The Acquisition of Verbal Morphology in Persian

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Doctor of Philosophy

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Language and Linguistic Science

June 2014

Abstract

This study constitutes the first focused description and analysis of the acquisition of Persian inflectional morphology. It focuses on the order in which children acquire the verbal morphological system and also considers factors that influence the order of acquisition.

Three monolingual Persian children with the age range of 1;8 to 3;1 were videotaped at one-to-four month intervals in naturalistic interaction with their mothers. Based on transcription of these sessions, the point of acquisition of verbal inflections was determined following two sets of criteria: productivity and contrastive use of inflections (Pizzuto and Caselli, 1994, adjusted to Persian) and deployment of morphemes in obligatory context (Cazden, 1968).

The main finding is that although some shared order of emergence and development of productivity can be identified, it is not possible to talk about distinct stages in the acquisition of verbal morphemes, such that the acquisition of number, aspect, mood, tense or person could be said to occur in any set order. For example, in two of the children Person and Mood contrasts develop before AFF/NEG and Tense contrasts, followed by Number and Aspect contrasts; however, Person and AFF/NEG inflections are acquired to full criteria at the same MLU in each child (i.e., 1.5 and 1.9, respectively).

The different patterns of productivity along with different pictures of development observed for each of the three children raise the question of what determines which forms will be learned and in which order. The frequency of occurrence of verbal morphemes in the input speech of the three mothers was found to be related to the order of emergence, productivity and contrastive knowledge of the morphemes in the children, whereas the role of typological factors (i.e., perceptual salience and transparency) was not straightforward.

The results of the study are consistent with a constructivist account of language acquisition, which sees the acquisition of morphemes as a gradual process activated following considerable exposure to the input in different variations in terms of types and tokens. Furthermore, the findings confirm the interdependence of lexical and morphosyntactic development by demonstrating that it is prompted by an increase in the size of the lexicon over a certain level.

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Acknowledgements

My sincere gratitude goes out to the many individuals who have supported me throughout my studies at the University of York. First, I would like to express my sincere appreciation to my supervisor Professor Marilyn Vihman who made this thesis possible through her constant support, patience and guidance. I would also like to convey my sincere gratitude to Dr. Tamar Keren-Portnoy who acted as my second supervisor, for her valuable comments and ideas. This thesis would not see an end without the understanding and continuous support of my two supervisors during the difficult time I was experiencing in the final year of my studies.

I would also like to extend my thanks to the families who participated in this study and made this research possible through their help and patience.

Thanks must also go to my fellow student and friend, Ruwaishid Elruwaily, for his many helpful discussions and friendly advice.

My special appreciation also goes to my cousin, Dr. Nadereh Nafisi, who helped me gain a better understanding of Persian verbal morphology.

Finally, my most heartfelt acknowledgement goes to my wonderful parents and my sister for their continuous support and encouragement. Words alone cannot express my gratitude to my mother and father for their inspiration, infinite love, and faith. I would not have been in the position to write this thesis without their constant encouragement and emotional and financial support.

Declaration

I hereby declare that this thesis is a presentation of my original research. I certify that this work has not been previously submitted for an award at this, or any other, University. Except where states otherwise by reference or acknowledgment, the work presented is entirely my own.

1 Introduction

1.1 Aims and objectives

Much of the research in the field of child language acquisition so far has focused on studies of major Indo-European languages, particularly English. A number of studies have also examined the development of grammar in languages that display more complex systems of morphology. Particularly in the last few decades, a great deal of attention has been drawn to the acquisition of verbs as various studies have carried out detailed analyses of the process of verbal morphology acquisition in young children acquiring different languages, e.g., Pizzuto and Caselli (1994) and Longobardi et al. (2015) for Italian; Choi (1998) for Korean; Aksu-Koç (1998) for Turkish, Behrens (1993) and Bittner (2000) for German, Gathercole et al. (1999) and Aguirre (2003) for Spanish, etc. Indeed, considering the diversity of linguistic structures found in different languages, it is important to study developmental data from as broad a range of languages as possible in order to add to the knowledge of child language acquisition.

So far there has been no comprehensive study of the acquisition of morphology in Persian except for P-LARSP developed by Samadi and Perkins (1998), which is an adaptation of the LARSP[1] profile for Persian and represents the full range of grammatical structures produced by three Persian monolingual children. However, to my knowledge no fine-grained study has yet been carried out specifically on the acquisition of verbal morphology in this language. Therefore, the present work will

[1] Language Assessment, Remediation and Screening Procedure

contribute to the literature by providing data analysis on a typologically different language for which verbal morphology has rarely been studied developmentally.

The objective of this thesis is thus to investigate the development of Persian verbal morphology within the constructivist approach to language acquisition. In this thesis naturalistic data has been collected on a longitudinal basis with the aim of addressing the following questions:

1. What is the order of emergence and acquisition of verbal inflections for agreement (number, person) and tense/mood/aspect?

2. What is the role of typological factors in the acquisition of inflectional paradigms?

3. Is there any link between the grammatical and the lexical development of verbs, and in particular is there evidence for the 'critical mass' hypothesis?

4. What is the role of input in the emergence and acquisition of inflectional paradigms?

1.2 Outline of the thesis

Chapter 2 discusses the theoretical foundation of the thesis. This chapter reviews the main theories that explain the acquisition of morphology. The first section of the chapter provides an overview of the main theoretical framework used in this thesis (i.e., the constructivist view) for the acquisition of grammar in general. After a brief presentation of this approach, the proposals within the constructivist framework that

will be adopted here to trace the acquisition of Persian inflectional morphology are outlined.

Chapter 3 presents a brief overview of Persian verbal morphology. In this chapter the main features of verbal inflections are outlined, mainly using examples taken from the input speech of the mothers recruited for this study. This chapter concludes with predictions about the order in which children would be expected to learn morphological paradigms based on the typological properties of verbal morphemes and their frequency in the input as well as predictions about continuity between lexical and grammatical development.

Chapter 4 outlines the general methodology used in the study and provides information about the procedure of data collection, participants, transcribing and coding the data and finally presents the motivation for developing a revised method for the analysis of data. This chapter concludes with a detailed section discussing the criteria used to establish the acquisition of Persian verbal morphemes.

Chapter 5 presents the results of children's data analysis. In this chapter the development of verbal morphology is tracked through different levels (i.e., from emergence to full acquisition). In addition, to provide a more complete picture of acquisition this chapter also includes an analysis of the errors noted in the children's speech. This chapter ends with a discussion about the process of acquisition of morphemes and the role of typological factors in the order of acquisition.

Chapter 6 reports the results of the mothers' input analysis, following a section providing details about the method of analysis. This chapter concludes with a discussion of the influence of input on the development of Persian verbal morphemes

Chapter 7 concludes the thesis with a discussion of the implications of the findings within the constructivist accounts of language acquisition and suggests further investigation on typologically diverse languages in order to gain a more comprehensive account of language development.

2 Theoretical Review

2.1 Approaches to language acquisition

It is generally agreed that the acquisition of the first language happens rapidly and with relative ease. Extensive research has been done to understand the nature of the language learning process. While different researchers use different approaches and terminologies to describe the pathways to the acquisition of first language, two broad approaches dominate these various attempts to describe language development. One approach is the 'generative' perspective proposed by Noam Chomsky (1965). Following a sharply critical review of Skinner's behaviorism approach (1957), Chomsky argued that infants are born with a 'language-acquisition device' or LAD (Chomsky, 1965) that allows them to acquire and produce language by discovering linguistic structures in the input, based on pre-existing knowledge of universal linguistic principles, rather than constructing the grammar on the basis of imitation and selective reinforcement as proposed by the behaviorist approach. While Chomsky's ideas have inspired many subsequent theorists and supporters, they have also begun to be widely questioned by cognitive linguists and researchers who adopt a 'usage-based' position and who have contributed extensively to the present dynamic field of psycholinguistics.

A second perspective on language acquisition is represented by the cognitive-functional theories, according to which children are equipped with cognitive skills which enable them to categorise and generalise knowledge without having an innate blueprint for grammar. This constructivist approach claims that input speech, in combination with both general and language-specific learning capabilities, suffices

for language acquisition. In other words, this approach assumes that while the potential to acquire language is innate, children are not endowed with innate knowledge of grammatical categories and they construct their grammar on the basis of the input they are exposed to (Ambridge and Lieven, 2011). The non-nativist view has many branches but the recurrent idea within this account is that the emergence of language can be accounted for through usage in social contexts, by means of applying learning mechanisms derived from general cognitive mechanisms.

Tomasello (2003) sketches a relatively complete constructivist, usage-based account of language acquisition. In his account, which draws on the work of researchers in the constructivist tradition such as Brown (1973), Bowerman (1973) and Braine (1976), Tomasello (2003) states that the intention to communicate in addition to the ability to detect patterns of regularity lead to acquisition. Tomasello emphasizes the fact that children learn from their experiences. Within this usage-based approach, early constructions are built around particular lexical items (see Tomasello, 1992 and Pine and Lieven, 1997); as the grammar develops, general categories appear and become increasingly abstract. Thus the constructivist accounts stress the gradualness of the process of acquisition by children at the initial stages of development. Although there have been variations over time, the idea of a piecemeal pattern of acquisition has been recurrent in studies within constructivist framework.

The constructivist approach to language acquisition has evolved to some extent over the past four decades and its hypotheses about the acquisition of morphology have also changed, so that within this framework a variety of theoretical approaches can be found. This thesis adopts a constructivist approach to the acquisition of verb morphology which is quite different from Skinner's views, on the one hand, and

which additionally includes a variety of different models. In the following sections I will be drawing on two of the main approaches in constructive accounts concerning the acquisition of morphology (i.e., the usage-based account briefly outlined in this section and the Natural Morphology model).

2.2 Constructivist accounts of the acquisition of morphology

According to the usage-based account, the child has a general learning mechanism that enables him/her to recognize patterns in utterances and build rules around them. One of the earliest proposals in the usage-based tradition is the 'Verb Island Hypothesis' (Tomasello, 1992). Through precise analysis of his daughter's early uses of verbs, Tomasello (1992) documented that the child's use of arguments and verbal morphology was restricted to particular lexical items. He proposed the 'Verb Island Hypothesis', according to which abstract knowledge of the usage of verbs originates from learning combinatorial possibilities and argument roles for each verb individually. In other words, the child creates an 'island' consisting of a verb-specific construction with an open slot for a particular semantic role, based on learning the combinatorial possibilities present in the input and the marking of these possibilities for each verb on an individual basis. These constructional islands (or schemas), which are organised around particular verbs (verb islands), form the child's early linguistic knowledge. Tomasello (2006) suggests that, once the child has gained a critical mass of verb island constructions, she begins to construct a generalised system through the process of analogy. To illustrate this phenomenon, Tomasello reports that around the age of 19 months his daughter started using some productive verb morphology but this morphology was not of a verb-general nature. "T's verb morphology during the period prior to her second birthday was of a verb-

specific nature—that is, she learned some things about how to inflect a number of verbs in one of several ways, but she did not show any evidence of inflections applying to the entire class of verbs....” (Tomasello, 2006:254).

Tomasello’s report of his daughter’s development of early language is one of the wide-ranging accounts of the constructivist approach to language acquisition, which sees the acquisition of grammar as occurring in a piecemeal fashion. The key result of Tomasello’s study was that most verbs were initially used with only a single construction and afterwards there was little or no overlap in the sets of constructions used with individual verbs. For example, although the number of verbs appearing with the past tense *-ed* morpheme was equal to the number used with present progressive *-ing* morpheme, only four verbs (2%) appeared in both constructions. Tomasello and Brooks (1999) argue that, from a constructivist point of view, children only gradually learn linguistic constructions; their progress toward adult-like production is mainly determined by the adult language (i.e., the input).

According to this view children begin to produce multi-word speech without having knowledge of abstract syntactic categories, such as VERB and NOUN. Instead, children’s early language use is based on a "functionally based distributional analysis" of the language they hear (Tomasello, 1992:28). The results of experimental studies using production or act-out methods where children between the ages of 2 and 3 years of age produce or act out sentences with novel verbs also suggest a gradual development for even a simple frequent structure like the English transitive (e.g., Abbot-Smith, Lieven, and Tomasello, 2001; Akhtar and Tomasello, 1997). That is, when children are told to ‘Make X dack Y’ or ‘Show me: X is dacking Y’ they are equally likely to make either X or Y the agent of the action. The

evidence provided by IPLP (Intermodal Preferential Looking Paradigm) studies, however, suggests that children have verb-general knowledge of argument structure earlier than Tomasello (1992) proposed. In IPLP studies children watch two videos side-by-side, and hear an audio that matches only one of the videos. According to the studies which used this method, when children as young as 25 months of age heard a transitive sentence their looking times to a causal action (e.g., a duck forcing a rabbit into a bending position) was significantly increased as compared to a non-causal action (a duck and rabbit flexing their own arms) (Naigles, 1990).

However, due to the inconsistency of the results across different IPLP studies and in order to find out at what age English-learning children are able to show verb-general knowledge of transitive and intransitive structures, Noble et al. (2011) used the FCPP (the Forced-Choice Pointing Paradigm) to investigate children's knowledge of syntactic structure. In the FCPP the child is presented with two visual scenes and an accompanying sentence, and then he/she is required to point to the scene which matches the sentence presented. Noble et al. (2011) showed that English-learning children as early as 2;3 have verb-general knowledge of two aspects of transitive structure (i.e., using transitive argument structure with causal events as well as using transitive argument structure for giving agent and patient roles correctly). In their study Noble et al. adopted a pointing task which consisted of one animation showing one animal performing a causal action on another animal and one animation of the same animals both performing a noncausal action. For example, *The duck and the bunny are blicking! Point to where the duck and the bunny are blicking! or The duck is blicking the bunny! Point to where the duck is blicking the bunny!* The results indicated no significant difference in performance between the different age groups selected for the study. These results support the IPLP findings, which indicate that

children have enough verb-general knowledge early in development to allow them to understand the meaning of transitive argument structures.

These results, however, challenge the findings of earlier studies using production methodologies (e.g., Dodson and Tomasello, 1998; Akhtar and Tomasello, 1997), which have reported that children aged 2 do not have verb-general knowledge of transitive argument structure. These findings, along with previous IPLP findings (Naigles, 1990; Gertner et al., 2006), demonstrate that young children's knowledge of syntactic structure may be underestimated through act-out and production methodologies.

Although the evidence for knowledge of verb-general structure is not in line with a strict version of the Verb Island Hypothesis, it gives support to a more recent account which claims that grammatical structure does not have to revolve exclusively around verbs, but can be built around other lexical items, particularly pronouns. McClure et.al (2006) examined Tomasello's (1992) claim that children's knowledge of SVO word order is gradually built around particular verb structures. They compared the development of constructions around verbs in Tomasello's (1992) case study of his daughter, with those of 10 children (Stage I-II) in a year-length study. In this study the verbs used by children during Brown's MLU Stage II were divided into OLD verbs (those which had occurred in Stage I and then reappeared at Stage II) and NEW verbs (those which only occurred in Stage II). These different groups of verbs were examined in terms of number of arguments which were first produced at Stage II. The results demonstrated that OLD verbs were produced with a larger number of arguments at Stage II than NEW verbs, suggesting that children's knowledge about verb argument structure was built up

gradually around particular lexically specific verb structures. On the other hand, the results also showed that NEW verbs were produced with a larger number of arguments at Stage II than OLD verbs at Stage I. This suggests that children are capable of producing longer utterances with novel verbs due to their knowledge of verb-general structure by Stage II. In order to explain the above findings, it is argued that although children's early knowledge of verb-argument structure revolves around particular lexically specific structures, these structures are not necessarily verbal; in other words, children's early knowledge of verb-argument structure can be tied to other high frequency lexical items such as pronouns (Pine et al., 1998). As a matter of fact, further analysis of children's verb use at Stage I revealed a highly productive *I* + Verb pattern before they entered stage II. In other words, it can be argued "that children are learning limited scope formulae around high frequency subjects and objects, which serve as building blocks for more abstract structures such as S+V and V+O." (McClure, 2006: 717). These findings therefore cast some doubt on Tomasello's claim that children's early grammar is exclusively built around lexically-specific verb structures.

Another issue in the acquisition of verbal morphology, independent of the units discussed earlier involves the question of the mechanism underlying the acquisition of regular vs. irregular morphology. There are presently two main approaches to children's acquisition of inflectional morphology, which constitute a longstanding controversy in linguistics and psycholinguistics, namely, dual-route and single-route approaches. Dual-route approaches, also known as dual-mechanism models, which are rule-based by nature, generally assume a distinction between grammar, believed to be learnt by innate rules, and the lexicon, which is assumed to be rote-learnt (e.g., Pinker 1984; Clahsen and Felser, 2006). According to this account irregular past

tense forms are stored in memory as lexical items (Ambridge and Lieven, 2011). In contrast, for regular inflections, while the stem is stored, the past tense derives from the application of a default grammatical rule, adding *-ed*. Within this account, regular inflections are highly productive, since morphological rules function on lexical items in a quasi-algebraic, unselective way. Thus the error rate should be very low, as once a particular irregular form is learned, due to the irregular form blocking the default rule, overgeneralization (errors resulting from the application of a grammatical rule where it doesn't apply) with that verb will not occur (Marcus et al, 1992). Marcus et al (1992), averaging across 83 children, found an overall overgeneralisation rate of 4%, which they saw as confirming the low error rate predicted by the dual-route model.

However, Maratsos (2000) claimed that sampling problems may have biased the results of Marcus et al.'s study. Marcus et al (1992:29) had excluded individual irregular verbs that were sampled 10 times or less to avoid unreliable estimates. However, Maratsos (2000) argues that such a high number of verbs should not be excluded if one is to gain an accurate picture of the rate of overregularization. He shows that in one of the children, the 40 verbs which were infrequent and therefore excluded from the sampling had the very high overgeneralisation rate of 58% (Maratsos 200: 189).

According to the dual route model, zero-marking errors (errors in which the inflection was omitted or no change was made to the stem, as in using *come* instead of *came* as the past tense of *come*) should disappear as soon as the child begins to use overregularisation errors. This is because overregularisation errors are evidence that the child has acquired the default rule. In other words, the child will use either

an irregular form, if it has been acquired, or add the default rule, if it is not blocked by an irregular form.

Single-route approaches, which are usage or schema-based models (Bybee, 1985, 2001; Bybee and Slobin, 1982; Dąbrowska, 2001, 2004) and are pertinent to this thesis, by contrast, assume that the learning process relies on small-scale associations called schemas on the basis of phonological associations (Stoll, 2015). Theories taking a single-route approach propose that both regulars and irregulars are stored in an associated memory system and do not differ in their learning mechanism. In the single-route model, in which generalisations are made by phonological analogy to stored forms creating schemas for both regular and irregular inflections, morphological productivity results from new items fitting into these schemas. The extent to which a given schema is productive depends on its type frequency (i.e., the number of items fitting into it). In other words, inflections shared by a number of verbs will gradually be extended to new verbs, with a larger type frequency of verbs fitting in to a schema resulting in a more rapid extension. In this view, overgeneralization errors will persist for a period of time, even though the irregular form has been acquired. The reason for this is that the regular form will remain as a competing pattern (Ramscar and Yarlett, 2007). With respect to zero-marking errors, according to the single-route model there would be a gradual decline as the child builds a VERB+*ed* construction. However, Marcus et al (1992), interpreting Cazden's (1968) data, state that the first over-regularization error happened during a three-month period in Adam's development when regular marking increased from 0 to 100%, whilst McClelland and Patterson (2002), discussing the same data, report that the first over-regularization occurred during a six-month period in Adam's speech when the probability of using the regular gradually increased from 24-44%.

