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Towards the identification of linguistic characteristics of specific language impairment in Persian

by

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This thesis is dedicated to

My parents for their unconditional love, endless support and encouragement,

and

My loving husband, Hamid, with whom the journey of life has been a truly wonderful experience

Abstract

Studies on specific language impairment (SLI) have identified specific aspects of language as particularly vulnerable. However, a picture of relative strengths and weaknesses characterizing SLI in Persian has not been established. This dissertation aims at the identification of linguistic characteristics of SLI in Persian-speaking children. It focuses on language abilities at 2 levels: at one level it explores areas of difficulty at higher-level component of language such as narratives (*i.e.,* first mentions, story grammar) and at the other level, it examines the difficulties within a lower-level component of language such as morphosyntax (*i.e* case marking, object clitics). Elicited speech samples were collected from 9 Persian-speaking children with SLI as well as 16 TD children matched on age. Children with SLI scored lower than age-matched children on all of these measures. These findings are consistent with accounts that assume processing limitation in children with SLI, such as the morphological richness hypothesis.

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List of Abbreviations

ACC	Accusative marker
DO.CLI	Direct object clitics
EMP	Emphasis
MLU	Mean length of utterance
PAST	Past tense
PL	Plural
POS	Possessor
PRES	Present tense
QAN	Quantifier
SLI	Specific language impairment
Stm	Stem
TD	Typically developing
1SG	1st person singular
2SG	2nd person singular
3SG	3rd person singular
1PL	1st person singular
2PL	2nd person singular
3PL	3rd person singular

CHAPTER 1: Introduction

Cross-linguistic studies have played a central role in the study of specific language impairment (SLI) for decades. These studies can be particularly useful from 2 standpoints. First, they enable researchers to tease apart universals from language specific phenomena in the language development of children with SLI. It has widely been documented that grammatical morphology is of particular difficulty for children with SLI across languages. However, the specific aspects of morphosyntax that are vulnerable for impaired learners vary from one language to another, depending on the structural characteristics of the target language. For example, while many English-speaking children with SLI have difficulties with tense-marking morphemes, difficulties with such morphemes are far less common in the case of children with SLI acquiring other languages such as Italian and Spanish, where other morphemes pose greater problems for the children (e.g., Jacobson & Schwartz, 2003; Leonard, 1998; Leonard, Sabbadini, Leonard & Volterra, 1987; Rice, 2003). Thus, one could make the generalization that grammatical morphology as a linguistic domain tends to pose difficulties for children affected with this disorder, but the aspects of grammatical morphology that are affected is often specific to a language or a language family (Crago, Paradis & Menn, 2008). Further research on crosslinguistic SLI is needed to elucidate general patterns across languages and language families, with the ultimate goal of determining some linguistic universals of this disorder.

The second reason crosslinguistic studies of SLI are useful is because data from different languages are essential for establishing the validity of certain theoretical explanations of SLI. For example, several theories of SLI share the assumption that language difficulties displayed by these children are caused by limitations in processing capacity (Kirchner & Klatsky, 1985). In order to thoroughly evaluate whether processing capacity limitations are a potential cause of SLI, cross-linguistic studies have to be done. This is because if limitations in the information processing are the underlying cause of SLI, its effect should be observed in children with SLI regardless of the language they are learning.

This dissertation was aimed at identifying the linguistic characteristics of SLI in Persian by comparing the abilities in 2 linguistic domains, narratives and grammatical morphology, of Persian-speaking children with SLI to typically-developing (TD) Persian-speaking children. Results are intended to be a contribution to our knowledge of Persian SLI in particular, and also to our more general knowledge of linguistic universals or tendencies in SLI across languages, and of theoretical models of the nature of SLI.

This dissertation is organized into 8 chapters. In chapter 1, I give an introduction to specific language impairment by presenting a definition of impairment, sketching the history of the problem, introducing linguistic and non-linguistic characteristics of SLI and a theoretical framework of language deficits. Chapter 2 describes a linguistic description of the Persian morphemes of interest (i.e case marking, clitics, tense and agreement). The chapter ends with a summary of the aims of this thesis. Chapter 3 gives an overview of criteria for SLI in

general, assessment of children with specific language impairment in Iran and characteristics of the children who participated in this study. Chapter 4 investigates the language abilities of children with SLI, such as those related to story narration and explores whether measures of story narration can distinguish between children with SLI and TD peers. Chapter 5, 6 and 7 lay out an overview of an investigation aimed at the identification of clinical markers of Persian SLI in the morphosyntactic domain such as those related to case-marking system (Ch.5), clitics (Ch.6), and tense and agreement marking (Ch.7). The final chapter (Ch. 8) summarizes the findings of the study and draws theoretical and clinical implications.

1.1 Defining Specific Language Impairment

The task of language acquisition is complex and difficult. Yet, many children can accomplish this remarkable feat with speed and ease. A typically developing child is able to accomplish the basics of language development and comprehend and produce long and relatively complex sentences by the age of 4 to 5 years (Hoff, 2005). However, there are some children who experience difficulties in comprehending and producing language. Child language impairment generally refers to an inability to acquire and use language at the normal rate of children of the same age (Reed, 2005). This impairment can co-occur with other conditions. For example, some children may have a hearing loss or neurological damage that impedes their language development. Others may be cognitively impaired with below-average developmental functioning in several areas, including language.

Children who have Autism spectrum disorder might also have difficulty developing language skills. Language impairment of these types is a consequence of another condition and is the case for the majority of children with language impairment (Law, Garrett & Nye, 2004; Tallal, 1975). But language impairment can also exist as the sole clinically-significant developmental problem a child has. SLI is a term that characterizes this kind of language impairment, i.e., language impairment that is not a consequence of another condition. Children with SLI exhibit significant deficits in the production and/or comprehension of language in the absence of other disabilities such as hearing impairment, cognitive disabilities, neurological damage, physical disability in the speech organs or emotional/behavioral problems in the autism spectrum (Laws & Bishop, 2003; Leonard, 1998; Stark & Tallal, 1981). Thus, a child with SLI appears to be relatively normal in all aspects of cognition, except for language acquisition.

The history of specific language impairment dates back to the nineteenth century when Franz Gall (1835, as cited in Leonard, 1998) provided a description of children with problems in language who did not have any cognitive disabilities. Gall's remarks were followed by investigations by researchers from different disciplines such as neurology, audiology and medicine. For example, Wilde (1853, as cited in Allen 1952) and Vaisse (1866, as cited in Benton, 1959) describe various patterns of language difficulties in children who did not have hearing impairment or cognitive disabilities. Broadbent (1872) reports a case study of an 11-year-old boy who had language impairment, even though his comprehension and nonverbal intelligence were within the normal range. These

early works sowed the seeds for much of the research that was conducted throughout the following decades, which eventually made valuable contributions to the field of specific language impairment in children (e.g., Basser, 1962; Guttman, 1942; Worster-Drought & Allen, 1929). A broad variety of labels was used to describe children of this category, including 'congenital aphasia' (Wilde, 1853; Moyer, 1898), 'infantile aphasia' (Gesell & Amatruda, 1947; van Gelder, Kennedy & Lagauite, 1952), 'developmental aphasia' (Benton, 1964; Eisenson, 1968; Morley, Court, Miller & Garside, 1955), 'dysphasia' (Inhelder, 1963, Weiner, 1969), 'developmental dysphasia' (Chiat & Hirson, 1987; Clahsen, 1989; Wyke, 1978), 'developmental language disorder' (Aram & Nation, 1975), 'developmental language impairment' (Wolfus, Moscovitch & Kinsbourne, 1980) and 'language impairment' (Johnston & Ramstad, 1983). The contributions by these researchers helped to form the current views of SLI. By excluding other disorders, they developed criteria for defining SLI that excluded children with hearing impairment, neurological damage, cognitive disabilities and emotional/behavioral disorder. Accordingly, children with Down syndrome, Williams syndrome and Autism are not included in this category (Tomblin, Records, Buckwatter, Zhang, Smith & O'Brien, 1997; Leonard, 1998).

SLI is defined primarily by exclusionary criteria rather than inclusionary criteria. The inclusionary criteria require children with SLI to demonstrate pronounced weaknesses in their language abilities (Leonard, 1998). This is usually determined by the criteria of 1 standard deviation or more below the mean expected score for their age (Leonard, et al., 1992; Rice & Oetting, 1993; Stark &

Tallal, 1988). The measures of language ability that are employed to identify children with SLI mainly include standardized test batteries, and/or MLU in samples of children's spontaneous speech (Leonard, 1998). Despite the exclusionary and inclusionary criteria, there is considerable heterogeneity within the SLI population with respect to profiles of language deficits across various linguistic domains (Conti-Ramsden & Botting, 1999, 2004; van der Lely, 2003). Botting and Conti-Ramsden (2004, p. 23) describe the term SLI as the one that "is used to describe children with a range of profiles, all of which include marked language difficulties in the context of normal cognitive abilities".

The prevalence of SLI in children is approximately 7% of the population (Leonard, 1998), and the majority consists of boys with a ratio of 4:3 (boys:girls) (Tomblin, et al., 1997). Findings from longitudinal studies indicated that SLI persists over time. One such study that followed children with SLI over a period of 10 years indicated that 64% of children with SLI were still exhibiting difficulties at 15 years of age (Stothard, Snowling, Bishop, Chipchase & Kaplan, 1998). Children with SLI are more likely to have parents or siblings with a history of language learning problems (Choudhury & Benasich, 2003; Conti-Ramsden, Simkin & Pickles, 2006; Leonard, 1998). Familial aggregation studies of SLI suggest that children with SLI are 3 times more likely to have a family member with SLI (Tallal, Hirsch, Realpe-Bonilla, Miller, Brzustowicz, Bartlett & Flax, 2001). This points to the hereditary nature of SLI (e.g., Bishop, North, & Donlan, 1995; Bishop, Laws, Adams & Norbury, 2006; Chu & Flores, 2011; Plomin &

Dale, 2000), although the underlying cause of this disorder is still unknown (Leonard, 1998, Mainela-Arnold, Evans & Coady, 2010).

1.2. The notion of clinical markers

It has always been a major issue for researchers and clinicians to identify children with language impairment. Typically, a child is considered to have SLI if his/her language performance falls below the normal range by more than 1 standard deviation relative to age-matched children, while s/he demonstrates age-appropriate abilities in the normal range (or above) in areas other than language (e.g., cognition, motor skills, hearing, etc). This approach to identification is based on the normal distribution of children's general language performance. In this distribution, children are spread out in such a way that a few show very high levels of performance, a few exhibit a very low level of performance, and the majority lie in the middle. The assumption is that children with SLI fall at the lower bound of the normal distribution.

The normal distribution, however, is not applicable to all aspects of language. There are parts of grammar where variations across individuals are not expected by a certain age. For example, a five-year-old TD child's knowledge of copula or auxiliary BE is virtually adult-like. So the expected distribution of correct use in obligatory context would be a skewed distribution; one that is clustered at the upper-level of performance. If children with SLI do not know this part of the grammar by age 5, they perform below the unaffected children and show a skewed distribution towards the lower level of expected performance. This

variation that shows a bimodal distribution of individual differences has high levels of sensitivity, where true cases of affectedness are detected, and specificity, where true cases of unaffectedness are distinguished. A grammatical marker that follows such distributional properties (i.e. a bimodal distribution) can function as a clinical marker of SLI and distinguish between children with SLI and TD children (Rice, 2000, 2003).

1.3 Language abilities of children with SLI

Limitations in the language abilities of children with SLI have been found in all language domains; higher-level domains such as narrative structure, and in more basic domains such as the lexicon, syntax and morphology (Boudreau, 2007; Fletcher, Leonard, Stokes & Wong, 2009; Marchman, Wulfeck & Weismer, 1999; Paradis, 2010; Pearce, McCormack & James, 2003; Polite, Leonard & Roberts, 2011; Schneider, Haywood & Dube, 2006). Thus, children with SLI can be characterized by limited abilities in providing story content and structure, slow vocabulary acquisition, and syntactic and morphological difficulties (Rescorla & Carlson Lee, 2000). Keep in mind, however, that although deficits have been found in these domains, they are not equally affected by SLI and as will be shown in the following sections, morphosyntax is more affected than other linguistic domains by SLI cross-linguistically (Crago, et al., 2008; Leonard, 1998).

The subsequent sections review narrative, lexical, syntactic and morphological characteristics of children with SLI obtained through studies in a variety of languages.

1.3.1 Narratives

Narratives provide a rich context to evaluate cognitively-integrated linguistic skills of children with SLI. To tell a story, a child needs to attain a certain level of linguistic, cognitive and social skills. Linguistically, narratives require considerable skills in coordinating lexical, morphosyntactic, phonological and pragmatic elements (Bishop & Donlan, 2005; Guo, Tomblin & Samelson, 2008; van der Lely, 1997). Cognitively, a child has to make inferences about the motives behind characters' actions, causes of events, logical relationships between events, and extract theme and plot of the story (Olley, 1989). Narratives can be viewed as "communication acts serving the needs of particular moments and audiences" (Johnston, 1982, p. 144). That is, the narrator must take the listener's perspective of understanding and needs. Given the range of skills required to create a good narrative, analyzing children's narratives enables researchers to explore language development along with the relationship of language development to other cognitive abilities (Leonard, 1998).

A story can be analyzed in 2 levels: microstructure and macrostructure. The microstructure concerns the internal linguistic structures used in the narrative construction (e.g., Epstein & Phillips, 2009; Hughes, McGillivary & Schmidek, 1997; Schneider & Hayward, 2001). It includes the use of cohesive devices to articulate the sequence of events and their temporal relations and spatial relations (Reilly et al, 2004). That is, the story components must be formulated in a way that the entire sequence of events is interrelated in a meaningful way. One such cohesive device is *referring expressions*. Referring expressions are linguistic

forms that are used to refer to characters, objects and other entities in a context. Studies show that abilities to use adequate referring expressions to introduce characters and objects are less advanced in children with SLI than age-matched peers (Schneider & Hayward, 2010; Tsai & Chang, 2008). Referring expressions can be adequate "if they are appropriate for the listener's knowledge, shared physical context and preceding linguistic context" (Schneider & Hayward, 2010, p. 460). For example, the use of an indefinite noun phrase is adequate if the referent is unknown to the listener, whereas, the use of a definite noun phrase or a pronoun is adequate if the referent is known to the listener. Inadequate reference to the story makes it difficult to comprehend the story and has been reported as a reason for difficulty in understanding the stories of children with SLI. Difficulties with referential adequacy have been documented in English where children with SLI exhibited more inadequate referring expressions than age-matched TD children (e.g., Liles, 1985a; Norbury & Bishop, 2003; Schneider & Hayward, 2010). For example, children with SLI in Schneider & Hayward (2010) show more difficulty with first mentions of referents and tend to use a definite noun phrase such as 'the elephant' for introducing a new character than TD children. Similar to English, French-speaking children with SLI have a significantly lower performance in the use of first mentions (Gagné, 2008; Gagné & Crago, 2010). With regard to other types of referring strategies, Liles (1985a; 1985b) reports that children with SLI use fewer personal pronouns and more demonstratives and nouns for referents than age-matched TD children. This tendency for nominal rather than pronominal reference has also been reported elsewhere. For example,

Norbury and Bishop (2003) observe that abilities to use an anaphoric strategy of using pronouns to maintain a reference and to switch references are diminished in children with SLI when compared to TD children. Furthermore, findings have demonstrated that school-age children with SLI have more difficulties in self-initiated cohesive repairs in a story-retelling task than age-matched peers (Liles & Purcell, 1987; Purcell & Liles, 1992). Thus, different studies have pointed to the fact that children with SLI have difficulties with referential cohesions, which have been identified as a good measure for discriminating between affected and unaffected groups.

The macrostructure of a narrative consists of the "main ideas represented in the global structure of a text", which is commonly known as story grammar (Fayol & Lemaire, 1993, p. 6). Story grammar units are various types of information that are provided in a certain order in a story. According to the story grammar model, stories consist of a set of units that hold the key content of the story (Stein and Glenn, 1979). They include: Setting, Initiating Event, Internal Response, Internal Plan, Attempt, Outcome and Reaction of characters. A story is well-formed and complete if it contains these units (Merritt & Liles, 1987). Studies have shown that children with SLI have weaknesses in their story grammar, a central component of good stories (Pearce, McCormack & James, 2003; Schneider, Haywood & Dubé, 2006). When narrating a story, children with SLI usually do not organize the story contents in ways similar to age-matched peers. It has been reported that English-, French- and Cantonese-speaking children with SLI use a smaller number of story grammar units in their narratives

than TD peers (Chan Loi Lee, 2003; Gagné, 2008; Schneider & Haywood & Dubé, 2006). Literature on English-speaking children with SLI shows that these children usually include core components (i.e., Initiating Event, Attempt and Outcome) of the story grammar whereas supplementary components (i.e., Setting, Internal Response, Internal Plan and Reaction of characters) of the story grammar are occasionally omitted (Clifford et al, 1999; Klecan-aker & Kelty, 1990; Liles, 1985, 1987). During story narration, Cantonese-speaking children with SLI use more story grammar units in a simple story than in a complex story (Chan Loi Lee, 2003). Hence, story grammar units have been identified as a good measure for discriminating between children with SLI and TD children, and have been widely used by researchers for identifying the affected population (Gagné & Crago, 2010; Merritt & Liles, 1987; Ripich & Griffith, 1988; Schneider, Williams & Hickmann, 1997; Schneider, Hayward & Dubé, 2006).

1.3.2 Lexical and semantic abilities

The late acquisition of first words has widely been proposed as a feature shared by children with SLI, regardless of the language they are learning. Evidence from early case studies as well as more recent studies with larger numbers of children using varieties of experimental and measuring techniques, corroborate the fact that children with SLI have limited lexicons. For example, an English-speaking child in Weeks (1974) did not go beyond 50 words until age 2;4 (years;months). The level of performance is reported to be parallel to the language acquisition of younger TD children (Rice, 2003; Rice, Buhr, & Nemeth, 1990). A study based

on parental report revealed that on average, the acquisition of first words in children with SLI is delayed by 10 months (Thal et al, 1999). In this study, an average number of 17 words was produced by children with SLI at age 2;2 which is comparable to the number produced by TD children at age 1;4. They also showed that older children with SLI who ranged in age from 3;2 to 4;1 produced roughly 426 words which is close to the number of words that were used by TD children at age 2;3. In addition, studies of conversational language abilities of English- and Chinese-speaking children with SLI have shown that the language of the affected group was less lexically diverse than the unaffected group (e.g., Klee, Stokes, Wong, Fletcher & Gavin, 2004; Leonard, Miller & Gerber, 1999; Stokes & Fletcher, 2003; Wong, Klee, Stokes, Fletcher & Leonard, 2010). Problems in word-finding is another limitation that has been reported for children with SLI (e.g., Dockrell, Messer, George & Wilson, 1998; German, 1987). These children can lack a quick and accurate ability to retrieve a known word from their mental lexicon. Manifestations of this limitation include circumlocutions, use of unspecific terms (e.g., *thing*, *stuff*, etc.), and phonological or semantic substitutions of the targeted word (McGregor & Leonard, 1995). Within the lexicon, verbs appear to be affected the most, and children with SLI show a great tendency to use high frequency, semantically-flexible verbs such as *do, go, get, put* and *want* in their speech (Rice, 2003; Watkins, Rice & Moltz, 1993). Further results show that children with SLI encounter difficulties when it comes to extracting word meaning and recalling of words that have not been explicitly

taught (e.g., Nash & Donaldson, 2005; Oetting, Rice, & Swank, 1995; Rice, Buhr & Oetting, 1992; Shulman & Guberman, 2007).

Difficulties in word learning are also seen in incidental learning contexts, in which children's comprehension and production are examined after exposures to real words (Rice, Buhr & Nemeth, 1990; Rice et al., 1992) as well as novel words (Kan & Windsor, 2010; Oetting et al, 1995). Children with SLI seem to fast map (i.e., learning about the meaning of a word from contextual clues) fewer lexical labels and demonstrate difficulties with establishing strong semantic features associated with novel objects (Alt & Plante, 2006; Alt et al, 2004; Sheng & McGregor, 2010). Moreover, there is evidence that the manner in which words are presented to children with SLI can influence the way their lexicons are built. For example, presenting words as bare stems in sentence final position seemed to pose less difficulty for children with SLI than presenting words in their inflected forms (Haynes, 1982; Leonard et al, 1982). Also, putting a pause before novel words does not facilitate learning, whereas, presenting new words with emphatic stress appears to be helpful (Ellis Weismer & Hesketh, 1998; Rice et al, 1992). When words are presented at a rapid rate, the acquisition of novel words by children with SLI falls below that of TD children (Ellis-Weismer & Hesketch, 1993; 1996).

Smaller lexicons, as compared to age-matched TD peers, are usually observed in children with SLI until school-age years and beyond. But the difference in lexical skills appears to increase with age. In a longitudinal study, Stothart et al. (1998) followed the language development of 71 children with SLI

from age 5;6 into adolescence, until ages 15-16. Results showed that the size of lexicon in children with SLI, as compared to TD children, tended to seem comparatively smaller.

All these findings indicate that children with SLI have limited lexicons, usually perform at the level of younger TD children, are lexically less diverse, are unable to quickly retrieve the known words, and that their lexical learning may be limited to specific kinds of input in which new words are made salient through stress, sentence position and slow rate of articulation.

1.3.3 Syntax

Crosslinguistic research has demonstrated that difficulties with syntactic structures are characteristic of children with SLI. There is evidence that children with SLI have difficulties with the order or the number of arguments in a clause. Fletcher (1991) examined spontaneous speech samples of school-age English-speaking children with SLI and reported that those children exhibited incorrect ordering of arguments (e.g., “my mum was take me a picture”, in which “me” got the incorrect thematic role of benefactive, p. 178). Similar findings have been reported for elicited verbs and arguments of Spanish-speaking children with SLI (Simon-Cereijido, 2009). These children tended to omit more sentence constituents as the complexity of the verb argument structure increased. Some of these studies have indicated that subject arguments tended to be the most widely omitted argument (Fletcher, 1991; King & Fletcher, 1993; Rice & Bode, 1993; but see Grela & Leonard, 1997). Further, Thordardottir & Ellis Weismer, (2002)

report fewer argument types, fewer types of argument structure and less ability to use verb alternations in the spontaneous speech of 100 school-age children with SLI.

Other syntactic areas in which there is evidence of difficulty are relative clauses and *wh*-questions. For example, Starvrakaki (2002) reported that Greek-speaking children with SLI tended to have more incorrect relative clauses compared to their mental-age- matched controls in an elicitation task. Furthermore, the performance of the affected children on *wh*-questions types (*who*-Subject, *which*-Subject, *who*-Object and *which*-Object) appeared to be significantly lower than the mental-age controls. That is, they turned object-questions (e.g., *who*-Object) into subject-questions (e.g., *which*-Subject) in the obligatory contexts.

Van der Lely and Harris (1990) tested 4 to 7-year-old children's comprehension of syntactic structures such as active and passive voices, locative and dative constructions. The children were presented with reversible active and passive sentences and canonical and noncanonical locative sentences (e.g., *The cup is in the box* vs. *In the box is the cup*) and canonical and noncanonical dative sentences (e.g., *Give the boy to the girl* vs. *Give the girl the boy*). Results showed that, in general, canonical sentences were easier than noncanonical sentences for all children, but children with SLI showed particularly weaker performance than age-matched and MLU-matched TD children. A study of relative clauses in Hebrew showed that children with SLI failed to comprehend sentences with object relative clauses by age 11, which their age-matched TD peers can do at age

6 (Friedmann & Novogrodsky, 2004). Similar results were reported by Håkansson & Hansson (2000) for the comprehension and production of relative clauses in Swedish. Investigation of the use of *who*-object questions in Cantonese also show lower accuracy among children with SLI in using *wh*-object questions compared to age- and MLU-matched TD controls (Wong, Leonard, Fletcher & Stokes, 2004). In a cross-modal picture priming experiment, 10- to 17-year-old school-aged children and youth with SLI showed a failure to establish a syntactic filler-gap dependency and interpret *wh*-questions via lexical-thematic information (e.g., *Balloo gives a long carrot to the rabbit$_i$. Who$_i$ did Balloo give the long carrot to t_i at the farm?*). In contrast, age-matched and vocabulary-matched TD children processed *wh*-questions through syntactic filler-gap dependencies (Marinis & Van der Lely, 2007).

The general conclusion from these studies is that children with SLI have difficulties in the syntactic domain of language that affect both their comprehension and production.

1.3.4 Grammatical morphology

Although there are numerous studies showing children with SLI to have deficits with basic components of language such as lexicon and syntax, a great deal of research has concentrated on grammatical morphology in children with SLI. Difficulties with grammatical morphology have been reported from many different languages such as, Arabic, Cantonese, Dutch, English, French, German, Greek, Hebrew, Hungarian, Inuktitut, Italian, Japanese, Swedish, Spanish and

Turkish (e.g., Abdulla & Crago, 2008; Anderson & Souto, 2005; Bedore & Leonard, 2001; Bishop & Leonard, 2000; Bortolini, Caselli, Deevy & Leonard, 2002; Clahsen, Rothweiler, Woest & Marcus, 1992; Crago & Allen, 2001; de Jong, 1999; Dromi, Leonard & Shteiman, 1993; Eisenbeiss, Bartke & Clahsen, 2006; Fletcher, Leonard, Stokes & Wong, 2005; Grela, Snyder & Hiramatsu, 2005; Håkansson, 2001; Hansson, Nettelbladt & Leonard, 2000; Leonard, 1998; Leonard, Dromi, Adam, & Zadunaisky-Ehrlich, 2000; Lukács, Leonard, Kas & Pleh 2009; Lukács, Leonard & Kas 2010; McGregor, Rost, Guo & Sheng, 2010; Oetting & Rice, 1993; Owen, 2010; Paradis & Crago, 2001; Paradis, Rice, Crago, Marquis, 2008; Rice, Wexler & Cleave, 1995; Rice, Wexler & Hershberger, 1998; Roberts & Leonard, 1997; Stavrakaki & Clahsen, 2009; Stavrakaki & van der Lely, 2010). These studies have used various methods to examine the use of grammatical morphology by children with SLI such as, spontaneous language samples, picture elicitation tasks and storytelling. Findings also show that weaknesses in the use of grammatical morphemes is not only evident in the preschool years, but it can also extend into the school-age years, similar to errors with lexicon and syntax (e.g., Finneran, Leonard & Miller, 2009; Marchman, Wulfeck & Ellis Weismer, 1999; Norbury, Bishop & Briscoe, 2001; Rice, Wexler & Hershberger, 1998; Tomblin, Freese, & Records, 1992; Valez & Schwartz, 2010). Conspicuous among the difficulties with grammatical morphology are weaknesses in the use of grammatical morphemes that mark cases, object clitics and tense. In the following section, I will review some findings from previous

crosslinguistic studies identifying case marking, object clitics, and tense as vulnerable areas across languages.

1.3.4.1 Case marking

Case marking can be highlighted as an area of language that poses a special difficulty for children with SLI in variety of languages. Difficulty with definite accusative case marking has been one of the most common profiles in Hebrew-speaking children with SLI. The Hebrew case marker is a free-standing morpheme, and marks accusative case when the noun is definite. Data from spontaneous speech samples of 7 children (5 boys and 2 girls) have yielded differences between 4-to-5 year old children with SLI and younger TD children (Rom & Leonard, 1990). The findings showed that children with SLI omitted the definite accusative case marker *et* in obligatory contexts more frequently than a group of TD children, who display highly accurate rates of case marking (64% for SLI vs. 94% for TD). Similar results have been reported on the basis of picture-elicited speech of Hebrew-speaking children with SLI. Dromi, Leonard & Shteiman (1993) compared elicited speech from 4-to-5 year old children with SLI, from younger TD children and from age-matched TD children. In line with the findings from spontaneous speech samples of children with SLI, they showed a similar profile of case marking ability: both MLU-matched and age-matched children outperformed children with SLI on the picture elicitation task (86% SLI vs. 97% MLU vs. 96% age-matched).

Investigations on Turkish contribute further to the understanding of the characteristics of case marking in children with SLI. In spontaneous speech samples, a Turkish child with SLI demonstrated morphological errors with respect to accusative and dative case morphology (Acarlar, 2008; Rothweiler, Chilla & Babur, 2010; but see de Jong & et al., 2008). The child in Acarlar (2008) study had particular difficulties with the accusative case marker *i* and dative case marker *a* in contexts where a case marker was expected. Although patterns of errors were more frequent in the affected child than in MLU-matched children, differences seemed to diminish at a later MLU stage. This suggests that children with SLI might gradually master case markers as they age. Similar findings in terms of difficulties with case morphology in Turkish SLI can be observed in Rothweiler et al. (2010). Special difficulties in the production of Turkish case marking have also been reported in the spontaneous speech samples of German-Turkish bilingual children (Chilla & Babur, 2010, but see Yağmur & Nap-Kolhoff, 2010).

The available data from children with SLI acquiring Japanese suggest that they have difficulty with case particles, like children learning Hebrew and Turkish. In one study, Tanaka Welty, Watanabe & Menn (2002) reported that twelve 5-year-old children with SLI (mean age = 5;6) used the dative case marker *ni* less frequently than age-matched TD children, but similar to MLU-matched children. In addition to lower frequency of use (i.e., the percentage of case marker produced in possible contexts), children with SLI had lower accuracy rates (i.e., percentage of case marker correctly used) with the *ni*-particle compared to MLU-matched children. This particle has many semantic and grammatical functions: it

marks agent in passive sentences, recipient in benefactive/dative sentences, causee in causative sentences, and also means "in/on" in locative constructions. A lower accuracy rate was also observed for the use of the case *ga* as a grammatical subject marker (*ga* does not consistently mark subjects and is sometimes replaced by the *wa*-particle that mainly marks topics).

