			
5	Regression	722.762	6	120.460	3.772	.007[e]
	Residual	862.209	27	31.934		
	Total	1584.971	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, Judgment of Morphological Relationships
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, Judgment of Morphological Relationships, FAC_Dialect
f. Dependent Variable: Reading

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-2.605	10.764		-.242	.810		
	Age	.081	.115	.124	.708	.484	1.000	1.000
2	(Constant)	-4.398	10.502		-.419	.678		
	Age	.026	.119	.039	.217	.830	.878	1.140
	Peabody	.557	.336	.309	1.660	.107	.836	1.196
	Raven	.115	.301	.074	.382	.705	.765	1.308
3	(Constant)	-6.473	9.256		-.699	.490		
	Age	.063	.105	.096	.597	.555	.866	1.154
	Peabody	.324	.304	.180	1.063	.296	.786	1.272
	Raven	.165	.265	.107	.623	.538	.762	1.313
	FAC_SA	3.373	1.076	.487	3.134	.004	.932	1.073
4	(Constant)	-14.716	9.545		-1.542	.134		
	Age	.049	.099	.075	.495	.625	.863	1.159
	Peabody	.401	.289	.223	1.384	.177	.774	1.292
	Raven	.108	.252	.070	.429	.671	.753	1.328
	FAC_SA	2.529	1.089	.365	2.322	.028	.810	1.235
	Judgment of Morph. Relationships	.527	.246	.326	2.140	.041	.862	1.160
5	(Constant)	-12.116	10.019		-1.209	.237		
	Age	.036	.101	.054	.352	.727	.843	1.186
	Peabody	.364	.293	.202	1.241	.225	.759	1.318
	Raven	.120	.253	.078	.475	.638	.751	1.332
	FAC_SA	2.303	1.122	.332	2.052	.050	.768	1.302
	Judgment of Morph. Relationships	.463	.258	.286	1.798	.083	.795	1.259
	FAC_Dialect	.990	1.115	.143	.887	.383	.778	1.286

a. Dependent Variable: Reading

Predicting the Spelling Outcome (the Syllabic factor, the Judgment of Relationships task and the dialect factor were significant predictors, so they are entered together as a third, fourth and fifth steps alternately after controlling for age and cognitive abilities in the first and second steps, to test for their independence).

SA after controlling for the other variables:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.113[a]	.013	-.018	3.61607	.013	.417	1	32	.523
2	.469[b]	.220	.142	3.31979	.207	3.983	2	30	.029
3	.735[c]	.540	.477	2.59249	.320	20.194	1	29	.000
4	.790[d]	.624	.557	2.38532	.084	6.256	1	28	.018
5	.849[e]	.721	.659	2.09397	.097	9.334	1	27	.005

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships
d. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, FAC_Dialect, FAC_SA

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.452	1	5.452	.417	.523[a]
	Residual	418.430	32	13.076		
	Total	423.882	33			
2	Regression	93.252	3	31.084	2.820	.056[b]
	Residual	330.630	30	11.021		
	Total	423.882	33			
3	Regression	228.974	4	57.243	8.517	.000[c]
	Residual	194.909	29	6.721		
	Total	423.882	33			

4	Regression	264.569	5	52.914	9.300	.000[d]
	Residual	159.313	28	5.690		
	Total	423.882	33			
5	Regression	305.495	6	50.916	11.612	.000[e]
	Residual	118.388	27	4.385		
	Total	423.882	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships
d. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, FAC_Dialect, FAC_SA
f. Dependent Variable: Spelling