"These statements are both true, because the rate of 100% represents a spike in the rate of correct regular marking" (Ambridge and Lieven, 2011: 178).

Hoeffner (1996), interpreting the same data from Cazden (1968), reported that age was a statistically significant (negative) predictor of the rate of zero-marking errors (Ambridge and Lieven, 2011). Since aging is a gradual process, Hoeffner's (1996) claim is considered to support the single-route model.

Another recent constructivist approach to the acquisition of morphological paradigms was developed by Dressler (1997), in the Natural Morphology model (Dressler et al., 1987; Galeas, 1998). This approach is constructivist by nature as it does not assume an innate morphological module in the brain. The theory of Natural Morphology proposes that children prefer what is cognitively simple and therefore easily accessible (Dressler and Karpf, 1995). According to Karpf (1991), environmental experience that is the result of the interaction between innate cognitive skills and environmental factors results in the development of the cognitive structures in the adult brain. In other words, acquisition is the result of the operation of biological factors and environmental conditions, which result in establishing a system of rules by the natural classification of linguistic units; therefore, the brain should give preference in classification to frequent and regular linguistic data. Thus, it is supposed that the child constructs grammatical units by pattern selection (i.e., selecting the appropriate and natural structures from the input language) (Dressler, 2004). When more linguistic data is received and the complexity of the system increases the child begins to successfully divide the general patterns into smaller and more specific units (Bittner et al., 2003) and the categories emerge over time through this process of self-organization.

Dressler (1997) divides the process of acquisition of morphology into three periods: premorphology, protomorphology and morphology proper. During the pre-morphological stage the grammatical categories have not yet developed and the acquisition of morphology is governed by general cognitive principles while the verb productions of the child generally consist of only one rote-learned form per verb lemma (following Tomasello, 1992). According to Bittner et al. (2003), this form may be an inflected form or an uninflected root/stem. Children depend largely on imitation at this stage; therefore, the input frequency of a particular lemma plays an important role in the process of rote learning (Bybee, 1995). Furthermore, children generally appear to use morphological markers correctly during this period, although they are not used productively (i.e., they are not extended to new stems).

Acquisition of the morphological paradigm begins during the proto-morphological stage. In this period children carry out morphological analysis and establish associations based on analogies; the child's syntax is characterised by isolated 'verb-island' syntax; this is when the highest rate of individual differences in the course of acquisition is seen (Dressler et al., 2002). During this phase, the number of inflectional types of a given lexeme increases and children begin to organize and analyse stored forms. This is when errors occur and children gradually produce over-generalized forms (i.e., the forms that follow an overextended rule, where the rule does not apply).

Properties such as transparency, salience, and frequency play an important role in the development of the morphological system in this phase. The child selects some forms which are more frequent and salient from a context, and begins the process of self-organization (i.e., the child not only imitates elements he/she received from the

input but also begins to construct the inflectional patterns.) Once the linguistic data accumulates and becomes more complex, categories begin to emerge through self-organisation (Bittner et al., 2003).

The proto-morphological phase ends when the adult-like morphological categories appear and different categories of the linguistic system begin to interact (Dressler and Karpf, 1995). The onset of this stage is evidenced by a noticeable increase in the productivity of morphological combinations, and along with this, the emergence of more frequent overgeneralization errors. This is assumed to be the phase where schemas begin to emerge following the development of morphology.

The "Crosslinguistic Project on Pre- and Proto-morphology in Language Acquisition", coordinated by Dressler (1994), aimed to investigate the early phases of morphological development in a large sample of different languages that demonstrate important typological differences. This project, which involves a theory-guided comparative analysis of longitudinal data from about age 1;2 to 3;0, encompasses seventeen different languages from the Indo-European, Semitic and Finno-Ugric language families, as well as Turkish, which is Altaic, and Yucatec Maya, which is a Meso-American language. A prominent finding from this project is that a linguistic system that at first sight looks quite complex is not necessarily difficult to acquire, or does not necessarily take a lot of time to master. In the same way, ‘easy’ morphological patterns are not necessarily acquired very early by language learners, and may even take more time to master. The main hypothesis is that “the richer noun or verb morphology is in the input, the more stimulated the child will be to develop noun or verb morphology rapidly” (Dressler, 2007:8). That is, there is a relationship between the degrees of morphological richness of the input

the speed of morphological development. Furthermore, Dressler (2007) applied a mathematical measure to evaluate the speed of morphological acquisition and demonstrated that factors such as transparency and salience influence the speed of development of morphemes. According to this account it is anticipated that the child selecting suitable units from the surrounding linguistic environment and/or the input language constructs the grammatical modules (Dressler, 2004), while different factors direct the choices of the child at different stages of language acquisition (Bittner et al., 2003). The theoretical approach followed in this thesis is a constructivist model applying the basic parameters of natural morphology to the acquisition of Persian verbal inflections. Below, the concepts derived from the integrated model of Natural Morphology and a usage-based account of the constructivist approach to the acquisition of morphology are outlined in more detail.

2.3 Theories of morphological development within the constructivist accounts

A first set of claims within the functionalist/constructivist accounts proposes that the acquisition of morphology in young children depends upon both general cognitive and language-specific linguistic factors, namely, the typological properties of the language (Dressler, 1997; Slobin, 1997). Specific typological properties of different languages lead to variations in the input the children receive and thus to different developmental patterns. Accordingly, detailed analyses in particular languages have been carried out in order to make cross-linguistic comparisons of the process of development and shed light on the general and particular issues in the process of language acquisition among different languages (Bates and MacWhinney, 1987; Slobin, 1985, 1997; Bittner et al. 2003).

A second set of claims considering the role of input stimuli is the function of type and token frequency on the productivity of inflectional morphology. Generally speaking, in usage-based models of language acquisition the token frequency of a construction in the language input is understood to facilitate the language learners' access to that particular construction so that it can be used fluently as a whole (Langacker, 1988; Krug, 1998; Bybee and Schreibman, 1999). On the other hand, type frequency establishes the productivity of the construction (Bybee, 1985, 1995). These two types of frequency together, alongside the child's cognitive processes, may clarify the process of acquisition of the specific linguistic constructions in specific contexts and explain how the child generalizes these constructions to new contexts based on the various kinds of type variations he/she receives in the input. This variation may be restricted to a single slot or may occur in all parts of a linguistic construct.

A third set of claims is based on the functionalist integrative model, suggesting that linguistic categories appear and develop together with cognitive development as well as with the development of other language skills, particularly lexical skills. In other words, there are argued to be interdependencies between lexical and grammatical development (Bates and Goodman, 1999; Marchman and Bates, 1994). This perspective criticizes the traditional generativist account in which syntax develops individually and independently of other levels of linguistic accounts and emphasizes the role of language learners in integrating and using different levels of linguistics knowledge, such as lexical, syntactic or pragmatic levels.

Finally, a fourth set of claims is built on the idea that linguistic categories are learned and constructed in a gradual manner, suggesting that children's acquisition of morphological structures is a piecemeal process (Tomasello, 1995). Gathercole, Sebastián and Soto (1999: 160-161) compare the early acquisition of Spanish verbal morphology to

> drops of water falling down, eventually form a river. Each drop adds to the previous ones, until there is a substantial, critical mass to establish a whole, which both functions as a stable unit in itself, and at the same time continually changes as new drops fall and old ones dry up or roll away. At no point is it possible to say that before that point there was no river, while after it there is.

According to these authors, this process is in line with dynamic self-organizing systems, "capable of generating stable patterns of enormous complexity, without pre-existing programs or prescribed processes" (Gathercole et al., 1999:161). In the following section each of the above theories are discussed in more detail.

2.3.1 Typological Factors

One of the first indicators of the knowledge of verb morphology is the productive use of verb inflection. This is a notion frequently investigated in usage-based and Natural Morphology frameworks (e.g., Bittner et al., 2003). The notion of productivity in this context refers to the extent to which a morphological pattern can be applied to new words. According to Bybee and Moder (1983), different inflectional constructs vary in their productivity; for example, although English children are observed to extend the past tense formation of irregular verbs such as

swing–swung to new nonsense words, they do so only if the novel word is similar enough to the known word (e.g., *spling–splung*); however, it has been observed that the regular past tense morpheme is used (e.g., *walk–walked*) for novel words even if they are not similar to known verbs. Hence the regular past tense can be said to be much more productive than irregular constructs (Endress and Hauser, 2011). On the other hand, Dąbrowska (2001), applying productivity measures (provision rates, overgeneralisation rates), reports a gradual course of development for "irregular" and "regular" Polish nominal endings and finds no evidence for greater productivity of the latter.

Although it is undeniable that different morphological constructs have different degrees of productivity, the source of these differences is a point of debate in the constructivist accounts. As was pointed out above, within the constructivist perspective one of the factors used to draw conclusions about the primary nature of the mechanisms involved in the acquisition of morphology is the role of input. Following the presentation of general theories within the constructivist perspective it was proposed that the child selects the appropriate and natural units from the input language to construct the required grammatical structures; the selection of these units depends on different factors (Bittner et al., 2003) such as frequency, regularity, transparency and markedness, which have significant roles in the development of the morphological paradigm.

Slobin was the first to propose that the order of acquisition of inflectional morphemes in children's language can be determined by specific properties of the linguistic structures received in the input. Based on observation of language development in a large number of typologically different languages Slobin (1973:

203) proposed what he called operating principles. Operating principles illustrate how children analyse language input and how they interpret grammatical constructs. Among the most important of them are “pay attention to the order of words”, “avoid exceptions” and “pay attention to the end of the words”, the last one highlighting the significance of perceptual salience (i.e., the property of a structure making it perceptually distinct from its environment). In addition, Slobin proposed that children are guided by factors such as frequency and phonological salience in the course of acquisition of inflectional morphology, stressing the fact that children’s early linguistic development is influenced by the typological properties of the language they are exposed to (Slobin, 1985; Peters, 1997; Dressler, 1997, Devescovi et al., 2005).

I discuss here the typological parameters most relevant to this study: ‘perceptual salience’ and ‘morphological transparency’.

2.3.1.1 Perceptual salience

It is commonly agreed that children need to identify words and other linguistic units in the input language in order to acquire the inflectional system. However, pauses between words, which could help define word boundaries, are seldom heard in the input, making the identification of word boundaries difficult. Furthermore, within the constructivist view children are not endowed with a set of universal cues to aid them in defining the word boundaries (Cole and Jakamik, 1980); hence, the child’s attention must somehow be drawn to specific parts of the input signal for him to be able extract the units from the speech stream.

Peters (1983, 1985) proposed perceptual salience as a way to account for the initial extraction of the relevant units. According to Peters (1983), the child stores utterances as amalgams and then isolates the units which are perceptually salient; since syllables are more perceptually salient than phonemes, Peters claims that children initially segment larger units into syllables instead of phonemes. Perceptually salient syllables include those that appear at the ends of words and those which carry stress (Peters, 1983, 1985 and Slobin, 1985). Peters (1997) argued that morphemes that are frequent and have a recognizable form and are in a fixed position relative to their stem are easily segmented and therefore acquired. Peters (1983, 1985) also adds that syllables located in intonationally or rhythmically salient places and syllables repeated within an utterance are also easily segmented. In sum, any feature that makes a particular unit noticeable to the child can be easily segmented. On the other hand, some inflectional morphemes are less salient and can therefore be expected to be acquired later in the course of development; this includes morphemes that are unstressed, morphemes that cover multiple morphosyntactic features or inflectional morphemes that are embedded within words (i.e., infixes). Empirical studies carried out by Brown (1973), Slobin (1985) and Bittner et al (2003) support Slobin and Peter's proposals. In later studies also there is particularly strong evidence that stress and position within the word are helpful in the child's initial segmentation task (Echols and Martin, 2004) as it has been documented that young children tend to preserve stressed and final syllables in their productions while unstressed, non-final syllables are often dropped (Ingram, 1978; Klein, 1981; Pye, 1983; Echols and Newport, 1992; Echols, 1993; Vihman, 1980, 1996; Snow, 1994). Using experimental methods, Childers and Echols (2002) also found that children produce stressed and final syllables more accurately than their unstressed, non-final

counterparts. Although most of these studies have focused on children learning English, more findings suggesting the prominence of word position and stress in child's analysis have also been reported for languages from typologically distinct languages such as Quiché Mayan (Pye, 1983) and Mohawk (Mithun, 1989).

Similarly, in a later study designed to determine whether sentence-position effects can be explained by perceptual factors, Sundara et al. (2011) showed that two-year-old children were sensitive to the presence/absence of third person singular *-s* morpheme in sentence-final position; however, they showed no sensitivity to the same morpheme in sentence-medial position. Furthermore, third person singular *-s* was produced more accurately on verbs in sentence-final position in comparison with verbs in sentence-medial position.

In another study carried out by Freudenthal et al. (2006), MOSAIC (a computational model of the acquisition of syntax in children) was used to simulate the developmental pattern of the OI (Optional Infinitive) errors, as a way of investigating the interaction between the distributional characteristics of child-directed speech and utterance-final bias in learning English and Dutch. The OI stage is characterised by the alternate use of finite and infinitive verb forms by young children in sentences requiring finite forms. MOSAIC simulates OI errors due to its utterance-final processing bias by producing longer utterance-final phrases gradually as a result of the amount of input it is exposed to. "This bias results in the production of partial utterances that were present as utterance-final phrases in the input on which the model was trained" (Freudenthal et al., 2007:313).

Children begin by producing OI errors at relatively high rates and as the length of their utterances increase they produce fewer OIs. Since MOSAIC produces longer utterance-final phrases in a progressive manner, its early phrases are likely to be only non-finite verb forms. This is because of the way that compound finites are constructed in English and Dutch (i.e., the finite modal or auxiliary is placed before the infinitive). For example, omission of the modal *can* from the English utterance *Can he go* results in the Optional Infinitive *He go*. As the length of phrases in MOSAIC increases, finite modals and auxiliaries start to appear. The model's utterance-final bias in learning simulates children's learning from the end of utterances which plays an important role in determining the proportion of non-finite utterances that are produced at different points in development.

On the other hand, Longobardi et al. (2015)'s naturalistic study examined effects of positional salience on children's acquisition of nouns and verbs in a sample of twenty-six Italian-speaking children, recorded at 1;4 and 1;8 in spontaneous interaction with their mothers. The results underscored the salience effect of input utterance-final position for children's production of noun types; in other words, the majority of noun types in the input occurred in utterance-final position, facilitating children's acquisition of noun types. On the other hand, children's rates of verbal growth showed a positive relation with the percentages of input verb types occurring in utterance-initial position but a negative relation with the percentages of verbs located in utterance-final position in the input. One possible explanation for this effect, according to Longobardi et al. (2015), is the higher frequency of verbs in the initial position of input utterances as compared to nouns. Furthermore, the results of the study revealed the early primacy of nouns in child language as compared to verbs even though the input contains a larger number of verbs than noun types. This result

indicates that the positional salience of the nouns and their greater frequency in utterance-final position with age benefit their early primacy regardless of differences in the total numbers of nouns vs. verbs.

Having discussed the role of 'perceptual salience' in the acquisition of morphemes in child language, in the following section I outline the second typological parameter relevant to this study (i.e., 'morphological transparency').

2.3.1.2 Transparency

Another important typological factor that may influence the early acquisition of morphology is the transparency of grammatical constructions. Transparency, frequently referred to in Natural Morphology (Dressler et al., 1987; Kilani-Schoch and Dressler, 2005), is defined as a one-to-one relation between meaning and form of linguistic units.

For example, the shape of the stem and the suffix in the Persian singular form *dar* 'door' and its plural *dar-ha* 'doors' are transparent, whereas the shape of the stem *ketab* 'book' is not clear in the plural form *kotob* 'books'. Most of the languages of the world contain opaque constructions; another example is the person and number inflection which concord in Persian and therefore do not match with a one-to-one meaning-to-form relation as in:

1) *xord-am*
   eat-1SG
   'I ate'

Suffix *-am* in the above example marks both person and number; since two formal units have fused, the relation between the form and meanings is non-transparent.

While the one-to-one meaning-to-form relations are expected to be easier to acquire, the acquisition of opaque structures is a ground for difficulty for the language learner.

Krajewski et al., (2011) conducted a study of 2- to 3-year-old Polish-speaking children. In two experiments, they examined children's ability to switch from one inflectional form to another in a nonce word elicitation task. In the first experiment, different source forms of nonce words were presented to see how this would affect the production of the target form (always the genitive singular with a few endings). The results suggest that similarity in form between the source and target, rather than the frequency of the source form, influences children's ability to switch from one form to another. In the second experiment, the target form was changed to the nominative, but the source forms were the same as in the first experiment. Again, the production of the target form was influenced by the source form. Furthermore, the frequency of the target form seemed to be irrelevant, since the overall performance was equally good with the genitive in the first experiment and the nominative case in the second experiment, although the nominative was more frequent than the genitive. In view of these results Krajewski et al. suggest that "switching between inflections is underpinned by some sort of emergent generalisations based on a pairing of form and meaning" (Krajewski et al., 2011:854).

In a study by Gábor and Lukács (2006) of children aged between 2;10 and 4;7 acquiring Hungarian, an agglutinative language, noun inflections were productive in all age groups while verb inflections developed much later. This was due to the fact that in Hungarian nominal inflections are typically agglutinating and therefore transparent whereas verbal inflections are more fusional; that is, one form of a verbal

affix can simultaneously encode several grammatical functions. Therefore, it can be said that, given the regularity and therefore the transparency of agglutinating structures, such structures are acquired more easily and therefore earlier than fusional structures. Variation between the development of nominal and verbal inflection has also been documented among highly fusional languages. For instance, Slobin's (1985) comparison of verbal and nominal inflection in Slavic languages (Polish, Russian and Servo-Croatian) showed that inflections in the verbal domain are acquired earlier than inflections in the nominal domain. This must be due to the degree of salience of the morphemes of the specific domain that children are exposed to in the input.

This is true not only within an individual language but also across languages as cross-linguistic studies have shown that when inflections are transparent and salient, children produce them accurately at earlier stages compared to opaque and less salient inflections (Slobin, 1985; Peters, 1997; Dressler, 1997; Laaha and Gillis, 2007). For example, as was said earlier, according to Bittner et al. (2003), it takes only two to four months for Finnish and Turkish children to produce their first verbal mini-paradigms at initial stages of language production (Kilani-Schoch and Dressler, 2002; Bittner et al., 2003); however, it takes twice as long for children acquiring Italian, French, Dutch, German and English to reach the same level. For example, mini-paradigms appear at 1;7 in Turkish (Aksu-Koç and Ketrez, 2003) and at 2;5 in English (De Villiers and De Villiers, 1985; Gülzow, 2003). This is due to the morphophonological regularities of agglutinative Turkish and Finnish, where there is a one-to-one correspondence between inflections and syntactical categories, in contrast with the opacity of the English verbal paradigm, for example.