One of the features of the production ability of Hungarian-speaking children with SLI is their limited use of accusative inflection. A body of research on Hungarian-speaking children with SLI suggests lower accuracy in producing nouns with accusative inflection (Lukács, Leonard & Kas, 2010). Hungarian has a rich system of nominal inflectional markers, which are invariable with both regular and irregular noun stem types. For example, *-k* is the plural marker and *-t* is the accusative marker in all types of nouns. Lukács et al. (2010) compared the use of plural and accusative markers by younger children with SLI (mean age= 6;0), older children with SLI (mean age= 9;0) and 2 groups of control children who were matched to both SLI groups based on receptive vocabulary scores on the Hungarian version of the Peabody Picture Vocabulary Test (verbal controls). Results showed that children with SLI had significantly more difficulties with the accusative marker. Older children with SLI showed lower accuracy with accusatives of irregular stems than vocabulary-matched controls. The younger children with SLI scored significantly lower than vocabulary-matched controls on plural+accusative on regular stems. They also tended to reduce plural+accusative to either plural or accusative only.

In contrast to these findings, a study on German SLI revealed a different result. (Eisenbeiss, Bartke & Clahsen, 2006). Investigations with a group of children with SLI and a group of younger, MLU-matched TD children demonstrated high accuracy in the use of nominative, accusative and dative markers. This result, which is inconsistent with findings from other case-marking languages such as Hebrew, Turkish, Japanese and Hungarian, indicates that difficulties with case systems are not universal to all languages and that language profiles could change from one language to another depending on the structural characteristics of the language. However, the weight of evidence suggests that there is a tendency toward case being a vulnerable morphological system for children affected with SLI across languages.

1.3.4.2 Object clitics

The acquisition of object clitics appears to be of particular difficulty for children with SLI. A body of research has revealed object clitics to be clinical markers of SLI in Romance languages. A study by Jakubowicz et al. (1998) with a group of 5- to 13-year-old French-speaking children with SLI and a group of 5-year-old TD children found lower levels of accuracy with the elicited object clitic pronouns *se* and *le*, in the former group compared to the latter group. Grüter (2005) observed similar error profiles in French-speaking children's production of object pronominalization in a picture story containing target and filler questions that required responses involving use of object clitics. Interestingly, results from the comprehension task (sentence-picture matching task) showed good

performance by the children with SLI, indicating that there might be a limited correlation between performance in production and comprehension in children with SLI. Parallel findings have been reported in studies that looked at the use of object clitics in the spontaneous speech of children with SLI (Hamann et al, 2003; Paradis 2004; Paradis & Crago, 2003). Paradis (2004) and Paradis and Crago (2003) reported 47.3% appropriate clitic use in pronominalization contexts by affected children compared to 97.63% appropriate use by an age-matched control group and 85.56% appropriate use by MLU-matched control children. Variable use of clitic objects in French was observed mainly in the form of omission, comprising up to 82% of all errors.

As in French, the acquisition of direct object clitics in Italian causes difficulty for children with SLI (Bortolini, Arfé, Caselli, Degasperi, Deevy & Leonard, 2006; Bortolini, Caselli, Deevy & Leonard, 2002; Leonard & Bortolini, 1998; Leonard, Bortolini, Caselli, McGregor & Sabbadini, 1992). For example, the Italian-speaking children with SLI in Leonard et al. (1992) showed significantly lower use of clitics (26%), compared to MLU-matched TD children (M = 66.3%) and age-matched TD children (M = 91.7%). In all these studies, omissions constituted the majority of errors with clitics for Italian-speaking children. Parallel patterns were found in the clitic use of Spanish-speaking children with SLI (Bedore & Leonard, 2001; Jacobson & Schwartz, 2003). For example, Jacobson & Schwartz (2003) reported that Spanish-speaking children with SLI produced clitic pronouns less frequently than age-matched TD children in a picture elicitation task. Spanish-speaking children's errors were reported to be

most commonly in the form of omissions. However, the rates of omission are often lower for Spanish speakers (e.g., Bosch & Serra, 1994) compared to Italian speakers (e.g., Leonard et al., 1992). Finally, spontaneous speech data from Cypriot-Greek-speaking children with SLI showed clitic errors in the form of misplacement (Petinou & Terzi, 2002). Thus, cross-linguistic data have shown this aspect of morphology to be clinical markers of SLI in certain languages.

1.3.4.3 Tense

Children with SLI seem to have serious difficulty with respect to tense-marking properties of grammar in many languages. Studies of English SLI have found evidence of tense difficulty, including omission of the past tense suffix *-ed*, the present habitual suffix *–s,* the copula and tense-bearing auxiliary verbs in the speech of children with SLI (Clahsen, Bartke & Gollner, 1997; Cleave & Rice, 1997; Oetting & Horohov, 1997; Owen, 2010; Rice, Wexler & Hershberger, 1998). Like data from spontaneous speech samples of children with SLI, data from elicitation probes have also shown lower levels of accuracy in the use of morphemes in obligatory contexts by children with SLI (Rice, Wexler & Hershberger, 1998; Marchman, Wulfeck & Ellis Weismer, 1999; Paradis, Rice, Crago, Marquis, 2008). Comprehension and grammaticality judgment measures of English-speaking children also show a greater proportion of errors by the affected group than the unaffected group (Rice, Wexler & Redmond, 1999; Leonard & Deevy, 2010).

As in English, research on German-speaking children with SLI also suggests a special difficulty with this aspect of morphology. On the basis of spontaneous speech sample data comparing 8 children with SLI (age range = 4;0-4;8) and 8 MLU-matched TD children (age range = 2;1 to 2;7), Rice, Ruff Noll & Grimm (1997) observed tense errors and omission of the copula *sein* by children with SLI. The use of tense morphology by French-speaking children with SLI resembles the data reported for English- and German-speaking children (Hamann, Ohayon, Dubé, Frauenfelder, Rizzi, Starke & Zesiger, 2003; Jakubowicz, Nash & van der Velde, 1999; Paradis & Crago, 2001). For example, Paradis and Crago (2001) compared spontaneous speech samples of 10 school-age French-speaking children with SLI (mean age = 7;6) with groups of age-matched and MLU-matched controls. The authors found greater error rates with past and future tense for children with SLI relative to both age-matched and MLU-matched children. In Dutch, children with SLI also tend to make mistakes in the use of tense morphology. de Jong (2003) looked at the elicited speech of 35 school-age children with SLI (mean age = 7;7 year;months) and 2 groups of age-matched and MLU-matched controls. Results revealed omission of present or past tense markers. Parallel findings have been obtained from studies that explore tense errors in Swedish SLI. Hansson and Nettelbladt (2000) tested the grammatical abilities of 14 Swedish-speaking children with SLI in spontaneous speech samples. Compared to TD age-matched and MLU-matched children, the affected group tended to use a lower percentage of present tense copula and regular past tense inflections. Similar profiles have been revealed by Hungarian-speaking

children with SLI. Lukács et al. (2009) reported that 25 children with SLI fell below the level of morphological ability observed for vocabulary-matched controls in a task which required children to repeat sentences and provide appropriate tense and agreement inflections.

All these findings indicate that tense can be of particular difficulty cross-linguistically.

1.4 Nonlinguistic abilities of children with SLI

The evidence reviewed so far indicates that children with SLI have substantial difficulties within different areas of language. However, there is a body of evidence that shows they have subtle cognitive difficulties, even when little or no language is involved (Leonard, 1998). It is important to note that, although these studies have reported differences in the nonlinguistic abilities of children with SLI and TD children, the amount of difficulty is quite small compared to that of the linguistic difficulties. After all, if this difference were large, children with SLI would not meet the criterion of normal nonverbal IQ in the first place (Leonard, 1998). For example, a series of findings on the non-linguistic abilities of children with SLI in 3 different aspects of cognition: symbolic play, mental imagery and mathematical skills have indicated that children with SLI do not perform as well as age-matched TD controls do (e.g., Donlan, Cowan, Newton & Lioyd, 2007; Fazio, 1994, 1996; Lovell, Hoyle & Siddell, 1968; Miller et al, 2001; Powell & Bishop, 1992; Shore, O'Connell & Bates, 1984; Windsor et al, 2008). Such results inspired some researchers to consider SLI as a problem that goes beyond

limitations in linguistic knowledge, as will be detailed in the following section (1.5).

1.5 Theoretical approaches to SLI: Limited processing capacity

Thus far, we have seen that children with SLI have substantial impairment in language, as well as subtle cognitive difficulties even when little or no language is involved. Such a pattern of difficulties affecting linguistic abilities as well as non-linguistic abilities have prompted some researchers to suggest that the underlying deficit in SLI originates from general processing capacity limitations (Ellis Weismer, van Evans & Hesketh, 1999; Ewijk & Avrutin, 2010; Leonard, Bortolini, Caselli, McGregor & Sabbadini, 1992; Leonard, Ellis Weismer, Miller, Francis, Tomblin & Kail, 2007; Miller et al., 2001; Windsor & Hwang 1999; *inter alia*). This limitation, according to the *limited processing capacity* hypothesis (henceforth LCP; Paradis, 2010), could affect children's ability to use language effectively. The effective use and learning of language requires the simultaneous coordination of a remarkable range of linguistic and cognitive resources, so that the incoming information can be processed and stored. According to Paradis (2010), limitations in processing capacity might stem from *working memory* (Ellis Weismer, Evans & Hesketh, 1999; Gathercole, 2006), *speed of processing* (Miller, Kail, Leonard & Tomblin, 2001) or both (Leonard et al., 2007; Montgomery & Windsor, 2007, as cited in Paradis, 2010). Paradis (2010) argues that LPC theories posit that SLI arises from domain-general deficits, in contrast to other theories, which assume the presence of additional, domain-specific deficits

in SLI (e.g., Rice, 2004). Within LPC theories, the surface hypothesis (Leonard & Eyer, 1996; Leonard et al., 1992; Leonard, Eyer, Bedore, & Grela, 1997), specifically, accounts for deficits in grammatical morphology. According to this hypothesis children with SLI have difficulties in perceiving and processing "low phonetic-substance morphemes", that is, brief or nonsalient (Leonard, 1998). These difficulties result in the delayed acquisition for children with SLI across languages. Paradis (2010) cites the following from Leonard (1998) to illustrate how, on the surface account, a combination of deficits in working memory and speed of processing on the one hand, and brief and nonsalient properties of grammatical morphology on the other, underlie the difficulty in morphological learning:

> If inflected words are typically heard in one-word sentences separated by pauses, there would be no problem. However, fast on the heels of the inflected word is the next word in the utterance that must be held in working memory and processed, and so on. Thus, processing is pressed from two directions; processing of a first item must be completed before the item fades from memory, and it must be processed in time for the next item. Given the reduced speed of processing assumed for children with SLI, sufficient processing of one item can't be completed before the next item appears. Consequently, some material is processed incompletely or not at all (Leonard, 1998, p. 251; as cited in Paradis, 2010, p. 238).

In line with this statement, some studies have reported that children with SLI

display low levels of accuracy with morphology. For example, Leonard & Eyer (1996) reported that Italian-speaking children with SLI showed less accuracy when using articles and direct object clitics than MLU-matched children, perhaps because these morphemes are unstressed and short in duration. In another study, Le Normand, Leonard & McGregor (1993) showed that French-speaking children with SLI had a higher rate of definite article use in obligatory contexts than Italian- or English-speaking children. The authors attributed these results to the surface properties of the definite article in French. That is, the duration of article is more similar to those of adjacent syllables and hence, more salient in French than English and Italian.

Additional data supporting the LPC hypothesis come from studies on bilingual children with SLI. Orgassa and Weerman (2008) observed that Dutch bilingual children with SLI had lower scores with adjectival gender inflections than monolingual children with SLI. According to LPC theories of morphological acquisition, children with SLI would need more exposure to completely acquire morphology, due to limitations in processing capacity (Paradis, 2010). Accordingly, bilingual children with SLI who acquire 2 languages and hence have less exposure to each language would have exceptionally weaker performance than monolingual children with SLI. This amount of input coupled with limited processing capacity would produce "a cumulative effect" which results in extreme difficulty in bilingual children (Paradis, 2010, p. 240; see Paradis, 2007a and 2010, for evidence that does not support the notion of a "cumulative effect" in bilingual SLI).

More evidence for the LPC hypothesis comes from studies that have shown the effect of task demands on language production in children with SLI. Thordardottir (2008) collected language samples under conditions of varying task demands such as conversation and narration. Compared to conversation, narratives require "larger planning units, including both longer and more complex utterances and multiple utterances per asking turn, use of cohesive ties, distinction between central and peripheral objects and events and proper temporal or causal relationships" (Thordardottir, 2008, p. 924). She observed that English-speaking children with SLI had significantly higher morphological error rates in more demanding contexts such as narration than less demanding contexts such as conversation. This variability in the manifestation of SLI was attributed to the fact that increased processing load of the more demanding context would lead to worse performance due to limited processing recourses.

LPC theories also predict other language outcomes like deficits with macro- and micro-structure in story-telling, as have been reported in various studies (e.g., Botting, 2008; Epstein & Philips, 2009; Fey, Catts, Proctor-Williams, Tomblin & Zhang, 2004). For example, when retelling or generating a story, children with SLI are obliged to use their working memory in order to recall the story and also to use the structure that is appropriate for the listener's knowledge based on the linguistic context (van der Lely, 2003). Thus, limitations in processing capacity can affect individuals' abilities to coordinate linguistic, cognitive and pragmatic skills required for story narration.

1.5.1 Morphological Richness Hypothesis

Some cross-linguistic research has shown that the *level* of difficulty with grammatical morphology shown by children with SLI varies across languages (Leonard, 1998). For example, although tense, agreement and aspectual morphemes are difficult for children with SLI in languages such as English, French, Dutch, German and Cantonese (Clahsen, Bartke & Göllner, 1997; de Jong, 1999, 2003; Fletcher, Leonard, Stokes & Wong, 2009; Rice, 2003; Rice, Wexler & Hershberger, 1998; Paradis & Crago, 2000, 2001; Stokes & Fletcher, 2003), less problematic areas for children with SLI include tense inflections in Greek, and agreement inflections in both Italian-, and Hebrew (e.g., Bortolini, Caselli & Leonard, 1997; Clahsen & Dalalakis, 1999; Dromi, Leonard, Adam, Zadunaisky-Ehrlich, 1999; Leonard, 1998; Leonard, Sabbadini, Leonard & Volterra, 1987). The better performance seen for Italian- and Hebrew-speaking children with SLI over their English, French, Dutch, German and Chinese counterparts has been attributed to the fact that agreement inflections are richer and more regular in the former languages in that each person in the verb paradigm, both singular and plural, has a unique morpheme (Dromi, Leonard & Shteiman, 1983; Leonard, Sabbadini, Leonard & Volterra, 1987). The richness and regularity of inflections, according to the *Morphological Richness Hypothesis* (henceforth MRH), could increase children's sensitivity to morphological features, which in turn raises their accuracy in using the morphemes in obligatory contexts (Dromi, et al., 1983; Leonard et al., 1987). According to Leonard (1998,

p. 246) “features of language that are low in these characteristics are most vulnerable” and hence are of special difficulty for children with SLI.

The MRH assumes that children with SLI have a processing capacity limitation that reduces their available cognitive resources (Leonard, 1998; Leonard, 2000). Thus, children with SLI have to devote their limited resources to the aspects of their language that are rich and regular (Dromi, Leonard, Adam & Zadunaisky-Ehrlich, 1999; Lukács et al., 2009). As such, there are fewer resources that remain for the sparse and irregular aspects of the language. For languages such as English and Chinese with impoverished inflectional paradigms, this limitation can constrain and delay acquisition of inflectional morphology (Leonard, 1998). In contrast, children acquiring languages with rich inflectional morphology direct their limited resources to this aspect of language. This results in more accurate use of grammatical morphology in the latter group compared to the former (Leonard, 1998). Thus, on one level MRH refers to the general degree of richness or sparseness of morphological inflections in an entire language. Note that in cases where an error occurs in a morphologically rich language, it will often be in the form of substitution rather than omission (Dromi et al, 1999, 2000; Jacobson & Schwartz, 2002; Leonard, Bortolini, Caselli, McGregor, Sabbadini, 1992; Paradis, 2004; Paradis & Crago, 2001). Furthermore, the substituted form would be the one that shares the most features with the form that it replaces. For example, Bedore and Leonard (2001) who showed that children with SLI replaced a third person singular form for a third person plural.

It is important to keep in mind that the grammatical morphology is relatively useful to the children with SLI only if it can be fully processed when children direct their limited resources toward this area of language (Leonard, 1998, 2000). However, if the morphology is extremely complex, it offers no relative advantages compared to languages such as English (Leonard, 1998, 2000). Put differently, if inflections manifest a complex combination of grammatical features, difficulties can occur even in the presence of morphological richness. Therefore, rich inflectional morphology is beneficial to children with SLI only up to a point. The picture that Hebrew verb-agreement morphology paints seems to support this hypothesis (Dromi, Leonard, & Shteiman, 1993; Dromi, Leonard, Adam & Zadunaisky-Ehrlich, 1999; Leonard & Dromi, 1994). This is because Hebrew verb-agreement morphology is relatively simple in the present, and relatively complex in the past. For example, Dromi et al. (1999) found that with respect to marking present tense agreement, the performance of children with SLI in Hebrew was found to be as accurate as that of MLU-matched controls (Dromi et al., 1999). In contrast, they were more limited than MLU-matched children in their use of agreement inflection in the past tense, possibly because the past tense paradigm requires manipulation of 4 features: tense, number, person and gender, in contrast to the present tense paradigm that requires manipulation of just 3 features: tense, number and gender (Dromi et al., 1999). Such a complex combination might tax the limited capacities of children with SLI, as hypothesized by Leonard (1998, 2000).

Similar to Hebrew, Hungarian has a rich verb inflectional paradigm. According to the MRH, Hungarian children with SLI might be expected to be more attentive and accurate with inflections on verbs. However, the inflections mark a complex combination of 4 features: tense, person, number and definiteness, which makes this part of the language relatively complex (Lukács et al., 2009). Accordingly, accuracy is expected to be lower for Hungarian children with SLI. One study that supports this hypothesis is Lukács et al. (2009), in which children with SLI exhibited weak performance compared to their vocabulary-matched controls (Lukács et al., 2009). Thus, on another level, morphological richness refers to richness, regularity and complexity of morphology in a particular area of a language.

To recapitulate, morphological richness has 2 different levels (Leonard, 1998, 2000). On one level, it refers to the general degree of richness or sparseness of morphological inflections in an entire language. Inuktitut and Italian are instances of languages that have a rich morphological system (Bortolini et al., 1997; Crago & Allen, 2001) whereas English and Cantonese have a sparse morphological system (Fletcher et al., 2005; Leonard et al., 1992). On another level, it can refer to richness, regularity and complexity of morphology in a particular area of a language. An example of this level would be the contrast between Hebrew's present tense agreement versus its past tense agreement, as discussed above (Dromi et al., 1993; Dromi et al., 1999; Leonard & Dromi, 1994).

CHAPTER 2: Sketches of grammatical morphology in Persian

As previously mentioned (Chapter 1) specific aspects of morphosyntax that are difficult for children with SLI vary from language to language, and hence research on crosslinguistic SLI is required to identify the profiles across languages. There is a dearth of any research on Persian SLI. Therefore, this dissertation will contribute at indentifying the linguistic characteristics of Persian SLI.

Persian is an Iranian language of the Indo-Iranian branch of the Indo-European language family which consists of 3 major dialects: Farsi or the Persian of Iran, Dari or the Persian of Afghanistan and Tajik that is a variant spoken in Tajikistan. They all are mutually intelligible. The richly inflected morphological system of Old Persian has to some extent been reduced in Modern Persian. Yet, it is considered as a morphologically rich language with basic subject-object-verb word order. Grammatical features that are relevant to this study include case marking, clitics and verbal inflection. These are described in the following sections.

As we have seen, cross-linguistic research has shown that some features of morphological systems, such as those related to richness, regularity and complexity, play a role in the manifestation of the deficits caused by SLI. If this is true, similar effects should also be observed in Persian SLI. In this thesis, the MRH will be tested with 2 grammatical categories in Persian that differ in degree of richness, regularity and complexity: case, which involves sparseness and irregularity; and direct object clitics, which involve what could be considered

exceptional complexity. As will be explained in 2.1 and 2.2, there are good reasons to suspect that these grammatical categories could be clinical markers in Persian. To evaluate the effects of the richness, regularity and complexity of these structures, and their contributions to the manifestation of SLI, one morphological category that is rich, regular, but not complex, will be used as a control along with the case markers and direct object clitics. This control is the person-number agreement on verbs, which will be detailed in 2.3.

The following sections provide a description of the morphemes of interest in this study: Case marker, object clitics, agreement markers and tense in Persian.

2.1 Case marking

Grammatical case can be defined as "a system of marking dependent nouns for the type of relationship they bear to their heads" (Blake, 2001). For example, in many languages, one case is assigned to subjects, while another is assigned to direct objects. Case-marking languages, however, do not necessarily mark all grammatical relations with case markers. For example, Turkish has a system of 6 case markers, German has 4, Swedish has 2, and Persian has 1 (Ahmadi-Givi & Anvari, 2006; Blake, 2001; Maling, 1993). Where case markers are not used, prepositions and/or word order usually help to mark the grammatical function (Miller, Vandome & McBrewster, 2009).

In Persian, the overt case marker is a suffix that signals the grammatical function of direct object (Karimi, 1996). Consider the following sentences:

(1) a. (man) sib ro[1] xord-am

I apple ACC ate.PAST. Stm-1SG

'I ate the apple'

b. (man) un ro xord-am

I it ACC ate.PAST.Stm-1SG

'I ate it'

c. Sepehr sib-esh ro xord-∅

Sepehr apple-POS ACC ate.PAST.Stm-3SG

'Sepehr ate his apple'

d. Sepehr sib-a ro xord-∅

Sepehr apple-PL ACC ate.PAST.Stm-3SG

'Sepehr ate the apples'

In (1a) the *ro*-particle indicates that *sib* 'apple' is the direct object of the verb *xordam* 'ate'. In (1b) the pronoun *un* 'it', accompanied by *ro,* shows that the particle is not limited to nouns and can appear on pronouns too. Examples (1c, d) show that the *ro*-particle follows the possessive suffix -*esh* 'his' and plural suffix -*a*, respectively. Since Persian is a pro-drop language, the optional pronominal subjects are shown in brackets.

[1] *ra* is the formal form of the accusative case and *ro* is used in colloquial language. Throughout this dissertation, I've spelled words as they are pronounced in colloquial language.

The *ro*-particle also indicates that *sib* ‘apple’ and *un* ‘that’ are definite and specific, since in Persian only definite and specific direct objects are marked by the accusative marker (Ahmadi-Givi & Anvari, 2006; Ghomeshi, 1997; Karimi, 1996; Mahoozi, 2006; Vahidian-Kamyar & Omrani, 2006). Non-definite and non-specific direct objects are marked by a zero case marker, as shown in (2a, b and c). Example (2d) illustrates that appearance of a pronoun (inherently specific and definite) without the case marker makes a sentence ungrammatical.

(2) a. (to) do kilu sib
you two kilogram apple
xarid-i
bought.PAST.Stm-2SG
‘You bought 2 kgs of apples’

b. (una) chand ta sib chid-an
they several QAN apple pick.PAST-3PL
‘They picked several apples’

c. Sepehr sib xord-∅
name apple ate.PAST.Stm-3SG
‘Sepehr ate an apple’

d. *Sepehr un xord-∅
name it ate.PAST.Stm-3SG

‘Sepehr ate it’

The examples in both (1) and (2) also show that subjects in Persian, e.g., *to* ‘you’ in (2a), *una* ‘they’ in (2b) and *Sepehr* ‘a name’ in (2c), are not overtly case-marked.

The grammatical roles of arguments other than subject or object in Persian are marked by prepositions. The examples below illustrate the use of the preposition *be* ‘to’ before the oblique arguments *Sepehr* ‘a name’ (3a) and *un* ‘he’ (3b).

(3) a. sib ro be Sepehr dad-am
apple ACC to sepehr gave.PAST.Stm-1SG
‘I gave the apple to Sepehr’’

b. sib ro be un dad-am
apple ACC to him gave.PAST.Stm-1SG
‘I gave the apple to him’

Because of the properties described above, the Persian case-marking system can be characterized as both sparse and irregular. It is sparse because there is only one overt case marker in the paradigm. It is irregular because although the accusative case marker expresses the direct object, not all the direct objects are marked by this case. Only direct objects that are definite and specific receive the accusative case marker. In addition, the post-nominal position of the case particle differs from the pre-nominal position for the prepositions, which case mark for oblique

objects, thereby increasing the irregularity of the system. All these features together make a system that can be considered as sparse and irregular, and thus an appropriate structure with which to evaluate the validity of MRH.

These predictions are based on the MRH; however, it is important to point out that developmental delay in terms of case particles has been found across languages such as Hebrew, Turkish, Hungarian and Japanese and has been consistently documented in previous research (except for German). Thus, it is reasonable to assume that similar problems for case markers is likely in Persian SLI, regardless of considerations of morphological richness.

2.2 Clitics

Clitics can be definited as "intermediate linguistic units, which grammatically behave alike in that they combine with other words or phrases to make phrases, but are phonologically bound to an adjacent word traditionally referred to as the host" (Russi, 2008). Persian clitics include personal pronouns (Karimi, 1989; Browning & Karimi, 1994; Ghomeshi, 1996; Ganjavi, 2007). They select a host and are subject to a variety of morphosyntactic constraints (as will be described below) based on identification criteria for clitics proposed by Kayne (1975) (as cited in Cardinaletti & Starke). This definition shows clitic affinity to affixes. The reason to consider Persian pronominal clitics an instance of clitics and not inflectional affixes is their distribution with regard to ordering, as defined by Zwicky (1985). That is, suffixes such as subject agreement must attach directly to verbs whereas pronominal clitics cannot do so (Ghomeshi, 1996). Example (4)

shows that while subject agreement suffixes and pronominal clitics appear on a verb, pronominal clitics cannot directly attach to the verb.

(4) a. did-am=esh
saw-1SG=DO.CLI:3SG
'I saw him'

b. *did=esh-am
saw=DO.CLI:3SG-1SG
'I saw him'

Table 2.1 summarizes the clitic pronoun paradigm, along with the paradigm of the corresponding strong pronouns.

Table 2. 1 The Persian Clitic paradigm

	Singular		Plural	
Person	Pronoun	Clitics	Pronoun	Clitics
First	man	=(a)m	ma	=(e)mun
Second	to	=(e)t	shoma	=(e)tun
Third	un	=(e)sh	una	=(e)shun

The following examples show how strong pronouns substitute for nominals (5b, 5d), and how third-person singular clitic *=esh* and first-person singular *=am* substitute for nominals (5c and 5e, respectively).

(5) a. (man) sepehr ro did-am
I sepehr ACC saw-1SG
'I saw Sepehr'

b. (man) un ro did-am

I he ACC saw-1SG

'I saw him'

c. (man) did-am=esh

I saw-1SG=DO.CLI:3SG

'I saw him/her'

d. Hamid man ro did-Ø

Hamid I ACC saw-3SG

'Hamid saw me'

e. Hamid did-Ø-am

Hamid saw-3SG=DO.CLI:1SG

Hamid saw me'

These examples show that clitics and strong pronouns are not in complementary distribution in Persian (Karimi, 1989). This contrasts with the pronominal system in French and Italian, in both of which strong pronouns are in complementary distribution and it is ungrammatical to use a strong pronoun as a direct object of a verb (Grüter, 2005; Monachesi, 1995b).

Similar to other languages, strong pronouns (i.e., non-clitic pronouns) in Persian share distributional properties with noun phrases whereas object clitics are distributionally special. These properties have been summarized below, based on

identification criteria for clitics proposed by Kayne (1975), as cited in Cardinaletti & Starke (1999).

Special position. Syntactically, the direct object pronominal clitics have to appear in a postverbal position as illustrated in (6a). This is different from the corresponding lexical objects and strong pronouns that can appear in both preverbal and postverbal positions (7a, b, c, d). Examples (6b, c) show the impossibility of interverbal and preverbal positions for clitics. Thus, clitics have more restrictions with respect to syntactic position.

(6) a. (man) did-am=esh
I saw.PAST.Stm-1SG- DO.CLI:3SG
'I saw him'

*b. did=esh-am
saw- DO.CLI:3SG-1SG
'I saw him'

*c. esh-did-am
DO.CLI:3SG-saw-1SG
'I saw him'

(7) a. (man) Sepehr ro did-am
I Sepehr ACC saw-1SG
'I saw Sepehr'

b. (man) did-am Sepehr ro
I saw-1SG Sepehr ACC
'I saw Sepehr'

c. (man) un ro did-am
I him ACC saw-1SG
'I saw him'

d. (man) did-am un ro
I saw-1SG him ACC
'I saw him'

Obligatory presence of the verb (host). The clitic is dependent on the presence of its host verb and cannot appear on its own. Consider the following sentences:

		Prompt			*Response*	
(8)	a.	ki	ro	did-i?	Sepehr	ro
		who	ACC	saw.PAST.Stm-2SG?	Sepehr	ACC
		'Who did you see?'			'Sepehr'	
	b.	ki	ro	did-i?	un	ro
		who	ACC	saw.PAST.Stm-2SG?	s/he	ACC
		'Who did you see?'			's/he'	

c. ki ro did-i? *=esh

who ACC saw.PAST.Stm-2SG? DO.CLI:3SG

‘who did you see? ‘her/him’

The questions in (8) require a specific/definite answer. While either the lexical object *Sepehr* (8a) or the strong pronoun *un* ‘her/him’ (8b) can be a correct answer to the question because it can appear on its own, the clitic (8c) cannot, because it must attach to a host verb.

Similarly, if the verb is omitted under ellipsis, the clitic cannot be retained (9c), but the strong pronoun can be (9b).