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.518	5.574		-.093	.927
	Age	.038	.059	.113	.646	.523
2	(Constant)	-1.731	5.137		-.337	.738
	Age	-.013	.058	-.037	-.216	.831
	Peabody	.284	.164	.305	1.730	.094
	Raven	.213	.147	.267	1.449	.158
3	(Constant)	-9.630	4.380		-2.199	.036
	Age	-.016	.045	-.049	-.362	.720
	Peabody	.301	.128	.323	2.346	.026
	Raven	.173	.115	.217	1.501	.144
	Judgment of Morph. Relationships	.475	.106	.568	4.494	.000
4	(Constant)	-6.423	4.229		-1.519	.140
	Age	-.029	.042	-.086	-.694	.494
	Peabody	.240	.121	.257	1.988	.057
	Raven	.193	.106	.242	1.813	.081
	Judgment of Morph. Relationships	.380	.105	.454	3.632	.001
	FAC_Dialect	1.147	.459	.320	2.501	.018

5	(Constant)	-6.276	3.713		-1.690	.102
	Age	-.011	.037	-.033	-.299	.767
	Peabody	.163	.109	.175	1.501	.145
	Raven	.216	.094	.270	2.303	.029
	Judgment of Morph. Relationships	.299	.095	.358	3.138	.004
	FAC_Dialect	.861	.413	.240	2.083	.047
	FAC_SA	1.271	.416	.355	3.055	.005

a. Dependent Variable: Spelling

JMR after controlling for the other variables:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.113[a]	.013	-.018	3.61607	.013	.417	1	32	.523
2	.469[b]	.220	.142	3.31979	.207	3.983	2	30	.029
3	.721[c]	.520	.454	2.64751	.300	18.170	1	29	.000
4	.787[d]	.619	.551	2.40215	.098	7.227	1	28	.012
5	.849[e]	.721	.659	2.09397	.102	9.848	1	27	.004

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect, Judgment of Morphological Relationships

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.452	1	5.452	.417	.523[a]
	Residual	418.430	32	13.076		
	Total	423.882	33			

2	Regression	93.252	3	31.084	2.820	.056[b]
	Residual	330.630	30	11.021		
	Total	423.882	33			
3	Regression	220.612	4	55.153	7.869	.000[c]
	Residual	203.270	29	7.009		
	Total	423.882	33			
4	Regression	262.314	5	52.463	9.092	.000[d]
	Residual	161.569	28	5.770		
	Total	423.882	33			
5	Regression	305.495	6	50.916	11.612	.000[e]
	Residual	118.388	27	4.385		
	Total	423.882	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, FAC_Dialect, Judgment of Morphological Relationships
f. Dependent Variable: Spelling

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.518	5.574		-.093	.927
	Age	.038	.059	.113	.646	.523
2	(Constant)	-1.731	5.137		-.337	.738
	Age	-.013	.058	-.037	-.216	.831
	Peabody	.284	.164	.305	1.730	.094
	Raven	.213	.147	.267	1.449	.158
3	(Constant)	-2.983	4.107		-.726	.473
	Age	.010	.047	.029	.211	.835
	Peabody	.143	.135	.154	1.060	.298
	Raven	.244	.118	.305	2.072	.047
	FAC_SA	2.035	.477	.568	4.263	.000
4	(Constant)	-1.006	3.798		-.265	.793
	Age	-.009	.043	-.027	-.212	.834
	Peabody	.109	.123	.118	.889	.382
	Raven	.250	.107	.313	2.344	.026
	FAC_SA	1.630	.459	.455	3.552	.001
	FAC_Dialect	1.224	.455	.341	2.688	.012

5	(Constant)	-6.276	3.713		-1.690	.102
	Age	-.011	.037	-.033	-.299	.767
	Peabody	.163	.109	.175	1.501	.145
	Raven	.216	.094	.270	2.303	.029
	FAC_SA	1.271	.416	.355	3.055	.005
	FAC_Dialect	.861	.413	.240	2.083	.047
	Judgment of Morph. Relationships	.299	.095	.358	3.138	.004

a. Dependent Variable: Spelling

Dialect after controlling for the other variables:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.113[a]	.013	-.018	3.61607	.013	.417	1	32	.523
2	.469[b]	.220	.142	3.31979	.207	3.983	2	30	.029
3	.721[c]	.520	.454	2.64751	.300	18.170	1	29	.000
4	.822[d]	.676	.618	2.21526	.155	13.422	1	28	.001
5	.849[e]	.721	.659	2.09397	.045	4.337	1	27	.047