According to O'Grady et al. (2011) form-function mapping can be problematic for the language learner either due to the form's phonetic profile, which can be acoustically compromised, or because the precise semantic function of the form is difficult to distinguish. It is argued that high-frequency instantiations in the input help the acquisition of such mappings. According to Ellis (2006a:1), language acquisition essentially involves "the gathering of information about the relative frequency of form-function mappings" (see also Ambridge, Theakston, Lieven and Tomasello, 2006). Therefore, in in order to discern the effect of transparency in the speed of development of morphemes, frequency must be controlled. We cannot draw clear conclusion here because this seems not to have been done in previous studies.

Having discussed the role of two important typological factors in the course of morphological acquisition, in what follows I turn to another set of theories within the constructivist accounts, the role of type and token frequency of input in the productivity of morphemes.

2.3.1.3 The role of Type and Token Frequency in productivity

In various naturalistic studies of children's language acquisition it has been documented that the more frequently children hear a construction or expression, the earlier they acquire it and use it productively. For example, in the studies carried out by de Villiers (1985), and Theakston et al. (2004), the order of production of some specific verbs is significantly correlated with the frequency of their use in the input language. Furthermore, these studies show that the syntactic diversity of children's verbs correlates with the diversity of verbal constructions adults used in their speech directed to children. In the development of auxiliary and copula also Wilson (2003),

Theakston et al. (2005) and Pine et al. (2008) have shown input frequency effects on the production of obligatory auxiliaries and copula. According to Tomasello et al. (1997), children initiate their acquisition of grammatical forms by rote-learning unanalysed phrases and then break these phrases down on the basis of type frequency (i.e., the number of different forms in which one experiences a linguistic expression) in order to create "slots". Similarly, Bybee (1985, 1995) points out that type frequency of an expression decides on the possibilities, or productivity, of the expression whereas the token frequency of an expression helps to establish an expression in the language learner's memory enabling him/her to access the expression more easily.

Within this perspective there have been more recent studies (Dąbrowska, 2005; Dąbrowska and Szczerbiński, 2006; Krajewski et al., 2011) that tested the roles of type and token frequencies in the acquisition of morphological patterns and processing of both regular and irregular words (e.g., Bybee, 1995; Marchman, 1997). A high number of verb types contributing to a particular schema strengthens that schema and results in greater ease of generalization (Bybee and Newman, 1995; Dąbrowska 2004). In addition, type frequency has been shown to have a facilitating effect on children's correct production of regular and irregular inflected items (Dąbrowska, 2004; Ragnarsdóttir et al., 1999). Inflected words with high token frequency are predicted to be acquired earlier; since these forms are encountered frequently they are likely to be stored and incorporated into the existing representations. On the other hand, words with low token frequency are assumed to exhibit higher error rates. Studies of children from a variety of language backgrounds have shown that they are better at inflecting high than low token

frequency regular and irregular words (e.g., Dąbrowska, 2001, 2004; Marchman, 1997; Ragnarsdóttir et al., 1999).

In a study of Polish-born children Dąbrowska and Szczerbiński (2006) correlated the use of different inflectional patterns with the type frequency of these patterns in Polish and found a strong correlation between the type frequency of those patterns and their productivity. However, since the type frequency of the patterns was also strongly correlated with their token frequency, strong conclusions about the relative contributions of type and token frequencies are difficult. Such experimental studies show that even though the acquisition of inflectional endings initially starts early, productivity in the use of these inflections, which is responsive both to type and token frequencies, will develop gradually and in a piecemeal fashion.

On the other hand, it has been argued that performance on irregular verbs is sensitive not only to frequency but to similarity to other irregulars (Pinker and Prince, 1992; Ullman, 1999). Still other studies report the influence of frequency and phonological neighbourhood (clusters of words sharing phonological features) for both regulars and irregulars (Marchman, 1997; Orsolini and Marslen-Wilson, 1997; Alegre and Gordon, 1999; Ramscar, 2002). As was previously discussed within the single route approaches such as the schema (Bybee, 1988, 1995; Bybee and Slobin, 1982; Langacker, 1987, 2000) and connectionist accounts (e.g., Eddington 2009; Plunkett and Marchman, 1993; Plunkett and Nakisa, 1997; Rumelhart and McClelland, 1986), which differ from the dual route approach in assuming no qualitative distinction between regular and irregular items, the phonological form of a word in relation to other words the child knows is assumed to affect the processing of that word (Bybee, 1995; Marchman, 1997). If a word's base and inflected forms (e.g., *sing* → *sang*,

ring → *rang*) rhyme with many other words (i.e., the word has many phonological 'friends'), and if it has few/no 'enemies' (i.e., words whose base forms rhyme with it but whose inflected forms do not, e.g., *brake* → *braked, take* → *took*), the word should be easier to acquire/process than a word that has few friends and/or many enemies. There is some support for this claim from children acquiring English, where children have been shown to acquire morphologically complex/simplex words that have many phonological friends earlier than words that have no/few friends (Marchman, 1997; Storkel, 2004). Similarly, overgeneralization errors are commonly caused by phonological similarity between the overgeneralized/irregularized verb and a group of verbs rhyming with it (Kidd and Lum, 2008; Marchman, 1997; Ragnarsdóttir et al., 1999).

As was pointed out before, frequency also interacts with a number of other factors; neighbourhood effects in phonology and the semantic or prosodic salience of items in the input may increase or reduce the effects of frequency (Theakston et al., 2005). Ramscar (2002) questioned the assumption that inflection is driven solely by grammar and phonology. Using a series of elicited inflection tasks he showed that the forms participants produced to mark the past tense of a novel verb are significantly influenced by the semantic context in which the verb occurred. For example, if participants first encountered the novel verb *sprink* in a context which made it semantically similar to *drink* they were likely to produce an irregular past-tense form for it (i.e., *sprank*). However, if *sprink* was used in a context making it semantically similar to *blink*, the participants were likely to produce a regular past tense form (i.e., *sprinked*). On the other hand, Abbott Smith et al. (2004), adapting the methodology of Childers and Tomasello (2001), investigated the roles of semantic similarity in the acquisition of an English SVO transitive construction with

children aged 2;6 and found no evidence for semantic similarity. In Childers and Tomasello' study children heard transitive SVO sentences with familiar verbs during training and were encouraged to produce such sentences with novel verbs at test. In their study the training (familiar) and test (novel) verbs were both of the same semantic class (caused-motion). However, in Abbot-Smith et al. (2004) only training verbs were of this semantic class while test verbs were emission verbs. It was predicted that if semantic similarity is crucial for the process of analogy and acquisition, the children in Abbot-Smith et al.'s study should perform worse than the children the same-age in Childers and Tomasello's study. However, the results showed that the proportion of children who produced a transitive sentence with the test verbs was the same as the rate observed in the study of Childers and Tomasello (2001), where the training and test verbs were semantically related. According to Ninio (2005) these results can indicate that semantic similarity is not necessary for generalizing argument structures in acquisition. However, Abbot-Smith et al. (2004), point out that the children could have simply interpreted the verbs of emission as having an element of causation (one hand-puppet acting on the other) and therefore failed to differentiate between them and the training (caused-motion) verbs. Investigating the role of semantics in inflectional morphology is outside the scope of this study; however, further analysis would be needed to assess its influence on the acquisition of Persian verbal morphemes.

2.3.1.4 Continuity between lexical and grammatical development

One of the primary issues in language acquisition theories is the degree to which acquisition occurs as separate mechanisms in different domains. Various studies of early language acquisition within the functionalist account have revealed that there are continuities and interdependencies across and between different domains of language in the pathway of the acquisition, particularly between grammatical and lexical development. Such continuities have also been evidenced in the earliest stages of language acquisition, where the phonological inventory of children's vocal practice in babbling acts as the foundation for their subsequent word production (Vihman et al., 1986, Keren-Portnoy et al., 2010). Such continuities would not be expected if language acquisition is implemented by separate mechanisms across different domains. Focusing on later stages, different longitudinal and cross-sectional studies have shown non-linear correlations between vocabulary size and grammatical development among children (Bates and Goodman, 1999; Caselli, Casadio and Bates, 1999). These data indicate that lexical growth is a strong predictor of subsequent development in morphology and syntax and this relation may be a common property of language development. To discover whether the relation between lexical and grammatical development is also present when addressing particular aspects of grammar Marchman and Bates (1994), using the MacArthur CDI, investigated the relation between the number of verbs used in children's utterances and their development of verb morphology. The results showed a strong non-linear relation between the number of verbs used by the child and the production of regulars, correct irregulars and incorrect overgeneralizations. These results substantiate the existence of a relationship between the use of particular grammatical structures and the size of the verb vocabulary.

Similar results to Marchman and Bates (1994) were found in other naturalistic studies. In a longitudinal study of the development of nouns and verbs in the free speech of a French-speaking child between the ages of 1;2 and 2;6, Bassano (2000) found the quantitative production of noun and verb lexicons to be related to the development of grammatical classes of the noun and verb. After increases in lexical production, both nouns and verbs, there was a remarkable increase in the grammaticalization processes, measured by the use of the determiner for nouns and by inflection and auxiliary use for verbs. Bassano and Eme (2001), which also focused on the noun grammaticalization process in French, reported strong correlations between the level of grammaticalization and the number of noun types used by 10 children at ages 1;8 and 2;6. In these studies the initial rote learning occurred along with the incremental lexicon expansion, followed by a later period of erroneous production as a result of the growth of the lexicon. In other words, the overgeneralization of morphemes did not happen until the lexicon was large enough to support the extraction of general patterns. Then the tendency to produce errors decreased, depending on the frequency of the types in the input. These results agree with the 'critical mass hypothesis' (Bates and Goodman, 1999; Marchman and Bates, 1994), which argues that morphosyntactic development is prompted by an increase in the size of the lexicon over a certain level; this in turn confirms the interdependence of lexical and morphosyntactic developments.

However, contrary to the predictions of Marchman and Bates (1994), Marcus et al. (1992:99) have reported that the beginning of production of overregularization errors could not be explained by increases in the number of verb tokens or types produced by children or their parents, stating that "something endogenous to children's

grammatical systems and not a change in either their environments or the vocabularies causes overgeneralization errors to begin". In other words, in their analysis of 83 children's spontaneous speech overregularization did not correlate with increases in the number or proportion of regular verbs in parental speech, children's speech or children's vocabularies. These results suggest that what drives morphological advance is not the size of the verbal lexicon, which goes against the association between the lexical and morphological acquisition. According to Marcus et al. (1992), Marchman and Bates' (1994) use of parental checklists as a method for estimating vocabulary size has no advantage over recording spontaneous speech. To the contrary, parental checklists may underestimate the number of verbs used by the child and are no more accurate than counts based on transcripts, or may be even less so. Furthermore, Marcus et al. (1992) claim that since Marchman and Bates have no data on the overregularization rate ("the probability that the child will use an overregularization as compared to the correct irregular past"), their correlations are artifactual (Marcus et al., 1992:98).

2.3.1.5 Gradual development of grammar

The proposal that acquisition proceeds through gradual, piecemeal learning occurs frequently in the literature. In one of the initial approaches to language acquisition within the constructivist frame, Braine (1976) argued that the earliest word combinations in children's language are made through a limited range of formulas which can be completely different among children learning the same language at the earliest stages of development. Brown (1973) also documented the gradual process of acquisition in children leaning English as their first language. According to

MacWhinney (1978) children use the strategies of rote learning, analogy and combination in their early production of morphemes and word order. He proposed that when affixes are acquired, they will first be used with only a limited number of roots and will not be generalized to new roots. Clark (1974, 1982) also argued for children's use of superficial strategies to combine words and phrases into longer units before fully analysing them. Bloom, Lifter, and Hafitz (1980) investigated the early uses of the verbal inflections *-ing, -s,* and the irregular past in subjects between 22 and 28 months of age and documented the fact that, depending on the semantics inherent in the verb, these inflections were used only with particular verbs.

Supporting the idea of a piecemeal pattern of acquisition, Tomasello and Brook (1999:161) argue that "in the constructivist perspective children acquire linguistic competence in the particular language they are learning only gradually, beginning with more concrete linguistic structures based on particular words and morphemes and then building up to more abstract and productive structures based on various types of linguistic categories, schemas and constructions". Lieven and Pine have also recognized a piecemeal pattern of learning in the early use of a wide range of grammatical structures (Lieven, Pine, and Baldwin, 1997; Pine and Lieven, 1993, 1997). According to the advocates of the constructivist approach, larger proportions of errors are expected to occur in early productions.

These predictions have been substantiated by a variety of studies investigating the acquisition of morphology in languages other than English, such as Italian (Pizzuto and Caselli, 1994), Spanish (Gathercole, Sebastián and Soto, 1999), Portuguese (Rubino and Pine, 1998) and Spanish (Aguado-Orea, 2004); however, in spite of the results of these studies supporting a lack of productivity in the early stages, the low

overall error rate reported disguises parts of the system where error rates can be much higher. Aguado-Orea and Pine's (2015) analysis of the development of subject-verb agreement in Spanish-speaking children between the ages of 2;0 and 2;6, showed that the overall rate of agreement error in present tense contexts was 4%; this had already been reported by other studies (e.g., Gathercole, Sebastián and Soto, 1999 and Pizutto and Caselli, 1992). Similarly, in Aguado-Orea's (2004) study of two Spanish children's early development of verbal morphology, the overall error rate of person-marking on the verbs for the two children was at around 4.5%. However, Rubino and Pine (1998) point out that since such error rates collapse together information about inflectional contexts that occur with very different frequencies, they are potentially misleading. In other words, the children may show very low overall error rates despite showing much higher error rates for particular inflections. Similarly, Aguado-Orea and Pine's (2015) error analyses showed that, although the rate of subject-verb agreement errors in the children's speech was very low, this overall rate similar to previous studies hid the fact that error rates were considerably higher in low frequency contexts as compared to high frequency contexts (<1% for 3sg versus 30% to 50% for 3pl contexts), and significantly higher for low frequency than for high frequency verbs. These results are in line with constructivist models that claim "that low overall error rates will hide pockets of high error in low frequency parts of the system that reflect systematic gaps in children's partially productive knowledge" (Aguado-Orea and Pine, 2015:17). They therefore support the view that the children's early knowledge of verb inflection is limited in productivity.

Furthermore, Pizzuto and Caselli (1992, 1993, and 1994) argue that Italian-speaking children's productive use of verbal inflections is not more advanced than that of English-speaking children. Pizzuto and Caselli (1994), focusing on the apparent lexical specificity of children's early use of inflections, argue that in fact, in the early samples, the subjects of their study used only one form for each verb, taking this as evidence that their knowledge of verb morphology is initially tied to particular lexical items, which is similar to Tomasello's view. However, taking the Zipfian nature of language into account (Yang, 2011), Aguado-Orea and Pine (2015:2) point out that the reason for most of children's initial usage of verbs in only one form could be that most of the verbs "occur so infrequently in the relevant speech samples that the chances of them occurring in more than one form are extremely low". (see Chapter 4)

Arguing in favour of the view that children's early knowledge of verb inflection is less than fully productive, Pizzuto and Caselli (1994) report that the children only used a few verbal inflections productively. These included the third person singular indicative, which was productive for all three subjects, the first person singular indicative for two subjects and the first person plural indicative/imperative for only one subject. These results are in line with the proposition that person appears early in the speech of children acquiring rich inflectional languages (Grinstead, 1998, 2000; Hoekstra and Hyams, 1995). For example, Grinstead (2000:132) compares the production of person with number and tense examining Spanish and Catalan data. He argues that person is "active from the very beginning" while number and tense "do not form an active part of the clause structure of child Catalan and Spanish in the early stage". One possible explanation for this is the effect of target-language

typology on the acquisition of morphemes of different levels, which was discussed in previous sections.

To summarize, the usage-based, schema-based account of language acquisition claims that children's grammar is initially formed based on the phonological–lexical constructions that they receive from the input without analysis. Once a language learner has reached a certain threshold or 'critical mass' (Marchman and Bates, 1994) of whole (i.e., inflected words) stored in associative memory, schema-based abstractions will begin to develop on the basis of phonetic similarities between different stored items. In other words, when similarities are identified, related words are linked. These connections need not occur only at word level but can also occur at the level of bound morphemes (e.g., *-ed*). It is the detection of these similarities that results in the construction of schemas of varying levels of abstraction that simulate rule-like behaviour. According to Krajewski et al. (2012), the child begins to develop a schema in which an abstract slot appears in the place of varying stems once she has stored a number of word forms sharing paired forms in her lexicon. "Such a schema then works as a productive morphological pattern, into which a new lexical item can be accommodated (e.g., a verb can be inflected, even if the child has not heard a given inflectional form of that verb before)" (Krajewski et al., 2012:10).

This gradual course of development, along with the effect of phonological neighbourhood, types and token frequency in input, may clarify how children generalize constructions to new contexts based on the various kinds of type variation in the input, ranging from a single slot to all the parts of a linguistic construct. In addition, following the principles of Natural Morphology, in the course of language development the child prefers whatever is cognitively simple and therefore most

accessible. In other words, the child tends to select appropriate and natural structures from the input language. This is where typological factors such as transparency and perceptual salience of items in the input interact with frequencies and may increase or decrease the influence of frequency on acquisition (Theakston et al., 2005). In other words, what children hear in the input is critically important to interpreting the level of abstraction in their linguistic representations. But according to the Competition Model of Bates and MacWhinney (1987) it is not only the frequency of the form but also its salience and how reliable the mapping is of the form to the particular function that determine how this abstraction develops. In the Competition Model, which relies on the concept of linguistic cues (i.e., marking of a linguistic function by a linguistic form) in the input, the frequency of a cue (cue availability), its complexity (cue cost) and its consistency in indicating a function (cue reliability) are measures that can be used to quantify the role of input in language learning. Two dimensions of cues - availability and reliability - can be combined to give an overall measure of cue validity (Kempe and MacWhinney, 1998). Based on this model, Bates and MacWhinney (1987) predicted that children should first acquire those cues with the highest cue validity.

Dittmar et al., (2008) conducted an experimental study to investigate whether German children are able to use the grammatical cues of word order and word case markers to identify agents and patients in a causative sentence. Their results suggest that young German children rely on different input parameters at different stages of development; specifically, they rely more on cue availability (mainly frequency) early in development and more on cue reliability later in development. These findings suggest that children do not begin by attending to single cues, but rather

they learn the most frequent form with all the cues. In agreement with this view, many studies have reported the importance of frequency in early language development (see Lieven & Tomasello, 2008).

In this thesis the claims and concepts discussed in this chapter will be tested on Persian, a typologically different language with a complex system of verbal morphology.

3 Adult Persian

3.1 Introduction

In order to provide a clear picture of the morphological system that children acquire a brief description of Persian verbal system is presented providing an overview of the main features of verbal inflections in this language. Most of the examples used in this section have been adopted from the input speech of the mothers recruited for this study.