(9) a. Sepehr shalvar khar-id va

Sepehr pants bought.PAST.Stm-3SG and

Saba kafsh

Saba shoes

‘Sepehr bought pants and Saba shoes’

b. Sepehr un ro khar-id va

Sepehr that ACC bought.PAST.Stm-3SG and

Saba in ro

Saba this ACC

‘Sepehr bought that and Saba this’

*c. Sepehr khar-id=esh va
Sepehr bought.PAST.Stm-3SG- DO.CLI:3SG and
Saba =esh
Saba DO.CLI:3SG

No conjunction. Unlike lexical objects and strong pronouns, clitics cannot be conjoined. Consider example (10). In (10a) *sib* 'apple' and *porteghala* 'oranges' are conjoined, and their corresponding strong pronouns *in* 'it' and *una* 'them' are conjoined in (10b). This is, however, not possible for clitics. The unacceptability of conjoined clitics can be observed in (10c, d).

(10) a. (man) sib ro va porteghal-a ro
I apple ACC and orange-PL ACC
xord-am
ate.PAST.Stm-1SG
'I ate the apple and oranges'

b. (man) in ro va una ro xord-am
I this ACC and that ACC ate.PAST.Stm-1SG
'I ate it and I ate them'

*c. (man) xord-am=esh-va=eshun
I ate.PAST.Stm-1SG=DO.CLI:3SG-and=DO.CLI:3PL
I ate it and I ate them'

*d. (man) =esh-va-eshun-xord-am

I DO.CLI:3SG-and=DO.CLI:3Pl-ate.PAST.Stm-1SG

'I ate it and I ate them'

These properties show that pronominal clitics are instances of 'special clitics'. An additional question that is raised is what determines whether a speaker will use a clitic or a strong pronoun. This question is important for this study because the task developed for the children attempted to elicit clitic pronouns, but the use of other pronominals was often a grammatical option for speakers. Thus, it is relevant to ask whether there are discourse conditions that favour clitics over strong pronouns. Generally speaking, the choice goes towards pronominal constructions with clitics in colloquial language and towards pronominal constructions with strong pronouns in formal language (Ghomeshi, 1996). Young children are exposed to and use mainly colloquial language, so it was expected that they would do so on the clitic task.

The Persian clitic system can be characterized as complex, because of (1) the parallel strong pronouns, as well as (2) the restricted syntactic distribution (i.e., strictly postverbal position, an obligatory verbal host). Although clitics are more frequent in informal speech, which is presumably what children hear more, their more restricted distribution is predicted to be more challenging for children with SLI. As observed, compared to clitics, strong pronouns behave like nouns: that is, they can freely appear on their own, in any position in a sentence. In contrast, clitics always attach to a preceding verb which they are an (object) argument of. These features are predicted by MRH to pose particular difficulties

for children with SLI. Thus, in contrast to Persian case morphology, whose sparseness would cause difficulties for children with SLI, too much richness and complexities of clitics are predicted to be problematic for these children.

These predictions are based on MRH, however, previous cross-linguistic findings also showed that they are vulnerable structures. In particular, French has a similar strong vs. clitic pronoun system, and clitics are definitely a clinical marker in French SLI. Therefore, it is reasonable to hypothesize that similar difficulties exist in Persian SLI, regardless of consideration of MRH.

2.3 Agreement and tense

It should be noted however, that not all grammatical morphology in Persian is complex. Two types of grammatical morphemes for which no difficulty is expected among Persian children with SLI are agreement and tense. Indeed, agreement is included as a control variable in this dissertation. Tense was also chosen as an example here due to unplanned, post-hoc findings with children's use of tense in the experimental tasks, see Chapter 7.

Agreement refers to "some systematic covariance between a semantic or formal property of one element and a formal property of another" (Steele, 1978, p. 610). In other words, these 2 agreeing elements vary together in some systematic way. An example of properties that undergo agreement are person and number in English, which are marked by suffixes on the verbs. In the English example *John laughs*, *laughs* is third person singular because *John* is third person singular. In Persian, like most other Indo-European languages, person-number agreement is

pervasive. All verbs must agree with the subject for person (first, second and third) and for number (singular and plural). The Persian person-number agreement morphemes are shown in Table 2.2.

Table 2. 2 Person-number agreement suffixes in Persian

	Number	
Person	Singular	Plural
First	-am	-im
Second	-i	-id
Third	-e	-an

In Persian, time is expressed by tense inflections, auxiliary verbs, time adverbials and aspect inflections (Mahoozi, 2006). A recent description of the verbal system indicates that the tense categories are present, past and future, and the main aspectual distinctions are between the perfective and imperfective (Mahoozi, 2006).

Each verb has 2 stems that can be referred to as the "present" stem and the "past" stem, as shown in the following table (2.3).

Table 2. 3 Present and past stems in Persian

Stems	
Present	Past
kar 'plant'	*kasht* 'planted'
xor 'eat'	*xord 'ate'*
bin 'see'	*did* 'saw'
shnav 'hear'	*shenid 'heard'*
bar 'take'	*bord 'took'*
rang-kon 'paint'	*rang-kard 'painted'*

The present stem of a verb is used for the simple present, the present progressive, and future tense (10a). The formal future tense is expressed with the

auxiliary *xah* 'will', but is only used in formal contexts. In colloquial registers, simple present tense is used to refer to future time (in parallel with English). Due to this fact, and the fact that young children are not regularly exposed to it, I will ignore the future tense and express future events with the present tense only.

(10) a. gol mi-kar-am
flower PRES- plant.PRES.Stm-1SG
'I plant/ I am planting a flower/ I will plant a flower'

b. gol kasht-e-am
flower PAST.Stm-PRF-1SG
'I have planted a flower'

As example (10) shows, the present tense prefix *mi-* is attached to the present stem of a verb, as is the person-number agreement suffix. Note that *mi-* can be served as the marker of either habitual or continuous aspects (Hojattolah Taleghani 2008; Mahutian 1999). The following examples, illustrate the systematic appearance of agreement morphemes on different verbs as well as the present tense in the non-perfective aspect and the future time.

(11) a. gol-a ro mi-kar-am
flower-PL ACC PRES-plant.PRES.Stm-1SG
'I plant the flowers/ I am planting the flowers/ I will plant the flowers'

b. sib mi-xor-i

apple PRES-eat.PRES.Stm-2SG

'you eat an apple/ you are eating an apple/ you will eat an apple'

c. film mi-bin-e

movie PRES-see.PRES.Stm-3SG

'S/he watches a movie/ she is watching a movie/ s/he will watch a movie'

d. seda-toon ro mi-shnav-im

voice-your ACC PRES-hear.PRES.Stm-1PL

'We hear your voice/ we are hearing your voice/ we will hear your voice'

e. mashin ro mi-bar-id

car ACC PRES-take.PRES.Stm-2PL

'You take the car/ you are taking the car/ you will take the car'

f. divar-a ro rang mi-kon-an

wall-PL ACC paint PRES-do.PRES.Stm-3PL

'They paint the walls/ they are painting the walls/ they will paint the walls'

All these examples show that the Persian agreement paradigm has a one-to-one relationship between each person-number combination and a morpheme. Hence, the system can be characterized as rich, as defined by MRH in 1.5.2. Also, it is regular because the Persian agreement inflections are applied consistently to all verbs, across all tenses. These properties, according to MRH, could be predicted to be beneficial to children with SLI and to significantly reduce associated difficulties.

2.4 Summary and dissertation aims

This study is the first attempt to examine the language abilities of Persian-speaking children with SLI. This goal was pursued by examining the linguistic skills in 9 children with SLI as compared to 16 of their TD age-matched peers. First, I attempted to characterize the higher-level language abilities of children with SLI, such as those related to their story narration within the framework of LPC. Narratives heavily rely on cognitive resources. When telling a story, children are obliged to use their cognitive recourses such as working memory in order to recall the theme of the story, describe the events in a meaningful way, use the structure that is appropriate for the listener's knowledge based on the linguistic context, provide information from the point of view of the protagonists as well as information about character's actions, emotions and goals (van der Lely, 2003). Limitations in processing capacity would influence a variety of children's responses such as first mentions and story grammar. Therefore, the narrative data will lead into verifying the validity of the assumption of LPC

theory. In addition, cross-linguistic research has demonstrated that these aspects of language are affected in children with SLI of other languages, and can distinguish between children with SLI and TD controls, as described in 1.3.1. Accordingly, these features were predicted to be affected in Persian SLI as well.

Further, I aimed to find out which areas of morphology present the most problems for Persian children with SLI, and whether they constitute clinical markers in Persian SLI. Certain morphological properties associated with case marking (as shown in 2.1) and object clitics in Persian (as shown in 2.2), coupled with cross-linguistic research on these aspects of grammatical morphology (as shown in 1.3.4), provide a rationale for examining whether these morphemes are affected in Persian SLI, and whether they are possible clinical markers in this language. This hypothesis is situated within MRH (Leonard, 1998, 2000). This account predicts that both case marking and object clitics would be vulnerable in SLI (Leonard, 2000). With respect to case marking, it predicts that due to limited processing resources, this sparse and irregular element will be sacrificed in favor of other richer and more regular features (Leonard, 2000). As such, the difference in the use of case morphology between children with SLI and their age-matched TD peers is predicted to be significant (Leonard, 2000). With respect to object clitics, the MRH predicts difficulties for impaired children as well (Leonard, 2000). The rationale behind this prediction is that the high number of grammatical features (e.g., non-canonical order, requiring a verbal host to attach to, etc.) overloads the limited processing capacity of children with SLI (Leonard, 2000). Hence, a significant difference in the level of performance between children with

SLI and age-matched TD children is predicted (Leonard, 2000). Following the same rationale, subject-verb agreement, as a rich and regular system is hypothesized as an area that poses the least difficulty for Persian-speaking children with SLI (Leonard, 2000).

CHAPTER 3. Identifying specific language impairment

This chapter describes the participants in the current study. To lead up to this, details on clinical procedures for identification of SLI in North America and Iran will be given. It should be emphasized that the complete set of clinical protocols described below were not directly used in the current study. Rather, those I describe here were used to identify and recruit children as SLI in consultation with speech and language pathologists.

Recall from section 1.1 that establishing whether a child has specific language impairment requires 2 types of criteria to be met: inclusionary and exclusionary (Leonard, 1998, 2003). A diagnosis of significant limitations in language ability is usually assessed through comprehensive standardized tests that include various aspects of language, phonology, lexicon, syntax and morphology (Tomblin et al, 1997). However, as also previously mentioned in section 1.1, the identification of children with SLI tends to be primarily done on the basis of exclusionary criteria. As such, consideration of children as having SLI takes place through exclusion of those whose language profile exhibit symptoms of secondary language impairments, that is, language impairments that are a consequence of another disorder, such as Down Syndrome or Autism Spectrum Disorder, or the result of sensory or nervous system deficits or physical impediments to speech. This ensures that the deficits experienced by children with specific language impairment should be central to language functioning and should not be a consequence of other problems. Children with SLI are expected to have language

difficulties while their development appears to be normal in other aspects. Therefore, certain areas have to be tested before the term SLI can apply. Most studies of children with SLI employ a set of criteria to test children's abilities. One of the most fundamental criteria in the diagnosis of SLI is a child's performance on a standardized test of nonverbal intelligence (Leonard, 1998; Plante, 1998; Rice, 2004). An IQ score of at least 85 or 1 SD below the mean is required to establish that a child has normal nonverbal intelligence, and therefore, does not have significant cognitive disabilities. Another exclusionary criterion that is considered for SLI is passing screening for hearing loss and otitis media (Leonard, 1998). Hearing problems make auditory intake of speech difficult or impossible and hence development of speech and language skills can be hampered (Friel-Patti & Finitzo, 1990; Hall & Hill, 1986; Lieu, Tye-Murry, Karzon & Piccirillo, 2010). Thus, in order to identify a child as SLI, no hearing-related problems should be found. Another exclusionary criterion involves physical structure of speech organs (Chapman, Hardin-Jones & Halter, 2003; Pamplona, Ysunza, Gonzalez, Ramirez & Patino, 2000; Priester & Goorhuis-Brouwer, 2008). Speech involves the coordinated effects of the tongue, lips, teeth, larynx, vocal cords and so on. A structural disability of one of these organs may have a significant effect on language skills. Therefore, the absence of abnormalities of the speech organs in children has to be verified prior to testing (e.g., a cleft lip and/or palate, a heavy tongue, etc). Furthermore, a wide range of neurological disabilities such as focal lesions or traumatic brain injury may affect an individual's understanding or the ability to process language (Duran, Guimaraes,

Medeiros & Guerreiro, 2009; MacWhinney, Feldman, Sacco & Valdes-Prez, 2000; Parkinson, 2002). In order for a child to be identified as SLI, no sign of frank neurological impairment should be found. Another important exclusionary factor to be considered is the absence of symptoms of socio-emotional developmental deficits such as those associated with Autism Spectrum Disorders. This type of disorder is likely to lead to difficulties with comprehension in conversational contexts and problems in pragmatic domains (Bishop & Rosenbloom, 1987; Knaus, Silver, Kennedy, Lindgren, Dominick, Siegel & Tager-Flusberg, 2010; Volden, Coolican, Garon, White & Bryson, 2009). Accordingly, no symptoms of social or emotional problems should be observed in the behavior of children with SLI.

Table 3.1 provides a summary of the criteria for a diagnosis of SLI, adapted from Leonard (1998).

Table 3. 1 Criteria for SLI, adapted from Leonard (1998, p.10)

Factor	Criterion
Language ability	Language test scores of -1.25 standard deviations or lower; at risk for social devalue
Non-verbal IQ	Performance IQ of 85 or higher
Hearing	Pass screening at conventional levels
Otitis media with effusion	No recent episode
Neurological dysfunction	No evidence of seizure disorders, cerebral palsy, brain lesions; not under medication for control of seizure
Oral structure	No structural anomalies
Oral motor function	Pass screening using developmentally appropriate items
Physical and social interactions	No symptoms of impaired reciprocal social interaction or restriction of activities

3.1 Identifying specific language impairment in Iran

This section is intended to inform the reader about the procedures used to identify children with specific language impairment in Iran and the way children with SLI were identified and recruited for the current study. The information reported here does not come from a government agency, but instead is gathered from speaking directly to 2 practicing speech and language pathologists in Iran. These 2 speech and language pathologists provided information regarding measurement tools, procedures and tests that they use in their speech and language pathology clinics to assess children with SLI as well as assessment tools used in other speech and language pathology clinics through contacting their colleagues (M. Faham, personal communication, July 20, 2009; H. Tamana, personal communication, August 2, 2009). It should be emphasized that this information comes from several speech and language pathology clinics in Shiraz only, thus variation might be observed across the country. The following paragraphs lay out the diagnostic protocols that were used, as described during consultations with M. Faham and H. Tamana.

Clinical assessment of children with specific language impairment in Iran includes a variety of measurement tools, procedures and tests that assess children's general physical and cognitive status along with their language behavior. In the first step, parents play an important role in directing their children to speech and language pathology centers if they are suspicious about their children's language development and speech clarity. One speech and language

pathologist I spoke with (H. Tamana, August 2, 2009) estimated that more than 90% of the children with SLI referred for assessment and intervention are sent by their parents. In addition, a number of school-aged children might be sent for speech assessment by teachers or school health visitors (schooling begins in Iran at age 7). Health visitors in Iran are registered health professionals who have undertaken training to work as part of primary school children's health care team. Their role is to check children's physical and social development, and to ensure that they are growing and progressing normally. They help children by notifying families, giving advice and referring them to relevant clinics. But not every school is privileged to benefit from this opportunity, because health visitors are not numerous and work only for certain public schools.

When referred to a speech and language pathology clinic, an assessment starts through completion of a case history via interviews with the parents. Case history forms are clinic-based and may vary from clinic to clinic. Appendix A provides a sample case history form that is used in one of the speech and language pathology clinics in Shiraz, Iran.

Once the preliminary information is gathered, the actual assessment of children's performance on linguistic and non-linguistic measures is made. The following set of linguistic measures is used to assess the language behavior of a child, and to make a diagnosis.

Gathering information on language developmental milestones is one of the tools that speech and language pathologists in Iran use to assess a child's language abilities. They follow a checklist that can determine whether the child's language

skills are developing on schedule. With the help of these milestones, speech and language pathologists can find out the rate of a child's language development, and determine whether s/he may need extra help with speech and language. Depending on the test results, the speech and language pathologists may suggest certain activities at home to help speech and language development, or they might recommend therapy.

In some clinics, linguistic assessments are made based upon observations of a child's natural speech. This assessment includes the examination of speech in a natural conversational setting through direct observation. Written notes are made during the conversations. During observation, special attention is paid to errors in phonology and the child's length of utterances. Depending on the speech and language pathologist, there might be some attention to morpho-syntactic errors, which are central to SLI, but this is not the focus of the majority of clinicians according to reports from the speech and language pathologists that I dealt with.

Other clinics use a set of tests that are intended to measure children's abilities on comprehension and expression. Some of these tests are translated versions of English tests; others were designed by Iranian speech and language pathologists. These tests include those that target children's ability to name words of different syntactic categories (e.g., nouns, verbs and adjectives) based on pictures, or their ability to identify phonemes and to make same-different judgments (e.g., Wepman's Auditory Discrimination, Wepman & Raynolds, 1987). The cutoff point for children with SLI is set to -1.25 standard deviations or

lower from the mean score, depending on the clinic. Some of the translated tests have been normed in Persian with Iranian children.

In addition to linguistic measures, Iranian clinicians use children's scores on nonverbal tests of intelligence as a part of the assessment. The assessment of intellectual abilities is done in other centers by psychologists, and the results are sent to the relevant speech and language pathology centers. Tests that are used are translated versions of the Goodenough-Harris Drawing Test (Goodenough & Harris, 1963) and the Wechsler Intelligence Scale for children (Wechsler, 1976).

As another part of the assessment, hearing abilities of children are tested to ascertain possible hearing loss. This is done by referring the children to an audiologist for hearing screening. The test includes one of the following: pure tone, Visual Reinforcement Audiometry (Decker & Wilson, 1977; Liden & Kankkunen, 1969), Conditioned Play Audiometry (Thompson & Weber, 1974) or Auditory Brainstem Response Audiometry (Jewett & Williston, 1971) depending on the age of the children. In addition, as part of the health profile of children, they are usually checked at birth for their hearing abilities. In Iran, the hearing of newborns has to be screened and recorded in their health profile. Thus, their initial hearing condition, in addition to their current hearing condition, is sometimes used as a reference.

The decision for children's intervention program is made on the basis of these assessments and also the family history of the individuals. If the family history shows a pattern of certain problems such as language impairment or dyslexia, children will go into therapy and treatment immediately. If family

history shows no such problems, speech and language pathologists adopt a Response To Intervention (RTI) approach (Fuchs, Mock, Morgan, & Young, 2003; Vellutino, Scanlon, Small & Fanuele, 2006). That is, children who potentially have language impairment are given the chance to improve through guided interventions by their parents for about 6 months. After this period, their progress is monitored to see if the parental intervention has been sufficient to help them to catch up with their peers. If children fail to show significant improvement in their language, this will be taken as evidence for language disability and children will undergo clinical therapy and intervention.

As previously indicated, this information comes from speech and language pathologists in Shiraz, and not from a government policy document; thus, part of these practices and interventions might apply to individual clinics only. Unfortunately, the information regarding how much of it applies to the whole country is unavailable.

3.1.1 Participants

Nine children with SLI ranged in age from 4;4 to 7;6 (mean age = 67.11 months) were recruited from Shiraz, Iran. The TD group consisted of 16 age-matched Persian-speaking children from the same region: 6 boys and 10 girls. The identification of Persian-speaking children with SLI was done through consultation with speech and language pathologists at the speech and language pathology centers in Shiraz, Iran by employing the exclusionary criteria described above. They were asked to list those children who met not only inclusionary

criteria but also the exclusionary criteria. That is, none of them should show a history of cognitive disabilities, hearing problems, neurological dysfunction, physical disability in the speech organs or emotional/ behavioral problems associated with the autism spectrum disorders. Based on this set of criteria 9 children, 8 boys and 1 girl, were identified as having SLI. These children were confirmed by the speech and language pathologists as having language abilities lower than age-expected norms based on the evaluations described in 3.1 (inclusionary criterion) and displaying within-normal-limit nonverbal intelligence, hearing, physical and emotional development. In addition, utterance intelligibility was a requirement, so data could be interpretable. Recruitment was conducted in 2 speech and language pathology centers located in Shiraz: Speech and Language Pathology Clinic of The Rehabilitation Institute of Shiraz and Speech and Language Pathology Clinic of Amoozesh-va-Parvaresh. Given that in Iran, children begin the first grade at about age 7, the group was comprised of 7 preschoolers and 2 school-age children. All preschool children in this study were attending daycare. Information concerning gender and age of each child is provided in Table 3.2.

Table 3. 2 Persian-speaking children with specific language impairment

		Age	
Children	Gender	Year; Months	Months
Matin	M	4;3	52
Soroosh	M	4;4	53

Reza	M	5;0	61
Mohamad	M	5;2	63
Amir-Ali	M	5;3	64
Hassan	M	5;3	64
Ali	M	6;2	75
Armin	M	7;0	84
Sareh	F	7;3	88
Mean		5;5	67
SD		0.13	13

The 9 children with SLI participated in all studies with the exception of the narrative task in which 8 of the 9 children with SLI participated. One child did not cooperate for the narrative task but cooperated for the other tasks.

The children with SLI were matched to children of the same age with typical language development who participated as a comparison group. Following groupwise matching criterion (Paradis, 2010), only those children whose age fell within the range of ages in the affected group were considered for inclusion. That is, none of the TD children's ages were lower than the minimum age in the affected group (i.e., 4;3) nor were any of them older than the maximum age in the affected group (i.e., 7;3). They ranged in age from 4;5 to 6;9 (mean age = 5;8) at the time of data collection. Using an independent sample *t*-test, no statistically significant difference was observed regarding the age between the 2 groups, $t(23) = -.57$, $p = .57$.

Table 3. 3 TD Persian-speaking children

Participants	Gender	Age	
		Year;Months	Months
Elaheh	F	4;4	53
Ainaz	F	4;5	54
Armita	F	5;1	62
Parinaz	F	5;3	64
Armin	M	5;4	65
Negin	F	5;5	66
Ariana	F	5;7	69
Ehsan	M	5;7	69
Kiana	F	5;8	70
Abbas	M	5;9	71
Amir	M	6;3	76
Arsalan	M	6;4	77
Arash	M	6;5	78
Shiva	F	6;6	79
Kimiya	F	6;6	79
Saina	F	6;7	81
Mean		5;7	69
SD		0.9	9

None of the children in the TD group had a history of hearing problems, demonstrated hearing problems at the time of testing, cognitive disabilities,

neurological dysfunction, emotional-behavioral difficulties and language disorders that would preclude their participation in this study, according to parental report. All parents of children included in the TD group in this study reported that everything was normal with respect to their children's development and hence they were assumed to be typically developing. Table 3.3 shows information regarding gender and ages of the TD children.

As gender columns in tables 3.2 and 3.3 show there were an unequal number of girls and boys in the two groups of children. The larger number of boys in the affected group (8 boys vs. 1 girl) is not surprising and in fact is consistent with other studies reporting a greater prevalence of SLI in boys than girls (Corriveau, Pasquini & Goswami, 2007; Fletcher et al., 2005; Leonard, 1998; Tomblin et al., 1997). In contrast, despite an attempt for gender balance, girls outnumbered boys in the unaffected group (10 girls and 6 boys). The reason for having a larger number of girls in the unaffected group was unwillingness of the boys to participate in the study. Despite this imbalance, it is unlikely that this factor had any significant effect on the data because of age of the TD children. Unlike toddler boys who might display a bit of delay at the onset of expressive language there are usually no large differences in the language skills of older TD children (Hoff, 2005).

CHAPTER 4: Language abilities of the Persian children: Story narration

This study examines the higher-level language abilities of children with SLI, such as those related to their story narration. As the section on narratives in the literature review (1.3.1) indicated, the ability to narrate stories has been found to be an area of difficulty for children with SLI in a variety of languages such as English, French and Cantonese (Gagné, 2008; Liles, 1985; Merritt & Liles, 1987, 1989; Norbury & Bishop, 2003; Paul & Smith, 1993; Schneider & Hayward, 2010; Schneider, Haywood & Dube, 2006). If children with SLI have limitations in their processing capacity, their abilities to narrate stories is predicted to be affected. Following these observations, the objective of this study was to investigate whether story narration presents problems for Persian-speaking children with SLI and whether this measure of language ability could discriminate between affected and unaffected children. Many researchers believe that underlying deficit in SLI comes from limited processing capacity (e.g., Ellis Weismer et al., 1999; Leonard et al., 1992; Miller et al., 2001). This limitation is assumed to affect many aspects of basic cognitive and perceptual processes required to accomplish a language task successfully. Story telling, as described in 1.3.1, 1.5 and 2.4, is a complex task that requires integration of linguistic and cognitive skills (Olley, 1989; Bishop & Donlan, 2005). Cognitively, children have to extract the theme of the story, make a logical relationship between events and use the structure that is appropriate for the listener's knowledge based on the linguistic context. Therefore, narratives provide a logical context in which to

evaluate the notion that underlying deficits in SLI come from limited processing capacity. In this study, 2 narrative abilities, first mentions (microstructure) and story grammar (macrostructure) of the Persian-speaking children with SLI will be tested and compared to those of their age-matched TD peers. Narrative abilities will be assessed with a story narration task. The subsequent sections illustrate the method of investigation and analysis of the narratives.

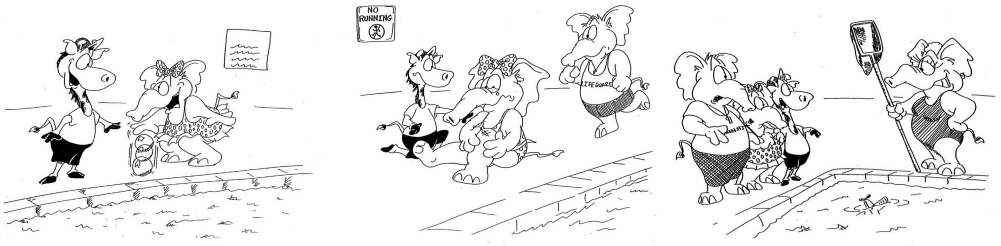
4.1 Methods

4.1.1 Task description

The task that was used to assess children's narrative abilities is Edmonton Narrative Norms Instrument (ENNI: Schneider, Dubé & Hayward, 2005). This task consists of wordless black and white pictures drawn by a professional artist, based on a set of written scripts. The sequence of pictures in each set contains sufficient information to enable the children to tell a complete story. The pictures involve 2 books, A and B, each containing a set of 3 stories differing in number of characters, length and complexity. Story 1 is a single-episode story depicted in 5 pages, with 2 young animal characters of different genders (Fig 4.1 A1; Fig 4.2 B1). Story 2 is a 2-episode story depicted in 8 pages with the 2 previously introduced young animals and a new adult animal character (Fig 4.1 A2; Fig 4.2 B2). Story 3 is a 3-episode story depicted in 13 pages, with the 3 previously introduced animals and another new adult animal (Fig 4.1 A3; Fig 4.2 B3). In addition to characters, there are objects in the stories that are important referents (e.g., *a ball*, *an airplane* and *a net* in set A and a *sandcastle*, *a balloon* and

bunches of balloons in set B). Figures 4.1 and 4.2 illustrate the characters and objects of story A and B, respectively.

Figure 4. 1 Story A from Edmonton Narrative Norms Instrument



A1 A2 A3

Figure 4. 2 Story B from Edmonton Narrative Norms Instrument

B1 B2 B3

As evident from the pictures, the stories contain 2 main protagonists that appear throughout the 3 stories in each set, and the secondary characters are added to the second and third stories. Moreover, various objects are involved in the stories. Thus, the stories increase in the number of referents and referential difficulty. The full set of stories can be viewed and downloaded from the ENNI website (Schneider & et al., 2005: http://www.rehabmed.ualberta.ca/spa/enni/). This particular picture book (*i.e.,* ENNI) was selected because it has already been employed in previous studies with children of different ages and in different languages and has been demonstrated as a good assessment tool for narrative

development in children (Gagné & Crago, 2010; Paradis & Schneider, 2008; Schneider et al., 2006).

4.1.2 Procedure and coding

The testing took place either in children's homes, or in speech pathology clinics for children with SLI, or in daycares for TD children. All children were tested individually in a quiet room, either in the presence of their parents or alone depending on the desire of the parents or children. As the experimenter I administered the task to the 2 groups of children and recorded the sessions for later transcription and analysis. All sessions were videotaped with the exception of one child with SLI and 11 TD children, who were audiotaped because either their parents or the director of the daycare did not give permission for videotaping. In this test, the procedures and coding that were developed in ENNI were followed, with the exception of some coding details adapted to Persian, as described below (Schneider & et al., 2005).

Testing for all children began with a practice story task consisting of 2 characters in a single-episode story. The purpose of the practice story was to familiarize the child with the task and also provide verbal feedback if the child had difficulty with the task. Because ENNI was designed as a storytelling task, no verbal response or feedback was allowed during the actual task. After administering the practice story, the target story task started. Following the ENNI manual (Schneider & et al., 2005; http:// www.rehabmed.ualberta.ca/spa/enni/), the picture book was held so that the child could not see the pictures. Then s/he

was asked to tell the story. The instructions emphasized that the experimenter was not able to see the pictures. So the child needed to tell the story in such a way that the experimenter could understand the story. The instructions informed the child that s/he would see all the pictures first, so s/he could preview the entire story, and then would be asked to tell the story to the experimenter. When the child seemed to be done telling the story for a picture, the experimenter turned the page for the following picture. The stories were always presented in the same order: the simple story first (A1, B1), the medium-complex story (A2, B2) second and the complex story (A3, B3) last. No questions were asked and responses that were made to the child were neutral responses such as 'oh', or 'okay'. The same procedure was followed for each of the 6 stories, with a short break between the 2 story sets.