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, Judgment of Morphological Relationships
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, Judgment of Morphological Relationships, FAC_Dialect

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.452	1	5.452	.417	.523[a]
	Residual	418.430	32	13.076		
	Total	423.882	33			

2	Regression	93.252	3	31.084	2.820	.056[b]
	Residual	330.630	30	11.021		
	Total	423.882	33			
3	Regression	220.612	4	55.153	7.869	.000[c]
	Residual	203.270	29	7.009		
	Total	423.882	33			
4	Regression	286.476	5	57.295	11.675	.000[d]
	Residual	137.406	28	4.907		
	Total	423.882	33			
5	Regression	305.495	6	50.916	11.612	.000[e]
	Residual	118.388	27	4.385		
	Total	423.882	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, Judgment of Morphological Relationships
e. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, Judgment of Morphological Relationships, FAC_Dialect
f. Dependent Variable: Spelling

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.518	5.574		-.093	.927
	Age	.038	.059	.113	.646	.523
2	(Constant)	-1.731	5.137		-.337	.738
	Age	-.013	.058	-.037	-.216	.831
	Peabody	.284	.164	.305	1.730	.094
	Raven	.213	.147	.267	1.449	.158
3	(Constant)	-2.983	4.107		-.726	.473
	Age	.010	.047	.029	.211	.835
	Peabody	.143	.135	.154	1.060	.298
	Raven	.244	.118	.305	2.072	.047
	FAC_SA	2.035	.477	.568	4.263	.000

4	(Constant)	-8.537	3.756		-2.273	.031
	Age	.001	.039	.002	.017	.987
	Peabody	.195	.114	.209	1.713	.098
	Raven	.205	.099	.257	2.073	.048
	FAC_SA	1.467	.429	.409	3.423	.002
	Judgment of Morphological Relationships	.355	.097	.425	3.664	.001
5	(Constant)	-6.276	3.713		-1.690	.102
	Age	-.011	.037	-.033	-.299	.767
	Peabody	.163	.109	.175	1.501	.145
	Raven	.216	.094	.270	2.303	.029
	FAC_SA	1.271	.416	.355	3.055	.005
	Judgment of Morphological Relationships	.299	.095	.358	3.138	.004
	FAC_Dialect	.861	.413	.240	2.083	.047

a. Dependent Variable: Spelling

1Predicting the Pseudoword Decoding Outcome (Dialect Factor was the only independent predictor of Pseudoword Decoding, no further regressions are required).

Predicting the Reading Comprehension Outcome (both the Syllabic factor and the Judgment of Relationships task were significant predictors, so they are entered together as a third and fourth steps alternately after controlling for age and cognitive abilities in the first and second steps, to test for their independence).

SA after controlling for JMR:

Model Summary[e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.137[a]	.019	-.012	8.00024	.019	.614	1	32	.439	
2	.406[b]	.165	.081	7.62416	.146	2.617	2	30	.090	
3	.637[c]	.406	.324	6.53689	.242	11.810	1	29	.002	
4	.707[d]	.500	.411	6.10373	.094	5.262	1	28	.030	1.724

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships
d. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, FAC_SA
e. Dependent Variable: Reading Comprehension

ANOVA[e]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.317	1	39.317	.614	.439[a]
	Residual	2048.124	32	64.004		
	Total	2087.441	33			
2	Regression	343.606	3	114.535	1.970	.140[b]
	Residual	1743.835	30	58.128		
	Total	2087.441	33			
3	Regression	848.242	4	212.061	4.963	.004[c]
	Residual	1239.199	29	42.731		
	Total	2087.441	33			
4	Regression	1044.287	5	208.857	5.606	.001[d]
	Residual	1043.154	28	37.256		
	Total	2087.441	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships
d. Predictors: (Constant), Age, Peabody, Raven, Judgment of Morphological Relationships, FAC_SA
e. Dependent Variable: Reading Comprehension