Iranian Persian, also known as Farsi, belongs to the Indo-Iranian branch of the Indo-European language family and is the most widely spoken of the modern Iranian languages. According to Windfuhr (1987), Classical Persian emerged around the thirteenth century and persisted until the beginning of the nineteenth century when contemporary standard Persian appeared. The three major dialect divisions of Modern Persian are Farsi, spoken in Iran; Dari, or the Persian of Afghanistan and Tajik, spoken in Tajikistan in Central Asia in the northeast.

Persian is a pro-drop language (i.e., pronouns are usually dropped as the verb form carries information about the person and number) with canonical Subject-Object-Verb (SOV) word order; however, its syntax can be variable as it does not always follow a strict word order and almost any element except adjectives can move to sentence-initial position in colloquial speech. According to Mahootian (1997), Persian word order in declaratives is identified as: (Subject)-(Object)-(Prepositional Phrase)-Verb, (S) (O) (P-P) V. This indicates that even a verb on its own can constitute a sentence:

2) (you) *raft - i* (EM)[2]
went-2SG
'you went'

3.2 Persian verb morphology

Each verb has two stems; present and past, and all tenses can be formed from one of these two stems. The infinitive ends in *-an* (e.g., *raft-an* 'to go'); the past stem is obtained by omitting the final *–an* of the infinitive (e.g., *raft).* However, the rule for obtaining the present stem of verbs is different and depends on the verb class. The 'regular' verbs form their present stem by omitting their past stem ending. On the other hand, there is no transparent relationship between the present stem and the past/infinitive of the 'irregular' verbs and they must be learnt individually. Some examples of the infinitive, past and present stems of regular verbs are given below. In these examples the present stem is obtained by omitting *–id* of the past stem:

Past Stem	**Present Stem**	**Infinitive**	**Gloss**
borid	*bor*	*borid-an*	'to cut'
xabid	*xab*	*xabid-an*	'to sleep'
xarid	*xar*	*xarid-an*	'to buy'
raghsid	*raghs*	*raghsid-an*	'to dance'

However, the most common verbs in Persian have irregular present stems. As Mahootian (1997), argued, in the following verbs the relation between the past and present stems is not rule-governed and the stems must simply be memorized.

Past Stem	**Present Stem**	**Infinitive**	**Gloss**
goft	*gu*	*goft-an*	'read'
amad	*ia*	*amad-an*	'to come'
did	*bin*	*did-an*	'to see'
shekast	*shekan*	*shekast-an*	'write'
kard	*kon*	*kard-an*	'make/do'

[2] Elly's mother

Persian morphology is an affixal system consisting mainly of suffixes and a few prefixes. The verbal inflectional system is quite regular and can be obtained by the combination of suffixes to mark the person/number and prefixes to express different tenses, aspects and moods, stems, A few tense/aspect constructions are also formed using auxiliaries.

3.2.1 The Suffixes

There are three kinds of suffixes: personal suffixes, non-finite suffixes and a causation suffix. As was mentioned earlier, Persian verbs in all tenses are modified according to person and number by taking personal suffixes. The set of personal suffixes according to Megerdoomian (2000) are classified as Present inflections, Past inflections and Imperative inflections (see Table 3-1).

Table 3-1 Personal Suffixes Paradigm

Present		**Past**		**Imperative**	
Singular	**Plural**	**Singular**	**Plural**	**Singular**	**Plural**
mixor-**am** I eat	mi-xor-**im** we eat	xord-**am** I ate	xord-**im** we ate	_	_
mixor-**i** you eat	mixor-**id** (mixor-in) ** you eat	xord-**i** you ate	xord-**id** (xord-in)* you ate	boxor* eat	boxor-**id** (boxor-in) ** eat
mixor-**ad** (mixor-e)** she/he eats	mixor-**and** (mixor-an)** they eat	xord * she/he ate	xord-**and** (xord -an)** they ate	_	_

* 3SG and 2SG have no suffixes in the past tense and imperative forms, respectively.
** the items in parentheses indicate colloquial usage

As can be seen in Table 3-1, the Present inflection paradigm largely overlaps with the Past paradigm in personal inflections, except for the 3SG morpheme, which is null in the Past tense. On the other hand, in the Imperative inflection paradigm only the plural form (2PL) overlap with the Present inflection paradigm.

The non-finite verbal suffixes consist of *-an* attached to the past stem to mark the infinitive, *-ande* inflecting the present stem to mark the Present Participle and *-e* attached to the past stem to mark the Past participle as in:

3) *kard-an* (MM)[3]
did-INF
'to do'

4) *xabid-e* (LM)[4]
slept-PP
'asleep'

Finally, the causation suffix *an/ani* is added to the end of the Present Stem of the verb and is followed by Personal inflections; however its discussion is beyond the scope of this study as it did not occur in the data collected.

3.2.2 The Prefixes

Verbs have just three prefixes: The Present/Imperfective marker *mi-*, marking the present and past stems, the IMP AFF/ SBJV marker *be-*, marking the present stem, and the NEG marker *na-*, added to the past and present stems. It should be noted that the SBJV marker and the Imperfective marker *mi-* never occur together on the same stem.

[3] Melika's mother
[4] Lilia's mother

The IMP/SBJV and the NEG markers are subject to phonological alternations depending on the following segment, as *be-* changes to *bo-* when the first vowel of the present stem is *-o* and the NEG morpheme *na-* changes to *ne-* if followed by the DUR marker *-mi*.

3.2.3 Persian Tenses and Aspects

Table 3-2 displays the forms of the most common Persian tenses and aspects used in the 3SG:

Table 3-2 Persian Tenses

Mood	**Tense/Aspect**	**Form**	**Gloss**
Declarative	Present	mi-rav-ad	He/she goes
Declarative	Past (Preterit)	raft	He/she went
Declarative	Present perfect	raft-e ast	He/she has gone
Declarative	Past perfect	raft-e bud	He/she had gone
Declarative	Present progressive	(dar-æd) mi-rav-ad	He/she is going
Declarative	Past prog (Imperfect)	(dasht) mi-raft	He/she was going
Declarative	future	xah-æd raft	He/she will go
Subjunctive	Present	be-rav-ad	...that he/she go

As Table 3-2 shows, in modern Persian the present tense, expressed by PRES prefix *mi-* followed by the present stem with a personal suffix (e.g., *mi-ravam* 'I go'), serves as both habitual and progressive; however, it should be noted that some verbs do not take the PRES prefix in the present tense (e.g., stem *dar* from infinitive *dashtan* 'to have'). Similarly the past imperfect tense, made up of *mi-* followed by the past stem with a personal suffix identifying person and number, can serve as both habitual and progressive in the past tense. In colloquial Persian, however, to express the present progressive and past progressive a compound verb is usually developed using auxiliary *dashtan* 'to have' in present and past stems, respectively; this only occurs in the affirmative and agrees with subject in person/number as in (5):

5) *Dar-i* *mi-xor-i* (EM)
Dar-2SG PRES-eat- 2SG
'you are eating'

The simple past tense in Persian is made up of the past stem followed by a personal ending indicating number and person.

The present perfect is made up of the past participle of the verb (past stem +*e)* + auxiliary *budan* (in simple present tense) + personal suffix.

In the past perfect, the past participle of the verb is followed by the auxiliary *budan* (in simple past tense). The past participle is non-finite in Persian; it is the auxiliary which agrees with the subject.

The present tense in SBJV mood, which is frequently used in Persian, is made up of prefix *be* + present stem + personal suffix. This mood is used to express doubt, wish, regret, request, demand, or proposal as in (6):

6) *mi - xah-im be-rav-im* (EM)
PRES-want-1 Pl SBJV-go-1PL
'we want to go'

It should be noted that in compound verbs consisting of *kardan* 'to do', SBJV/IMP prefix (*be-, bo-*) is often omitted.

7) *bazi kon* (MM)
play do
'play'

8) *mi - tavan-i bazi kon-i* (LM)
PRES-can-2SG play do-2SG
'you can play'

Although Persian has a future tense construction, it is primarily restricted to formal written texts. The future construction, made of *xah* (the present stem of the verb 'want') + personal suffix + 3SG past, is generally replaced by present tense in colloquial speech.

Negation in Persian is achieved through adding prefix *na-/ne-* to the beginning of the conjugated unit in every tense.

9) *Man **ne**- mi- dun-am.* (MM)
I Neg- PRES-know-1SG
'I don't know'

The negative in the SBJV mood is constructed by replacing the *be-/bo-* prefix with NEG marker *na-*.

10) *mi- shav- e na- charx -i* (MM)
PRES-would-3SG NEG-turn-2SG
'would you not turn around'

On the other hand, the Imperative mood is made by adding the prefix *be-* to the bare present stem of the verb; in the negative form (prohibitive mood) prefix *be-* is replaced by *na-* :

11) *Be-ro* (from the infinitive *raftan*) (EM)
Imp- go
'Go'.

12) Na-Ro (from the infinitive *raftan*) (MM)
Imp (NEG)-go
'Don't go'.

3.2.4 Compound verbs

Persian has a large number of compound verbs which are made with the few existing light verbs, such as *kardan* (do, make), *dada*n (give), *zadan* (hit, play) following nouns, adjectives and prepositions. One of the most popular light verbs used in making compound verbs is *kardan* 'to do'. This verb is widely used in Persian to make compound verbs with nouns and adjectives e.g:

13) shena kardan
swim do
'to swim'

14) ezdevaj kardan
marry do
'to marry'

15) kutah kardan
cut do
'to cut'

3.3 Stress in Persian verbs

Stress generally occurs on the word-final syllable. However, stress can be affected by affixation. According to Lazard (1992) personal suffixes do not affect stress

which remains on the final syllable of the stem before the personal suffix whereas verbal prefixes (i.e., the PRES/PROG prefix *mi-*, the IMP/SBJV prefix *be-/bo-*, and the NEG prefix *na- ne-*) all attract stress. According to Ferguson (1957), the only cases of final word stress in the Persian verb system are (1) the third person singular preterit, which has a zero ending, and (2) the infinitive and participle, which are essentially nouns in form; therefore, 'It is certainly safe to say that in modern Persian the verb has recessive stress'(1957:126). It should be noted that if there are two prefixes in a verb, the stress falls on the first prefix (e.g., *n**e**-mi-xah-am*).

3.4 Pronominal object clitics

Persian has a set of pronominal object clitics (POC) which refer to the direct object and appear after the personal suffix.

Table 3-3 Pronominal Object Clitics

Pronominal Object Clitics			
1 SG	-am	1 PL	-emun
2 SG	-et	2 PL	-etun
3 SG	-esh	3 PL	-eshun

In the case of light verb constructions, POC may appear either on the first element of the construction or after the light verb personal suffix as in (16) and (17):

16) Kutah-esh kard
Cut - 3 SG POC did
'He/ she cut it'

17) Kutah kard-esh
Cut did - 3SG POC
'He/she cut it'

Persian verbs, as was discussed, have a complex inflectional system and rarely surface as unmarked or bare stems as in most cases verbs can be built from combining affixes and stems (the 3rd person singular past tense is an exception). As in English these affixes can provide information about grammatical categories (person and number agreement, tense, aspect and mood) so that children are unlikely to produce a bare stem to which they are not exposed. Thus, in Persian, as in Polish, in most cases "morphological development should be conceived of as the acquisition of the ability to REPLACE grammatical morphemes according to the rules of the language rather than the ability to ADD them to the basic forms when required" (Smoczyńska, 1985:596). The acquisition of such a complex system could be expected to require a large amount of knowledge from speakers.

As was discussed earlier, perceptually salient syllables (i.e., those which appear at ends of words and those which carry stress) are easily segmented and therefore acquired; furthermore, transparent morphemes (i.e., where there is a one-to-one form-to-meaning relation) are expected to be easier to acquire, whereas the acquisition of opaque structures is grounds for difficulty for language learners. Since verbal prefixes in Persian encode only one function in a given verb and also attract stress they are expected to appear earlier in children's productions than personal suffixes. It should be noted that some grammatical functions are shared by Persian prefixes (i.e., IMP and SBJV are both expressed by *be/bo;* PRES and PI are both expressed by *mi-*); however, each prefix encodes only one function at a time; in other words, the relation between form and meaning is transparent. On the other hand, personal suffixes encode both person and number and therefore do not have a one-to-

one form-meaning relation; however, since they appear verb-finally they carry positional salience.

Therefore, based on the salient and transparent nature of prefixes it is predicted that these should appear and become productive earlier in children's productions than suffixes, which are perceptually salient but structurally opaque.

Furthermore, as discussed in Chapter 2, high-frequency instantiations in the input facilitate the acquisition of problematic form-function mappings. Therefore it is predicted that the more frequent a morpheme is in the input, the earlier it will emerge and become productive, regardless of the level of transparency and/or salience of morphemes.

Following the functionalist integrative model it is also predicted that there will be continuity between lexical and morphological development in the course of acquisition. In other words, it is predicted that children will apply their inflections to a wider range of verb types following an increase in the size of their verbal lexicon.

4 Methodology

4.1 Introduction

The results presented in this thesis are based on data from naturalistic samples of speech that have been collected on a longitudinal basis. This kind of methodology is well reported in the studies of child language. In fact, data collected on child language over thirty years ago are still being analysed (Bloom, 1970; Brown, 1973, MacWhinney, 1978) while more recent databases have also been developed (Lieven, Behrens, Spears, and Tomasello, 2003).

Naturalistic data collection provides a great deal of information about the language acquisition process and is an effective method of collecting data in order to investigate the role of input in child language development. Since naturalistic studies seek to observe language development in a particular child or group of children over a long period of time, they are likely to be longitudinal. As the name implies, longitudinal data collection takes an extended period of time to conduct; however, in contrast to cross-sectional studies, they permit language development to be monitored as an ongoing process in individual children (O'Grady and Cho, 2001). On the other hand, in view of the fact that some structures and constructs may occur rarely in children's everyday speech, it can be difficult to collect adequate information from natural speech samples to test hypotheses or come to solid conclusions; furthermore, speech samples collected using this methodology reflect only a small part of individual children's utterances at any given point in development because of the size of sampling (O'Grady and Cho, 2001).

Alternatively, in experimental studies, researchers control the conditions by applying specially designed tasks to elicit linguistic responses to their research questions. The children's responses are then the basis for the hypotheses about the type of grammatical structure they are employing at that point in time. Since experimental research studies and compares the linguistic knowledge of different children at a given point in language development, it is usually cross-sectional and therefore the subjects are meant "to be representative of a particular stage, or 'cross-section' of the developmental process" (O'Grady and Cho, 2001:410). Among the tasks employed in experimental studies to elicit linguistic activity are tasks to test children's production. In a typical production task, the child is shown a picture and asked to describe it. Although production tasks can be used to assess certain types of linguistic knowledge, many structures such as passives, which are used only in special contexts, are hard to elicit even from adults. Furthermore, production tasks can provide only a limited view of linguistic development because children's ability to comprehend language is often superior to their ability to construct sentences of their own (O'Grady and Cho, 2001; Ambridge and Rowland, 2013). In other words, production tasks provide an overly conservative view of linguistic development unless they are supplemented by other types of tests. On the other hand, comprehension methods do not require children to produce any language; instead, children show their comprehension of a structure or a sentence that is presented to them by picking a matching picture from a selection; this is done either implicitly by looking or explicitly by pointing. Such methods have been proved to be extremely useful when children are too young to take part in a production task. In addition, they are more suitable than production tasks for investigating the development of some linguistic structures, even with older children and adults. For example,

although adults may be able to produce all passives sentences correctly, they find these sentences easier to process with some verbs than others. However, it should be noted that for complex constructions such as those that involve relative clauses comprehension does not always precede production (Ambridge and Rowland, 2013).

Measuring productivity is a central concept in the study of morphological development. Since the introduction of modern approaches to language acquisition, productivity has been of major theoretical and methodological interest (e.g., Brown's 1973, 90% provision of grammatical morphemes in obligatory contexts as a measure of acquisition). Naturalistic studies focus on overgeneralisation rate as a measure of the productivity of morphemes; however, in more morphologically complex languages, the overgeneralisation rate can be very low (Smoczyńska, 1985; Dąbrowska, 2001; Krajewski et al., 2010). Furthermore, depending on sampling density, overgeneralisation errors can be difficult to find (Tomasello and Stahl, 2004). Therefore, other productivity measures may be used for assessing productivity, such as contrastive use of inflections. However, using this measure still cannot clarify whether the stem and inflection have been rote-learnt as a whole or not. Furthermore, as discussed in Chapter 2, a principle that underlies constructivist models of the development of verbal morphology is that children's knowledge of verb inflection develops gradually, meaning that children's early knowledge of inflection is only partially productive (i.e., does not automatically generalise to all verbs). Studies of the acquisition of verb morphology in English show that children fail to use appropriate tense and agreement morphology in obligatory contexts for a long period of time (Brown, 1973). In addition, in languages with a rich verbal morphology such as Spanish and Italian children's knowledge of verb inflection is initially tied to particular lexical items (Gathercole, et al., 1999; Pizzuto and Caselli,

1992). These results all suggest that children's knowledge of verb inflection is considerably less productive than adults'.

However, as pointed out in section 2.3.1.5, one problem with this interpretation, according to Aguado-Orea and Pine (2015), is that the limited flexibility of children's knowledge of verb morphology can be the result of the distributional properties of naturalistic speech samples, that is, due to sampling issues and not the limited nature of children's underlying knowledge. In other words, such interpretations implicitly assume that the verbal inflection system is fully productive in the spontaneous speech of adult speakers of the language. However, adult use of inflections need not represent full productivity, as using certain verb types may be restricted to particular inflections and use of certain inflections may be restricted to particular verb types.

A few recent studies have used rigorous methods to assess the morphological productivity of child speech in relation to adult speech (Aguado-Orea, 2004; Krajewski, Lieven and Theakston, 2012; Aguado and Pine, 2015) and the determiner category (Pine et al., 2013). In these studies comparing the use of children's and adults' use of inflections in matched speech samples while controlling potentially biasing differences between a child and an adult speech such as vocabulary range and sample size, children's use of inflections was found to be lexically more restricted than adults'. According to Aguado-Orea and Pine (2015:4) this comparative approach addresses "how productive children's knowledge" is, rather than focusing on when "children's knowledge becomes productive". The results of these studies suggest that it would be wrong to assume that the obvious lexical specificity of children's early speech is simply a sampling artefact (see Aguado-Orea, 2004 and Krajewski, Lieven, and Theakston, 2012).

One important aspect that needs attention when collecting naturalistic data is the amount of sampling required in order to obtain an accurate picture of the subject of interest. In other words, the density of sampling is a major variable in naturalistic studies. According to Tomasello and Stahl (2004) the typical samples used in the study of child language are assumed to be adequate for high-frequency items like children's use of copulas or pronouns in English; however, for low frequency targets sparse sampling is certainly not enough. For example, as was pointed out in Chapter 2, in Marcus et al's (1992) study of English-speaking children's past tense, issues of frequency and sampling were crucial factors in determining overgeneralization errors. Marcus et al (1992:29) excluded individual irregular past tense verbs that were sampled 10 times or less to avoid unreliable estimates. Since the lower frequency verbs were the ones that were overgeneralized most often, this procedure almost certainly resulted in an underestimation of error rate (Maratsos, 2000). In some cases also the low frequency was a reason to sum observed errors across many months, which masked any possible developmental effects (Tomasello and Stahl, 2004).