Transcription. The narrative samples were transcribed according to the guidelines for Codes for Human Analysis of Transcripts (CHAT) from CHILDES database (MacWhinney, 2000; MacWhinney & Snow, 1990). Following the ENNI manual, the narratives were segmented into communication units (C-units) for analytical purposes. C-units consist of either an independent clause or an independent clause plus any dependent clauses associated with it. For identifying types of clauses and determining C-unit boundaries, "General transcription notes", pages 2-6 in the ENNI Manual was referred to.

Coding for first mentions (Microstructures). Following the scoring protocol developed by Schneider, Dubé & Hayward (2005), stories 1, 2 and 3 in sets A and B were coded for first mentions. First mentions were given a relevant score ranging from 3-0, depending on how adequate the expression used by a

child was. Persian, like English, is a language where noun phrases are marked morphologically as definite or indefinite. An indefinite noun phrase such as, *ye fili* 'an elephant' or *ye fil* 'an elephant' that is marked by *ye* or *ye* + *i* for indefiniteness is appropriate for introducing a new character in a story was scored as 3 (e.g. *ye fil* or *ye fili* 'an elephant'; Example 1a,b). If children gave a name to the characters (e.g., Sadaf), they were scored as 3 as well (Example 1c). Similarly, if children used bare noun phrases as a proper noun (e.g., Fil 'Elephant') for first mentions it was scored as 3 (Example 1d). If a definite noun phrase such as *fil(e)* 'elephant' was used to introduce a new character, it was scored as 2 (Examples 1e, 1f). Unlike indefinite nouns, definite nouns are ended with a linking element *e* (e.g. *file* 'the elephant). Accordingly, if the noun phrase ended with the linking element *e*, it was counted as a definite noun (Examples 1e, 1f), whereas if it lacked the linking element *e,* it was counted as a proper noun or name (Example 1d). Pronouns such as *un* 's/he' are inadequate for introducing a new character/object, and thus, were scored as 1 (Examples 1g). Persian is a null-subject or pro-drop language, meaning that the subject may not be overt if the referent can be inferred from the morphological inflections on verb and is understood from context. As described in Chapter 2 (2.3) verbs must agree with the subject in person (first, second, third), and number (singular, plural). Therefore, if a null subject pronoun was used, it was accepted as a pronoun and given a score of 1 (Example 1h), as long as the obligatory person-number inflection was on the verb. Finally, a score of zero was given if no referent was provided. For example, in story (A3) Armin did not mention the object *toor* 'net',

and hence received a score of 0. Example 1i shows that Character 4 reached for the airplane without mentioning the object that was used to get it (*it* in example 1i refers to the airplane not the net). The maximum score for first mentions was 42. The scoring protocol for first mentions is provided in Appendix B. The following examples taken from elicited speech of a number of children with SLI show different types of responses. The italicized NP is the one that was scored.

(1) a. ye roozi *ye* *zarafe-i* bood-∅
one day one giraffe-INDEF was-3SG
'Once there was a giraffe' (*Ali: SLI; An indefinite NP 'a giraffe' ;Score:3/3)*

b. *ye* *gav* va *ye* *khar* dava mi-kon-an
one cow and one donkey fight PRES-do-3PL
'A cow and a donkey are fighting' (*Soroosh: SLI; Indefinite NPs 'a cow and a donkey'; Score: 3/3)*

c. va *sadaf* ba un mi-raft-∅
and Sadaf with her PRE-go-3SG
'And Sadaf was going with her' *(Sareh: SLI; A name 'Sadaf'; Score:3/3)*

d. in *fil* hast in *olagh*

this elephant is this donkey

'This is Elephant, this is Donkey' (*Soroosh: SLI; Bare NPs 'Elephant and donkey', as a proper noun, score 3/3*)

e. ye roozi *file* va *zarafehe* bazi

one day elephant and giraffe play

mi-kard-an

PRES-did-3PL

'Once the elephant and the giraffe were playing' *(Abbas:TD; Definite NPs 'the elephant and the giraffe'; Score: 2/3)*

f. ye roozi ye badkonak avord-e bood *hapooe*

one day one balloon brought-3SG had doggie

'Once, the doggie had brought a balloon' (*Ariana: TD; Definite NP 'doggie'; Score: 2/3)*

g. *una* xune dorost mi-kon-an

they house build PRES-do-3PL

'They are building a house' (*Hassan: SLI; Overt pronoun 'they'; score 1/3*)

h. ye roozi ye badkonak did-an

one day one balloon saw-3PL

'One, they saw a balloon' *(Sareh: SLI; Null pronoun; Score: 1/3)*

i. inja dar-esh avord-

here out-it brought-3SG

'Here he brought it out' (*Armin: TD; no mention of the object toor 'net' (it here refers to the airplane not the net; Score: 0/3*)

Coding for story grammar (Macrostructure). Stories A1 and A3 from the ENNI were used in the story grammar analysis. Only these 2 stories were considered because no coding protocol is available from the ENNI website for other stories (i.e., A2, B1, B2 & B3). As noted previously, story A1 is a simple single-episode story with 2 characters, and story A3 is a complex 3-episode story with 4 characters. Following the scoring protocol developed by Schneider et al. (2005), these stories were coded for story grammar units. Story grammar includes units that are needed for a story to be considered complete. They include Characters, Setting, Events, Response, Plan, Attempt, Outcomes and Reaction. Among these units, Event, Attempt and Outcome are considered core units because of their essentiality to each story. Two points were assigned for these units in the protocol (example 2a-f). For example, in story (A1) an event such as *toop oftade-bood tooye ab* 'ball fell in water' was scored as 2 because the initiating event was provided (2a). In contrast, in example 2b, Soroosh was not given a credit because

there was no mention of ball. In example 1c, the child was given points for Attempt because he said that *havapeymae ro gereft* 'he (i.e. the elephant) took the airplane'. In Examples 1e, he earned points for Outcome because he said that *toope ro avod va dad daste file* 'he got the ball and gave it to the elephant', which is a logical outcome of *zarafehe talash kard toope ro begire* 'the giraffe trying to get the ball'. Supplementary story grammar units include Characters, Setting, Response, Plan, and Reaction and were given 1 point each (examples 2g-k). For example, in 1g Reza earned point for Characters *fil* 'elephant' and *khar* 'donkey'. In 1h, the child was given a credit because there was a mention of *estakhr* 'swimming pool' in *ba doostesh oomadan labe estakhr* 'He came near the pool with his friend'. In 1i, the child received credit for Initiating Event because she had mentioned *mamne file oomad* 'The elephant's mother came over'. In 1j, the child got credit for Internal Responses because he said *shire khast bere biyaradesh* 'The lion wants to go get it'. In 1k, she was given a credit for Internal Plan, because she has indicated that the elephant is going to bring a net, *man miram ye toor miyaram* 'I am going to bring a net'. The maximum scores for the simple story A1 and complex story A3 are 13 and 37, respectively. Sample stories of A1 and A3 and scoring sheet for one child with SLI and one TD child are provided in Appendices C, D, E and F, respectively.

(2) a. Initiating Event, Story A1

toope-shun	oftade-bood-ø	tooye	ab
ball-POS	fell-3SG	in	water

'Their ball fell in water' *A1 (Ali: SLI, scored as 2/2)*

b. *Initiating Event, Story A1*

ab hast

water is

'There is water' *(Soroosh: SLI, scored 0/2 because there was no mention of ball)*

c. *Attempt, Story A3*

bad havapeymae ro gereft- ø

then airplane ACC took=3SG

'Then she took the airplane' *(Arash: TD, scored 2/2)*

e. *Outcome, Story A1*

toope ro avord-ø dad-ø daste file

ball ACC got-3SG gave-3SG hand elephant

'He got the ball and gave it to the elephant' *(Abbas: TD, scored 2/2)*

f. *Outcome, story A3*

bad havapeymash be gave dad-ø

then airplane to cow gave-3SG

'Then he gave his airplane to the elephant' *(Amir-Ali: SLI, 2/2)*

g. *Characters, Story A1*

ye fil hast

one elephant is

'There is an elephant'

inam ye khar hast

this one donkey is

'This one is a donkey' *(Reza: SLI, scored 1/1)*

h. *Setting, Story A1*

ba doost-esh oomad-an labe estakhr

with friend-POSS come-3PL near pool

'He came near the pool with his friend' *(Ainaz: TD, scored 1/1)*

i. *Initiating event, story A3*

bad mamane file oomad- ø

then mother elephant came-3SG

'Then the elephant's mother came over' *(Arash: TD, scored 2/2)*

j. *Internal response, story A1*

shire xast- ø bere biyarad=esh

lion wanted go get=3SG

'The lion wanted to go get it' (*Ali: SLI, scored 2/2*)

k. *Internal plan, story A3*

bad	goft	man	mi-ra-am	ye	toor
then	said	I	PRES-go-1SG	one	net
	mi-yar-am				
	PRES-bring-1SG				

'Then said "I am going to bring a net' *(Kimia: TD, scored 1/1)*

4.1.2.1 Reliability procedures

I completed the transcripts and coding and checked them a second time. Unfortunately, the typical reliability procedure for transcription and coding could not be followed, that is, the files were not checked by a second person because I was the only qualified Persian speaker who was available. Instead, I went over a subset of stories in translation with an experienced ENNI user to co-determine the coding. Disagreements were discussed and resolved.

4.1.3 Results

The raw score means and standard deviations for the first mention data are displayed in Table 4.1 by groups. Raw scores were chosen because norms for these factors have not been established in Persian.

Table 4. 1 First mention scores for children with SLI and age-matched TD peers

		FM (Max = 42)		
Group	n	Mean	SD	Mean percent
SLI	8	25.13 (range = 17-33)	5.91	59.52
TD	16	35.25 (range = 29-42)	3.8	83

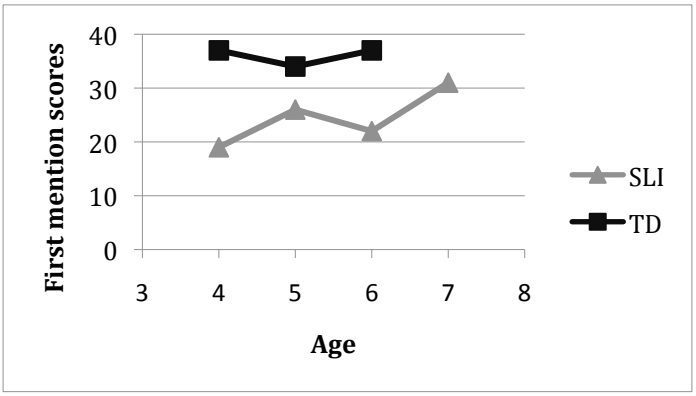
A *t*-test was conducted to look at the differences on the total scores. This difference reached statistical significance, $t(22) = -5.1$, $p < .001$, with a large effect size ($d = -2.03$ and $r = - .71$). Thus, comparisons revealed that the Persian children with SLI used significantly fewer adequate first mentions in their narratives than age-matched TD children.

Because of the potential heterogeneity in the groups of children with SLI, the data from each child were examined to see whether they support the group pattern revealed by the analysis above. Individual scores for both children with SLI and TD children are illustrated in Appendices G and H, respectively. Data show that despite heterogeneity among children with SLI (score range = 17-33), all of them underperformed their TD peer's average (TD $M = 35.25$). Moreover, 5 out of 8 children with SLI scored less than 29, which was the lowest score in the unaffected group. Thus, the individual scores support the group data showing particular vulnerability with first mention among children with SLI.

Comparison of age showed that oldest Persian-speaking children with SLI achieved higher scores ($M = 31$) on referent introduction than youngest children ($M = 19$) (Figure 4.3).

Analysis of results showed that TD children had higher scores than children with SLI of the same age. Four-year-old children with SLI had a mean score of 19 whereas their age-matched TD counterparts achieved 37. Five-year-olds had a mean score of 26 in contrast to their TD counterparts who achieved a score of 34. The only six-year-old child in the group with SLI had a score of 22 whereas his TD counterparts had a mean score of 37.

Figure 4. 3 Mean scores for first mention by age



First mention scores of TD children were tested to see whether their performance changed between ages of 4-6. The older children's means for first mentions was 37, which is similar to the means of younger children. Thus no systematic developmental progression is evident from the current data.

Table 4.2 breaks down the raw score means and standard deviations for story grammar data of the 2 stories. Because the 2 stories had different maximum raw scores, mean percents story grammar are given for the convenience of comparisons, though the *t*-test reported was conducted on the raw scores. The analysis of story grammar indicated a significant difference between the groups:

$t(22) = -5.82$, $p < .05$ for the story grammar simple story (A1) and $t(22) = -5.59$, $p < .05$ for the story grammar complex story (A3), indicating that children with SLI provided fewer story grammar units ($M = 5.13$ for A1; $M = 13.75$ for A3) than age-matched TD controls ($M = 9.75$ for A1; $M = 23.63$ for A3).

Table 4. 2 Mean and standard deviation raw story grammar scores and percentage score for children with SLI and age-matched TD controls in story A1 and story A3

		Story A1 (Max = 13)			Story A3 (Max = 37)		
Group	n	M	SD	M %	M	SD	M %
SLI	8	5.13 (Range = 2-9)	2.64	38	13.75 (Range = 6-22)	5.7	38
TD	16	9.75 (Range = 7-12)	1.29	77	23.63 (Range = 17-28)	3.0	65

A 2x2 ANOVA, using the group (SLI vs. TD) as the between-subjects factor and the story (Simple story A1 vs. Complex story A3) as the within-subjects factor, was performed. This analysis revealed a significant main effect of story type $F(1, 22) = 9.98$, $p < 0.05$, indicating that the simple story (A1) was easier for children than the complex story (A3). The interaction between group and story did not yield significance $F(1, 22) = 0.415$, $p > 0.05$. The analysis showed a significant main effect for group $F(1,22) = 36.23$, $p < .001$.

Individual scores for both the children with SLI and TD children are given in Appendices I and J, respectively. The within-group performance showed that there was more variation within the SLI group for the simple story (A1) with

scores ranging between 2-9, than within the TD group, with scores ranging between 7-12. For the complex story (A3), however, the within-group variation was relatively high in both groups. Scores of the children with SLI varied between 6-22, and those of the TD children varied between 17-28. Note that despite the variations, the unaffected group achieved generally higher scores on story grammar (range = 17-28) than the affected group (range = 6-22).

4.2 Discussion

The aim of this study was to determine whether the narrative skills of Persian-speaking children with SLI differ from those of age-matched peers. To do so, measures of first mention (microstructure) and story grammar (macrostructure) were compared between the 2 groups. These narrative abilities of the 2 groups were examined using the ENNI (Schneider et al., 2005). The ENNI includes first mentions, as a measure of cohesion to evaluate the referring expressions that children use to introduce story characters/ objects. The following section presents findings on the skills of Persian-speaking children with respect to their production of first mentions. In addition, in the ENNI, the children generate a story based on a sequence of pictures. The number of characters/ objects, amount of story information, length and complexity in the stories increase as the task progress. This increase in how demanding each story was has consequences for the story grammar variable, and will be discussed in the subsequent sections.

First mentions. The children with SLI followed the expected result by producing significantly fewer adequate first mentions compared to the age-

matched TD peers. These results show that they are less sensitive to listener needs when introducing story characters/objects. These findings are similar to previous research on referential cohesion and adequacy reviewed earlier (1.2.1) in that children with SLI achieved lower scores on referent introduction than TD children (e.g., Liles, 1985a, 1985b; Paul & Smith, 1993; Schneider & Hayward, 2010; Stokes, Cheung & T'sou, 2010; Tsai, W. & Chang, C-J. 2008). In line with those results, this study found that first mentions could be useful for differentiating young children with SLI from their age-matched TD peers in Persian. The results, however, are not consistent with van der Lely (1997), who reports that children with SLI are not distinguished from TD children by referring measures. The explanation that was proposed by Liles et al. (1995) for the discrepancy they found was the difference in control groups between the studies. The control groups in van der Lely (1997) were comprised of 3 groups of TD children who were carefully matched with the affected group on various linguistic measures, such as morphosyntactic abilities and the expression and comprehension of words. Like the control group in this study, Liles et al. (1995) and Schneider and Hayward (2010) have all been similar in that they matched children on the basis of age rather than linguistic abilities. Therefore, it is likely that the difference in the control groups between the studies was a factor underlying the conflicting results.

Older Persian-speaking children with SLI achieved higher scores on referent introduction than younger children (Figure 4.3). So there is an improvement from age 4 to 7 in the affected group in a way that the youngest

children showed the weakest ability to introduce new characters and objects and the oldest children perform comparably to the same level as age-matched TD peers. This is similar to the results of previous research on first mentions in stories in which older children with SLI achieved higher scores on referent introduction than younger children (Hickmann, 1991, 1997, 2003; Karmiloff-Smith, 1987; Schneider & Dube, 1997; Schneider & Hayward, 2010). This suggests that age improves the ability to focus on the forms of referents that are appropriate for listener knowledge, i.e., adequate first mentions.

In contrast to the results of other studies such as Schneider and Hayward (2010), first mention scores of TD children in this study did not appear to increase between the ages of 4 to 6. This source of discrepancy can be due to a smaller number of children per age group. The Schneider and Hayward (2010) study involved a group study with 50 children per group in contrast to this study that had 1 to 3 children per group. So it is quite likely that the small number of children does not represent the actual trends. Therefore, it has limited power to support the suggested trend for the age groups. Future studies involving a larger number of children are needed to re-examine the first mentions in order to identify the developmental trend between ages 4 and 6 in the unaffected group.

In sum, the results of the first half of the test, first mentions, suggest that children with SLI and age-matched TD peers differ in their abilities to use referring expressions adequately. Hence, first mentions seem to be a good measure for evaluating language abilities in young children with SLI, and could be useful in the assessment of SLI in Persian-speaking children.

Story grammar. The test for group differences revealed a significant difference between the 2 groups of children. Children with SLI included significantly less story information in their stories than TD children of the same age. This difference was observed for both simple (SLI *M* = 38% vs. TD *M* = 77%) and complex stories (SLI *M* = 38% vs. TD *M* = 65%). These results, therefore, corroborate previous research on narratives of children with SLI that showed that English-, French- and Cantonese-speaking children with SLI use fewer story grammar units than age-matched TD children (Chan Loi Lee, 2003; Gagné, 2008; Gagné & Crago, 2010; Schneider & Hayward, 2006).

The observation that both Persian-speaking children with SLI and TD peers produced more story grammar units in the simple story than in the more complex story is consistent with the findings reported in previous studies investigating story grammar skills of English- and Chinese-speaking children (Chan Loi Lee, 2003; Schneider et al., 2006). The findings here are unsurprising under the assumption that due to limited available processing resources among children with SLI, the increased processing load of the more demanding context leads to worse grammatical scores overall (Thordardottir, 2008).

These results indicate that Persian-speaking children with SLI and age-matched TD peers differ in their story grammar skills. Therefore, story grammar seems to be a good measure for evaluating narrative ability in Persian-speaking children with SLI, and an effective measure for distinguishing affected group from unaffected children.

Conclusions. Overall, the findings of this study show a contrast in both first-mention and story-grammar abilities between Persian-speaking children with SLI and age-matched peers. With significant differences between the 2 groups on these measures, it can be concluded that micro- and macrostructural levels in narratives provide diagnostic potential in differentiating Persian-speaking children with SLI and their TD peers.

Prior to this research, the use of ENNI with young Persian-speaking children had not yet been documented. The results of this study also demonstrate that ENNI is a good assessment measure of narrative development in Persian-speaking children.

CHAPTER 5: Linguistic abilities of the Persian children: Case marking

Chapter 4 presented a picture of the language abilities of Persian-speaking children with SLI in the study sample, such as abilities related to their story narration. In this chapter, I will focus on a specific area of Persian morphology, accusative case marking, and compare children with SLI and their age-matched controls on the use of this morpheme. The aims are to see (1) whether case-marking can constitute a clinical marker in Persian SLI, and (2) whether the theory of SLI being explored in this thesis, (i.e., the Morphological Richness Hypothesis) can account for the patterns.

The prediction is that Persian-speaking children with SLI show a significantly higher incidence of difficulties with the accusative marker and use lower percentages of the case particle than age-matched children. Recall from the discussion in chapter 1 that there are at least 2 possible reasons to make such a prediction. First, similar to the case system in Hebrew, the sparse nature of the case marking system is likely to affect the use of the case marker that appears in the language by children with SLI. This is also much like the sparse verb inflections in English that affect their use by children with SLI. More specifically, the sparseness of case markers in Persian could mean that Persian-speaking children with SLI might not process case morphology effectively. This is because, if processing resources are limited for these children, they might overlook those aspects of grammar that are less rich, as described in 1.5.1. In addition to that, the use of case marking on the direct object is restricted to a particular context, that is,

when the referent is both definite and specific. When it is unspecific, there is no need to use the marker and it has to be dropped. Therefore, the sparse occurrence of case markers on one hand and the irregular occurrence (i.e. it appears on specific and definite direct objects only), on the other hand, is predicted to play a role in rendering the case system difficult for children with SLI.

5.1 Methods

5.1.1 Task description

In order to provide every child with the same opportunity to produce the accusative case, the examination of children's use of the case marker was carried out in an experiment. The test consisted of a picture elicitation task adapted from the one used in Bedore & Leonard (2001), in which children were asked to complete sentences. The task was designed to provide obligatory contexts with which children's expressive abilities in the use of the accusative case could be assessed. A set of 55 stimuli was designed to elicit accusative case use in 3 different conditions: (1) noun + accusative, where the case particle follows a simple noun with no affixes, or modifying noun, or adjective phrases (Condition 1), (2) noun + plural + accusative, where the case particle appears after a noun inflected with the plural marker *-a* (Condition 2) and (3) noun + adjective + accusative, where the case particle is preceded by a noun phrase containing a noun and an adjective (Condition 3). There were 21 stimuli in condition 1, 17 stimuli in condition 2 and 17 stimuli in condition 3. The underlying reasons for including

different conditions was to provide enough stimuli for analysis to detect whether accusative case is of particular difficulty in children with SLI regardless of extra elements in a sentence. If this area of morphology is vulnerable, a consistent difficulty must be observed under a variety of different conditions. Compared to the first condition where the noun phrase has a simple noun, noun phrases in conditions 2 and 3 require extra elements -- an inflection or a lexical item, respectively -- to be repeated in the sentence completion task.

Experimental items for each condition contain pictures of 4 animate characters or inanimate objects involved in an activity or event. They were selected from photographs of children's toys. Only pictures of referents and scenes likely to be known to children in this age range were chosen. The age-familiarity issue was ensured by (1) selecting the objects and activities from children's books, and (2) checking the objects and activities with 2 three-year-olds living in Iran at the time. Given that these 2 children were about 4 to 6 months younger than the youngest participant in this study (Matin, age 4;4, as shown in Table 3.2 of Chapter 3), the assumption was that the experimental items were familiar to all participants. The cultural appropriateness of the pictures was also ensured. For example, a picture of a blonde-hair girl in the task was used because Iranian children are well exposed to such figures through toys, storybooks and cartoons. Therefore, all experimental pictures were age-appropriate, depicted familiar scenes for that age range, and were culturally relevant. All pictures were bound and presented as a picture book.

In this task, the characters or objects were arranged in a two-by-two grid on one page (Figures 5.1 to 5.4). These pictures were followed by 2 companion pictures in the following page through which the characters or objects were shown to be involved in an activity (Figures 5.5, 5.6). The first activity was described by the experimenter and the second activity was intended to be completed by the child. The list of the verbs is provided in Appendix K. Some verbs were used more than once. The reason for using these verbs more than once was that there are limits on the range of activities that could be depicted in pictures. Thus, some verbs had to be used more than once in order to provide a sufficient number of stimuli to test the children. The list of the verbs used more than once is provided in Appendix L. The stimuli were piloted on 2 adult speakers of Persian to ensure that the intended responses would be elicited. The complete list of the stimuli sentences in each condition is provided in Appendix M with interlinear glosses and translations.

5.1.2 Procedure and coding

A testing session was scheduled for those children whose parents provided consent for participation. The testing condition was similar to the narrative testing condition in that it took place in either children's homes or in Speech Pathology Clinics for children with SLI, or in daycares for TD children. All children were tested individually in a quiet room, either in the presence of their parents or alone, depending on the desire of the parents or children. As the experimenter, I administered the task to the 2 groups of children and recorded the sessions for

later transcription and analysis. All the sessions were videotaped, with the exception of 1 child with SLI and 11 TD children, who were audiotaped because either their parents or the director of the daycare did not give the permission for videotaping.

The procedure for administering the task was done as follows. Each child was presented with a picture book that illustrated characters and objects who were engaged in an event or an activity. Each stimulus was depicted through 6 pictures in 2 pages. The first page contained 4 pictures laid out in a two-by-two grid, and the second page contained 2 pictures laid out horizontally or vertically. I explained the task to each child as follows: "I am going to show you pictures of children or animals involved in an activity or event. First I will show you 4 pictures and name the characters and/or objects for you. Then I will show you 2 pictures showing the characters are doing something. I will look at the first picture and describe what s/he is doing and I want you to look at the second picture and complete my sentence by telling me what the other one is doing". For example, I showed the child pictures that introduced 4 things: a boy, a girl, a table and a chair. Then I named them for the child as "This is Sepehr" (Figure 5.1) and "This is Saba" (Figure 5.2), "This is a table" (Figure 5.3) and "This is a chair" (Figure 5.4). Then I showed the child another picture that showed Sepehr moving the table (Figure 5.5) and a picture of Saba who was moving the chair (Figure 5.6). I pointed to the first picture (Figure 5.5), and said "Sepehr is moving the table and Saba ------" (while pointing to the second picture, Figure 5.6). The child was expected to say *sandali ro jabeja-mikone* 'chair accusative moving', in the form

noun + accusative + verb. The following example shows the prompt and the expected response in Persian.

(1) *Prompt:*

Sepehr	miz	ro	jabeja	mi-kon-e	va
Sepehr	table	ACC	move	PRES-do.PRES.Stm-3SG	and

Saba
Saba
'Sepehr is moving the table and Saba ------'

Expected response:

sandali	ro	jabeja	mi-kon-e
chair	ACC	move	PRES-do.PRES.Stm-3SG

'is moving the chair'

Note that the accusative case was given in the prompt, since this is the only grammatical option in Persian. However, in spite of being used in the prompt, children with SLI tended to omit this morpheme in their responses, as will be shown in the results section (5.1.3).

Prior to the presentation of the target stimuli, practice items were given to children in order to familiarize them with the task. Upon seeing the target stimuli, if the children's response did not contain the accusative case, they were encouraged to elicit the expected structure by returning back to the practice items and requesting to hear the rules again. The children were given a short break after every 20 stimuli, during which they were rewarded with stickers. The experiment took approximately 30 minutes, though it took a bit longer for children who needed a longer break. The procedure for data collection was the same for the 2 groups of children.

Figure 5. 1 Sepehr

Figure 5. 2 Saba

Figure 5. 3 A table

Figure 5. 4 A chair

Figure 5. 5 Sepehr is moving the table

Figure 5. 6 Saba is moving the chair

Scoring. Children's responses were coded for (1) their overall accuracy in the use of the accusative case across conditions, and (2) accuracy in the use of the particle and other elements within each condition separately.

Scoring for overall accuracy. The participants' responses were either considered correct and given a score of 1 or incorrect and given a score of 0. Cases of no response or off-topic responses were excluded from the analysis (n = 2). An example of an off-topic response would be a child commenting on his own bike, saying "oh, my dad bought a blue bike for my birthday" upon hearing the word 'bike' in the prompt. These children were given another chance to complete the sentence. If they completed the sentence, the response was accepted and considered as scorable. The use of the accusative case was coded as correct in obligatory contexts when the particle either in the form of *ro* or *o* appeared after the direct object (*ro* can be shortened to *o* for sound harmony in colloquial language). So even if the plural inflection or adjectives were missing, the response was still considered correct as long as the object and the accusative case were produced. The following examples show instances of correct and incorrect responses (as explained and displayed in 2.1). Elements that could legitimately be omitted appear in brackets.

(2) *Prompt:*

Saba	sandali	ghermez-a	ro	jabeja	mi-kon-e
Saba	chair	red-PL	ACC	move	PRES-do.PRES.Stm-3SG

va Sepehr
and Sepehr
'Saba is moving the (red) chair(s) and Sepehr'

Correct response:

sandali	*(abi)-(ya)*	*ro*	*jabeja*	*mi-kon-e*
chair	blue-PL	ACC	move	PRES-do.PRES.Stm-3SG

'is moving the (blue)chair(s)'

Incorrect response (accusative omission):

sandali	*(abi)-(ya)*	*jabeja*	*mi-kon-e*
chair	blue-PL	move	PRES-do.PRES.Stm-3SG

'is moving (blue) chair(s)'

Scoring for accuracy within different conditions. This analysis involved children's use of the case particle in condition 1, where they had to provide a response in the form of noun + accusative; in condition 2, where children had to provide noun + plural + accusative; and in condition 3 where children had to provide noun + adjective + accusative.

In condition 1, a response was considered as correct if the object and the accusative case were produced, and incorrect if either was omitted. The accuracy was calculated by dividing the total number of correct responses by the total number of responses. Examples of correct and incorrect responses are provided in 3 (as explained and displayed in 2.1).

(3) *Condition1 (noun + accusative)*

Prompt:

Nima	sandughe	ro	mi-kesh-e	va	Sepehr
Nima	box	ACC	PRES-pull.PRES.Stm-3SG	and	Sepehr

'Nima is pulling the box and Sepehr ----------'

Correct response:

mize	ro	mi-kesh-e
table	ACC	PRES-pull.PRES.Stm-3SG

'is pulling the table'

Incorrect response (accusative omission):

mize mi-kesh-e
table PRES-pull.PRES.Stm-3SG
'is pulling a table'

In condition 2, two types of coding were done. The first one concerned the correctness of the response. A response was considered as correct if a noun + plural + accusative were used and as incorrect if any of these elements was omitted, as example 4 illustrates. Note that in the following sentences the plural *-a* has been alternated to *-ha* on stems ending in a vowel.