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-4.282	12.332		-.347	.731		
	Age	.103	.131	.137	.784	.439	1.000	1.000
2	(Constant)	-6.629	11.797		-.562	.578		
	Age	.026	.134	.034	.194	.848	.878	1.140
	Peabody	.698	.377	.338	1.851	.074	.836	1.196
	Raven	.196	.338	.111	.580	.566	.765	1.308
3	(Constant)	-21.861	11.043		-1.980	.057		
	Age	.018	.115	.024	.160	.874	.877	1.140
	Peabody	.730	.323	.353	2.258	.032	.836	1.197
	Raven	.119	.291	.067	.408	.686	.760	1.316
	Judgment of Morphological Relationships	.916	.267	.494	3.437	.002	.992	1.008
4	(Constant)	-19.842	10.349		-1.917	.065		
	Age	.050	.108	.067	.463	.647	.863	1.159
	Peabody	.535	.314	.259	1.705	.099	.774	1.292
	Raven	.178	.273	.100	.652	.520	.753	1.328
	Judgment of Morph. Relationships	.695	.267	.374	2.601	.015	.862	1.160
	FAC_SA	2.709	1.181	.341	2.294	.030	.810	1.235

a. Dependent Variable: Reading Comprehension

JMR after controlling for SA:

Model Summary[e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.137[a]	.019	-.012	8.00024	.019	.614	1	32	.439	
2	.406[b]	.165	.081	7.62416	.146	2.617	2	30	.090	
3	.616[c]	.380	.294	6.68278	.215	10.047	1	29	.004	
4	.707[d]	.500	.411	6.10373	.121	6.763	1	28	.015	1.724

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, Judgment of Morphological Relationships
e. Dependent Variable: Reading Comprehension

ANOVA[e]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.317	1	39.317	.614	.439[a]
	Residual	2048.124	32	64.004		
	Total	2087.441	33			
2	Regression	343.606	3	114.535	1.970	.140[b]
	Residual	1743.835	30	58.128		
	Total	2087.441	33			
3	Regression	792.313	4	198.078	4.435	.006[c]
	Residual	1295.128	29	44.660		
	Total	2087.441	33			
4	Regression	1044.287	5	208.857	5.606	.001[d]
	Residual	1043.154	28	37.256		
	Total	2087.441	33			

a. Predictors: (Constant), Age
b. Predictors: (Constant), Age, Peabody, Raven
c. Predictors: (Constant), Age, Peabody, Raven, FAC_SA
d. Predictors: (Constant), Age, Peabody, Raven, FAC_SA, Judgment of Morphological Relationships
e. Dependent Variable: Reading Comprehension

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.282	12.332		-.347	.731		
	Age	.103	.131	.137	.784	.439	1.000	1.000
2	(Constant)	-6.629	11.797		-.562	.578		
	Age	.026	.134	.034	.194	.848	.878	1.140
	Peabody	.698	.377	.338	1.851	.074	.836	1.196
	Raven	.196	.338	.111	.580	.566	.765	1.308
3	(Constant)	-8.980	10.367		-.866	.393		
	Age	.068	.118	.090	.576	.569	.866	1.154
	Peabody	.433	.341	.210	1.272	.214	.786	1.272
	Raven	.253	.297	.143	.853	.401	.762	1.313
	FAC_SA	3.820	1.205	.480	3.170	.004	.932	1.073
4	(Constant)	-19.842	10.349		-1.917	.065		
	Age	.050	.108	.067	.463	.647	.863	1.159
	Peabody	.535	.314	.259	1.705	.099	.774	1.292
	Raven	.178	.273	.100	.652	.520	.753	1.328
	FAC_SA	2.709	1.181	.341	2.294	.030	.810	1.235
	Judgment of Morph. Relationships	.695	.267	.374	2.601	.015	.862	1.160

a. Dependent Variable: Reading Comprehension

Appendix 14 – Mediational Analyses Models for the Third Research Hypothesis

Established Mediation Model between Morphological Predictor, Dialect Mediator and Spelling Outcome of Deaf Children