Since the aims of this study are to observe the development of high-frequency verbal morphemes in early stages of child language development and examine the role of input frequency in the development of morphemes, naturalistic data collection over an extended period of time serves our purposes. Furthermore, this study constitutes the first detailed study on the development of Persian verbal morphology; therefore, naturalistic data can give a wider picture of the development of verbal morphemes in children.

4.2 Data collection and sampling

For the purposes of this investigation, initially eight children, aged between 1;6 and 2;6, were recruited through friends and Iranian academic staff of the University of York who had contacts among Iranian residents in the UK. Since the children were widely located across the UK, an initial telephone conversation was arranged with the parents who expressed their willingness to participate in the study, in order to obtain some information about the age and language level of the children; afterwards information sheets describing the study and consent forms were sent to them via e-mail. They were given a few days to go through the information sheets and to ask any questions concerning the study and/or data collection. Those parents who indicated their interest in participating in the study were subsequently contacted for recording arrangements. The investigator carried out the recordings using a SONY camcorder provided by the University of York. In order to develop a corpus, spontaneous speech of the children was videotaped at one-to-two month's intervals in a naturalistic context while the children interacted with their mothers in play situations. The mothers were told to behave naturally and on occasions when the child felt uncomfortable with the presence of the investigator, the investigator left the scene. After a few months of recordings, English became the dominant language for one of the eight children when she stopped using Persian almost completely within a few months, due to extensive exposure to English through her bilingual parents, attending nursery and having an English-speaking nanny. Another child turned out to be extremely slow in linguistic development, considering the timescale of this study. The parents of the four other children did not continue their participation for various reasons such as relocating, loss of interest in recording

sessions, etc.; as a result only the two children identified by the pseudonyms, Elly and Melika, participated in data collection for a long enough period.

A total of seven sessions were recorded for Elly, out of which six sessions, which showed consistent increase in MLU (Mean Length of Utterance), have been chosen for the present study. In order to obtain samples in a comparable size for Melika, six out of twelve recorded sessions which correspond relatively to Elly's sessions in terms of MLU were selected.

The data for the third child of this study, Lilia, collected by Neiloufar Family in 2007, was obtained from the CHILDES database (MacWhinney, 2000), which includes a variety of language samples from a wide range of ages and situations. Recordings for Lilia were made between the ages of 1;11 and 2;10 in a natural setting, in the child's home in Tehran, while the child was primarily interacting with her mother and brother. Out of 30 sessions six were selected for this study on the basis of relatively consistent increase of MLU. In order to obtain samples in a comparable size for Lilia as for Melika, six sessions which correspond comparatively to Elly's and Melika's sessions in terms of MLU were selected.

In case of Elly and Melika the recordings consisted of play situations in the presence of the investigator. In contrast, the investigator was not present when Lilia's recordings were made; instead, the mother was given an audio recorder to record the sessions. Furthermore, Lilia's recordings were more varied, consisting of play situations and other activities, such as having dinner and/or watching TV. For Elly and Melika, every recording session lasted approximately forty minutes. In contrast, Lilia's recordings were of various lengths; in order to assess the children's development on a comparable basis, approximately 40 minutes of the selected

sessions were extracted for analysis. As an exception, for the fifth session (i.e., when Lilia was 2;6), 67 minutes were extracted, as many of Lilia's utterances in this session were limited to one word yes/no answers; in addition for some minutes the situation was non-interactive as Lilia was dancing to music. Therefore, Elly's speech samples are 243 minutes in total; Melika's speech samples are 246 minutes and Lilia's are 275 minutes (see Table 4-1).

Table 4-1 Child's Age & MLU & Length of Sessions

Age at session	Length of session (minutes)	MLU (words)	No. of Utterances	Age at session	Length of session (minutes)	MLU (words)	No. of Utterances	Age at session	Length of session (minutes)	MLU (words)	No. of Utterances
Elly				**Melika**				**Lilia**			
2;4	41	1.3	155	1;8	41	1.0	127	1;11	41	1.4	156
2;6	40	1.5	154	1;10	41	1.3	147	2;1	44	1.7	108
2;7	41	1.8	232	2	41	1.9	236	2;3	41	2.2	147
2;9	41	2	181	2;3	41	2.1	276	2;4	42	2.5	120
2;11	40	2	150	2;7	41	2.6	252	2;6	67	2.6	121
3;1	40	2.1	300	2;11	41	2.7	221	2;8	40	2.8	128

4.3 Participants

As was discussed in the previous section, the data for this study comes from a longitudinal study of three Persian monolingual children (Elly, Melika and Lilia) and their respective parents. **Elly**, who was born and raised in the UK as the only child of an Iranian family, participated in the study from the age of 2;4 to 3;1. Her parents are both native speakers of Persian who moved to the UK a few months before Elly was born. Elly's mother, a housewife, received her undergraduate education in Iran; she spoke English poorly and communicated only in Persian during the period of data collection; Elly's father, on the other hand, has a good command of English and did his postgraduate education in the UK; however, he was mostly away on overseas

trips during the period of the study. The family were rarely in contact with English speakers as they were living in an Iranian community and Elly was not attending nursery at the time, so her occasional exposure to English was through watching English TV programs (mainly CBeebies channel), which was kept to minimum, and looking at illustrated children's English books while the mother would read out the simple words for her. That was how Elly learned a few English words, consisting mainly of children's TV characters and words from children's rhymes as in (18 to 21):

18) *Pakka Pakka* (for Makka Pakka-TV character) (Elly 2;4)

19) *Head* (a word from 'Head, Shoulder Knees and Toes' rhyme) (Elly 2;4)

20) Mickey (for Mickey Mouse) (Elly 2;6)

21) Twinkle (a word from 'twinkle twinkle little star' rhyme) (Elly 2;7)

Melika was also born and raised in the UK. She participated in this study from the ages of 1;8 to 2;11. Melika is the only child of an Iranian couple who are both native speakers of Persian. Melika's parents received their undergraduate education in Iran and are both fluent in English; Melika was exposed to Persian at home through both of her parents and an uncle who was living with them from the time she was born; at the time when the recordings were made Melika's mother was her main caregiver, although the father also spent a considerable amount of time with her. Melika's exposure to English was through attending nursery three hours per week and watching English TV programmes for children. Therefore her English knowledge was limited to a few words she had learnt through nursery rhymes and possibly TV programmes (22 and 23):

22) *potty* (Melika 1;8)

23) *Twinkle twinkle* (Melika 2; 0)

Lilia, unlike the other two children, was born and raised in Iran. She is a second-born child living in Tehran, having an older brother who was 5;11 at the start of recordings. Lilia's main caretakers are her mother and her nanny. Lilia's parents are both professionals; however, her mother was on maternity leave at the time of data collection and therefore spent a considerable amount of time with her. Lilia's data was used from the age 1;11 to the age of 2;8.

The mothers of the three children are the main adult participants in the recordings. In the case of Lilia, her older brother was also present in most of the recordings.

4.4 Transcription and coding

Elly's and Melika's tapes were transferred to PC using Adobe Premiere Elements software as the recordings were being collected. ELAN software was used for viewing and transcription. All speech, produced by both children and adults, was transcribed and transliterated using English orthography in order to facilitate the reader's understanding of Persian structures. Comments about the context were also often provided. Self-repetitions and imitations of the parent or investigator's utterances as well as utterances containing unintelligible sections were labelled, to be excluded from the analysis. Rhymes, proverbs and English words were also marked for later exclusion.

For Lilia, transcription of the recorded sessions was done by Family using the CLAN software and all speech was transcribed in CHAT format (MacWhinney, 2000). Similar to Elly's and Melika's transcriptions, self-repetitions, imitations of the parent or investigator's utterances as well as utterances containing unintelligible sections, rhymes and proverbs were labelled to be excluded from the analysis.

4.5 Analysis

To serve the goals of this study, which are to discover the order in which children acquire the verbal morphological system and the factors that influence acquisition, I have established a methodology to track the children's developmental progress and to examine the influence of input on the development of morphemes at different levels.

First, the point in development at which the *first occurrence of inflections emerged* was observed and reported. Second, *productivity criteria* were applied based on the contrastive use of affixes and stems in Persian. Third, *contrastive knowledge of morphemes* was identified; and fourth, *the rate of provision of relevant morphemes in obligatory contexts* was measured in the children's data. Afterwards, *frequency* of relevant verbal morphemes in *parental input* was calculated and correlations computed in order to examine the influence of input on the order in which verbal morphemes appear and children begin to use them productively.

In observing the emergence of morphemes, some studies establish acquisition on the basis of a single occurrence of a morpheme; however, these studies do not examine to what extent the morpheme is productive; in other words, it is not possible to monitor points in development when productivity is not complete and therefore

gradual development cannot be observed. In order to avoid the possibility of the use of rote-learned first verbs, Pizzuto and Caselli (1992) proposed a different method supporting the approach according to which the production of verbal morphemes does not originate from the use of a generalisation rule; they suggest that 'any given inflection was beginning to be used productively by the child when a) the same verb root appeared in at least two distinct inflected forms and b) the same inflection was used with at least two different verbs' (Pizzuto and Caselli,1995:156). More recently, Gathercole, Sebastián and Soto (2002a) applied Pizzuto and Caselli's (1994) method of the contrastive criteria to Spanish corpora. They observed that different grammatical categories become productive in different orders. In order to credit a child with the acquisition of a morpheme a great number of previous studies have measured the number of correct morphemes provided by children at particular points in development. Cazden (1968:435) identifies point of acquisition as 'the first speech sample of three such that in all three the inflection is supplied in at least 90% of the contexts in which it was clearly required'. Taking into account the inflection system of Persian verbs, it is not possible to assess the contrastive use of inflections exclusively by observing their emergence and calculating their rates of provision in obligatory contexts; in other words, the production of a morpheme in a required context does not necessarily signify the child's ability to use that morpheme productively and contrastively, as the child may produce an inflection correctly with the same verb type several times in a given sample. As a result, in the present study a method is designed which combines the above methods in order to assess the productivity and acquisition of verbal morphemes in Persian.

4.5.1 Method

Following Brown's study (1973), in order to have a measure of the child's language development, the first 100 consecutive intelligible utterances were identified, excluding the first 5 minutes of the recordings; as in other studies of morphologically rich languages, MLU was measured in words rather than morphemes (see Table 4 1).

For the purpose of analysis all utterances containing verbs were selected. In order to identify the productive use of verbal inflections, the two-part criterion proposed by Pizzuto and Caselli (1994:156) was used; this criterion, which is widely used for inflectional languages, has been followed by Ezeizabarrena (1997); Gathercole et al. (1999, 2000); Pizzuto and Caselli (1994) and Vihman and Vija (2006). According to this measure of productivity a form has to meet two criteria:

a. The same verb stem appears in at least two distinct forms

(contrast for verb types)

b. The same inflection is used with at least two different verbs

(contrast for inflections)

However, due to the structures of Persian verbs it is possible for a form to meet the above criteria and still be rote-learnt and therefore remain unanalysed by the child. Therefore the above criteria have been adjusted to suit the structure of Persian verbs. As described in Chapter 2, verbs in Persian can have prefixes attached to their stems to mark aspect/mood and tense and suffixes in order to mark person/number; for example in:

24) *Bo - xor - am*
SBJV - eat - 1SG
'I (want to) eat'

bo signals SBJV mood while *am* signals 1 SG.

or in:

25) *na - xor - i*
NEG - eat - 2 SG
'you shouldn't eat'

na negates the stem while *i* marks 2 SG.

In order to determine the 'contrastive use'[5] of inflections and verb stems the following steps are applied:

To determine the contrastive use of suffixes for verbs, at least two verb forms (from the same stem) that carry the same prefix should occur to ensure that the different suffix indicates contrast for the verbs. Taken together, examples (26) and (27) illustrate contrastive use of 1SG and 2SG for the stem *xor*:

26) *bo - xor - **am***
SBJV - eat - 1SG
'I (want to) eat'

(Contrastive use of 1SG and 2SG for the stem xor)

27) *bo - xor - **i***
SBJV - eat- 2SG
'You (want to) eat'

Furthermore, the contrast for suffixes is determined on the basis of their use with at least two different stems bearing the same prefix. Taken together, examples (28) and (29) illustrate contrastive use of *xor* and *kon* for 2 SG:

[5] 'Contrastive use' is used here differently from the expression 'contrastive knowledge' used later in the thesis.

28) *bo* - ***xor*** - *i*
SBJV - eat- 2SG
'You (want to) eat'

(Contrastive use of *xor* and *kon* for 2SG)

29) *bo* - ***kon*** – *i*
SBJV - do - 2SG
'You (want to) do'

In example (30) the same verb stem (*xor*) has been used with two distinct suffixes (1SG and 2SG), establishing contrast for the verb stem; furthermore, 2SG is used with two different stems, establishing contrast for the inflection; therefore, 2SG is deemed to be productive as the verb stem *xor* appears in at least two distinct forms in suffix position (with 2SG and 1SG) and 2SG is used with at least two different verbs):

30) *bo* - *xor* - ***am***
SBJV - eat - 1SG
'I (want to) eat'

(Contrastive use of 1SG and 2SG for the stem *xor*)

bo - ***xor*** - ***i***
SBJV - eat- 2SG
'You (want to) eat'

(Contrastive use of *xor* and *kon* for 2SG)

bo - ***kon*** – *i*
SBJV - do - 2SG
'You (want to) do'

Similarly, to determine the contrastive use of prefixes for verbs, at least two verbs (from the same stem) that carry the same suffix should occur to ensure that the

different prefix indicates contrast for the verbs. Taken together, examples (31) and (32) illustrate contrastive use of SBJV and NEG for stem *xor*:

31) ***bo*** - *xor* - *am*
SBJV- eat - 1SG
'I (want to) eat'

(Contrastive use of SBJV and NEG for the stem *xor*)

32) ***na*** - *xor* - *am*
NEG- eat - 1SG
'I don't (want to) eat'

Furthermore, the contrast for prefixes is determined on the basis of their use with at least two different stems bearing the same suffix. Taken together, examples (33) and (34) illustrate contrastive use of *xor* and *kon* for SBJV:

33) *bo* - ***xor*** - *am*
SBJV- eat - 1SG
'I (want to) eat'

(Contrastive use of *xor* and *kon* for SBJV)

34) *bo*- ***kon*** -*am*
SBJV - do - 1SG
I (want to) do'

In example (35), SBJV is deemed to be productive when the verb stem *xor* appears in at least two distinct forms in prefix position (with SBJV and NEG) and SBJV is used with at least two different stems:

35) ***bo*** - *xor* - *am*
SBJV- eat - 1SG
'I (want to) eat'

(Contrastive use of SBJV and NEG for the stem *xor*)

na - ***xor*** - *am*
NEG- eat - 1SG
'I don't (want to) eat'

(Contrastive use of *xor* and *kon* for SBJV)

bo- ***kon*** -*am*
SBJV - do - 1SG
I (want to) do'

As can be seen in examples 30 and 35, the same verb stem (*xor*) has been used with two distinct suffixes (1SG and 2SG) and two distinct prefixes (SBJV and NEG, respectively), establishing contrast for the verb stem; therefore, in order to establish contrast for a given prefix or suffix, the verb stem should appear in at least two distinct forms in either prefix or suffix position, not in both.

Following Gathercole et al. (2002), in order to find out what features of the verbal paradigms (i.e., Person, Number, Mood, Tense, Aspect) have been learnt by each session, in addition to the above measure to establish the productivity of individual inflections, 'contrastive knowledge' of productive verbal elements was established on the basis of productivity for at least two persons, two moods or aspects or two numbers. This is because every verb form in Persian expresses some mood, aspect, person and number; thus if only one form (e.g., SBJV *be*- in 2SG SBJV as in *be-xor*-

i ‘you should eat’) is productive according the above two criteria, it is still not clear whether the child has established the knowledge of be until another inflection indicating a different mood is used productively. In addition, since person and number in Persian verbs are expressed by a single morpheme, if only one form (e.g., 1SG PRET as in *kard-am* ‘I did’) is productive according to the above two criteria, it cannot be concluded whether the child has established a given person (1) or number (SG) until another person or number is used productively in another form; “until this additional production is observed, we cannot rule out that the single form that is “productive” may be some kind of default form” (Gathercole et al., 2002: 688).

In order to establish the accuracy of morpheme production an obligatory context analysis was conducted and erroneous productions identified. An obligatory context is defined on the basis of a morpheme being required to make an equivalent grammatical utterance in adult speech. Following Cazden’s (1968) guidelines, obligatory contexts of use for each of the morphemes analysed were identified in the children’s production; afterwards, the children’s performance on each verb inflection was scored. It should be noted that an obligatory context analysis was carried out only on morphemes clearly required in the context. For example the use of SBJV prefix *be/bo* is optional with present stem *kon* from the infinitive *kardan* ‘to do’; therefore obligatory use could not be determined for this morpheme.

4.5.1.1 Acquisition of verbal morphemes

One of the problems in considering the development of inflectional morphology is defining the acquisition point of an inflection. If we focus on the assessment of acquisition, as discussed earlier, three different kinds of methods have been

considered in many observational studies: (1) observing the point in development at which the first instance of an inflection emerges; (2) applying criteria on the basis the contrastive use of affixes and verbal stems; and (3) measuring rates of provision in obligatory contexts.

For this study the point of acquisition of verbal inflections was determined following Pizzuto and Caselli's (1994) criteria of productivity and contrastive use of inflections adjusted to the Persian morphological system, together with Cazden's (1968: 435) criterion for production of morphemes in obligatory contexts; as discussed previously, this acquisition criterion is defined as "the first speech sample of three such that in all three the inflection is supplied in at least 90 percent of the contexts in which it is clearly required" (Cazden 1968: 435). Hence the point of acquisition of a given morpheme for this study is the first sample out of three successive speech samples in which a given morpheme is supplied correctly in at least 90% of the contexts in which it is clearly required as well as being used productively and contrastively in that sample. Where the context could not be determined, the utterance would be considered ambiguous for a particular inflection. In order to assess the reliability of coding, all the samples studied were re-coded by the investigator. The utterances which included ambiguous contexts were excluded from the study. However, due to the nature of Persian morphemes there were few cases of ambiguity.

The reasons to jointly apply these two criteria was, first, that some forms may not be produced by the child and one may wonder whether this is because the child has no occasion to do so, as those forms are not required by the context of use; one way to explore this is to look at the production of forms in obligatory contexts. On the other hand, the production of a morpheme in a required context does not necessarily

indicate that the child is able to use that morpheme productively and contrastively, as the child may produce an inflection with the same verb type several times in a given sample. However, after analysing the data it was discovered that some of the forms are used productively and their contrasts have been established in only one paradigm or person (e.g., productive and contrastive use of 1SG in SBJV paradigm only); this could indicate that the child was still using the morpheme within a limited scope; therefore, the third criterion suggested is that for a given morpheme to be established as acquired it should be used productively as well as establishing contrast in at least two different morphological paradigms/persons. In other words, a form is taken to be 'acquired' by the child if it meets all three of the criteria applied here: (1) Pizzuto and Caselli's criteria (1991) adjusted for Persian; (2) provision in at least 90% of the contexts in which it is clearly required and (3) productive use and established contrastive knowledge in at least two morphological paradigms. This indicates that the child should be able to use a form productively and contrastively widely in the required contexts to be credited with the command of a given verbal morpheme. The next chapter will explore and describe the results of the above analyses in order to shed light on the extent of use of the Persian morphological paradigms in Elly, Melika and Lilia's spontaneous productions.