(4) *Condition 2 (noun + plural + accusative)*

Prompt:

Sepehr panguan-a ro nega mi-kon-e va

Sepehr Penguin-PL ACC watch PRES-do.PRES.Stm-3SG and

Saba
Saba
'Sepehr is watching the penguins and Saba -------'

Correct response:

jooje-ha ro nega mi-kon-e

chick-PL ACC watch PRES-do.PRES.Stm-3SG

'is watching the chicks'

Incorrect response (accusative omission):

jooje-ha nega mi-kon-e

chick-PL watch PRES-do.PRES.Stm-3SG

'is watching the chicks'

Incorrect response (omission of plural):

jooje ro nega mi-kon-e

chick ACC watch PRES-do.PRES.Stm-3SG

'is watching the chicks'

Incorrect response (omission of plural + accusative):

jooje nega mi-kon-e

chick watch PRES-do.PRES.Stm-3SG

'is watching the chicks'

Another type of coding concerned the type of incorrect response, that is, whether the error involved omission of the accusative case, omission of the plural or the omission of both the plural and the accusative case.

As in condition 2, two types of coding were done in condition 3. One concerned the correctness of the response. A response was considered as correct if a noun, an adjective and the case particle were used. If any of these elements was omitted, the response was considered incorrect, as example 5 shows.

(5) *Condition 3 (noun + adjective + accusative)*

Prompt:

Saba sandali ghermeze ro

Saba chair red ACC move

jabeja mi-kon-e va Sepehr

PRES-do.PRES.Stm-3SG and Sepehr

'Saba is moving the red chair and Sepehr --------'

Correct response:

sandali	abiye	ro	jabeja	mi-kon-e
chair	blue	ACC	move	PRES-do.PRES.Stm-3SG

'is moving the blue chair'

Incorrect response (omission of the accusative):

sandali	abiye		jabeja	mi-kon-e
chair	blue		move	PRES-do.PRES.Stm-3SG

'is moving the blue chair'

Incorrect response (omission of an adjective):

sandali		ro	jabeja	mi-kon-e
chair		ACC	move	PRES-do.PRES.Stm-3SG

'is moving the chair'

Incorrect response (omission of an adjective + accusative):

sandali		jabeja	mi-kon-e
chair		move	PRES-do.PRES.Stm-3SG

'Sepehr is moving a chair'

In addition, the type of incorrect response was recorded as well. That is, whether the error involved omission of the accusative case, omission of an adjective or the omission of both an adjective and the case particle.

5.1.3 Results

Overall accuracy. The percent of correct and incorrect use of the accusative case were calculated for participants and were compared across the 2 groups. The resulting mean correct percent of the accusative case was 45% (SD = 39) for the affected group and 97% (SD = 4.5) for the unaffected group. Mann-Whitney U comparisons were performed between the means for the 2 groups. A non-parametric Mann-Whitney test was used because the Kolmogorov-Smirnov test showed that the data from TD children did not follow a normal distribution. Results showed a significant difference between the 2 groups for case particle scores, $p < .05$, with a large effect size $d = -1.97$. Keep in mind that this is probably a non-conservative effect size since Cohen's *d* assumes normality.

Table 5. 1 Mean Percent of use of the accusative case by individual children with SLI

Participant	Mean (%)	Ratio
Matin	2	1/53
Soroosh	13	7/55
Reza	4	2/55
Mohammad	96	53/55
Amir-Ali	78	43/55
Amir-Hassan	32	18/55
Ali	30	17/55
Armin	49	27/55
Sareh	96	53/55
Total Mean	45	
SD	39	

The individual patterns of errors were compared to the group error patterns for children with SLI. As shown in Table 5.1, 6 out of the 9 children with SLI

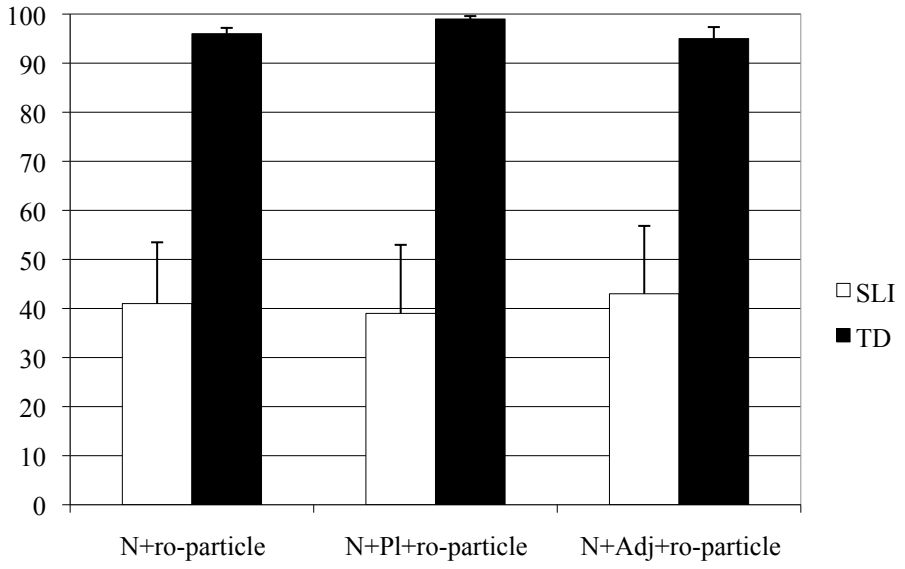
demonstrated accuracies of 49% or less (range 2%-49%) with the accusative case and 3 out of the 9 demonstrated relatively good levels of accuracy with the accusative case. Thus, more than half of the children with SLI showed weaknesses in the use of accusative case and this contributed to the overall pattern of low accuracy. As evident in Table 5.2, age-matched TD children were a more homogenous group than the children with SLI, demonstrating an accuracy range of 82% to 100% in the use of the accusative case.

Table 5. 2 Mean percent of use of the accusative case by individual TD children

Participants	Mean (%)	Ratio
Elaheh	100	55/55
Ainaz	96	53/55
Armita	100	55/55
Parinaz	96	53/55
Armin	95	52/55
Negin	82	45/55
Ariana	100	55/55
Ehsan	100	55/55
Kiana	100	55/55
Abbas	100	55/55
Amir	96	53/55
Arsalan	100	55/55
Arash	98	54/55
Shiva	98	54/55
Kimiya	98	54/55
Saina	98	54/55
Total Mean	97	
SD	4.5	

Accuracy within different conditions. The percent accuracy of the use of the accusative case was compared across 3 conditions between children with SLI and TD controls. The resulting mean percentages were 41% (SLI) vs. 96% (TD) for condition 1 where a noun + accusative was expected, 39% (SLI) vs. 99% (TD) for condition 2 where a noun + plural + accusative was expected and 44% (SLI) vs. 95% (TD) for condition 3 where noun + adjective + accusative was expected, as shown in Figure 5.7.

Figure 5. 7 Mean percent of correct use of the accusative case in different conditions



Three comparisons with 3 Friedman tests were performed to examine children's accuracy of the accusative case particle in the 3 conditions. The reason

for using a non-parametric test was because of heterogeneity of variance. Results showed no significant difference between conditions indicating that the accuracy of the accusative case use did not differ when object noun phrases required different elements, $p > .05$ condition 1 & 2, $p > .05$ condition 2 & 3 and $p > .05$ condition 1 & 3.

Table 5.3 illustrates the mean percent of use of the accusative case along with the ratio by individual children with SLI in all conditions.

Table 5. 3 Mean percent of use of the accusative case in all conditions by individual children with SLI

	N+Accusative		N+Pl+Accusative		N+Adj+Accusative	
Participant	Mean (%)	Ratio	Mean (%)	Ratio	Mean (%)	Ratio
Matin	5	1/20	0	0/16	0	0/17
Soroosh	19	4/21	0	0/17	18	3/17
Reza	0	0/21	6	1/17	6	1/17
Mohammad	95	20/21	94	16/17	100	17/17
Amir-Ali	62	13/21	82	14/17	94	16/17
Amir-Hassan	38	8/21	18	3/17	41	7/17
Ali	5	1/21	0	17/17	6	1/17
Armin	52	11/21	59	10/17	35	6/17
Sareh	95	20/21	100	17/17	94	16/17
Total Mean	41		39		43	

Error type analysis. The error type analysis was conducted to determine the types of errors that were made in condition 2 and 3 (i.e., noun + plural + accusative & noun + adjective + accusative), where extra elements were required. The purpose of this analysis was to figure out whether children with SLI omitted the accusative case and other elements equally, or whether they omitted the accusative case more often, when the object noun phrase to be repeated contained

more and different types of elements. Because children with SLI were the only group who made considerable errors on the task, the error type was calculated for this group only.

In condition 2 (noun + plural + accusative), 3 possible types of errors were expected. One type was the omission of the accusative case, another one was the omission of both the plural and the accusative case, and the third type was the omission of the plural suffix only. The proportions of these 3 types of omissions were calculated by dividing their frequencies by the total number of errors. Results showed that 30% were accusative case omissions, 25% were plural + accusative and 9% were plural omissions. A one-way repeated-measures ANOVA indicated no significant differences across error types, $F(1.998,15.984) = 1.348$, $p = .288$. The results demonstrate that the omission of the accusative case, with or without the plural, was the dominant error type in condition 2. At the same time, these results demonstrate that children with SLI form a heterogeneous group in their error types. That is, they responded differently, according to one of 3 patterns. Out of 9 children with SLI, 4 of them showed more accusative-like errors (Soroosh 71%, Reza 65%, Ali 65%, Armin 29%), 1 child showed more plural+accusative-like error (Matin 94%), 2 children showed plural-only pattern (Amir-Ali 25%, Amir-Hassan 53%) and 2 children showed no pattern because their errors were near or at zero overall (Mohammad and Sareh). The high rate of correct use by Mohammad and Sareh might have been the reason for the non-significant ANOVA in error type analysis.

Table 5. 4 Mean percent of error type in condition 2: noun + plural +accusative

	Accusative		Plural+Accusative		Plural	
Participant	Mean (%)	Ratio	Mean (%)	Ratio	Mean (%)	Ratio
Matin	6	1/16	94	15/16	0	0/16
Soroosh	71	12/17	29	5/17	0	0/17
Reza	65	11/17	29	5/17	0	0/17
Mohammad	6	1/17	0	0/17	6	1/17
Amir-Ali	6	1/17	12	2/17	25	6/17
Amir-Hassan	18	3/17	12	2/17	53	9/17
Ali	65	11/17	35	6/17	0	0/17
Armin	29	5/17	12	2/17	0	0/17
Sareh	0	0/17	0	0/17	0	0/17
Total Mean	30		25		9	

For error types in condition 3 (noun + adjective + accusative), 3 possible types of errors were expected. One error type was the omission of the accusative case, another type was the omission of the adjective and the accusative case, and the third type was the omission of the adjective or noun (some children tended to omit a noun instead of an adjective). The proportion of omission of each of these types from the total number of responses was calculated. Results showed 40% were accusative omissions, 16% were adjective + accusative omissions, and 5% were adjective or noun omissions. A one-way ANOVA indicated a significant difference between the error types, $F(1.428,11.426) = 4.929$, $p = .021$, showing that children with SLI had more accusative case omission, compared to adjective + accusative or adjective/ noun omissions. Tukey-Kramer post hoc comparisons revealed that the children with SLI had more accusative case omission than the other 2 types of omissions. The results demonstrate that the omission of the

accusative case without the adjective, was the dominant error type in condition 3. As with data in condition 2 error types, these results demonstrate that children with SLI form a heterogeneous group with regard to their error types. Out of 9 children with SLI, 5 of them showed more accusative-like errors (Matin 65%, Reza 94%, Amir-Hassan 53%, Ali 71%, Armin 47%), 1 child showed more adjective+accusative-like error (Soroosh 64%), 1 child showed adjective-only pattern (Sareh 18%) and 2 children showed no pattern because their errors were near or at zero overall (Mohammad and Amir-Ali).

Table 5. 5 Mean percent of error type in condition 3: noun + adjective + accusative

	Accusative		Adjective+Accusative		Adjective	
Participant	Mean (%)	Ratio	Mean (%)	Ratio	Mean (%)	Ratio
Matin	65	11/17	35	6/17	0	0/17
Soroosh	18	3/17	64	11/17	18	3/17
Reza	94	16/17	0	0/16	0	0/16
Mohammad	0	0/17	0	0/17	6	1/17
Amir-Ali	6	1/17	0	0/17	0	0/17
Amir-Hassan	53	9/17	6	1/17	0	0/17
Ali	71	12/17	24	4/17	0	0/17
Armin	47	8/17	18	3/17	6	1/17
Sareh	6	1/17	0	0/17	18	3/17
Total Mean	40		16		5	

5.2 Discussion

This chapter provided data on the accusative case marking use in Persian SLI. The main question was whether Persian-speaking children with SLI differ from age-

matched peers in the way they treat case marking and whether case marking could constitute a clinical marker in Persian SLI. This hypothesis was situated within the MRH. This account predicts that accusative case would be vulnerable in the affected group. To test this, children's language samples were elicited in a picture-elicitation task. Overall, the group results showed that Persian-speaking children with SLI were less likely to use the accusative case in obligatory contexts (43%) than the age-matched TD controls (97%). The observation that the performance of children with SLI was below that observed for TD children shows their relative difficulties with the accusative case marker. These data are compatible with the findings from previous studies in Hebrew, Hungarian and Turkish, which found vulnerability in children with SLI with respect to accusative case marking, as described in the introduction (section 1.3.4.1) (Acarlar, 2008; Lukács et al, 2009; Dromi, Leonard & Shteiman, 1993). Similar to reports from these studies, children with SLI were less accurate in use of accusative case than age-matched TD peers. Moreover, consistent with the findings from these studies, variable use of accusative case was in the form of omission in the current study.

Because of the potential heterogeneity in the affected group, the data from each child were examined to see whether they support the group pattern shown by the analysis above. The majority of children with SLI seemed to have a difficulty in the use of the accusative case. Six out of 9 children with SLI showed a performance level of 49% or less (in contrast to the other 3 who showed 80% or more). Thus despite variation, the majority of children in the affected group had significantly higher incident of deficits with the accusative case compared to age-

matched children. As a group and individually, these children had lower accuracies than TD children in providing the accusative case marker in obligatory contexts. These findings are in accordance with the prediction of the MRH, which posits the role of morphological properties in the manifestation of SLI. According to this account, difficulties with morphosyntax are the results of an interaction between limitations in processing capacity and the characteristics of the particular morphosyntactic system that must be learned. The characteristics of the particular system in this study, accusative case marking, relate to sparseness and irregularity. As described in 2.1, it is sparse because it is the only overt case marker in the paradigm. It is irregular because although the accusative case marker expresses the direct object, not all direct objects are marked by this case. In addition, the post-nominal position of the case marker differs from the pre-nominal position for the prepositions used to mark oblique arguments in the language. These results are consistent with the prediction of MRH in that case-marking accuracy is lower in children with SLI. Collectively, these results point to the validity of MRH and support the notion that morphological properties of a paradigm play a role in the morphosyntactic limitations of children with SLI in a language (Dromi, Leonard, Adam, Zadunaisky-Ehrlich, 1999; Leonard, 1998; Leonard, Sabbadini, Leonard & Volterra, 1987; Lukas, Leonard, Kas & Pleh, 2009a, Lukács, Leonard & Kas, 2009b).

The analyses of the conditions showed that children with SLI scored relatively similarly in the conditions where the accusative case had to be applied to a noun phrase requiring an extra element (condition 1 = 41%, condition 2 =

39%, condition 3 = 43%). This adds credibility to the hypothesis that children with SLI have a special difficulty with the accusative case, and indicates the challenging nature of case marking for the Persian children with SLI.

The observation that Persian-speaking children with SLI did not have more difficulties with a combination of plural + accusative than the accusative case, is not consistent with the findings from pervious studies in Hungarian (Lukács et al., 2009b). Lukács et al. (2009) found that Hungarian-speaking children with SLI were less accurate than younger verbal controls when plural + accusative case was required than singular suffixes, either accusative or plural. One factor that may have contributed to discrepant results can relate to characteristics of accusative and plural marking in these 2 languages. The Hungarian plural system differs from Persian in that it has both regular and irregular plurals with stem alternation in a variety of ways such as epenthetic, shortening, c-inserting, changing the quality of the linking vowel or allomorphy (Lukács et al., 2009). In contrast, in Persian the plural of nouns is formed from the singular by adding *-a* to the end of nouns (Ahmadi-Givi & Ansari, 2006; Mahoozi, 2006). Given these properties, it is possible that the combination of plural and accusative could put more demands on the processing capacities of Hungarian-speaking children with SLI than on the processing capacities of Persian-speaking children with SLI.

The detailed analysis of the affected children's error types in condition 2 (plural + accusative), showed that, despite individual variations, the children omitted a larger number of accusatives, with (30%) or without (25%) plural, than

plural only (9%). This clearly shows that their difficulty lies with the accusative case. At the same time, it suggests that challenges posed by the accusative case can affect accuracy of the plural use when it comes with the case marker.

The error type in condition 3 (adjective + accusative) was 40% accusative omission, 16% adjective plus accusative omission and 5% adjective omission and the difference reached a statistically significant difference. The observation that, despite individual variations, the omission of the accusative case was the most common error once again corroborates the fact that accusative is of particular difficulty for Persian-speaking children with SLI.

A comparison between the linguistic profiles of the oldest and youngest children with SLI in this study shows that the former group had higher scores on accusative use than the latter group. The oldest children with SLI who showed weaknesses in the use of case marking were Armin aged 7;0, Ali aged 6;2, and Amir-Hassan aged 5;3; the youngest children with SLI were Matin aged 4;3 and Soroosh aged 4;4. Comparing their percentage of correct uses of the accusative case shows a higher accuracy rate for the older children Armin (51%), Ali (30%) and Amir-Hassan (32%) compared to the younger children, Matin (2%) and Soroosh (13%). Thus, it seems that case marking error rates might decrease over time and the accuracy of children with SLI would improve. This is similar to the results of previous research on grammatical morphology in which older children with SLI performed better than younger affected children (Rice, 2000; Acarlar, 2008; Lukács, Leonard & Kas, 2009). This is similar to the results of first

mentions and story grammar in the current study reported in 4.1.3 in which Persian-speaking children with SLI showed improvement as they age.

Despite improvement, errors with case marking seem to persist in children with SLI. A comparison between the linguistic profiles of the oldest children with SLI and the youngest TD children gives us some insight on the persistence of the accusative case marker in this study sample. The oldest children with SLI who showed weaknesses in the use of case marking were Armin aged 7;0 (51%) and Ali aged 6;2 (30%). Comparing their percentage of correct use of the accusative case in obligatory contexts with the youngest TD children, Elaheh and Ainaz, both age 4;4 (100%, 96% respectively), a substantial difference can be seen. The youngest TD children performed at ceiling even though they were a little over 4 years old, whereas the children with SLI continued to have significant problems with case marking until 6 or 7 years of age. This is in line with clinical characteristics of a grammatical marker (Rice, 2000) and has been reported in previous studies (Norbury, Bishop & Briscoe, 2001).

In conclusion, children with SLI in this study were shown to exhibit a deficit in their ability to use the accusative case marker. These results suggest that the accusative case marker could be a promising clinical marker of Persian SLI. These data also support the MRH for determining potential morphosyntactic deficits in SLI cross-linguistically.

CHAPTER 6: Linguistic abilities of Persian children: Clitics

Chapter 5 discussed grammatical difficulties of Persian-speaking children with SLI that were associated with case marking. This chapter explores another aspect of morphology, direct object clitic pronouns, and reports findings from an experiment examining the performance of children with SLI and age-matched controls on the use of these morphemes. The aim of this investigation is to determine whether direct object clitics are of special difficulty for Persian-speaking children with SLI and whether they can be characterized as a clinical marker of SLI. The rationale for this prediction, according to the MRH, is the complexity of the pronominal system in Persian. Sources of complexities for children with SLI, as mentioned, are parallel strong pronouns (i.e., non-clitic pronouns) as well as the restricted distribution of clitics (e.g., non-canonical order, requiring a verbal host to attach to, etc). As described in Chapter 2 (section 2.2), compared to clitics, strong pronouns behave like nouns, that is, they freely appear on their own, in any position in a sentence. In contrast, a citic always attaches to a preceding verb, which it is an argument of. This complex combination of grammatical features is predicted by MRH to pose particular difficulties for Persian-speaking children with SLI. Thus, in contrast to case morphology, whose sparseness would cause difficulties for children with SLI, the complexities of clitics are predicted to be problematic for these children. In other words, the Persian pronominal could be characterized as “too rich” while the case system could be characterized as “too sparse”.

6.1 Methods

6.1.1 Task description

An experimental method of testing the hypothesis was devised in order to give each child the same opportunity to produce the direct object clitics. This test consisted of a picture elicitation task adapted from the one used in Bedore & Leonard (2001). The task was designed to provide contexts through which the production of object clitics would be the most felicitous option, so children's expressive abilities of the clitics could be evaluated. The clitic task required a child to look at pictures and complete sentences. In this task, every trial consisted of 2 pictures that depicted a series of events. The first event was described by an experimenter and the second one was intended to be completed by a child. A set of 21 stimuli was designed to elicit the use of clitics. Experimental items consisted of pictures of 2 characters or objects involved in an activity or event. The same procedure as in 5.1.1. was followed with regard to age-familiarity, cultural appropriateness and validity of the task. The complete list of stimuli is provided in Appendix N.

6.1.2 Procedure and coding

The same procedure used in 5.1.2 was followed with regard to testing and videotaping the children. Forty eight pictures and 21 sentences were created for this task. Every child was presented with the picture book that illustrated characters and objects that were engaged in an activity. Each stimulus was

depicted through 2 or 3 pictures laying out on a page. The children were presented with the pictures when the experimenter stated, “I am going to show you some pictures of children or animals who are involved in an activity. First I will look at the picture and describe what s/he is doing with a sentence. Then I want you to look at the last picture and complete my sentence.” For example, I presented the child with a picture of a girl who buys an ice-cream followed by another picture that showed the girl eating the ice-cream. I looked at the first picture and said “look Saba bought an ice-cream and then ---------.” The child was expected to say *ate it*, as the following example shows.

Prompt

Saba	bastaniye	ro	kharid-∅	va	bad
Saba	ice-cream	ACC	bought.3SG	and	then

‘Saba bought the ice-cream and then’.

(1) a. *Expected response (clitics)*

khord-∅=esh

ate.3SG-DO.CLI.

‘ate it’

b. *Possible grammatical response (strong pronouns)*

un	ro	khord-∅
it	ACC	ate.3SG

‘ate it’

c. *Possible grammatical response (lexical item)*

bastaniye ro khord-∅

ice-cream ACC ate.3SG

'ate the ice-cream'

d. *Ungrammatical response (omission)*

khord-∅

ate-3SG

'she ate'

Prior to testing the target stimuli, a practice test consisting of 2 items was administered to familiarize children with the task. Upon seeing the target stimuli, if the children's response did not contain the clitic, they were encouraged to elicit the expected structure by returning back to the practice items and requesting to hear the rules again. No feedback was given during the actual test. Pauses and breaks were given upon necessity. The same procedure was followed for the 2 groups of children.

Scoring for the use of object clitics. Responses were coded as clitic versus non-clitic responses. If the child responded with any one of the targeted clitics, it was given a score of 1. If the child produced an object in a form other than the targeted clitic (i.e., lexical items and strong pronouns) or omission, it was given a score of 0. Failures to respond and off-topic responses (i.e., commenting on a different aspect of picture) were considered unscorable and excluded from

analysis. Examples of clitics, strong pronouns, lexical items, and omission are provided in 2.

Prompt

Sepehr hadye ro gereft-∅ va bad

Sepehr gift ACC got.PAST.Stm-3SG and then

'Sepehr got the gift and then'

(2) a. *Expected response (clitics)*

baz=esh kard-∅

open-DO.CLI.3SG did.PAST.Stm-3SG

'He opened it'

b. *Possible grammatical response (strong pronouns)*

un ro baz kard-∅

that ACC open did.PAST.Stm-3SG

'He opened it'

c. *Possible grammatical response (lexical item)*

hadye ro baz kard-∅

gift ACC open did.PAST.Stm-3SG

'He opened the gift'

d. *Ungrammatical response (object omission)*

baz kard-∅

open did.PAST.Stm-3SG

'He opened it'

Scoring for the type of object use. The second type of coding consisted of the type of object children tended to use. Children's responses were coded as 4 types: (1) clitic (2) lexical item (3) strong pronoun (4) object omission.

6.1.3 Results

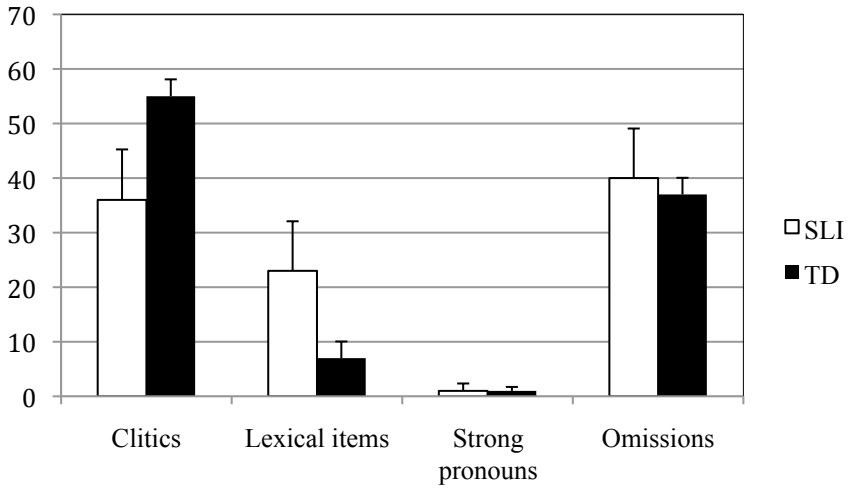
Group comparisons for the use of object clitics. The first analysis was to compare the 2 groups of children with respect to clitic and non-clitic responses. The percent of use of clitics was calculated out the total number of responses. The results of this analysis demonstrated that children with SLI had lower percent of clitic use (M = 36%; SD = 19) than age-matched TD children (M = 55%; SD = 14). In other words, clitic pronouns occurred less frequently in the elicited responses of children with SLI than TD children. On this measure, responses followed a normal distribution, so an independent samples t-test was conducted to make a comparison between children's use of clitics and non-clitics in scorable items. The analysis revealed a significant difference between the 2 groups $t(23) = -2.58$, $p = .022$, with a large effect size, $d = -1.13$.

A significant, positive correlation between age and clitic use indicated that the affected group's performance approached adult-like forms with age, $r(9) = .807$, $p = .009$. The correlation between age and clitic use in the unaffected group was also found to be positive, but only marginally significant, $r(16) = .491$, $p = .053$.

The individual children's production of the response type was calculated to determine whether the individual data support the group data. Results showed that although as a group, children with SLI evidenced lower clitic use, some children showed high rates of clitic use. Mean scores in this group ranged from as low as 9% to as high as 71%. This shows a great within group variability in performance. Similarly, although the TD children showed higher clitic use as compared to the children with SLI, variability was evident in their performance (23-71%).

Group comparisons for response type. Another analysis was conducted to examine the distributions of different response types by children with SLI and TD controls, when they did not use an object clitic. The results of this analysis are depicted in Figure 6.1. The children used either omission or a lexical item when they did not use a clitic. Strong pronouns hardly appeared in the speech of either children with SLI or TD peers, in line with the prediction of this study.

Figure 6. 1 Mean percent of response types in object pronominalization contexts in elicited production for the children with SLI and TD controls



Because responses did not follow a normal distribution a non-parametric test was used for analysis. A Mann-Whitney U test on the omission of object clitics showed no significant difference between the 2 groups (p = .286). However, a Mann-Whitney U test on lexical items did show a significant difference (p = .001). Mann-Whitney U comparisons showed no significant differences between the affected and unaffected group for strong pronoun use (p = .718). A Chi-square, based on the frequency distribution of responses, was used to calculate whether there was an interaction between object type and group. The analysis indicated that this interaction was significant (X^2 = 33.83, df = 3, p = 0.05).

Percent of use of objects per type (i.e., clitics, lexical items, strong pronoun, object omission) with their respective ratio are presented in Table 6.1 and Table 6.2 for individual children with SLI and the TD children, respectively.

Table 6. 1 Percent of use of objects by type for children with SLI

	Clitics*		Lexical items		Strong pronouns		Omission	
Participants (SLI)	Mean (%)	Ratio	Mean (%)	Ratio	Mean (%)	Ratio	Mean (%)	Ratio
Matin	9	2/21	43	9/21	0	0/21	48	10/21
Soroosh	23	5/21	29	6/21	5	1/21	43	9/21
Reza	43	9/21	14	3/21	0	0/21	43	9/21
Mohammad	19	4/21	43	9/21	0	0/21	38	8/21
Amir-Ali	48	10/21	9	2/21	0	0/21	43	9/21

Amir-Hassan	24	5/21	43	9/21	0	0/21	33	7/21
Ali	33	7/21	15	3/21	0	0/21	52	11/21
Armin	71	15/21	10	2/21	0	0/21	19	4/21
Sareh	52	11/21	5	1/21	0	0/21	43	9/21
Mean	35.78		23.44		0.56		40.22	

* Note that clitics are preferred grammatical response, lexical items and strong pronouns are possible grammatical responses and omission is an incorrect response.