5 Results of analyses

5.1 Introduction

The morphological system of verbs in Persian has a complex system in which the prefix and the suffix attach to the verb stem at the same time. These affixes provide information regarding certain grammatical categories (person and number agreement, mood, tense and aspect) resulting in the elaborate morphological system that was described in Chapter 3. The acquisition of such a complex system could be expected to require a large amount of knowledge from speakers.

This chapter focuses on the order in which Persian verbal morphemes emerge, become productive, establish contrast and finally become acquired by the children of this study; in order to assess the productivity and acquisition, a combination of criteria has been employed to assess the development of morphemes at different levels. The set of analyses in this chapter also include exploring the occurrence of errors in the children's speech; the next chapter will deal with the effect of input frequency on the order in which the verbal morphemes appear and become productive.

The forms appearing in the speech of the children in this study are Personal suffixes (i.e., 1SG, 2SG, 3SG, 1PL, 2PL, and 3PL), PP and prefixes (i.e., PRES, SBJV, PRET, PI, IMP AFF, IMP NEG, and NEG); pronominal object clitics were also present in the children's productions. However, the clitics are not included in the analyses due to their rare occurrence in the children's speech.

5.2 Results

The following graphs show the proportion of verb types appearing in different morphological forms identified in the production of each child by the last recording session regardless of whether their use was correct or not in obligatory contexts.

Figure 5-1 Prefixes produced in verb types by Elly

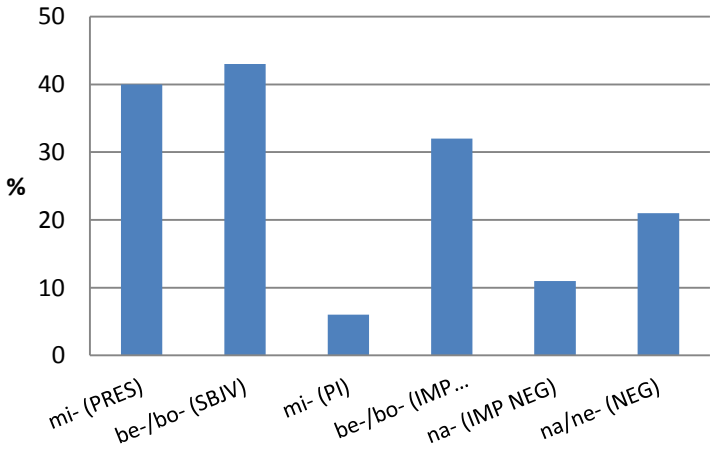


Figure 5-2 Prefixes produced in verb types by Melika

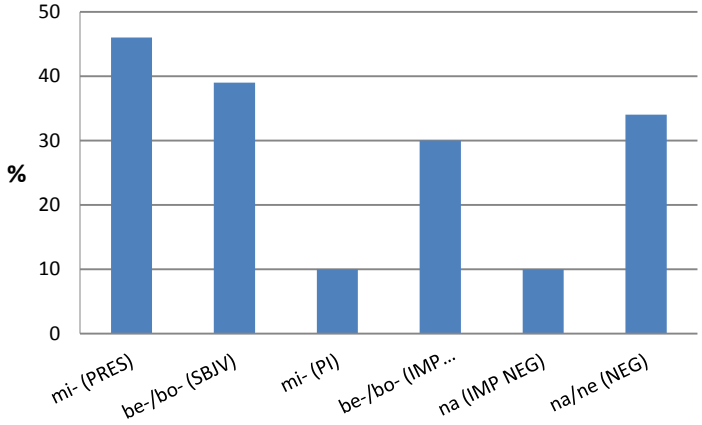
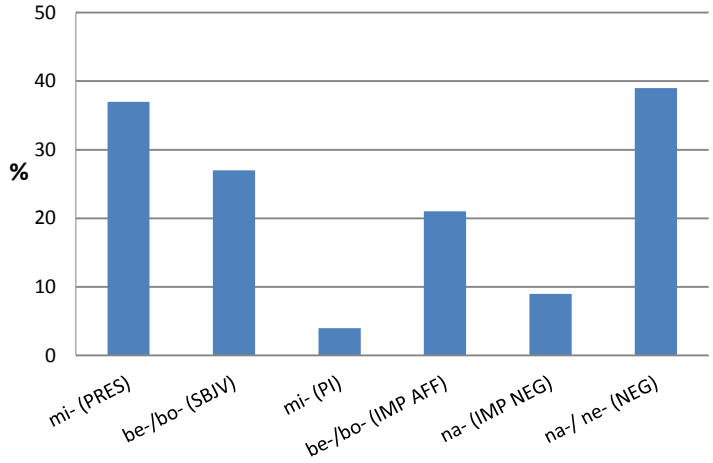


Figure 5-3 Prefixes produced in verb types by Lilia



As can be seen in Figures 5-1 to 5-3, PRES, SBJV, IMP AFF and NEG markers are frequently used in Elly's, Melika's and Lilia's productions whereas PI and IMP NEG are the least frequent prefixes in their productions.

According to Figures 5-4 to 5-6, 1SG, 2SG and 3SG are the most frequent suffixes in the children's productions whereas 1PL, 2PL, 3PL and PP are the least frequent suffixes.

Figure 5-4 Suffixes produced in verb types by Elly

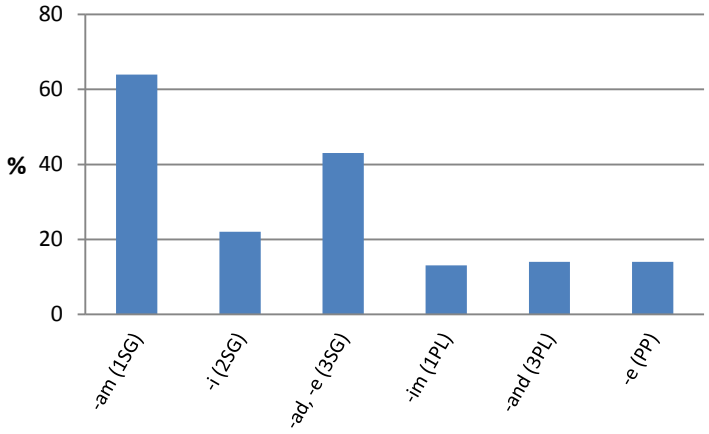


Figure 5-5 Suffixes produced in verb types by Melika

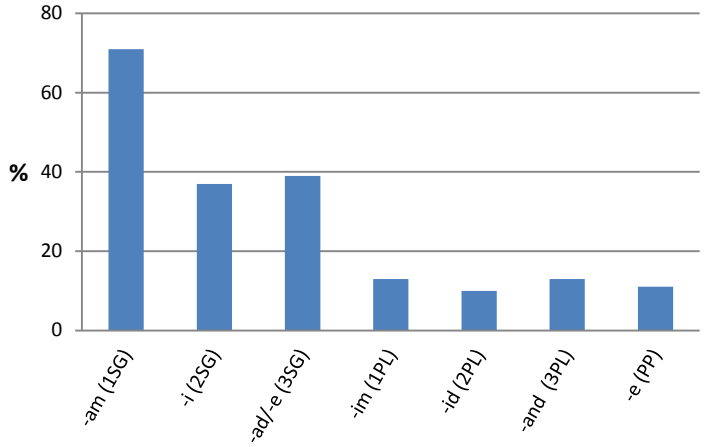
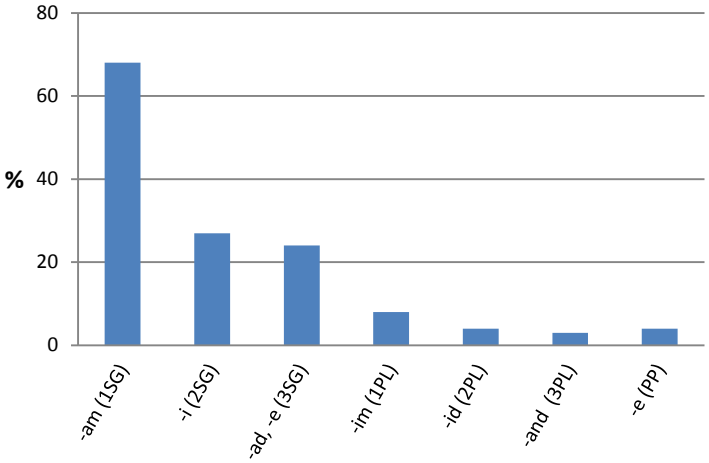


Figure 5-6 Suffixes produced in verb types by Elly



The inflections produced the most often in Elly's productions are the 1SG and SBJV markers, each supplied with over 60% and 40% of verb types, respectively. In Melika's samples 1SG and PRES markers are the most frequent inflections used. Lilia similarly used 1SG with over 60% of her verb types while NEG marker was the most frequent prefix supplied.

Following Gathercole et al (1999), the cumulative verb types used in each form by each child are classified in Appendix 1. Appendix 1 also shows the number of verbs that are used contrastively in a given form, following the criterion of productivity suited to Persian.

At first glance, the three children appear to be using a relatively wide range of structures with different verb types in their speech. Their command of Persian verbal morphology appears to be quite advanced and sophisticated. However, when the criterion for productivity is applied, we see that not all the forms are used productively; rather, in some cases the child produces a form with different verb types but none of them are used contrastively; for example, at 2;4 (MLU 1.3), Elly produced 1SG in the PRES paradigm with four verb types (*mi-kon-am* 'I do', *mi-xah-am* 'I want', *mixor-am* 'I eat' and *mi-zan-am* 'I hit'); however, none of the verbs showed any contrast (e.g., *mi-xor-am* and *bo-xor-e*). In this example, although the child has produced two different forms with the stem *xor*, no contrastive command of inflections can be credited as these verbs could be rote-learned.

In Appendix 2 the verbs each child produced at each session are shown along with the forms used. When a verb is first used in a new form contrastively in terms of suffixes or prefixes, that session is highlighted. As in Gathercole et al.'s (1999) study on acquisition of Spanish morphology, at the end of the appendix the proportion of verbs used contrastively by each session is calculated. Following Vihman and Vija (2006) this proportion is referred to as the contrast index, as it shows the fraction of verbs used contrastively in relation to the cumulative verb lexicon.

Figure 5-7 Proportion of verbs used contrastively by Elly

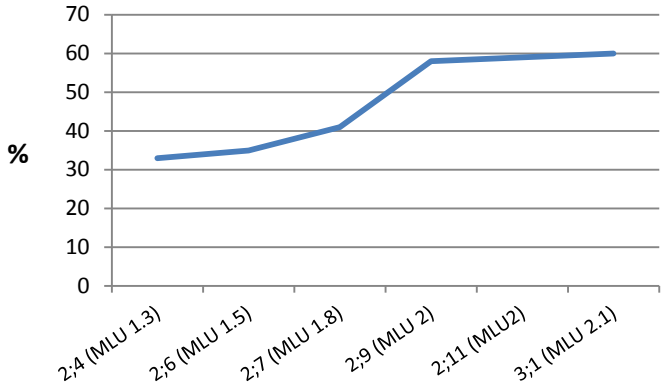


Figure 5-8 Proportion of verbs used contrastively by Melika

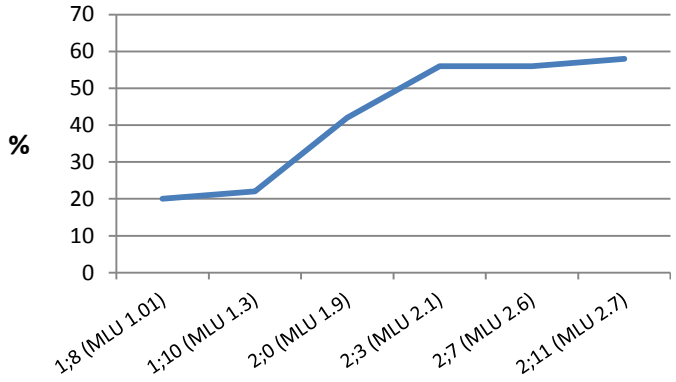
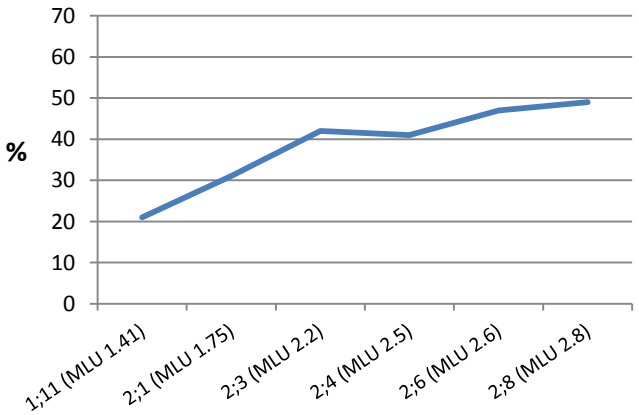


Figure 5-9 Proportion of verbs used contrastively by Lilia



As can be seen in Figures 5-7 to 5-9, there is a gradual increase in the proportion of verbs that occur contrastively, with the later sessions showing more verbs occurring in more than one form following the criteria set for determining contrastive use of Persian verbal inflections. In other words, the contrasts emerge gradually in Elly,

Melika and Lilia's productions. Alongside the increasing numbers of verbs occurring contrastively, new inflectional markers are established as productive in each period. Table 5-1 to Table 5-3 show the advances for each child on those elements that are used productively and contrastively.

5.2.1 Elly's production of verbal morphemes

Elly produced 62 verb types in the nine-month period of this study out of which 98% are overtly inflected. The only uninflected verb type is the compound verb *dard gereft* 'hurt' from the infinitive *dard gereft-an* 'to hurt', used in the 3SG PRET, which is a bare past in adult Persian. As can be seen in Figure 5-7, in Elly's cumulative verb lexicon, 33% show more than one inflected form used contrastively at 2;4 (MLU 1.3). This proportion increases to 41% in the three-month period to 2;7 (MLU 1.8) and finally reaches 60% by 3;1(MLU 2.1).

Table 5-1 Newly Productive Forms in Elly's Productions

Age/MLU	CUMU/V TYPE	Prefixes (mi-, be/ bo- na/ne-)						Suffixes (-am, -i, ad/e, -im, -and, -e,)				
		1 SG	2SG	3 SG	1PL	3PL	IMP	SBJV	PRES	NEG	PRET	PRES (no prefix)
2;4 1.3	15	SBJV **(be-)** PRES **(mi-)** **Contrast: Mood**	SBJV **(be-)**	SBJV **(be-)** PRES **(mi-)**			Imp, AFF **(be-)** Imp NEG **(na-)**	1SG **(am)** - 2SG **(i)** - 3SG **(ad)** - **Contrast:Person**	1SG (am) - - - 3SG(e/ad) -		- - **Ø** PP 3SG**(e)**	1SG **(am)**
2;6 1.5	31	SBJV **(be-)** PRES **(mi-)** NEG/SBJV **(na-)** **Contrast : AFF/NEG**	SBJV **(be-)** PRES **(mi-)**	SBJV **(be-)** PRES **(mi-)** NEG/SBJV **(na)** PI **(mi-)** **Contrast: Mood, AFF/NEG**			Imp, AFF **(be-)** Imp NEG **(na-)** **Contrast: AFF/NEG**	1SG **(am)** - 2SG **(i)** - 3SG **(e)** -	1SG **(am)** - 2SG **(i)** - 3SG **(e)** - **Contrast: Person**	1SG **(am)** - 3SG **(e)** **Contrast: Person**	1SG **(am)** - **Ø** PP 3SG **(e)** **Contrast: Tense**	1SG **(am)**
2;7 1.8	46	SBJV **(bo-)** PRES **(mi)** NEG/SBJV **(na-)**	SBJV **(be-)** PRES **(mi-)**	SBJV **(be-)** PRES **(mi-)** NEG/SBJV**(na)** PI **(mi-)**		PRES **(mi-)**	Imp, AFF **(Be-)** Imp NEG **(Na-)**	1SG **(am)** - 2SG **(i)** - 3SG **(e)** -	1SG **(am)** - 2SG **(i)** - 3SG**(e)** 3ppl **(and)** **Contrast: Number**	1SG **(am)** - 3SG **(e)**	1SG (am) 2SG **(i)** **Ø** PP 3SG**(e)**	1SG **(am)** 3SG **(e)**
2;9 2	50	SBJV **(be/bo-)** PRES **(mi-)** NEG/SBJV **(na-)**	SBJV **(bo-)** PRES **(mi)** NEG/SBJV **(na-)** **Contrast: Mood**	SBJV **(bo-/be-)** PRES **(mi-)** PI **(mi-)** NEG/SBJV**(na)** NEG/pres **(ne)** **Contrast: Tense/Aspect/AFF /NEG**	SBJV **(be-)**	PRES **(mi-)**	Imp, **(Be-)** Imp NEG **(Na-)**	**1SG (am)** 1PL(im) 2SG **(i)** - 3SG **(ad/e)** - **Contrast: Person**	1SG **(am)** - 2SG **(i)** - 3SG **(e)** 3PL**(and)**	1SG **(am)** 2SG **(i)** 3SG **(e)**	1SG **(am)** 2SG **(i)** **Ø** PP 3SG **(e)** **Contrast: Person/Tense/ Aspect**	1SG **(am)** 2SG **(i)** 3SG **(e)** **Contrast: Person**
2;11 2	57	SBJV **(be/bo)** PRES **(mi)** PI **(mi-)** NEG/SBJV **(na)** NEG/pres**(ne)** **Contrast : AFF/NEG**	SBJV **(bo-)** PRES **(mi)** NEG/SBJV **(na-)**	SBJV **(bo-/be-)** PRES **(mi-)** Imperft past **(mi-)** NEG/SBJV**(na)** NEG/pres **(ne)** NEG.past **(na)**	SBJV **(be-)** PRES **(mi-)**	PRES **(mi-)**	Imp, AFF **(Be-)** Imp NEG **(Na-)**	1SG **(am)** 1PL **(im)** 2SG **(i)** - 3SG **(ad/e)** **3PL(and)** **Contrast: Number**	1SG **(am)** 1PL(im) 2SG **(i)** - 3SG **(e)** 3PL**(and)**	1SG **(am)** 2SG **(i)** 3SG **(e)**	1SG **(am)** 2SG **(i)** **Ø** **3PL(and)** PP 3SG **(e)** **Contrast:Number**	1SG (am) **2SG (i)** 3SG **(e)** **Contrast: Person**
3;1 2.1	62	SBJV **(be/bo)** PRES **(mi)** PI **(mi-)** NEG/SBJV **(na)** **NEG/pres (ne)**	SBJV **(bo-)** PRES **(mi)** NEG/SBJV**(na)** **(Contrast: AFF/NEG)**	SBJV **(bo-/be-)** PRES **(mi-)** PI **(mi-)** NEG/SBJV**(na)** NEG/pres **(ne)** NEG.past(na) NEG past/part**(na)**	SBJV **(be-)** PRES **(mi-)** Imf past **(mi-)**	PRES **(mi-)**	Imp, AFF **(Be-)** Imp NEG **(Na-)**	1SG **(am)** **1PL (im)** 2SG **(i)** - 3SG **(ad)** **3PL(and)**	1SG **(am)** 1PL(im) 2SG **(i)** - 3psg **(e)** 3PL**(and)**	1SG (am) 2SG **(i)** 3SG **(e)** PP 3SG **(e)** **Contrast: Person**	1SG **(am)** - 2SG **(i)** - **Ø** 3PL**(and)** PP 3SG **(e)**	1SG**(am)** 1PL**(im)** 2SG**(i)** 3SG**(e)**

Table 5-1 illustrates the progression in those verbal forms which have become newly productive for Elly following the two-part criterion of productivity. An interesting finding to be seen in Table 5-1 is that forms are being used productively in different sessions for a single inflection. For instance, in the paradigm of Prefixes Elly produced PRES inflection *mi-* productively at 2;4 (MLU 1.3) in the 1SG by producing *mi-* with four different verb types while showing contrasts in the productions of *mi-zan-am* 'I hit' vs. *be-zan-am* 'I want to hit' and *mi-kon-am* 'I do' vs. *bo-kon-am* 'I want to do'. However, for the 3SG, no productive use of *mi* is seen until 2;6 (MLU 1.5): *mi-* has been used with only one verb type (*mi-rav-e* 'he/she goes'); within 2SG also no productive use of *mi-* is seen until 2;9 (MLU 2), when Elly produced *mi-xor-i* 'you eat' vs. *bo-xor-i* 'you should eat'. By 2;9 (MLU 2) Elly is using PRES and SBJV inflections productively and contrastively for all three singular persons; however, although by 3;1 several verbs were used in both forms (i.e., with *mi* and *be*/*bo*) in 1PL and 3PL, neither was used productively.

At 2;6 (MLU1.5) Elly adds the NEG inflection in the SBJV for the 1SG and 3SG; however, the NEG inflection in the SBJV for the 2SG is not used productively until 3;1 (MLU 2.1). Although Elly produced the IMP Affirmative (AFF) with 6 verb types at 2;4 (MLU1.3), no contrast for verb types occurred until 2;6 (MLU 1.5). Finally at 2;9 (MLU 2), productive and contrastive use of the imperfective inflection *mi-* is added in the 3SG.

Similarly, under the Suffixes category, 1SG is used productively from 2;4 (MLU 1.3) in the SBJV when Elly produces *–am* in the SBJV form with five verb types and uses *be-gir-am* ' I want to take' vs. *be-gir* ' take' while the 2SG inflection first becomes productive at 2;6 (MLU 1.6) in the PRES. In the SBJV mood, 1PL occurs only with one verb type at 2;9 and becomes productive by 2;11(MLU 2) while 3PL

becomes productive by 2;7 (MLU 1.8) in the PRES. By 3;1 (MLU 2.1), all the three singular persons are used productively and contrastively in SBJV, PRES and NEG forms.

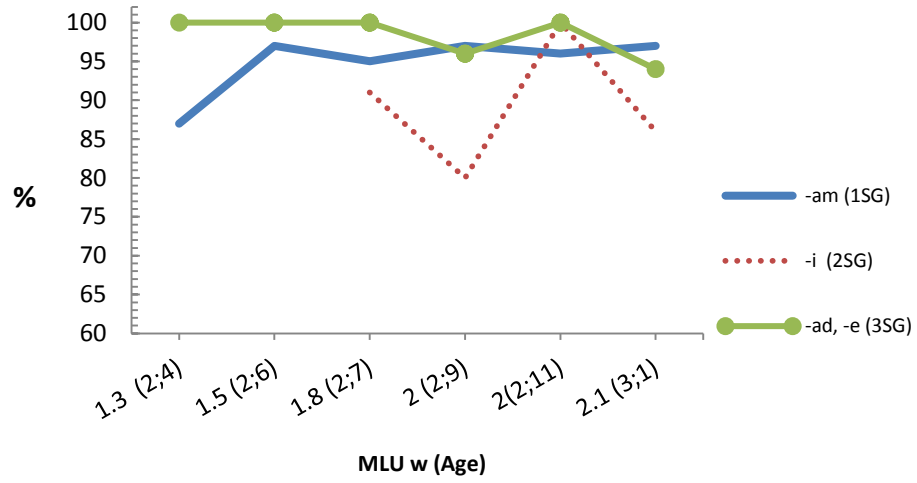
It can be gleaned from the results of Table 5-1 that the first contrasts emerging in Elly's use of inflections are a Mood contrast (SBJV vs. PRES) in the 1SG at 2;4 (MLU 1.3) and a Person contrast (1SG vs. 3SG) in the SBJV. Elly contrasts mood again at 2;6 (MLU 1.5), (NEG SBJV vs. PRES), this time in the 3SG. The first contrast to emerge for tense occurs at 2;6 (MLU 1.5) in the 1SG (PRET vs. PRES). At this time Elly also adds person contrasts within the PRES and NEG. She also establishes an AFF/NEG contrast in 1SG and 3SG SBJV forms as well as in the IMP. This is followed by a number contrast at 2;7 (MLU 1.8) when Elly for the first time uses 3PL productively. By the following session, at 2;9 (MLU 2), Elly adds a Tense/Aspect contrast within the 3SG where the PI contrasts with the PRES.

As was previously pointed out, productivity within one paradigm does not necessarily carry over to another paradigm. For example, the mood contrast between the SBJV and PRES forms in the 1SG does not appear in the 2SG until 2;9 (MLU 2); similarly the number contrast in the PRES does not occur elsewhere until it appears in the SBJV and PRET at 2;11 (MLU 2). So in order to determine the acquisition of these morphemes, as was previously suggested, one should look for their productive and contrastive use within at least two morphological paradigms along with establishing their use in the context for which they are clearly required.

5.2.1.1 Use of Elly's Verbal Morphemes in Obligatory Contexts

Figure 5-10 shows the percentage of morphologically correct occurrences of suffixes as a function of MLU (w) and age.

Figure 5-10 Elly's production of suffixes in obligatory contexts

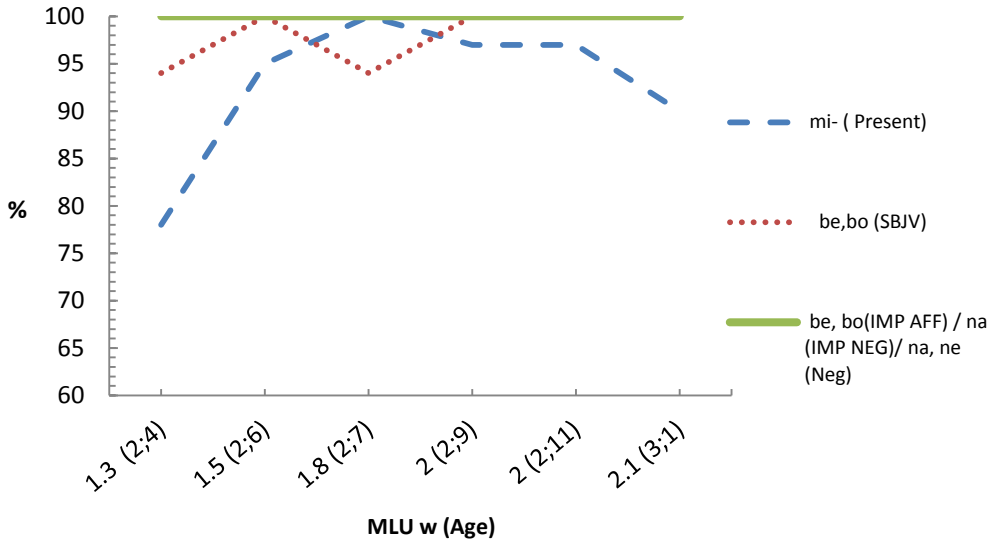


To illustrate the correct use of morphemes in obligatory contexts in the above graphs, the samples that contained fewer than five contexts of obligatory use were not shown. For example, in case of 2SG, in Elly's speech there was only one context for the obligatory use in the first sample and three in the second sample; according to the above graph this inflection does not meet this criterion of acquisition in the available data. In case of 3PL also, in all except the fifth sample the number of obligatory contexts of use were less than five. This is to be expected as according to Brown (1973), the constraints that define obligatory use are themselves acquired over time (1973:257). The emergence of 1PL inflection occurred at 2;9 (MLU 2) ; this morpheme was first produced over 90% in more than five obligatory contexts at 3;1 (MLU 2.1); however, since no later samples are available for the use of this

inflection the correct use of this morpheme in obligatory contexts in three successive samples could not be determined. On the other hand, from 2;6 (MLU 1.5) 1SG is produced in over 90% of obligatory contexts; 3SG is also produced in over 90% of obligatory contexts in all the investigated samples.

Figure 5-11 shows the percentage of morphologically correct occurrences of prefixes as a function of MLU (w) and age.

Figure 5-11 Elly's production of prefixes in obligatory contexts



According to Figure 5-11, in Elly's speech, the PRES inflection *-mi* started to be used in 90% of obligatory contexts from 2;6 (MLU 1.5). SBJV inflection *be-/bo-* showed over 90% of correct use in obligatory context from 2;4 (MLU1.3). Furthermore, IMP (AFF/NEG) and negation inflections were also produced 100% in obligatory contexts in all the samples.

Following determining the rates of provision of verbal morphemes in obligatory contexts as well as their productive use in Elly's speech, in the following section acquisition point of verbal morphemes is discussed.

5.2.1.2 Elly's acquisition of suffixes

Following the two-part criteria of productivity suited to Persian, according to Table 5-1, 1SG and 3SG inflections were first used productively and contrastively in at least two paradigms (SBJV, PRES and NEG) by 2;6 (MLU 1.5). Another index of acquisition is given by the 90% correct production of these morphemes in obligatory contexts at 2;6 (MLU 1.5). Thus it can be said that at 2;6 (MLU 1.5) the production of 1SG and 3SG meets the full criteria of acquisition, indicating that the child had acquired these two morphemes by 2;6 (MLU 1.5).

The 2SG first became productive and was used contrastively at 2;6 (MLU 1.5) within the PRES paradigm only. At 2;9 (MLU 2) Elly started using this inflection productively and contrastively in the SBJV and PRET paradigms as well; however, Elly's use of this inflection in obligatory context did not meet the 90% of correct use in three successive samples as at 2;9 (MLU 2) her correct production reduced to 80%; this was due to the errors she made, using the 1SG in place of 2SG in the following utterances (errors are underlined):

36) Motor- et- o mi- dah- am bazi *kon-**am*** (for *koni-**i***)
motorbike- POSS -ACC PRES- give-1SG play- ISG play-2SG

'I give you your motorbike to play'

37) charx-am- o mi- dah- am bazi *kon-**am*** (for *kon-**i***)
bike- POSS –ACC PRES-give- 1SG play- 1SG play-2SG

'I give you my bike to play'

Therefore Elly cannot be credited with the acquisition of 2SG following the acquisition criteria in this study. The 1PL was first used in Elly's speech at 2;9 (MLU 2) within the SBJV paradigm with only one verb type (this can be due to the presence of only three obligatory contexts in this session) and then it started to be

used productively and contrastively at 2;11 (MLU 2), still within the SBJV paradigm. Furthermore, it only started to be used in over 90% in more than five obligatory contexts at 3;1 (MLU 2.1), the last investigated sample; thus, although 1Pl started to be used productively and contrastively at 2;11 (MLU 2), it did not meet the criterion of use in at least two paradigms as well as 90% correct use in obligatory context in three successive samples and therefore its acquisition could not be determined.

The 3PL only started to be used productively and contrastively at 2;7 (MLU 1.8) in one paradigm as there was no context for its production prior to that age; by 2;11 (MLU 2) when it was used in the PRES and PRET paradigms it did not meet the obligatory context requirement and therefore the acquisition criteria so it could not be classified as an acquired inflection in this study. The PP *-e* in 3 SG did not become productive and contrastive until 2;9 (MLU 2); however, there is not enough evidence to show that it was correctly used in obligatory contexts as its production over 90% in a session with more than 5 obligatory contexts only occurred at 3;1 (MLU 2.1). The number of obligatory contexts for each form is shown in Appendix 3.

5.2.1.3 Elly's acquisition of prefixes

As previously discussed, Elly started using PRES inflection *mi-* productively and contrastively in two persons (1SG and 3SG) from 2;6 (MLU 1.5). This session was also the first of three consecutive sessions in which she produced *mi-* in 90% of obligatory contexts. Therefore the child can be credited with PRES inflection at 2;6 (MLU 1.5). The SBJV inflection *be/bo*, which meets Cazden's (1968) acquisition criterion in all samples, started to be used productively and contrastively at 2;4

(MLU 1.3) in the 1SG; however, it should be noted that although SBJV inflection is used productively also in the 3SG, it does not establish any contrast in the 3SG until 2;6 (MLU 1.5) therefore it cannot be said to be acquired until 2;6 (MLU 1.5).

At 2;6 (MLU 1.5), Elly also fills in the NEG that she uses productively and contrastively in the 1SG and 3SG and in 100% of obligatory contexts. By this session Elly also shows a productive and contrastive command of the IMP in NEG and AFF forms in 100% of obligatory contexts. It should be noted that since the IMP form does not take any suffixes, the criterion of usage in more than one paradigm does not apply to this morpheme; thus the child can be credited with the IMP morphemes at 2;6 (MLU 1.5).

Finally at 2;9 (MLU 2), Elly develops productive and contrastive use of the Imperfect inflection *mi-* in 3SG only, which occurred with 2 verb types; furthermore, there were only three obligatory contexts of use for this morpheme by 2;9 (MLU 2); therefore, the index of acquisition for this morpheme could not be met.

From these data, if we want to make a categorical statement regarding sequence of development of inflection in terms of productive and contrastive use only, we would have to say that in Elly's speech, Person and Mood contrasts develop before Tense and AFF/NEG contrasts and these in turn develop before Number and Aspect. Thus, the picture of development for Elly can be schematized as follows:

Mood, Person> AFF/NEG, Tense> Number> Aspect

5.2.2 Melika's production of verbal morphemes

Melika produced 69 verb types in the fifteen-month period of this study, with 95% overtly inflected verb types. The only uninflected verb types are *bord* 'took' from the infinitive *bordan* 'to take', *pashid* 'threw' from the infinitive *pashidan* 'to throw' and *tarsid* 'got scared' from the infinitive *tarsidan* 'to get scared', used in the 3SG PRET form, which are all bare past stems in adult Persian. According to Figure 5-2 andFigure 5-5, the inflections produced the most are the 1SG and PRES marker, supplied with over 70% and 40% of Melika's verb types, respectively. As can be seen in Figure 5-8, in Melika's cumulative verb lexicon, 20% of verb types show more than one inflected form used contrastively at 1;8 (MLU 1). This proportion increases to 42% in the four-month period to 2;0 (MLU 1.9) and finally reaches 58% by 2;11 (MLU 2.7).

As was previously mentioned, along with the increasing numbers of verbs occurring contrastively in each period, new inflectional markers are used productively. However, as was seen in Elly's productions, it is evident from the results of Appendix 1 that although Melika is using several verbs in each of the forms, there is no evidence to show that all the forms have been used productively; rather, in some cases the child produces different forms of the verb but they are not used contrastively.

Table 5-2 demonstrates the advances in those verbal forms which have newly become productive in Melika's productions following the revised two-part criterion of productivity.

The first inflection under the paradigm of Prefixes which Melika started producing productively is the NEG form *na-* in SBJV form in the 1 SG and 3 SG at 1;10 (MLU

1.3). This is followed by the productive and contrastive use of SBJV inflection *be-/bo- and* PRES inflection *mi-* at 2;0 (MLU 1.9) in the 1SG and the 3SG. However, no productive use of these forms is seen until 2;3 (MLU 2.1) for 2SG, when Melika uses PRES and SBJV inflections productively and contrastively for all three singular persons. On the other hand, for the plural by 2;7 (MLU 2.6) only SBJV inflection *be*/*bo* was used productively in the 1PL and by 2;11 (MLU 2.7) no other productive productions of the two inflections (i.e., *mi* and *be/bo*) occurred in the plural form. At 2;0 (MLU 1.9) Melika adds the productive and contrastive use of IMP in AFF and NEG forms. By 2;3 (MLU 2.1) she also shows a productive and contrastive use of Imperfective Past inflection *mi-* in the 3SG and by 2;11(MLU 2.7) in the 1SG.

Similarly, under the Suffixes category, 1SG is used productively from 1;10 (MLU 1.3) in the SBJV and NEG forms while the 2SG inflection first becomes productive at 2;0 (MLU 1.9) in the SBJV mood. By 2;3 (MLU 2.1), 1SG, 2SG and 3SG are all used productively and contrastively in the SBJV, PRES and NEG forms.

The 1PL and 2PL first become productive at 2;3 (MLU 2.1) in the SBJV mood while 3PL becomes productive in the PRES form by 2;7 (MLU 2.6).

It can be seen from the results of Table 5-2 that the first contrast emerging in Melika's use of inflections is a person contrast (1SG vs. 3SG) in the NEG form only, at 1;10 (MLU 1.3). Melika contrasts mood first at 2;0 (MLU 1.9), (SBJV vs. PRES), in the 1SG and 3SG. At 2;0 (MLU 1.9), Melika establishes AFF/NEG contrasts in the1SG and 3 SG as well as in the IMP. The first contrast to emerge for tense also occurs at 2;0 (MLU 1.9) in the 1SG (PRET vs. PRES). At this time Melika also adds more person contrasts but this time within the PRES and the SBJV. This is followed by another mood contrast (SBJV vs. PRES) in the 2SG at 2;3 (MLU 2.1). By this

session, Melisa also adds a Tense/Aspect contrast in the 3SG where the PI contrasts with the PRES. At 2;3 (MLU 2.1) she also develops a Person/Number contrast in the SBJV and PRET and more Person contrasts in the PRES, NEG and PRET. By 2;11 (MLU 2.7) Melika's speech shows more contrasts in different paradigms and persons (see Table 5-2).