Table 6. 2 Percent of use of objects by type for age-matched TD children

	Clitics*		Lexical items		Strong pronouns		Omission	
Participants (TD)	Mean (%)	Ratio	Mean (%)	Ratio	Mean (%)	Ratio	Mean (%)	Ratio
Elaheh	43	9/21	0	0/21	0	0/21	57	12/21
Ainaz	71	15/21	0	0/21	0	0/21	29	6/21
Armita	57	12/21	24	5/21	0	0/21	19	4/21
Parinaz	38	8/21	5	1/21	0	0/21	57	12/21
Armin	38	8/21	5	1/21	1	1/21	52	11/21
Negin	24	5/21	19	4/21	0	0/21	57	12/21
Ariana	52	11/21	0	0/21	0	0/21	48	10/21
Ehsan	71	15/21	0	0/21	0	0/21	29	6/21

Kiana	48	10/21	10	2/21	0	0/21	43	9/21
Abbas	62	13/21	5	1/21	0	0/21	33	7/21
Amir	62	13/21	14	3/21	0	0/21	24	5/21
Arsalan	67	14/21	14	3/21	0	0/21	24	5/21
Arash	67	14/21	0	0/21	0	0/21	33	7/21
Shiva	48	10/21	5	1/21	0	0/21	48	10/21
Kimiya	71	15/21	0	0/21	0	0/21	29	6/21
Saina	67	14/21	14	3/21	0	0/21	19	4/21
Mean	55.38		7.19		1		37.56	

* Note that clitics are preferred grammatical response, lexical items and strong pronouns are possible grammatical responses and omission is an incorrect response.

A comparison between younger and older children with SLI is in order to see whether there is an improvement in their language, as they age. The youngest children's means were 10% and 24% (Matin aged 4;3 and Soroosh aged 4;4, respectively) whereas the oldest children's were 52% and 72% (Armin aged 7;0 and Sareh aged 7;3, respectively). Thus, the younger children with SLI showed lower percent of clitic use than older children.

6.2 Discussion

Recall that the prediction of this study was that Persian-speaking children with SLI would have a lower production of clitics than age-matched peers in the

elicited task. This prediction was borne out in the sentence completion task where a significant difference was found between the 2 groups. An inspection of the means of the proportions of clitic use between groups revealed that the affected group performed worse than the unaffected group, despite the fact that TD children did not reach the ceiling (SLI = 36%, TD = 55%). This indicates that the affected group had more difficulties with the production of clitics when generating sentences compared to the unaffected group. The individual data supported the group data. The individual data showed that with the exception of 1 child who showed 71% clitic use, other children with SLI showed accuracies of 52% or less (range = 9%-52%). This range was lower than what was observed for the TD children whose range varied between 23%-71%.

These results provide support for the MRH, which predicts clitic use to be problematic for the children with SLI. According to this account, the more complex a system, the greater the demands on the limited processing capacity of children with SLI. The complexity of clitics, as defined in (5.1) and (2.2), stems from the parallel strong pronoun system, as well as the restricted distribution of clitics (i.e., simultaneous combination of several features such as syntactic position and a verbal host). These demands can result in incomplete processing, as observed in the affected group.

The analysis of response types revealed that omission and lexical items, but not strong pronouns, were used when children did not use clitics. This is consistent with the prediction that children would not use strong pronouns due to low frequency of occurrence in colloquial language. Omission, which is

ungrammatical in Persian, was the most frequent category for not only children with SLI but also TD children. Variable use of clitic objects mainly in the form of omission is also found in research on French-speaking children with SLI in previous studies (Jakubowicz et al., 1998; Paradis & Crago, 2003; Paradis, 2004; Grüter, 2005). The results of the current study show that similar patterns prevail in the elicited speech of Persian-speaking children with SLI. Contrary to the findings on French-speaking children in Grüter (2005), however, omission took place in the elicited speech of the Persian-speaking children with SLI and age-matched TD peers with fairly equal frequency. The children with SLI did not tend to omit clitics more than TD children (SLI = 40%, TD = 37%). When children with SLI did not use a clitic, they used more lexical items than the TD children -- this accounts for the lower clitic score on the one hand, but the nearly equal use of omission on the other hand. This result is similar to the findings from Grüter (2005) in that a difference between the 2 groups in the rate of lexical items substituted for clitics was found (SLI = 16%, TD = 7%, p. 380). Using lexical items is redundant in contexts where the object has been already mentioned. The prevalence of lexical items in comparison to strong pronouns found in this study is similar to results that have been reported in previous studies investigating both spontaneous and elicited production of clitics in French-speaking children with SLI and TD controls (Paradis & Crago; 2003; Paradis, 2004; Jakubowicz & Rigaut, 2000, as cited in Grüter, 2006).

Older Persian-speaking children with SLI in this study achieved higher scores on clitic use than younger children with SLI. The youngest children's

means were 10% and 24%, whereas the oldest children's were 52% and 72%. As with the narrative and case marking data, there is an improvement from age 4 to 7 in the affected group in a way that the youngest children show the weakest ability to use citics and the oldest children perform better, sometimes to the same level as age-matched TD peers. This observation is consistent with the results of other studies in French, Turkish and Hungarian in which older children with SLI outperformed younger counterparts (Acarlar, 2008; Hamann et al., 2003; Lukács et al., 2010).

In summary, these results provided tentative support for the notion that clitics are difficult for Persian-speaking children with SLI, due to the complex nature of the paradigm. However, before any conclusions can be drawn regarding clitics as a clinical marker of Persian SLI, additional investigations into children with SLI's abilities to use clitics are suggested. Testing the children with a different type of task as well as their spontaneous speech samples in addition to a larger number of children with SLI, might lead to results that are representative of children's abilities.

CHAPTER 7: Linguistic abilities of Persian children: Subject-verb agreement and present tense

Chapters 5 and 6 reported on 2 studies assessing linguistic abilities of Persian-speaking children with SLI that were associated with case marking and clitics, respectively, through picture-elicitation tasks. To evaluate patterns of performance between case marking and the clitic paradigm based on the sparseness-complexity logic as described in 1.5.2, control morphemes that are rich and regular but not exceptionally complex have to be tested. The aim was to determine whether children with SLI perform better when morphology is rich and regular. The subject-verb agreement paradigm meets this criterion and will be used for this purpose. As described in 2.3, Persian agreement has one-to-one relationship between each person-number combination and a morpheme, hence is rich. Also it is regular because the Persian agreement inflections are applied consistently to all verbs, across all tenses. These properties, according to the MRH, are predicted to be beneficial to children with SLI (Dromi et al., 1999; Leonard et al., 1987; Leonard, 1998, 2000).

Along with examining the use of agreement morphemes by the children with SLI, another area of difficulty that was not an a priori focus of this research was identified as vulnerable for these children. It was observed post-hoc that the affected group had difficulties with the use of the present tense *mi-*. Accordingly, this chapter will focus on this aspect of morphosyntax as well, and report the performance of the children with SLI as compared to age-matched peers.

7.1 Method

7.1.1 Task description

An experimental task was designed to assess the production of subject verb agreement. It consisted of a picture elicitation task in which children were asked to describe pictures. The task was designed to provide obligatory contexts through which information concerning children's expressive abilities in the use of subject-verb agreement could be assessed. In this task, 2 agreement inflections were examined: third-person singular and third-person plural. The underlying reason for examining only 2 agreement inflections was the impossibility of illustrating other persons (i.e., first and second person singular or plural) in pictures. A total of 47 agreement inflection items were presented to each child. Out of the 47 items, 25 showed third-person singular and 22 displayed third-person plural. The selected verbs referenced actions familiar to children of that age-range. The age-familiarity and cultural appropriateness of the pictures were ensured, following the procedures described in Chapter 5 (section 5.1.1). All pictures were bound and presented as a picture book. The activities that were depicted in the pictures are provided in Appendix O. Some verbs, such as the following, were used more than once: *khordan* 'eat', *bazi+kardan* 'play' and *docharkhe savari-kardan* 'ride', *khoondan* 'sing'. The reason for using these verbs more than once was that there are limits on the range of activities that could be depicted in pictures. Thus, some verbs had to be used more than once in order to provide a sufficient number of stimuli to test the children. Note that some of these verbs, such as *harf-zadan* 'talk', might be depicted ambiguously by the pictures. However, because the

lexicon was not the target of this study, the use of a non-targeted verb was not of concern. The stimuli were piloted on 2 adult speakers of Persian to ensure that the intended responses would be elicited. Following 4 practice trials, the participants were presented with the experimental trials. A complete list of the stimuli is summarized in Appendix P, with glosses and translations.

7.1.2 Procedure and coding

The procedures used here with regard to participation, testing session, administration and recording were the same as those used in case-marking and clitic tasks, as described in chapter 4 and 5. In this task, the child was presented with a book containing pictures that illustrated toy or cartoon characters participating in an activity, and was told to describe what the characters were doing. They were instructed verbally and with illustrations how to perform the task. The context required the use of a verb with a particular agreement inflection. For example, for the item "They are watching TV", they were shown a picture that displayed 2 children watching TV (Figure 7.1). Then they were told: "look at these children and tell me what they are doing". The child was expected to reply "They are watching TV". The following example shows the prompt and the expected response in Persian.

Prompt

(1)	in	bache-ha	ro	negah	kon
	these	kid-PL	ACC	look	do.3SG.imp.PRES.Stm
	'Look at these children'				

begoo	una	che	kar	mi-konan?
tell.imp.PRES.Stm	they	what	job	PRES-do.PRES.Stm

'Tell me what they are doing'

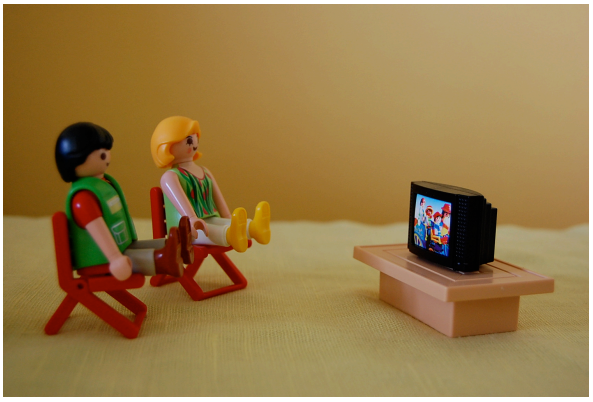
Expected response

television	nega	mi-kon-an
TV	watch	PRES-do.PRES.Stm-3PL

'They are watching TV'

Note that the tense and agreement morpheme were given in the prompt, since this is the only grammatical option. Thus the children needed to use their own verb to describe the pictures. However, in spite of it being used in the prompt, children with SLI showed difficulties with the use of tense, as will be shown in 7.2.3.

Figure 7. 1 Example of an experimental item in agreement elicitation task



As noted previously, all questions were asked in present tense. Thus, children were expected to provide a response in present tense using the *mi-* particle. Prior to presenting the target stimuli, practice items were given to children in order to familiarize them with the task. The procedure for data collection was identical for children with SLI and TD children. The task took approximately 5 to 10 minutes to administer.

Scoring for agreement. Before analyzing the data, the scorable items were first identified. The response was scored correct if the child used the relevant agreement marker on the verb. Case of off-topic responses or failures to respond were considered unscorable, and hence not included in the analysis. An example of an off-topic response would be a child's story about his own trip to a playground, upon seeing a picture of a child swinging. These children were given another chance to describe the picture. If they did succeed on the second try, the second response was accepted and considered as scorable. In addition, if the child used a verb that was not the expected target verb, it was still considered correct as well, as long as the response had the expected grammatical form. Thus a production of *bazi-mikonan* 'they play' in place of *harf-mizanan* 'they talk' was considered to be acceptable and hence scorable. The child's percent of correct responses was calculated by dividing the number of appropriate agreement morphemes produced, by the number of items for which a scorable response was obtained.

Scoring for tense. The children's responses were scored for accuracy of the present tense. The response was scored correct for the accurate use of the

tense marker *mi-*. If the child produced verbs that differed from the targeted ones, they were still treated as correct. Cases of off-topic responses or failures to respond were considered unscorable and hence not included in the analysis. The child's percentage of correct responses was calculated by dividing the number of appropriate tense morphemes produced, by the number of items for which a scorable response was obtained.

7.1.3 Results

Analysis of agreement. The percentages of correct and incorrect use of agreement were calculated for participants and were compared across the 2 groups. The resulting mean correct percent of agreement was 97% (SD = 2) for the SLI group and 100% for the TD group, showing that children of both groups performed at ceiling. A non-parametric Mann-Whitney U test was used because the Kolmogorov-Smirnov test showed that the distribution for each group was non-normal. Between-group comparison using Mann-Whitney U tests showed that children with SLI and their age-matched peers did not differ in the ability to use the agreement markers, $p = .16$.

Analysis of tense. The children with SLI used the tense morpheme *mi-* less frequently than age-matched TD peers. The mean proportions of *mi*-particle use for children with SLI and TD children were 69% (SD = 12) and 99% (SD = 0.3), respectively. A non-parametric test was used due to heterogeneity of variance. A between-group comparison using a Mann-Whitney U test showed that these

scores were significantly different, $p < .001$, with a large effect size $d = -2.12$, indicating that overall tense usage was lower in the affected group. Keep in mind that this is probably a non-conservative effect size since Cohen's *d* assumes normality.

An error analysis was performed by child to examine the distribution of error types among the children with SLI. Thus, the percent of each error type out of the total number of errors was calculated. For those children who had major problems with tense (Mohammad, Amir-Ali, Ali and Sareh) omission of the tense *mi-* appeared the most frequent type of error (97%).

Table 7. 1 Mean percent of use of tense marker by individual children with SLI

Participant	Mean	Ratio
Matin	96	45/47
Soroosh	96	43/45
Reza	98	46/47
Mohammad	47	25/47
Amir-Ali	25	23/47
Amir-Hassan	100	47/47
Ali	17	8/47
Armin	98	46/47
Sareh	49	23/47

The individual children's production of the tense morpheme *mi-* was calculated to determine whether the individual data support the group data. Results showed that although as a group, children with SLI showed lower accuracy rates, half of the children had high rates of tense use (range = 96-100%). The accuracy rate for the other half varied between 17% to 47%. Note that with the exception of one child (Ali), the children who had high error rates on this

measure had relatively much better outcomes on case markers (see Table 5.1 in Chapter 5).

7.2 Discussion

Agreement. Analyses of elicited language of children with SLI revealed that they closely resembled age-matched controls in providing third-person singular and plural inflections with a high accuracy score of 97% in comparison to age-matched TD controls, with a score of 100%. The high percent of correct use suggests that children with SLI were as proficient with subject-verb agreement as were the age-matched controls. This observation appears to be compatible with the prediction of MRH that the inflections with the likelihood of high accuracy in the speech of children with SLI are those that are structurally regular and rich, here subject-verb agreement. These findings that regularity and richness of a paradigm was of benefit to the children with SLI resemble the data reported from studies of children with SLI acquiring other languages with rich morphology such as Arabic, Hebrew, Italian and Hungarian (Leonard, Sabbadini, Leonard & Volterra, 1987; Bortolini, Caselli & Leonard, 1997; Leonard, 1998; Dromi, Leonard, Adam, Zadunaisky-Ehrlich, 1999; Abdula & Crago, 2008; Lukács, Leonard & Kas, 2009). The findings of the current study are particularly similar to findings from Arabic, Italian and Hebrew, where children with SLI displayed a relatively high use of agreement. Similar to Persian, these languages have a rich agreement system where each person and number has a unique morpheme, and

which has a one-to-one form-to-function mapping. Thus, the agreement results from these languages for children with SLI seem to be replicated in Persian.

Although these findings provided a tentative profile of agreement in Persian, 2 potential limitations must be pointed out. First, I limited my investigation to a subset of agreement morphemes, that is, third person singular and plural. In other words, other agreement morphemes such as first and second-person singular and plural were not tested. Although, based on the prediction of the MRH, minimal difficulties with agreement morphemes are predicted, one can bring up the possibility that these children might have some difficulties with first- and second-person singular and plural inflections. At least 2 reasons can make this possibility slim. First, other studies have indicated that children with SLI are more proficient in using the first and second person forms but less capable with the third person forms (Oetting & Horohov, 1996; Abdula & Crago, 2008). Because the available data documented more difficulties with third person than first and second person by children with SLI in other languages, it is likely that similar patterns hold true in Persian. Second, as the experimenter, I did not notice instances of first- and second-person singular and plural errors in the spontaneous speech by children with SLI. If difficulties with non-tested agreement morphemes were significant, errors should be apparent in their casual speech.

Another possible limitation of this study concerns the methodology. This study used an elicitation task and as mentioned previously, the targeted inflections were given in the prompt because it was the only grammatical option. Thus it is possible that the Persian-speaking children with SLI managed to exhibit high

percent of use of agreement inflections because they relied on the forms heard in the prompt. I acknowledge the possibility that patterns of performance in children with SLI might have been influenced by attention and rote memory. However, the possibility that such a high percent of correct use of agreement morphemes could be entirely an artifact of this kind of task does not seem likely for at least 2 reasons. First, as with agreement morphemes, the case marking particle (Chapter 5) and present tense morpheme *mi-* (Chapter 7) were given in the prompts as well. However, as reported, children with SLI had a significantly lower use of these morphemes (accusative case = 45%; present tense = 69%). If the use of target in the prompt would have significantly influenced the children's performance, it should have been evident in all 3 sets of data. Second, an extensive number of studies have indicated that children with SLI have difficulty with working memory and exhibit low scores on repetition tasks (Girbau & Schwartz, 2007; Ellis Weismer, Tomblin, Zhang, Buckwalter, & Jones, 2000). Thus, even if their attention and rote memory played some role, it is unlikely to be of significance. Nevertheless, future studies will be required to investigate to what extent, if any, this factor affected the performance of children.

To summarize, the findings were in keeping with the prediction of the MRH in that the richness of agreement morphemes contributed to the children's attention to these morphemes, and that agreement did not stand out as an area of vulnerability in Persian SLI, in contrast with the patterns found for case-marking, clitics and present tense.

Tense: The analysis of the elicited language of the children indicated that the affected group was significantly less consistent in the use of present tense than their age-matched peers. While the TD children were able to provide the present tense morpheme 99% of the time, children with SLI were able to do so only about 69% of the time. This low level of present-tense marking use in the production of children with SLI reveals their difficulty with this morpheme. These results are consistent with data obtained in English, French, Afrikaans, and Finnish, in which children with SLI had a markedly lower use of tense morphemes than their TD peers (Kunnari, Savinainen, Leonard, Makinen, Tolonen, Luotonen & Leinonen, 2011; Oetting & Horohov, 1997; Paradis & Crago, 2000; Southwood & van Hout, 2010).

An investigation of the individual patterns showed variation within the affected group. As shown in Table 7.1, despite the fact that some children with SLI had difficulties with present tense, others did not seem to have much problem with the use of the tense marker and were in fact as good as TD children in their performance. Five out of 9 children with SLI performed at ceiling (range = 96-100%), but the other 4 children did not perform at the extent level for their age (range = 17-47%). Note that, 3 out of 4 of these children who had difficulties with tense performed better on case marking (range = 78-96%, as shown in Table 5.1). The observation that individual children with SLI had discrepancies in their profile of language impairment is due to the nature of the SLI, and is consistent with the view that SLI is a heterogeneous disorder (Leonard, 1998; Botting, Faragher, Knox, Simkin & Conti-Ramsden, 2001, van der Lely, 2003).

In sum, the data from the present study suggest that Persian-speaking children with SLI present deficits in the present tense morpheme. This study did not make any a priori predictions with respect to this area of difficulty; however, these results suggest that tense morphology is worthy of further examination as a potential clinical marker of Persian SLI.

CHAPTER 8: Summary and conclusions

This study presented the results of an investigation on story narration and the use of grammatical morphology by Persian-speaking children with SLI and a comparison group of age-matched TD children. The aim was to find out whether measures of first mention and story grammar (i.e., higher level language abilities), as well as case marking and clitics, can discriminate Persian-speaking children with SLI from their TD peers. LPC theory and MRH were used to select morphological structures to test and predict specific error patterns. The data provided converging evidence for the challenging nature of narrative and morphological variables mentioned above among Persian-speaking children with SLI. The following sections will summarize the findings, followed by directions for future research.

8.1 Characteristics of SLI in Persian

As is true for other languages, children with SLI acquiring Persian displayed limitations in narratives and morphosyntax. Analyses of the data showed weaker performance by children with SLI compared to their age-matched peers on the mentioned elements. These elements stood out as extraordinarily difficult for Persian-speaking children with SLI, and demonstrated diagnostic potential in being able to differentiate children with SLI and age-matched TD controls. On the

basis of these findings, it can be proposed that first mentions, story grammar, case-marking, clitics and present tense can serve as potential markers of SLI in Persian. These findings are encouraging and suggestive of a number of promising characteristics of SLI. However, due to heterogeneity of SLI (Mohammad, Sareh and Amir-Ali performed very differently from other children in case marking and tense tasks, as shown in 5.1.3 and 7.1.3) none of these measures is sufficient in itself to identify SLI in young ages. Thus, using some combinations of tasks that target a wide range of skills strengthens the chance of identifying the affected children.

8.2 Heterogeneity of SLI

The results from chapters 4, 5, 6 and 7 pointed to areas of difficulty in Persian-speaking children with SLI. However, a closer look at the individual results reveals a more diverse pattern, and shows that a common profile was not found in all children. As Table 8.1 illustrates, heterogeneity and individual variation is evident throughout the data. The following paragraphs describe how children with SLI performed with each variable in comparison to the affected group mean and TD children of the same age.

Matin. Matin showed weaknesses in all aspects of narratives and morphology, with the exception of present tense. His adequate first mention score (raw score = 17), which was even lower than the affected group's mean (*M* = 25.13), was lower than four-year-old TD peers (*M* = 37). Matin appeared to have difficulties with story grammar (A1) (raw score = 2) to a greater extent than the

affected group (*M* = 8.4) and four-year-old TD peers (*M* = 10.5). He had a poor performance on story grammar (A3) (raw score = 8) in comparison to the affected group (*M* = 17) and four-year-old TD peers (*M* = 24). The accusative case-marking was used with lower percentage (*M* = 2%) by him than the affected group (M = 44.44%) and four-year-old TD peers (*M* = 98%). Matin showed weaker performance on clitics (*M* = 9%) than not only four-year-old TD peers (*M* = 57%) but also the affected group's mean (*M* = 35.78%). In contrast he produced present tense morpheme with a high percentage (*M* = 96%) than the mean for children with SLI (*M* = 69%), which was at the same level of four-year-old children (*M* = 100%). Therefore, Matin seems to have great difficulties with all measures of narrative and morphosyntax tested in this study except present tense.

Soroosh. Soroosh showed weaknesses in all aspects of narratives and morphology, with the exception of present tense that hardly presented a difficulty to him (M = 96%). He showed a low number of adequate first mentions (raw score = 22) in comparison to the affected group (*M* = 25.13) and four-year-old TD peers (*M* = 37). In the story (A1), he showed more difficulties (raw score = 5) in the use of story grammar relative to the affected group (*M* = 8.4) and four-year-old TD peers (*M* = 10.5). With respect to story grammar (A3), he achieved a score of 12, which was virtually lower than the affected group's mean (*M* = 17) and four-year-old TD peers (*M* = 24). Soroosh had a lower mean accuracy score for the case marking particle (*M* = 13%) than the affected group (*M* = 44.44%) and four-year-old TD peers (*M* = 98%). His clitic score was 23% in comparison to 35.78% for the affected group and 57% for four-year-old TD peers. In contrast,

his performance with the present tense (M = 96%) was as high as four-year-old children (M = 100%), but lower than the group mean for children with SLI (M = 69%). Therefore, similar to Matin, Soroosh's poor performance on narrative, case marking and clitic task is paired with relative strengh in present tense.

Reza. Reza showed limitations in all tested measures of language except first mentions and tense. He used a higher number of adequate first mention (raw score = 32), than the affected group (*M* = 25.13), but relatively similar to five-year-old TD peers (*M* = 34). In contrast to his relatively good ability to use first mentions, he seemed much less able (raw score = 2) than other children with SLI (*M* = 8.4) and five-year-old TD peers (*M* = 10.25) to use story grammar (A1). With regard to the story grammar (A3), he performed below (raw score = 12) the average level for the affected group (M = 17) and five-year-old TD peers (M = 24). Reza frequently dropped the case marking and showed only 4% correct use of this particle, which is lower than both the affected group's mean (*M* = 44.44%) and five-year-old TD peers (*M* = 96.62%). His performance with clitics was higher (*M* = 43%) than the mean for the affected group (*M* = 35.78%) but still lower than five-year-old TD peers (*M* = 48.75%). In contrast he used the present tense (*M* = 98%) with higher accuracy rate than the affected group (*M* = 69%) and to the same extent as the five-year-old children (*M* = 100%). Thus, it seems that all measures of narrative and morphosyntax tested in this study except first mention and tense present him with difficulties.

Mohammad. There is no narrative data for Mohammad, but all aspects of morphology posed problems for him except the case marking. His case marking

score was 96%, which is the same as five-year-old TD peers (*M* = 96.62%), but more than twice higher than those for the affected group's mean (*M* = 44.44%). He had a great difficulty with the production of clitics (*M* = 19%) because his percentage was lower than both the affected group's mean (*M* = 35.78%) and five-year-old TD peers (*M* = 48.75%). As for the present tense, he performed weak, with only 47% correct, which was not only lower than five-year-old TD peers (*M* = 100%) but also the mean for the affected group (*M* = 69%). Therefore, clitics and tense seem to be morphosyntactic areas that pose difficulties for him.

Amir-Ali. Amir-Ali had difficulties with adequate first mentions (raw score = 25) to the same extent as the average for the affected group (*M* = 25.13), but to a greater extent than five-year-old TD peers (*M* = 34). His story grammar (A1) score was 10 which is higher than the affected group's mean (*M* = 8.4) but at the same level of five-year-old TD peers (*M* = 10.25). His story grammar (A3) score was 14, which was lower than both the affected group mean (*M* = 17) and five-year-old TD peers (*M* = 24). With respect to the case marking his score was 78% which is higher than affected group's mean (*M* = 44.44%), but still lower than five-year-old TD peers' mean (*M* = 96.62%). Amir-Ali's ability to use clitics (*M* = 48%) was better than the average for the affected group (*M* = 35.78%), which was at the same level of five-year-old TD peers (*M* = 48.75%). In contrast he achieved lower correctedness scores on present tense (M = 25%) than the group mean for children with SLI (M = 69%) and five-year-old children (M = 100%). Therefore, all measures except story grammar (A1) and clitic seem to present difficulties for him.

Amir-Hassan. He elicited fewer first mentions (raw score = 20), than the average affected group (*M* = 25.13) and five-year-old TD peers (*M* = 34). His story grammar (A1) score was higher (raw score = 10) than the affected group (*M* = 8.4) but at the same level of five-year-old TD peers (*M* = 10.25). As for the scores for story grammar (A3), his score was 11 in comparison to the affected group's mean (*M* = 17) and five-year-old TD peers (*M* = 24). His score of correct use of the case marking was 32%. This number is lower than both the affected group's mean (*M* = 44.44%) and five-year-old TD peers (*M* = 96.62%). Reza's mean score for clitics (*M* = 24%) was lower than the affected group (*M* = 35.78%) and five-year-old TD peers (*M* = 48.75%). In contrast, his present tense percent was higher (M = 100%) than both the affected group's mean (M = 69%) and the same as those by five-year-old children (M = 100%). Thus, it seems that all measures of narrative and morphosyntax tested in this study except story grammar (A1) and tense are good measures pose difficulties for him.

Ali. Ali exhibited a difficulty in overall aspects of narratives and grammatical morphology investigated in this study. He produced a smaller number of adequate first mentions (raw score = 22) than the children with SLI (*M* = 25.13) and six-yes-old TD children (*M* = 36.33). His score for story grammar (A1) was lower (raw score = 7) than the average for the affected group (*M* = 8.4) and six-year-old TD peers (*M* = 10.5). Ali's story grammar (A3) score was 15, which was lower than the mean for both the affected group (*M* = 17) and the six-year-old TD peers (*M* = 25.5). He also had a low rate of the case marking use (M = 30%) in comparison with the affected group's mean (*M* = 44.44) and six-year-

old TD children (*M* = 96.6%). With respect to the clitic use, he performed (*M* = 33%) relatively same as the affected group's mean (*M* = 35.78%), but worse than the six-year-old TD peers (*M* = 63.66). Ali showed a great difficulty with the present tense (*M* = 17%) because his ability was not only lower than six-year-old TD children (*M* = 98.75%) but also was lower than the affected group's mean (*M* = 69%). Thus, all these areas are of difficulty for Ali.

Armin. Clitics and tense appeared to be the only intact areas for Armin. He had a difficulty producing adequate first mentions (raw score = 30) compared to six-year-old TD peers (*M* = 36.33), although his score went over affected group's mean (*M* = 25.13). His story grammar (A1) (raw score = 8) which was the same as group mean (*M* = 8.4) was lower than six-year-old TD peers (*M* = 10.5). As for the scores for story grammar (A3), his score was 22, which is higher than the affected group's mean (*M* = 17), but still lower than six-year-old TD peers (*M* = 25.5). For the case marking, his score was 49% which is higher than affected group's mean (M = 44.44%) but lower than six-year-old TD peers (*M* = 96.62%). Armin's ability to use clitic appeared to be relatively good (*M* = 71%) compared to the affected group (*M* = 35.78%) and six-year-old TD peers (*M* = 63.66%). He used present tense correctly 97%, which was higher than the affected group mean (*M* = 69%) and very close to six-year-old children (*M* = 98.75%). Thus among all measures tested in this study, clitics and tense are the only areas that posed a great difficulty for him.

Sareh. All aspects of narratives and morphology presented a difficulty to Sareh except case marking. She had a higher number of adequate first mentions

(raw score = 33) than the affected group's mean (*M* = 25.13), but still lower than six-year-old TD peers (*M* = 36.33). She evidenced poorer story grammar (A1) score (raw score = 7) than the affected group (M = 8.4) and six-year-old TD peers (M = 10.5). As for the scores of story grammar (A3), she achieved 23 which is higher than the affected group (*M* = 17) but lower than six-year-old TD peers (*M* = 25.5). Sareh's score of correct use of the case marking was 96% which was much higher than the affected group's mean (*M* = 44.44%), and in fact at the same level of six-year-old TD peers (*M* = 96.62%). Sareh's clitic score (*M* = 52%) appeared to be lower than six-year-old TD peers (*M* = 63.66%), even though it was higher the affected group (*M* = 35.78%). She was weaker (*M* = 45%) than the average children with SLI (*M* = 69%) and six-year-old children (*M* = 98.75%) on the present tense morpheme. All areas except and case marking seem to be difficult for her.

Table 8. 1 Individual scores for first mention, story grammar, case marking, clitics and tense for children with SLI

Participant	Age	*First mentions Max=42	Story grammar (A1) Max=13	Story grammar (A3) Max=37	Case	Clitics	Tense
Matin	4;3	17	2	4	2	9	96
Soroosh	4;4	22	3	8	13	23	96
Reza	5;0	32	2	9	4	43	98
Mohamad		-	-	-	96	19	47
Amir-Ali	5;3	25	8	11	78	48	25

Amir-Hasan	5;3	20	9	9	32	24	100
Ali	6;2	22	5	11	30	33	17
Armin	7;0	30	6	15	49	71	97
Sareh	7;3	33	6	19	96	52	45
Total Mean		26	5.13	13.75	44.44	35.78	69

* Note that first mention and story grammar scores are not mean percent whereas case marking, clitic and present tense scores represent mean percent.

To summarize, among the measures of morphosyntax, the majority of children with SLI had lower case marking and clitic scores from age-matched TD children. More specifically, 7 out of 9 children with SLI displayed weaker performance with case marking and clitics compared to age-matched TD peers. Tense presented difficulties for only 4 out of 9 children with SLI. Among the measures of narratives, story grammar (A3) was an area that posed difficulty for all children with SLI. This was followed by first mentions, which presented difficulty for 8 out of 9 children with SLI, and story grammar (A1), which was challenging for 7 out of 9 children with SLI. Although these measures seem to be promising linguistic characteristics of Persian SLI, none of them, with the exception of story grammar (A3), was of difficulty for all children with SLI. These observations once again suggest that none of these measures can be considered to be sufficient in itself to identify children with SLI and highlights the

importance of employing a combination of tasks, in order to enhance the chance of identifying the affected population.

The heterogeneity of SLI in children is a major issue in the research on SLI (see Leonard, 1998 for review). In most studies of SLI, considerable heterogeneity has been found in the sample, even if children were carefully recruited and met the criteria for SLI (Koponen, Mononen, Rasanen & Ahonen, 2006; Law, Tomblin, Zhang, 2008; Leonard, 2010; van der Lely & Howard, 1993). Thus, heterogeneity appears to be a common characteristic of children with SLI cross-linguistically. Heterogeneity of the linguistic characteristics of SLI has led researchers to consider positing subgroups among children with SLI. Several large-scale projects have been designed to categorize children with SLI into distinct subgroups on the basis of both statistical sorting procedures and clinical judgments (Aram & Nation, 1975; Korkman & Häkkinen-Rihu, 1994; Rapin & Allen, 1983, 1988; Van der Lely, 2000; Wolfus, Moscovitch & Kinsbourne, 1980, as cited in Leonard, 2003). Some researchers have selected subgroups on the basis of comprehension and/ or language production abilities (Edwards & Lehey, 1996; Korkman and Häkkinen-Rihu, 1994; Lehey & Edwards, 1996; Miller, Kail, Leonard & Tomblin, 2001), while others have selected subgroups according to deficits in the production of phonology and syntax (Wolfus, Moscovitch & Kinsbourne, 1980; van der Lely, 1994; 1996). Still other researchers adopted the strategy of selecting children on the basis of their positive family histories for language impairment (Gopnik & Crago, 1991). Nevertheless, despite their contributions toward our understanding that certain profiles are more common

than others, no cohesive subgroup of SLI has yet been identified. According to Leonard (2003, p. 213), “boundaries reflecting seemingly distinct subgroups that are formed retrospectively tend to blur or change when applied to a new sample of children”.

8.3 Theoretical implications

The LPC and MRH account adopted here seems to accommodate both the narrative and morphosyntactic data and explains why the children with SLI were relatively weak compared to age-matched TD peers.

In the narrative task, these children were more likely than TD peers to exhibit inadequate first mention of referents, and to use smaller numbers of story grammar units (i.e., central components of good stories). As reviewed in Chapter 1, specific language impairment has been explained as resulting from limitations in processing capacity. Generating a story on the basis of a number of sequenced pictures requires coordination of different skills, such as linguistic, cognitive and pragmatic skills. Cognitive and pragmatic knowledge involves making inferences about the motives behind characters’ actions, causes of events, and logical relationships between events; extracting the theme and plot of the story; and anticipating the knowledge and needs of the listener. Thus, many cognitive and pragmatic abilities are involved in story narration. These abilities, according to van der Lely (2003, p.117), “are likely to tap memory capacity, inferential abilities, previous world knowledge as well as more general processing and integration of information for online monitoring of the listeners needs”. Thus, the

observation that children with SLI had difficulties with measures of story narration supports the notion that their problems reside in limitations in processing capacity.

The MRH, which relies on the assumption of a processing capacity limitation, provides an explanation for the morphosyntactic data. According to this hypothesis, children with SLI have a general processing capacity limitation that reduces their available cognitive resources for managing and assimilating linguistic input (Dromi, Leonard, Adam, & Zadunaisky-Ehrlich, 1999; Leonard, 1998; Leonard, Sabbadini, Leonard, & Volterra, 1987; Lukács & Leonard, Kas, & Pléh, 2009). It is hypothesized that they tend to devote their limited resources to the aspects of the morphosyntax that are rich and regular (Leonard, 2000). As such, there are fewer resources that remain for those aspects of morphosyntax in their target language that are sparse, irregular and complex. This study involved 2 grammatical morphemes that had certain morphological properties: the accusative case, which is an example of sparseness (2.1), and direct object clitics, which are examples of what could be considered exceptional complexity (2.2). The findings that children with SLI performed worse than age-matched peers with respect to case marking and clitics, are consistent with the prediction that both the sparse and irregular element (i.e., case marking) and the complex elements (i.e., clitics) were sacrificed in favor of richer and regular morphemes (i.e., agreement) (e.g., Dromi et al., 1999; Lukács et al, 2009; Lukács et al. 2010). Children with SLI showed accuracies that are lower than those of age-matched controls for the 2 first

morphemes, whereas their accuracies on the use of agreement, which is rich and regular, are comparable with those of age-matched controls.

Putting together the results of the studies discussed in Chapters 4-7, the findings are consistent with the notion that processing-related factors (e.g., task demands, morphological properties) affect the manifestation of deficits in SLI (e.g., Leonard, 1998; Lukács & Leonard, Kas, & Pléh, 2009; Oetting & Horohov, 1997). It further indicates that the patterns of narrative and morphosyntax use seen in Persian-speaking children with SLI are compatible with the effects of accounts assuming processing limitations on the children with SLI.

8.4 Clinical implications

This study uncovered potential characteristics of Persian SLI that can be useful for the identification of the affected population in Persian-speaking communities in Iran and neighboring countries. Although standardized test batteries are a good means of assessing and identifying children with SLI, there are some limitations, because of the lack of a natural categorical distinction between affected and unaffected children, and because interpretation of a global test score in terms of a particular linguistic domain to target in intervention is limited (Rice, 2000). Furthermore, the tests currently being used in Iran are mostly translations of English-based tests that might not identify the important characteristics of Persian SLI. Thus, results of the current study contribute to establishing more accurate identifiers of Persian SLI.

8.5 Future directions

The findings of this dissertation must be considered in light of several potential limitations. First, findings from the picture elicitation tasks indicate that accusative case marking, clitics and present tense are of particular vulnerability in the elicited speech of the children with SLI tested. Because obligatory contexts for some of the grammatical morphemes may not appear frequently in spontaneous speech of children, and because some grammatical morphemes can be avoided in spontaneous speech, the use of elicitation tasks was chosen in this study. However, the observation of data from children's spontaneous speech would be beneficial in addition to elicited speech, following findings from other crosslinguistic studies reporting the effect of methodological variations (e.g., Blake, Myszczyszyn & Jokel, 2004; Masterson, 1997; Materson & Kamhi, 1992; Nippold, Hesketch, Duthie & Mansfield, 2005). Further research is needed to compare the children's patterns from elicited speech versus spontaneous speech and the extent to which each reflects the morphosyntactic abilities of children with SLI.

Furthermore, although the sample size of this study provides sufficient power to find statistically significant differences across language abilities of the groups, the number of participants in this study was small and were from a limited age range. So it is uncertain whether the same findings will hold for the broader population of Persian children with SLI. Larger sample sizes across a wider age range would provide further insight into the usefulness of the characteristics of SLI identified in this study. In addition, the conclusions of this study are limited

in that matching across groups was done on the basis of age alone. It is possible that TD children with similar linguistic abilities (MLU-matched controls) as the children with SLI would perform in similar ways. This can shed light on issues concerning delay versus deviant profiles of SLI (e.g., Rice, 2003).

Another limitation is related to the impact of intervention on children's performance. Information regarding how much and/or how early language intervention was received by the participants was not available in this study. The affected group included children who started their intervention at different ages and also were at different stages of intervention when tested. This might have been a factor that played a role in their performance patterns, and probably added to the heterogeneity of the group. Future studies should control this potential factor and explore the extent to which it affects the data.

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Appendices

Appendix A

A translated sample of child history form used in Iranian speech pathology clinics.

Child history form

General information

Child's name:

Date of birth:

Address:

Phone:

Mother's name:

Mother's level of education:

Mother's occupation:

Mother's business phone:

Father's names:

Father's level of education:

Father's occupation:

Father's business phone:

1) Describe your child's current expressive language? What sounds do you notice that he/she has difficulty producing?

2) What is your impression of your child's receptive language? Is he/she able to follow directions? Does he/she seem to understand age appropriate vocabulary? Can he/she seem to comprehend age appropriate stories?

3) When was the problem first noticed?

4) What do you think might have caused the problem?

5) Has the problem changed since it first started?

6) Describe your child's feeding/eating conditions (e.g., types of foods, sucking/swallowing, sensitivity to textures, picky eating).

7) Describe your child's temperament/personality (e.g., how s/he handles frustration, her/ his response to affection or needs).

8) Has your child received any diagnoses (e.g., hearing loss, cerebral palsy, Apraxia, receptive/expressive language delay)? If yes, please describe.

9) Since birth, has your child experienced any medical problems (e.g., hospitalizations, surgeries, diagnoses, feeding difficulties, ear infections) before/during/after birth? If so, please explain.

10) Has your child ever been seen by a Speech-Language Pathologist? If yes, when and where?

11) Have you or anyone in your family ever had problems talking, hearing, or learning to read and spell? If yes, please describe.

12) Were there any problems/complications during the pregnancy and delivery? If yes, please describe.

13) Was your child premature? If yes, how many weeks?

Development

14) Indicate the age at which your child began to do the following activities:

Crawl Sit Stand Walk Self-feed Self-dress

- Use single words (e.g., mom, dad, yes, etc)
- Combine words (me go, daddy shoes, etc)
- Use simple questions (where's daddy?, etc)
- Engage in conversation

15) Does the child have difficulty walking or running?

16) Describe the child's response to sounds.

Communication skills

17) How does the child interact with others?

18) What is your impression of your child's social communication?

19) Please describe your child's play behavior (e.g., sharing, cooperating with others, pretending, using toys appropriately and symbolically).

20) Provide any additional information that might be helpful in the evaluation of the child's problem.

Appendix B

ENNI First mention scoring sheet

Edmonton Narrative Norms Instrument
First Mentions Scoring Sheet

Name_____ Age_____ Date_____

Circle the expression that best fits the child's first mention of the character or object, using the first mentions scoring criteria and directions. If none of the descriptions fits, choose a level that seems most appropriate. A score of 0 indicates that the referent was not mentioned.

Referent	Expression used by child for first mention	Score (circle the appropriate number)
Giraffe		3 / 2 / 1 / 0 not mentioned
Elephant		3 / 2 / 1 / 0 not mentioned
Ball		3 / 2 / 1 / 0 not mentioned
Lifeguard		3 / 2 / 1 / 0 not mentioned
Airplane		3 / 2 / 1 / 0 not mentioned
Lady Elephant		3 / 2 / 1 / 0 not mentioned
Net		3 / 2 / 1 / 0 not mentioned
Dog		3 / 2 / 1 / 0 not mentioned
Rabbit		3 / 2 / 1 / 0 not mentioned
Sandcastle		3 / 2 / 1 / 0 not mentioned
Doctor		3 / 2 / 1 / 0 not mentioned
Balloon (first)		3 / 2 / 1 / 0 not mentioned
Balloon Seller		3 / 2 / 1 / 0 not mentioned
Balloon(s) (end)		3 / 2 / 1 / 0 not mentioned
Total of each column (3s, 2s, 1s):		___ + ___ + ___ =
TOTAL FIRST MENTIONS SCORE:		

Appendix C

Sample story of a child with SLI for story A1

Child's Name: Matin (SLI) **Age: 4;4**

Matin's Story A1

CHI: ye agha boode.
There was a Mister

CHI: matin boode
There was Matin

CHI: agha va matin.
Mister and Matin

CHI: bad too hmm.
Then in hmm

CHI: matin oftade.
Matin has fallen

CHI: bad khis shode.
Then he has become wet

SG Unit	**Acceptable [child need only have one alternative per unit to get credit for that unit]**	**Score**	
Character 1	Giraffe/male/boy (or any other type of animal such as horse) [not acceptable: pronoun] *CHI: ye agha boode (There was a Mister)*	0	1
Character 2	Elephant/female/girl (or any type of animal such as cow) [not pronoun] *CHI: matin boode (There was Matin)*	0	1
Setting	swimming pool had a ball/playing with ball/want t play ball	0	1
Initiating Event	ball goes in water/pool/sand/mud ball is in water they see a ball	0	2
Internal Response	One/both want to get ball Elephant says, e.g., "look what happened," "what am I going to do?" Elephant upset/sad [not: he/she/they want to go swimming]	0	1
Internal Plan	Giraffe decides to/think he will get the ball	0	1
Attempt	Giraffe jumps in pool/swims toward ball/tries to get ball [not: giraffe swimming (without goal); giraffe falls in water]	0	2
Outcome	Giraffe gets ball/gives ball to elephant	0	2

	[not: elephant gives ball to giraffe, unless it is noted as unexpected, e.g., 'but instead, Elephant gets it and gives it to him']		
Reaction of Giraffe	giraffe is happy/proud/smiles giraffe says "You are welcome" giraffe's teeth are chattering/giraffe is cold/wet	0	1
Reaction of Elephant	Elephant is happy/is grateful/says thank you Elephant hugs the ball [not: holds/has the ball]	0	1
Reaction both or known	"they" are happy/in love [code only as replacement for Reaction of Character 1 or 2; here should not be more than 2 reactions total]	0	1
	Total raw score:	2	

Appendix D

Child's Name: Abbas (TD) **Age: 5;11**

Abbas's Story A1

CHI: ye roozi ye zarafe va ye fili ba ham toop bazi mikardan.
Once a giraffe and an elephant were playing together

CHI: badan toope oftad tooye ab.
Then the ball fell in water

CHI: bad zarafehe toope ro gereft.
Then the giraffe got the ball

CHI: dad daste file.
Gave it to the elephant

CHI: hmm.

CHI: badan ham file khoshhal shod.
Then the elephant was happy

SG Unit	**Acceptable [child need only have one alternative per unit to get credit for that unit]**	**Score**	
Character 1	Giraffe/male/boy (or any other type of animal such as horse) [not acceptable: pronoun] *CHI:* ye roozi ye zarafe va ye fili ba ham toop bazi mikardan (*Once a giraffe and an elephant were playing together)*	0	1
Character 2	Elephant/female/girl (or any type of animal such as cow) [not pronoun] *CHI:* ye roozi ye zarafe va ye fili ba ham toop bazi mikardan (*Once a giraffe and an elephant were playing together)*	0	1
Setting	swimming pool had a ball/playing with ball/want t play ball *CHI:* ye roozi ye zarafe va ye fili ba ham toop bazi mikardan (*Once a giraffe and an elephant were playing together)*	0	1
Initiating Event	ball goes in water/pool/sand/mud ball is in water they see a ball *CHI: badan toope oftad tooye ab (Then the ball fell in water)*	0	2
Internal Response	One/both want to get ball Elephant says, e.g., "look what happened," "what am I going to do?" Elephant upset/sad [not: he/she/they want to go swimming]	0	1
Internal Plan	Giraffe decides to/think he will get the ball	0	1
Attempt	Giraffe jumps in pool/swims toward ball/tries to get ball [not: giraffe swimming (without goal); giraffe falls in water]	0	2

Outcome	Giraffe gets ball/gives ball to elephant [not: elephant gives ball to giraffe, unless it is noted as unexpected, e.g., 'but instead, Elephant gets it and gives it to him'] *CHI: bad zarafehe toope ro gereft dad daste file (Then the giraffe got the ball, gave it to the elephant)*	0	2
Reaction of Giraffe	giraffe is happy/proud/smiles giraffe says "You are welcome" giraffe's teeth are chattering/giraffe is cold/wet	0	1
Reaction of Elephant	Elephant is happy/is grateful/says thank you Elephant hugs the ball [not: holds/has the ball] *CHI: badan ham file khoshhal shod (Then the elephant was happy)*	0	1
Reaction both or known	"they" are happy/in love [code only as replacement for Reaction of Character 1 or 2; here should not be more than 2 reactions total]	0	1
	Total raw score:	8	

Appendix E

Amir Ali (SLI) Story Grammar (A3) **age: 5;4**

CHI: do ta heyvoon boodan, ye zarafe, ye fil.
There were two animals, a giraffe, a cow

CHI: bazi mikardan.
They were playing

CHI: bad havapeymash be gave dad.
Then he gave his airplane to the cow

CHI: bad raft too ab.
Then it went in water

CHI: bad babash khast havapeymash ro biyare.
Then her father wanted to get the airplane

CHI: un haminjoori gerye mikard.
He was crying hard

CHI: bad khanoom file gereftesh.
Then Ms elephant got it

CHI: bad dadesh be zarafe.
Then gave it to the giraffe

SG Unit	**Acceptable [child need only have one alternative per unit to get credit for that unit]**	**Score**	
Character 1	Giraffe/male/boy (or any type of animal such as horse) (not acceptable: pronoun) *CHI: do ta heyvoon boodan, ye zarafe, ye fil (There were two animals, a giraffe, a cow)*	0	1
Character 2	Elephant/female/girl (or any type of animal such as cow) [not pronoun] *CHI: do ta heyvoon boodan, ye zarafe, ye fil (There were two animals, a giraffe, a cow)*	0	1
Setting	At swimming pool/going swimming/are playing Has/is holding airplane/one asks other to play *CHI: bazi mikardan (They were playing)*	0	1
Initiating Event	G playing with airplane/making airplane fly G shows/give E his airplane *CHI: bad havapeymash be gave dad (then he gave his airplane to the cow)*	0	2
Internal Response	E wants/is interested in airplane	0	1
Internal Plan	E decides to take airplane	0	1
Attempt	E takes airplane/zooms airplane around/makes airplane fly/G gives E a	0	2

	turn		
Outcome	Airplane falls in pool/E throws plane in pool *bad raft too ab (then it went in water)*	0	2
Reaction of Giraffe	G angry/yells/stares at plane	0	1
Reaction of Elephant	"they" are unhappy [Code only as replacement for Reaction of Character 1 or 2; there should not be more than 2 reactions total]	0	1
Character 3 (C3)	Lifeguard/other elephant/other male/her father/ her brother	0	1
Initiating Event	C3 shows up/comes over/E sees C3/ C3 sees plane in water/ C3 asks what happened	0	2
Internal Response	E/G hopes C3 canhelp/C3 wants to help *CHI: bad babash khast havapeymash ro biyare (Then her father wanted to get the airplane)*	0	1
Internal Plane	E/G decides to ask for help/explains what happened/asks C3 to get plane/lifeguard decides to try NOT: E talks to C3 (without specifying what about)	0	1
Attempt	C3 tries to get plane/reaches for plane	0	2
Outcome	C3 can't reach plane/plane was too far/sinking	0	2
Reaction C1	G upset/sad/worried/cries/stares at plane *CHI: un haminjoori gerye mikard (He was crying hard)*	0	1
Reaction C2	E upset/feels bad/feels guilty/ looks sheepish	0	1
Reaction C3	C3 disappointed/shrugs/says he can't reach it	0	1
Reaction of both/unknow	"They" are disappointed/feels bad [code only as replacement for Reaction of another character: there should not be more than 3 reactions total]	0	1
Character 4 (C4)	Other lifeguard/other elephant/other female/her mother/her sister/other person *CHI: bad mamanesh gereftesh (then her mom got it)*	0	1
Initiating Event	C4 comes over/has net	0	2
Internal Response	C4 wants to help/knows how to get plane/offers to help	0	1
Internal Plan	C4 decides to try/has idea/says she will get it E/G/C3 asks C4 to get it	0	1
Attempt	C4 reaches for plane/is going to get it/tries to get it C4 gets plane *I: bad khanoom file gereftesh (then Ms elephant got it)*	0	2
Outcome	C4 gives plane to G/G has plane *CHI: bad dadesh be zarafe (Then gave it to the giraffe)*	0	2
Reaction of Giraffe	G is happy/ amazed/excited/hugs plane/says thanks	0	1
Reaction of Elephant 1	E happy/ relieved/feels better/says thanks	0	1
Reaction C4	Female lifeguard relieved/pleased	0	1
Reaction of both/ unknown	"they" are happy/excited/say thanks [code only as replacement for Reaction of another character; there should not be more than 3 reactions total]	0	1
	Total raw score:	14	

Appendix F

Child's Name: Arash (TD) **Age: 6;5**

Arash's Story A3

CHI: ye rooz ye pesari bood.
Once there was a boy

CHI: ye havapeymaei ham dasht.
He had an airplane

CHI: badesh ye dokhtar fili ham bood.
Then there was a girl elephant too

CHI: ba ham havapeyma bazi mikardan.
They played with the airplane

CHI: bad havapeymash ro gereft.
Then she took his airplane

CHI: havapeymahe mire too have.
The airplane goes in the air

CHI: bad miyad pain.
Then comes down

CHI: dobare partesh kard bala.
She threw it up again

CHI: oftad too hoz.
It fell in the pool

CHI: bad pesare ke havapeyma dasht asabani shod.
Then the boy who owned the airplane got angry

CHI: goft dige havapeymam ro behet nemidam.
He said I won't give you my airplane again

CHI: kheili asabani bood.
He was really angry

CHI: file goft bebakhshid.
The elephant said sorry

CHI: bad in kar ro kard.
The wind did it

CHI: bad babaye file oomad.
Then the elephant's father came

CHI: bad goft.
Then he said

CHI: mikham komaket konam zarafe.
I want to help you giraffe

CHI: vali zooresh naresid.
But his hands did not reach it

CHI: bad pesare gerye kard.
Then the boy cried

CHI: bad mamane file oomad.
Then the elephant's mother came

CHI: bad pesare be mamane file shekayat mikone.
Then the boys complains to the elephant's mom

CHI: mamane file miyad havapeyma ro az too ab ba ye paroon dar miyare.
The mother elephant gets the airplane with a paddle

CHI: bad mide be zarafe.
Then gives it to the giraffe

CHI: bad dokhtare mige baz ham havapeymat ro behem midi.
Then the girl asks whether he gives her his airplane

CHI: pesare mige na.
The boy says no

SG Unit	**Acceptable [child need only have one alternative per unit to get credit for that unit]**	**Score**	
Character 1	Giraffe/male/boy (or any type of animal such as horse) (not acceptable: pronoun) *CHI: ye rooz ye pesari bood (Once there was a boy)*	0	1
Character 2	Elephant/female/girl (or any type of animal such as cow) [not pronoun] CHI: *ye dokhtar fili ham bood (There was a girl elephant too)*	0	1
Setting	At swimming pool/going swimming/are playing Has/is holding airplane/one asks other to play *CHI: ba ham havapeyma bazi mikardan (They played together with the*	0	1

	airplane)		
Initiating Event	G playing with airplane/making airplane fly G shows/give E his airplane	0	2
Internal Response	E wants/is interested in airplane	0	1
Internal Plan	E decides to take airplane	0	1
Attempt	E takes airplane/zooms airplane around/makes airplane fly/G gives E a turn *CHI: bad havapeymae ro gereft (Then she took the airplane)*	0	2
Outcome	Airplane falls in pool/E throws plane in pool *CHI: oftad too hoz (it fell in the pool)*	0	2
Reaction of Giraffe	G angry/yells/stares at plane CHI: bad pesare ke havapeyma dasht asabani shod (Then the boy who owned the airplane got angry)	0	1
Reaction of Elephant	E feels bad/embrassed/scared/E stares at plane/says oops *CHI: file goft bebakhshid (The elephant said sorry)*	0	1
Reaction-both/ unknown	"they" are unhappy [Code only as replacement for Reaction of Character 1 or 2; there should not be more than 2 reactions total]	0	1
Character 3 (C3)	Lifeguard/other elephant/other male/her father/ her brother *CHI: bad babaye file oomad (Then the elephant's father came)*	0	1
Initiating Event	C3 shows up/comes over/E sees C3/ C3 sees plane in water/ C3 asks what happened *CHI: bad babaye file oomad (Then the elephant's father came)*	0	2
Internal Response	E/G hopes C3 canhelp/C3 wants to help *CHI: bad goft mikham komaket konam zarafe (Then said I want to help you giraffe)*	0	1
Internal Plane	E/G decides to ask for help/explains what happened/asks C3 to get plane/lifeguard decides to try NOT: E talks to C3 (without specifying what about)	0	1
Attempt	C3 tries to get plane/reaches for plane	0	2
Outcome	C3 can't reach plane/plane was too far/sinking CHI: vali zooresh naresid (But his hands did not reach it)	0	2
Reaction C1	G upset/sad/worried/cries/stares at plane *CHI: bad pesare gerye kard (Then the boy cried)*	0	1
Reaction C2	E upset/feels bad/feels guilty/ looks sheepish	0	1
Reaction C3	C3 disappointed/shrugs/says he can't reach it	0	1
Reaction of both/unknow	"They" are disappointed/feels bad [code only as replacement for Reaction of another character: there should not be more than 3 reactions total]	0	1
Character 4 (C4)	Other lifeguard/other elephant/other female/her mother/her sister/other person *CHI: bad mamane file oomad (Then the elephant's mother came)*	0	1
Initiating Event	C4 comes over/has net *CHI: bad mamane file oomad (Then the elephant's mother came)*	0	2
Internal Response	C4 wants to help/knows how to get plane/offers to help	0	1
Internal Plan	C4 decides to try/has idea/says she will get it E/G/C3 asks C4 to get it	0	1
Attempt	C4 reaches for plane/is going to get it/tries to get it	0	2

	C4 gets plane *CHI: mamane file miyad havapeyma ro az too ab ba ye paroon dar miyare (The elephant's mother gets the airplane with a paddle)*		
Outcome	C4 gives plane to G/G has plane *CHI: bad mide be zarafe (then she gives it to the giraffe)*	0	2
Reaction of Giraffe	G is happy/ amazed/excited/hugs plane/says thanks	0	1
Reaction of Elephant 1	E happy/ relieved/feels better/says thanks	0	1
Reaction C4	Female lifeguard relieved/pleased	0	1
Reaction of both/ unknown	"they" are happy/excited/say thanks [code only as replacement for Reaction of another character; there should not be more than 3 reactions total]	0	1
	Total raw score:	22	

Appendix G

First mention scores for individual children with SLI

Participant	Age (Year; Month)	Score (Max = 42)
Matin	4;3	17
Soroosh	4;4	22
Reza	5;0	32
Amir-Ali	5;3	25
Amir-Hassan	5;3	20
Ali	6;2	22
Armin	7;0	30
Sareh	7;3	33
Total Mean		

Appendix H

First mention scores for individual aged-matched TD controls

Participant	Age (Year;month)	FM scores
Elaheh	4;4	32
Ainaz	4;5	42
Armita	5;1	35
Parinaz	5;3	35
Armin	5;4	30
Negin	5;5	33
Ariana	5;7	33
Ehsan	5;7	36
Kiana	5;8	29
Abbas	5;9	41
Amir-Mohammad	6;3	35
Arsalan	6;4	35
Arash	6;5	41
Shiva	6;6	34
Kimiya	6;6	39
Saina	6;7	34
Total Mean		

Appendix I

Story grammar scores for individual children with SLI

Participant	Age (Year; Month)	Score (A1) (Max = 13)	Score (A3) (Max = 37)
Matin	4;3	2	6
Soroosh	4;4	3	10
Reza	5;0	2	11
Amir-Ali	5;3	8	13
Amir-Hassan	5;3	9	11
Ali	6;2	5	15
Armin	7;0	6	22
Sareh	7;3	6	22
Total Mean		5.13	9.75

Appendix J

Story grammar scores for individual age-matched TD controls

Participant	Age (Year;month)	Score (A1)	Score (A3)
Elaheh	4;4	9	24
Ainaz	4;5	9	22
Armita	5;1	10	27
Parinaz	5;3	10	22
Armin	5;4	10	22
Negin	5;5	9	17
Ariana	5;7	9	26
Ehsan	5;7	11	28
Kiana	5;8	11	24
Abbas	5;9	8	18
Amir-Mohammad	6;3	7	26
Arsalan	6;4	10	26
Arash	6;5	11	24
Shiva	6;6	9	26
Kimiya	6;6	12	23
Saina	6;7	11	23
Total Mean		13.75	23.63

Appendix K

List of verbs used in case marking elicitation task

savar-shodan ‘mount’, *bardashtan* ‘take’, *‘bordan’* ‘take’, *hol+dadan* ‘push’, *navazesh+kardan* ‘pat’, *keshidan* ‘pull’, *rundan* ‘drive’, *jabeja+kardan* ‘move’, *gereftan* ‘hold’, *xaridan* ‘buy’, *tamiz+kardan* ‘clean’, *doost+dashtan* ‘like’, *xordan* ‘eat’, *ab+dadan* ‘water’, *xandidan* ‘laugh’, *nega+kardan* ‘watch’, *pooshidan* ‘wear’, *gereftan* ‘catch’, *kandan* ‘pick’, *moratab+kardan* ‘organize’, *shostan* ‘wash’, *gereftan* ‘look after’, *xord+kardan* ‘chop’, *rang+kardan* ‘paint’, *utoo-kardan* ‘iron’, *jam-kardan* ‘pile up’, *avordan* ‘bring’, *avizun-kardan* ‘hang up’.

Appendix L

List of verbs used more than once in case-marking elicitation task

‘drive’, ‘take’, ‘pat’, ‘pull’, ‘mount’, ‘take’, ‘eat’, ‘water’, ‘buy’, ‘watch’, ‘wear’, ‘like’, ‘ wash’, ‘iron’ and ‘catch’.

Appendix M

Accusative case elicitation task by condition

Condition 1 (noun + raccusative):

1)	Saba	mashin	ro	mi-roon-e		va	Sepehr
	Saba	car	ACC	PRES-drive.PRES.Stm-3SG		and	Sepehr
		docharkhe	ro	mi-roon-e.			
		bicycle	ACC	PRES-drive.PRES.Stm-3SG			

'Saba drives the car and Sepehr rides the bike'

2)	Sara	sabad	ro	bar	mi-dar-e	va	Saba
	Sara	basket	ACC	take	PRES.Stm-3SG	and	Saba
		chart	ro	bar	mi-dar-e		
		umbrella		ACC	take	PRES.Stm-3SG	

'Sara takes the basket and Saba takes the umbrella'

3)	Nima	komod	ro	hol	mi-d-e			va
	Nima	closet	ACC	push	PRES-do.PRES.Stm-3SG			and
		sepehr	mashin	ro	hol	mi-de		
		Sepehr	car	ACC	push	PRES-do.PRES.Stm-3SG		

'Nima pushes the closet and Sepehr pushes the car'

4)	Nima	sandugh	ro	mi-kesh-e		va	Sepehr
	Nima	box	ACC	PRES-pull.PRES.Stm-3SG		and	Sepehr
		miz	ro	mi-kesh-e			

table ACC PRES-pull.PRES.Stm-3SG

'Nima pulls the box and Sepehr pulls the table'

5) Sepehr miz ro mi-kesh-e va Saba
Sepehr table ACC PRES-pull.PRES.Stm-3SG and Saba
sandali ro mi-kesh-e
chair ACC PRES-pull.PRES.Stm-3SG

'Sepehr pulls the table and Saba pulls the chair'

6) maman daste Saba ro mi-gir-e va
mother hand Saba ACC PRES-take.PRES.Stm -3SG and
baba daste Sepehr ro mi-gir-e
father hand Sepehr ACC RES-take.PRES.Stm-3SG

'Mommy holds Saba's hand and daddy holds Sepehr's hand'

7) Sara kot ro avizun mi-kon-e va Saba
Sara coat ACC hand PRES-do.PRES.Stm-3SG and Saba
kif ro avizun mi-kon-e
bag ACC hand PRES-do.PRES.Stm-3SG

'Sara hangs the coat and Saba hangs the bag'

8) Sepehr mashin ro tamiz mi-kon-e
Sepehr car ACC clean PRES-do.PRES.Stm-3SG
va Saba miz ro tamiz mi-kon-e
and Saba table ACC clean PRES-do.PRES.Stm-3SG

‘Sepehr cleans the car and Saba cleans the table’

9) Sepehr asbe ro naz mi-kon-e va
Sepehr horse ACC pet PRES-do.PRES.Stm-3SG and
saba sage ro naz-mi-kon-e
Saba dog ACC pet-PRES-do.PRES.Stm-3SG

‘Sepehr pets the horse and Saba pets the dog’

10) Saba sabade ro bar mi-dar-e
Saba basket ACC take PRES-do.PRES.Stm -3SG
va Sepehr durbin ro bar-mi-dar-e
and Sepehr camera ACC take-PRES-
do.PRES.Stm-3SG

‘Saba takes the basket and Sepehr takes the camera’

11) in dalghake olaghe ro mi-khandoon-e
this clown donkey ACC PRES-laugh.PRES.Stm-3SG
va oon dalghake gorbe ro
and that clown cat ACC
mi-khandoon-e
PRESlaugh.PRES.Stm-3SG

‘This clown makes the donkey laugh and that clown makes the cat laugh’

12) Sara tootfarangiye ro mi-xor-e va
Sara strawberry ACC PRES-eat.PRES.Stm-3SG and

saba bastani ro mi-xor-e

Saba ice-cream ACC PRES-eat.PRES.Stm-3SG

'Sara eats the strawberry and Saba eats the ice-cream'

13) Sara takht ro moratab mi-kon-e va

Sara bed ACC organize PRES-do.PRES.Stm-3SG and

saba komod ro moratab mi-kon-e

Saba closet ACC organize PRES-do.PRES.Stm-3SG

'Sara makes up the bed and Saba makes up the closet'

14) mooshe panir ro mi-bar-e va

mouse cheese ACC PRES-take.PRES.Stm -3SG and

moorche sandwich ro mi-bar-e

ant sandwich ACC PRES-take.PRES.Stm-3SG

'The mouse takes the cheese and the ant takes the sandwich'

15) meymoone moze ro peyda mi-kon-e

monkey banana ACC find PRES-do.PRES.Stm-3SG

va khargooshe havij ro peyda mi-kon-e

and bunny carrot ACC find PRES-do.PRES.Stm -3SG

'The monkey finds the banana and the bunny finds the carrot'

16) Saba shalvar ro mi-shoor-e va Sara

Saba pants ACC PRES-wash.PRES.Stm-3SG and Sara

sage ro mi-shoor-e

dog ACC PRES-wash.PRES.Stm-3SG

'Saba washes the pants and Sara washes the dog'

17) Nima piyaz ro xurd mi-kon-e

Nima onion ACC chop PRES-do.PRES.Stm -3SG

va maman-esh goje ro xurd mi-kon-e

and mother-his tomato ACC chop PRES-

do.PRES.Stm -3SG

'Nima chops the onion and his mother chops the tomato'

18) Sara pirane ro utoo mi-kon-e

Sara shirt ACC iron PRES-do.PRES.Stm -3SG

va Saba shalvare ro utoo-mi-kon-e

and Saba pants ACC iron-PRES-do.PRES.Stm-

3SG

'Sara irons the shirt and Saba iron the pants'

19) Saba gol ro ab mi-d-e va

Saba flower ACC water PRES-do.PRES.Stm -3SG and

baba-sh derakht ro ab mi-d-e

Father-POS tree ACC water PRES-do.PRES.Stm-

3SG

‘Saba waters the flower and her father waters the tree’

20) in sage kafshe ro bar mi-dar-e
this dog shoe ACC take PRES-do.PRES.Stm -3SG
va oon sage eynak ro
and that dog eyeglass ACC
bar-mi-dar-e
take-PRES-do.PRES.Stm-3SG

‘This dog takes the shoes and that dog takes the eyeglasses’

21) gorbehe mooshe ro mi-gir-e va
cat mouse AC PRES-catch.PRES.Stm-3SG and
Sepehr parvane ro mi-gir-e
Sepehr butterfly ACC PRES-catch.PRES.Stm-3SG

‘The cat catches the mouse and Sepehr catches the butterfly’

Condition 2 (noun+ plural + accusative)

1) Sepehr asb-a ro naz mi-kon-e
Sepehr horse-PL ACC pat PRES-do.PRES.Stm-3SG
va Saba gorbe-ha ro naz mi-kon-e
and Saba cat-PL ACC pat PRES-do.PRES.Stm-
3SG

‘Sepehr pats the horses and Saba pats the cats’

2) Saba sabad-a ro bar mi-dar-e

Saba basket-PL ACC take PRES-do.PRES.Stm-3SG

va Sepehr sandali-ya ro

and Sepehr chair-PL ACC

bar-mi-dar-e

take-PRES-do.PRES.Stm-3SG

'Saba takes the baskets and Sepehr takes the chairs'

3) Sepehr shirini-ya ro mi-yar-e va

Sepehr cookie-PL ACC PRES-bring.PRES.Stm-3SG and

Saba mive-ha ro mi-yar-e

Saba fruit-PL ACC PRES-bring.PRES.Stm-3SG

'Sepehr brings the cookies and Saba brings the fruits'

4) Sepehr panguin-a ro nega mi-kon-e

Sepehr penguin-PL ACC watch PRES-do.PRES.Stm-3SG

va Saba jooje-ha ro nega-mi-kon-e

and Saba chick-PL ACC watch-PRES-do.PRES.Stm-3SG

'Sepehr watches the penguins and Saba watches the chicks'

5) Saba gharch-a ro mi-kan-e va

Saba mushroom ACC PRES-pick.PRES.Stm-3SG and

Sepehr sib-a ro mi-kan-e

Sepehr apple-PL ACC PRES-pick.PRES.Stm -3SG

'Saba picks the mushrooms and Sepehr picks the apples'

6) Nima keshti-ya ro nega mi-kon-e
Nima ship-PL ACC watch PRES-do.PRES.Stm -3SG
va Sepehr parande-ha ro
and Sepehr bird-PL ACC
nega mi-kon-e
watch PRES-do.PRES.Stm-3SG

'Nima watches the ships and Sepehr watches the birds'

7) Saba rooba-ha ro nega mi-kon-e va
Saba fox-PL ACC watch PRES-do.PRES.Stm-3SG and
Sepehr sanjab-a ro nega mi-kon-e.
Sepehr squirrel-PL ACC watch PRES-do.PRES.Stm-
3SG

'Saba watches the foxes and Sepehr watches the squirrels'

8) baba pesar-a ro mi-gir-e va
father boy-PL ACC PRES-look after.PRES.Stm-3SG and
maman dokhtar-a ro mi-gir-e
mother girl-PL ACC PRES-look after.PRES.Stm-
3SG

'The father looks after the boys and the mothe looks after the girls'

9) Sara shalvar-a ro mi-poosh-e va Saba
Sara pant-PL ACC PRES-wear.PRES.Stm-3SG and Saba
daman-a ro mi-poosh-e
skirt-PL ACC PRES-wear.PRES.Stm-3SG

'Sara wears the pants and Saba wears the skirt'

10) Sara piran-a ro utoo mi-kon-e
Sara shirt-PL ACC iron PRES-do.PRES.Stm -3SG
va Saba shalvar-a ro utoo mi-kon-e
and Saba pant-PL ACC iron PRES-do.PRES.Stm-3SG

'Sara irons the shirts and Saba irons the pants'

11) Sepehr chamedoon-a ro mi-bar-e va
Sepehr luggage-PL ACC PRES-carry.PRES.Stm-3SG and
saba kif-a ro mi-bar-e
Saba bag-PL ACC PRES-carry.PRES.Stm-3SG

'Sepehr takes the luggages and Sara takes the bags'

12) babre chips-a ro boo mi-kon-e va
tiger chip-PL ACC smell PRES-do.PRES.Stm-3SG and
shire pofak-a ro boo mi-kon-e
lion cheetos-PL ACC smell PRES-do.PRES.Stm-3SG

'The tiger smells the chips and the lion smells the cheetos'

13) Sara lebas-a ro mi-shoor-e va Nima
Sara dress-PL ACC PRES-wash.PRES.Stm-3SG and Nima
zarf-a ro mi-shoor-e
dish-PL ACC PRES-wash.PRES.Stm-3SG

'Sara washes the dresses and Nima washes the dishes'

14) Nima narde-ha ro rang mi-kon-e
Nima fence-PL ACC color PRES-do.PRES.Stm -3SG
va baba-sh divar-a ro rang mi-kon-e
and father-his wall-PL ACC color PRES-
do.PRES.Stm -3SG

'Nima paints the fences and his father paints the walls'

15) Sara gol-a ro ab mi-d-e va
Sara flower-PL ACC water PRES-do.PRES.Stm -3SG and
baba-sh derakht-a ro ab mi-d-e
father-his tree-PL ACC water PRES-do.PRES.Stm -
3SG

'Sara waters the flowers and her father waters the trees'

16) moorche-ha miveh-a ro mi-bar-an va
ant-PL fruit-PL ACC PRES-take.PRES.Stm -3PL and
meymoone cake-a ro mi-bar-e
monkey cake-PL ACC PRES-take.PRES.Stm-3PL

‘The ants take the fruits and the monkey takes the cakes’

17) meymoone moz-a ro jam mi-kon-e
monkey banana-PL ACC pile up PRES-do.PRES.Stm-3SG
va xargooshe havij-a ro jam mi-kon-e
and rabbit carrot-PL ACC pile up PRES-do.PRES.Stm-3SG

‘The monkey piles up the bananas and the rabbit piles up the carrots’

Condition 3 (noun + adjective + accusative)

1) Saba mashin banafshe ro mi-roon-e
Saba car purple ACC PRES-drive.PRES.Stm -3 SG
va Nima mashin abiye ro mi-roon-e
and Nima car blue ACC PRES-drive.PRES.Stm-3SG

‘Saba drives the purple car and Nima drives the blue car’

2) Nima docharkhe bozorge ro savar
Nima bicycle big ACC mount
mi-sh-e va Saba docharkhe
PRES-do.PRES.Stm-3SG and Saba bicycle
koochike ro savar
small ACC mount PRES-do-3SG

‘Nima mounts the big bike and Saba mounts the small bike’

3) Saba sandali ghermeze ro jabeja mi-kon-e

Saba chair red ACC move PRES-do.PRES.Stm-3SG

va Sepehr sandali abiye ro

and Sepehr chair blue ACC

jabeja mi-kon-e

move PRES.PRES.Stm-do-3SG

'Saba moves the red chair and Sepehr moves the blue chair'

4) Nima asb sefide ro savar mi-sh-e

Nima horse white ACC mount PRES-do.PRES.Stm-3SG

va Saba asb siyahe ro

and Saba horse black ACC

savar mi-sh-e

mount PRES-do.PRES.Stm-3SG

'Nima mounts the white horse and Saba mounts the black horse'

5) Saba badkonak sabze ro mi-khar-e

Saba balloon green ACC PRES-buy.PRES.Stm-3SG

va Sepehr badkonak abiye ro

and Sepehr balloon blue ACC

mi-khar-e

PRES-buy.PRES.Stm-3SG

'Saba buys the green balloon and Sepehr buys the blue balloon'

6) Nima daste khanoom javoone ro

Nima hand lady young ACC PRES-

mi-gir-e va Sepehr daste khanoom pire

hold.PRES.Stm-3SG and Sepehr hand lady old

ro mi-gir-e

ACC PRES-hold.PRES.Stm-3SG

'Nima holds the young lady's hand and Sepehr holds the old lady's hand'

7) Saba lebas khalkhaliye ro mi-poosh-e

Saba shirt dotted ACC PRES-wear.PRES.Stm-3SG

va Sepehr lebas khatkhatiye ro

and Sepehr shirt stripped ACC

mi-poosh-e

PRES-wear.PRES.Stm-3SG

'Saba wears the dotted shirt and Sepehr wears the stripped shirt'

8) Sara aroosak sabze ro doost-dar-e

Sara doll green ACC like-do.PRES.Stm-3SG

va Saba aroosak abiye ro doost-dar-e

and Saba doll blue ACC like-do.PRES.Stm-

3SG

'sara likes the green doll and Saba likes the blue doll'

9) Sepehr daste doxtar moo bolande ro

Sepehr hand girl hair long ACC

mi-gir-e va Nima daste doxtar

PRES-take.PRES.Stm-3SG and Nima hand girl

moo kootahe ro mi-gir-e

hair short ACC PRES-take.PRES.Stm-3SG

'Sepehr holds the long-hair girl's hand and Nima holds the short-hair girl's hand.

10) Sepehr bastani shookoolatiye ro mi-khor-e

Sepehr ice-cream chocolate ACC PRES-eat.PRES.Stm-3SG

va Sara bastani mivei ro mi-khor-e

and Sara ice-cream fruit ACC PRES-eat.PRES.Stm-3SG

'Sepehr eats the chocolate ice-cream and Sara eats the fruit ice-cream'

11) Sepehr kafsh abiya ro doost-dar-e

Sepehr shoe blue ACC like-do.PRES.Stm-3SG

va Nima kafsh narenjya ro doost-dar-e

and Nima shoe orange ACC like-do-3SG

'Sepehr likes the blue shoes and Nima likes the orange shoes'

12) Saba kif sooratiye ro mi-xar-e

Saba bag pink ACC PRES-buy.PRES.Stm-3SG

va Sara kif abiye ro mi-xar-e

and Sara bag blue ACC PRES-buy.PRES.Stm-3SG

‘Saba buys the pink bag and Sara buys the blues bag’

13) khanoom khargooshe havij koochike ro
lady rabbit carrot small ACC
mi-khor-e va agha khargooshe havij
PRES-eat.PRES.Stm-3SG and Mr rabbit carrot
bozorge ro mi-khor-e
big ACC PRES-eat-3SG

‘lady rabbit eats the small carrot and mr rabbit eats the big carrot’

14) Nima cake bozorge ro mi-khor-e
Nima cake large ACC PRES-eat.PRES.Stm-3SG
va Sara cake koochike ro mi-khor-e
and Sara Cake small ACC PRES-eat.PRES.Stm-3SG

‘Nima eats the large piece of cake and Sara eats the small piece of cake’

15) sage kolah abiye ro mi-poosh-e va
sage hat blue ACC PRES-wear.PRES.Stm-3SG and
gorbehe kolah sooratiye ro mi-poosh-e
cat hat pink ACC PRES-wear.PRES.Stm-3SG

‘The dog wears the blue hat and the cat wears the pink hat’

16) Sara cake gilasiye ro doost-dar-e va
Sara cake cherry ACC like-do.PRES.Stm-3SG and

saba	cake	shookoolatiye		ro	doost-dar-e
Saba	cake	chocolate		ACC	like-do.PRES.Stm-
	3SG				

'Sara likes the cherry cake and Saba likes the chocolate cake'

17)

Sara	dokhtar	chaghe		ro	negah-mi-kon-e
Sara	girl	chubby		ACC	watch-PRES-do.PRES.Stm-
	3SG				
va	Saba	dokhtar	laghare		ro
and	Saba	girl	thin		ACC
negah-mi-kon-e					
watch-PRES-do.PRES.Stm -3SG					

'Sara watches the chubby girl and Saba watches the slim girl'

Appendix N

List of stimuli used in clitic elicitation task

1) bache-ha otobus ro did-an va bad

child-PL bus ACC saw.PAST.Stm-3PL and then

savar=esh shod-an

got.PAST.Stm-Clt.3SG did-3PL

'The children saw the bus and then got on it'

2) Sepehr cheragh ro roshan kard-∅

Name light ACC turned on. PAST.Stm did-3SG

va bad khamoosh=esh kard-∅

and then turned off.PAST.Stm= Clt.3SG did-3SG

'Sepehr turned on the light and then turned it off'

3) maman mive kharid-∅ va bad

mother fruit bought.PAST.Stm-3SG and then

shost=esh
washed.PAST.Stm-Clt.3SG

'The mother bought fruit and then wash it'

4) khargooshe tokhme-morgh-a ro avord-∅

rabbit egg-chicken-PL ACC brought.PAST.Stm-3SG

va bad rang=eshoon kard-∅

and then color-Clt3.PL did.PAST.Stm-3SG

'The rabbit brought the eggs and then color them'

5) bache-ha shirini dorost+kard-an va bad

child-PL cookie bake+did.PAST.Stm-3PL and then

khord-an=eshoon

ate.PAST.Stm-3PL-Clt.3PL

'The children bought cookies and then ate them'

6) Saba meymoone ro did va bad

Saba monkey ACC saw.PAST.Stm-3SG and then

baghal=esh kard

hug-Clt.3SG did.PAST.Stm-3SG

'Saba saw the monkey and then hugged him'

7) Arash ghoorbaghe ro did va bad

Name frog ACC saw.PAST.Stm-3SG and then

gereft-∅=esh

grabbed.PAST.Stm-3SG-Clt.3SG

'Arash saw the frog and then grabbed it'

8) Sepehr sandwich ro kharid-∅

Name sandwich ACC bought.PAST.Stm-3SG

va bad khord-esh

and then ate. PAST.Stm-3sg-Clt.3SG

'Sepehr bought the sandwich and then ate it'

9) Saba mahi ro kharid-∅ va bad

Saba fish ACC bought.PAST.Stm and then

gozasht=esh too ab

put.PAST.Stm-3SG-Clt.3SG in water

'Saba bought the fish and then put it in water'

10) olaghe hadye ro gereft-∅ va bad

donkey gift ACC got.PAST.Stm-3SG and then

baz=esh kard-∅

open-Clt.3SG did-3SG

'The donkey took the gift and then opened it'

11) Sepehr toop ro bardasht-∅ va bad

Name ball ACC took.PAST.Stm-3SG and then

gozasht-∅=esh rooye miz

put-PAST.Stm-3SG-Clt.3SG on table

'Sepehr took the ball and out it on the table'

12) Saba dar ro baz kard-∅ va bad

Saba door ACC open did.PAST.Stm-3SG and then

bast-∅=esh

closed.PAST.Stm-3SG-Clt.3SG

'Saba opened the door and then closed it'

13) Saba chaei ro rikht-∅ va bad

Saba tea ACC poured.PAST.STM-3SG and then

khord-∅=esh

drank.PAST.Stm-3SG-Clt.3SG

'Saba poured the tea and then drank it'

14) bache-ha charkh-a ro avord-an va

child-PL bike-PL ACC brought.PAST.Stm-3PL and

bad savar=eshoon shod-an

then mount-Clt.3PL did.PAST.Stm-3PL

'Children brought the bikes and then mounted them'

15) asb-a chaman-a ro did-an va bad

horse-PL grass-PL ACC saw.PAST.Stm-3PL and then

khord-an=eshoon

ate.PAST.Stm-3PL-Clt.3PL

'Horses saw the grasses and then ate them'

16) saba mooh-ash ro khosh kard-∅ va

Name hair-POSS ACC dry did.PAST.Stm-3PL and

bad shoon=ash kard-∅

then brush-Clt.3SG did.PAST.Stm-3PL

'Saba dried her hair and then brushed it'

17) bache-ha sandali-ha ro avord-an va

child-PL chair-PL ACC brought.PAST.Stm-3PL and

bad chid-an=eshoon

then organize.PAST.Stm-3PL-Clt.3PL

'Children brought the chairs and then arranged them'

18) Saba gol-a ro chid-∅ va bad

Saba flower-PL ACC picked.PAST.Stm-3PL and then

gozasht-∅=eshoon too goldoon

put.PAST.Stm-3SG-Clt.3PL in vase

'Sab picked the flowers and then put them in a vase'

19) Sara kafsh ro avord-∅ va bad

Sara shoe ACC brought.PAST.Stm-3SG and then

pooshid-∅=esh

wore.PAST.Stm-3SG-Clt.3SG

'Sara brought the shoes and then wore them'

20) bache-ha asb-a ro did-an va bad

child-PL horse-PL ACC saw.PAST.Stm-3PL and then

savar=eshoon shod-an

mount-Clt.3PL did.PAST.Stm-3PL

'Children saw the horses and then mounted them'

21) Saba lebas ro avord-∅ va bad

Saba shirt ACC brought. PAST.Stm.3SG and then

shost=esh

washted.PAST.Stm.Clt.3SG

'Saba brought the shirt and then watched it'

Appendix O

List of verbs used in the agreement task

are-kardan ‘saw’, *randan* ‘drive’, *doosh-gereftan* ‘bath’, *gerye-kardan* ‘cry’, *chidan* ‘cut’, *khandan* ‘read’, *tanab-bazi* ‘’, *ghaza-dadan* ‘feed’, *khandidan* ‘laugh’, *telefon-kardan* ‘call’, *nooshidan* ‘drink’, *kharid-kardan* ‘shop’, *bordan* ‘take’, *bazi-kardan* ‘play’, *docharkhe savari-kardan* ‘ride’, *tab bazi-kardan* ‘swing’ *avaz-khoondan* ‘sing’, *tanab bazi-kardan* ‘skip’, *mahi-giri-kardan* ‘fish’, *jaroo-kardan* ‘sweep, *khordan* ‘eat’, *negah-kardan* ‘watch’, *dorost-kardan* ‘make’, *kashtan* ‘plant’, *raghsidan* ‘dance’, *mesvak-zadan* ‘brush’, *kandan* ‘pick’, *davidan* ‘run’, *paridan* ‘jump’, *harf-zadan* ‘talk’, *shena-kardan* ‘swim’, *bala-raftan* ‘climb’, *rikhtan* ‘pur’, *shostan* ‘wash’.

Appendix P

List of stimuli used in agreement elicitation task

(1) choobe are mi-kon-e

wood saw PRES-do.PRES.Stm.3SG

'He is seeing the wood'

(2) mashin mi-roon-e

car PRES-drive.PRES.Stm-3SG

'He is driving a car'

(3) doosh mi-gir-e

shower PRES-take.PRES.Stm-3SG

'He is taking a shower'

(4) gerye mi-kon-an

cry PRES-do.PRES.Stm-3PL

'They are crying'

(5) moo-haye pesare ro kootah mi-kon-e

hair-PL boy ACC short PRES-do.PRES.Stm-3SG

'He is cutting his hair'

(6) ketab mi-xoon-an

book PRES-read.PRES.Stm-3PL

'They are reading books'

(7) tanab-bazi mi-kon-e

rope-play PRES-do- PRES.Stm-3SG

'He is skipping'

(8) ghaza be bach-ash mi-de-e

food to kid-her PRES-give.PRES.Stm.3SG

'She is feeding her kid'

(9) mi-xand-an

PRES-laugh.PRES.Stm-3PL

'They are laughing'

(10) ba telefon harf mi-zan-e

with phone talk PRES-make.PRES.Stm-3SG

'She is talk on the phone'

(11) ab-mive mi-khor-an

water-fruit PRES-eat-PRES.Stm-3PL

'They are drinking fruit juice'

(12) shir mi-khar-e

milk PRES-buy.PRES.Stm-3SG

'She is buying milk'

(13) bach-ash ro ba kalesge mi-bar-e

kid-her ACC with stroller PRES-take.PRES.Stm.3SG

‘She is taking her kid in the stroller’

(14) kaghaz-ha ro mi-chin-e

paper-PL ACC PRES-cut.PRES.Stm-3SG

‘She is cutting the papers’

(15) ba ghatar-esh bazi mi-kon-e

with train-his play PRES-do.PRES.Stm-3SG

‘He is playing with his train’

(16) docharkhe-savari mi-kon-an

bicycle-riding PRES-do.PRES.Stm-3PL

‘They are riding the bike’

(17) tab bazi mi-kon-e

swing play PRES-do.PRES.Stm-3SG

‘She is swinging’

(18) avaz mi-xoon-an

song PRES-sing.PRES.Stm-3PL

‘They sing a song’

(19) hamam mi-gir-an

bath PRES-take.PRES.Stm-3PL

‘They are taking a bath’

(20) toop bazi mi-kon-e

ball play PRES-do.PRES.Stm-3SG

'He is playing with a ball'

(21) gol mi-chin-e

flower PRES-cut.PRES.Stm-3SG

'She is picking a flower'

(22) mahi mi-gir-e

fish PRES-take.PRES.Stm-3SG

'He is fishing'

(23) zamin ro jaroo mi-kon-e

floor ACC sweep PRES-do.PRES.Stm-3SG

She is sweeping the floor'

(24) sandwich mi-khor-e

sandwich PRES-eat.PRES.Stm-3SG

'He is eating a sandwich'

(25) televesion negah mi-kon-e

televesion watch PRES-do.PRES.Stm-3SG

'He is watching a tv'

(26) adam-barfi dorost mi-kon-an

man-snow make PRES-do.PRES.Stm-3SG

‘They are making a snow-man’

(27) derakht mi-kar-an

tree PRES-plant.PRES.Stm-3SG

‘They are planting a tree’

(28) mi-raghs-an

PRES-dance.PRES.Stm-3PL

‘They are dancing’

(29) ghaza mi-xor-an

food PRES-eat.PRES.Stm-3PL

‘They are eating food’

(30) mesvak mi-zan-an

tooth-brush PRES-do.PRES.Stm-3PL

‘They are brushing their teeth’

(31) sib mi-chin-e

apple PRES-pick.PRES.Stm-3SG

‘She is picking apples’

(32) ghaza dorost mi-kon-an

food make PRES-do.PRES.Stm-3PL

‘They are making food’

(33) avaz mi-xoon-e

song PRES-sing.PRES.Stm-3SG

'She is singing a song'

(34) biscuit mi-xoor-an

cookie PRES-eat.PRES.Stm-3PL

'They ate eating cookies'

(35) docharkhe-savari mi-kon-e

bicycle-riding PRES-do.PRES.Stm-3SG

'He is riding a bike'

(36) mi-dav-an

PRES-run.PRES.Stm-3PL

'They are running'

(37) mi-raghs-e
PRES-dance.PRES.Stm.3SG

'She is dancing'

(38) alaf mi-xor-e

hay PRES-eat.PRES.Stm-3SG

'The cow is eating hay'

(39) mi-par-an

PRES-jump.PRES.Stm-3PL

'They are jumping'

(40) ab mi-khor-e

water PRES-eat.PRES.Stm-3SG

'She is drinking water'

(41) harf mi-zan-an

talk PRES-do.PRES.Stm-3PL

'They are talking'

(42) shena mi-kon-an

swim PRES-do.PRES.Stm-3PL

'They are swiming'

(43) az derakht bala mi-re-e

from tree up PRES-go.PRES.Stm-3SG

'He is climbing the tree'

(44) asb-savari mi-kon-e

horse-riding PRES-do.PRES.Stm-3SG

'She is riding the horse'

(45) television negah mi-kon-an

television watch PRES-do.PRES.Stm-3PL

'They are watching television'

(46) football bazi mi-kon-an

soccer play PRES-do.PRES.Stm-3PL

‘They are playing soccer’

(47) chai mi-riz-e

tea PRES-pour.PRES.Stm-3SG

‘He is pouring tea’

(48) lebas mi-poosh-e

dress PRES-wear.PRES.Stm-3SG

‘She is getting dressed’