Table 5-2 Newly Productive Forms in Melika's Productions

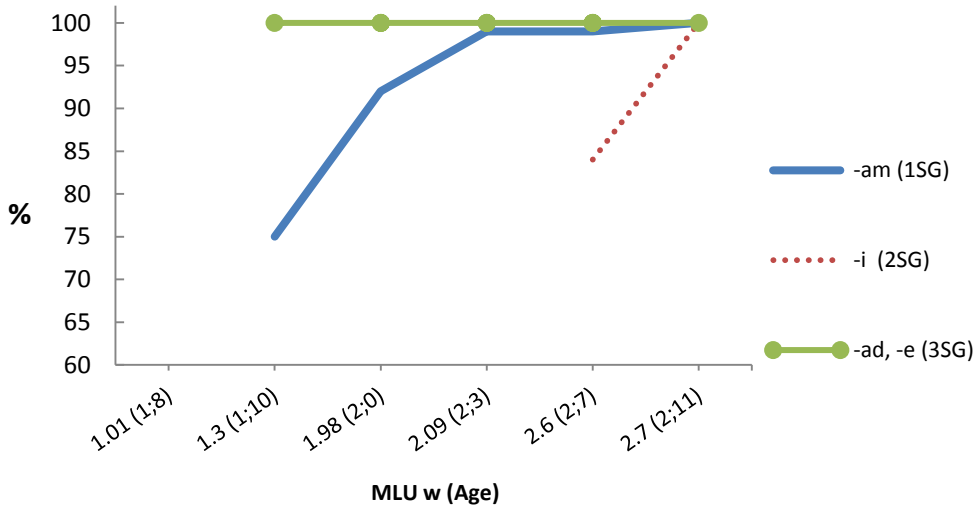
Age/MLU	CUMU/V TYPE	Prefixes (mi-, be/ bo- na/ne-)							Suffixes (-am, -i, ad/e, -im, -and, -e)				
		1SG	2SG	3SG	1PL	2PL	3PL	IMP	SBJV	PRES	NEG	PRET	PRES (no prefix)
1;8 1.03	5	SBJV (be/bo)						IMP AFF **(be)**	1SG(am)				
1;10 1.3	18	SBJV **(be/bo-)** PRES(mi) NEG/SBJV **(na-)** NEG/PRES **(ne)**	PRES **(mi-)** SBJV **(be/bo-)**	SBJV **(be/bo-)** PRES **(mi-)** NEG/SBJV **(na)** NEG/PRES**(ne)**				IMP AF **(be)**	1SG **(am)** 2SG **(i)** 3SG **(e)**	**1SG (am)** 2SG **(i)** 3SG **(e)**	1SG **(am)PRES -** 3SG **(e)** **Contrast: Person**	**1SG (am)** - **Ø**	1SG **(am)** **2SG (i)** 2PL(in) 3SG **(e)**
2;0 1.9	35	SBJV **(bo-be)** PRES **(mi)** NEG/SBJV (na-) NEG/PRES**(ne)** NEG/PRET(na) **Contrast: Mood,AFF/NEG/tense**	PRES **(mi-)** SBJV **(be/bo-)**	SBJV **(be/bo-)** PRES **(mi-)** NEG/SBJV **(ne)** **NEG/PRES (ne)** **NEG/PRET(na)** **Contrast: Mood,AFF/NEG/tense**				IMP AFF **(be)** IMP NEG **(Na)** **Contrast: AFF/NEG**	1SG **(am)** 2SG **(i)** 3SG **(e)** **Contrast: Person**	1SG **(am**) 2SG **(i)** 3SG**(e)** **Contrast: Person**	**1SG (am)p** - 3SG (e) Contrast: Person	1SG **(am)** 2SG**(i)** Ø 3PL(and) **PP 3SG (e)** **Contrast: Tense**	1SG **(am)** **2SG (i)** 2PL(in) 3SG **(e)**
2;3 2	50	SBJV **(be/bo-)** PRES **(mi)** NEG/SBJV **(na-)** NEG/PRES**(ne)** NEG/PRET(na)	SBJV **(be/bo-)** PRES **(mi)** NEG/SBJV **(na-)** **NEG/PRES(ne)** **Contrast: Mood**	SBJV **(Be-)** PRES **(mi-)** PI **(mi-)** NEG/SBJV **(ne)** **NEG/PRES (ne)** **NEG/PRET(na)** **Contrast: Tense/Aspect**	SBJV **(be/bo)** NEG/SBJV (na)	SBJV **(be/bo)**	PRES**(mi-)**	IMP NEG **(Na)** IMP AFF **(Be)**	1SG **(am)** 1ppl **(im)** 2SG **(i)** **2PL (id)** 3SG **(ad/e)** **Contrast: Person,Number**	1SG **(am)** 2SG **(i)** 3SG **(e,ad)** 3PL(and) **Contrast: Person**	1SG **(am)** 1PL **(im)** 2SG **(i)pr** 3SG **(e)** **PP 3SG (e)** **Contrast: Person**	1SG **(am)** 2SG**(i)** Ø **3PL(and)** **PP 3SG (e)** **Contrast: Person/Tense/Aspect/Number**	1SG**(am) 1PL(im)** 2SG **(i)** 2PL(in) 3SG **(e)** **Contrast: Number**
2;7 2.6	56	SBJV **(be/bo)** PRES **(mi)** PI **(mi-)** NEG/SBJV **(na-)** NEG/PRES**(ne)** NEG/PRET(na)	SBJV **(bo-)** PRES **(mi)** NEG/SBJV **(na-)** NEG/PRES **(ne)** **Contrast: AFF/NEG**	SBJV **(be)** PRES **(mi)** PI **(mi-)** NEG/SBJV**(na)** **NEG/PRES (ne)** **NEG/PRET(na)**	SBJV **(be/bo)** NEG/SBJV (na)	SBJV **(be/bo)** NEG/PI	SBJV **(be/b o)** PRES **(mi-)**	IMP AFF **(Be)** IMP NEG **(Na)**	1SG **(am)** 1ppl **(im)** 2SG **(i)** **2PL (id)** 3SG **(ad/e)** 3PL(and)	1SG **(am)** 2SG **(i)** 3SG **(e)** **3PL(and)** **Contrast:Number**	1SG **(am)** 1PL **(im)** 2SG **(i)** **2PL(id)p** 3SG **(e)** **PP 3SG (e)**	1SG **(am)** 2SG**(i)** **Ø** **3PL(and)** **PP 3SG (e)**	1SG **(am)** 1PL**(im)** 2SG**(i)** 2PL(in) 3SG**(e)**
2;11 2.7		SBJV **(be/bo)** PRES **(mi)** PI **(mi-)** NEG/SBJV **(na-)** NEG/PRES**(ne)** NEG/PRET(na) **Contrast: Tense/Aspect**	PRES **(mi)** SBJV **(be/bo)** NEG/SBJV **(na)** **NEG/PRES(ne)**	PRES **(mi)** SBJV **(be/bo)** PI **(mi-)** NEG/SBJV**(na)** **NEG/PRES (ne)** **NEG/PRET(na)**	SBJV **(be/bo)** NEG/SBJV (na) PI **(mi-)**	SBJV **(be/bo)** NEG/PI	SBJV **(be/bo)** PRES**(mi)** **NEG PRES (na)**	IMP AFF **(Be)** IMP NEG **(Na)**	1SG **(am)** 1ppl **(im)** 2SG **(i)** **2PL (id)** 3SG **(ad/e)** 3PL(and)	1SG **(am)** 2SG **(i)** 3SG **(e)** 3PL(and)	1SG **(am)** 1PL **(im)** 2SG **(i)** **2PL(id)** 3SG **(e)** 3PL(and)p	1SG **(am)** 2SG **(i)** **Ø** 3PL(and) **PP 3SG (e)** **Contrast: Person**	1SG **(am)** 1PL**(im)** 2SG**(i)** 2PL(in) 3SG**(e)**

As was previously seen in Elly's productions, productivity within one paradigm/person does not necessarily carry over to another paradigm/person. So in order to determine the acquisition of these morphemes, in addition to determining their use in the obligatory contexts we should look for their productive and contrastive use within at least two morphological paradigms.

5.2.2.1 Use of Melika's Verbal Morphemes in Obligatory Contexts

Figure 5-12 below shows the percentage of morphologically correct occurrences of suffixes as a function of MLU (w) and age.

Figure 5-12 Melika's production of suffixes in obligatory contexts

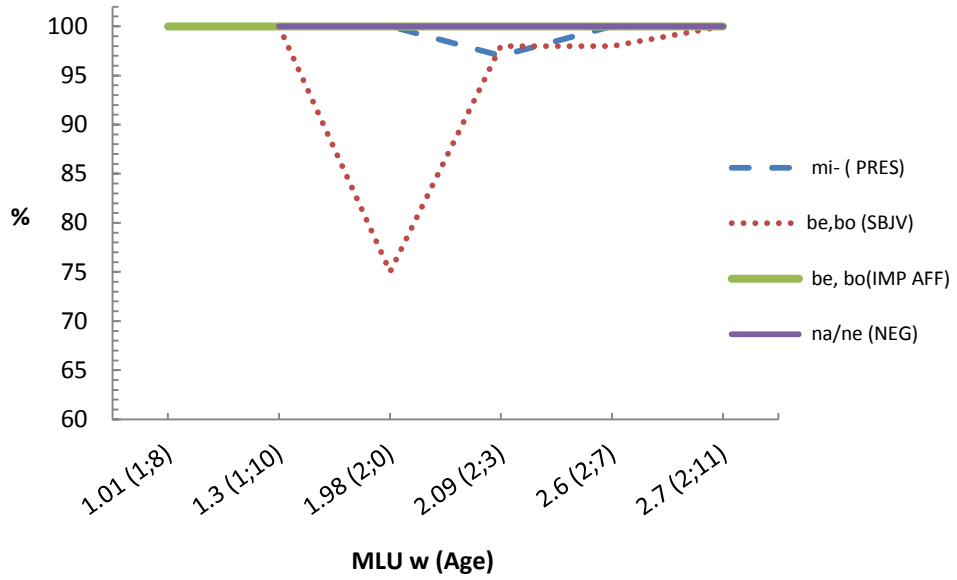


In the above graph, the samples that contained fewer than five contexts of obligatory use are not shown. In Melika's speech there was no context for the obligatory use of 2SG in the first two samples and only four in the third and fourth samples. Although the 2SG was used in over 90% of obligatory contexts in the last two samples which

contained more than five contexts for the use of this morpheme, 2SG still does not meet the 90% criterion in the available data. In the case of 1PL and 2PL also, there were no obligatory contexts of use or fewer than five for the two morphemes in all but the 2;7 (MLU 2.6) sample. Similarly in the case of 3PL, none of the available samples have five or more contexts of obligatory use. However, when the number of obligatory contexts and the actual production of morphemes increase a different pattern in the development of morphemes can be seen, as in the development of the1SG and 3SG. The 1SG is produced in over 90% of obligatory context from 2;0 (MLU 1.9); 3SG is also produced over 90% of obligatory contexts from 1;10 (MLU 1.3).

Figure 5-13 shows the percentage of morphologically correct occurrences of prefixes as a function of MLU (w) and age.

Figure 5-13 Melika's production of prefixes in obligatory contexts



According to Figure 5-13, in Melika's productions PRES tense inflection *-mi* started to be used in over 90% of obligatory contexts from 1;10 (MLU 1,3). SBJV inflection *be-/bo-* showed over 90% of correct use in obligatory contexts in three successive samples from 2;3 (MLU 2.1). IMP (AFF) *be-/bo* was used correctly in over 90% of obligatory contexts from 1;8 (MLU 1)while the negation inflections *na-/ne* were produced 100% in obligatory contexts from 1;10 (MLU 1.3).

5.2.2.2 Melika's acquisition of suffixes

Following the criteria of productivity, according to Table 5-2, 1SG was used productively in SBJV and NEG forms from 1;10 (MLU 1.3) ; however its contrastive use was established in only one paradigm (i.e., NEG) in this session. This inflection was first used productively and contrastively in at least two paradigms at 2;0 (MLU 1.9). Another index of acquisition is given by the 90% correct production of this morpheme in obligatory contexts at 2;0 (MLU 1.9). Thus it can be said that at 2;0 (MLU 1.9) the production of 1SG meets all criteria of acquisition, indicating that the child acquired this morpheme by 2;0 (MLU 1.9). Similarly 3SG was produced productively and contrastively from 1;10 (MLU 1.3) only in NEG form. This inflection started to be used productively and contrastively in two paradigms from 2;0 (MLU 1.9). Furthermore, Melika's correct use of 3SG in obligatory contexts in this sample was over 90%. Therefore, following the criteria of acquisition in this study, Melika can be credited with the acquisition of 3SG at 2;0 (MLU 1.9).

The 2SG first became productive and was used contrastively at 2;0 (MLU 1.9) within the SBJV paradigm only. At 2;3 (MLU 2.1) Melika started using this inflection productively and contrastively in the PRES and NEG forms as well;

however, Melika's use of this inflection in obligatory contexts did not meet the 90% of correct use in three successive samples as only two successive samples with 90% correct production were available. Therefore Melika cannot be credited with the acquisition of 2SG following the acquisition criteria in this study.

At 2;3 (MLU 2.1), 1PL started to be used productively and contrastively in more than five obligatory contexts, within the SBJV and Simple PRES paradigms; however, it only started to be used in over 90% of obligatory contexts at 2;7 (MLU 2.6), the fifth investigated sample; thus, although 1Pl started to be used productively and contrastively at 2;3 (MLU 2.1), it did not meet the criterion of use in obligatory contexts in three successive samples and therefore its acquisition could not be established.

The 2PL started to be used productively and contrastively at 2;3 (MLU 2.1) in the SBJV form only; furthermore, its use in 90% of obligatory contexts occurred only in two samples, so this inflection did not meet the acquisition requirements in the available data either.

The 3Pl was used productively and contrastively by 2;7 (MLU 2.6) in the PRET and PRES forms; however, since there was no sample available containing five or more obligatory contexts for the use of this morpheme as the other two plural inflections (i.e., 1PL and 2PL) its acquisition cannot be established.

Furthermore, PP *-e* did not become productive and contrastive until 2;3 (MLU 2.1) ; however, there is not enough evidence to show that it was correctly used in obligatory contexts as its production over 90% in a session with more than five obligatory contexts only occurred at 2;7(MLU 2;6) and 2;11(MLU 2;7). The number of obligatory contexts for each form is shown in Appendix 3.

5.2.2.3 Melika's Acquisition of prefixes

Melika started using PRES inflection *mi-* productively and contrastively in two persons (1SG and 3SG) from 2;0 (MLU 1.9). She also started producing *mi-* in 90% of obligatory contexts from 1;10 (MLU1.3). Therefore, the child can be credited with the acquisition of PRES inflection at 2;0 (MLU 1.9). SBJV inflection, which started to be used in 90% of obligatory contexts from 2;3 (MLU 2.1) was used productively and contrastively at 2;0 (MLU 1.9) in the 1SG and 3SG. Therefore, the child can be said to have acquired this morpheme by 2;3 (MLU 2.1).

At 1;10 (MLU 1.3), Melika also fills in the NEG marker that she uses productively but not contrastively in the 1SG and 3SG and in 100% of obligatory contexts; by 2;0 (MLU 1.9), Melika uses this morpheme contrastively in 1SG and 3SG. By this session Melika also shows a productive and contrastive command of the IMP in NEG and AFF forms in 100% of obligatory contexts. It should be noted that as previously discussed, since the IMP does not take any suffixes in single forms and its use in 2PL is rare in the mothers' productions, the criterion of usage in more than one paradigm does not apply to this morpheme; thus the child can be credited with the NEG and IMP (AFF/NEG) morphemes at 2;0 (MLU 1.9).

Finally at 2;3 (MLU 2.1), Melika develops productive and contrastive use of the Imperfect inflection *mi-* in 3SG only. It must be noted that the minimum five obligatory contexts of use for this morpheme did not occur before 2;11 (MLU 2.7). That is when *mi-* was used productively and contrastively in 1SG as well. Therefore, the index of acquisition for this morpheme was not met on the basis of the available data.

From these data, if we want to make a categorical statement regarding sequence of development of inflection in terms of productive and contrastive use only, we would have to say that in Melika's speech, person contrast develops before mood, tense and AFF/NEG contrasts and they in turn develop before aspect and number contrasts. Thus, the picture of development can be schematized as follows:

Person > Mood, AFF/NEG, Tense > Number, Aspect

5.2.3 Lilia's production of verbal morphemes

Lilia produced 61 verb types in the nine-month period of this study, out of which 96% are overtly inflected. The only uninflected verb types are *mund* 'stayed' from the infinitive *mundan* 'to stay' and *oftad* 'fell' from the infinitive *oftadan* 'to fall', both bare past stems used as the 3SG PRET in adult Persian. As can be seen in Figure 5-9, in Lilia's cumulative verb lexicon, 4 verbs or 21% show more than one inflected form used contrastively at 1;11. This proportion increases to 42% by 2;3 (MLU 2.2) and finally reaches 49% by 2;8 (MLU 2.8).

Similar to what was observed in Elly and Melika's progression in newly productive forms, the results in Table 5-3 illustrate that productivity within one paradigm/person does not necessarily carry over to another paradigm/person. In Lilia's production of verbal morphemes, the PRES and SBJV inflections are used productively and contrastively for all three singular persons by 2;4 (MLU 2.5); however, no contrast is established in the use of the above forms in the plural until 2;8 (MLU 2.8) when she contrasts mood in 1PL. By 2;4 (MLU 2.5) Lilia also establishes a productive and contrastive use of IMPs in NEG and AFF forms. By 2;8 (MLU 2.8), NEG inflection is used productively and contrastively for the three singular persons.

Similarly, under the Suffixes category, 1SG is first used productively and contrastively in the PRET from 1;11 (MLU 1.4) while the 2SG inflection first becomes productive at 2;1 (MLU 1.7) in the PRES mood. By 2;4 (MLU 2.5), 1SG, 2SG and 3SG are all used productively and contrastively in the SBJV and PRES forms.

While 1PL becomes productive at 1;11 (MLU 1.4) in the SBJV, no other productive use of this inflections is seen until 2;8 (MLU 2.8) in the PRES.

Table 5-3 Newly Productive Forms in Lilia's Production

Age/MLU	CUMU/V TYPE	Prefixes (mi-, be/ bo- na/ne-)							Suffixes (-am, -i, ad/e, -im, -and, -e)				
		1SG	2SG	3SG	1PL	2PL	3PL	IMP	SBJV	PRES	NEG	PRET	PRES (no prefix)
1;11 1.4	19	PRES **(mi)** NEG/PRES (ne) NEG/PRET(na)	PRES **(mi)**	SBJV **(be)** NEG/SBJV (na)	SBJV **(be)** PRES **(mi)**			IMP, AFF (Be-) IMP NEG (Na-)	- - **1PL (im)** - **2PL (id)** 3SG (e) -	1SG **(am)** 1PL **(im)** 2SG **(i)**	1SG **(am)** - 3SG **(e)**	**1SG (am)** 2SG **(i)** **PP 3SG (e)** **Contrast: Person/Aspect**	1SG **(am)**
2;1 1.75	29	PRES **(mi)** SBJV **(be)** NEG/PRES **(ne-)** NEG/SBJV (na) NEG/PRET(na) **Contrast:tense**	PRES **(mi)**	SBJV **(be)** PRES **(mi)** NEG/PRES **(ne)** NEG/SBJV (na) **Contrast: AFF/NEG**	SBJV **(be-)** PRES **(mi)**			IMP, AFF (Be-) IMP NEG (Na-)	**1SG (am)** 1PL **(im)** - 2PL **(id)** 3SG **(e)** - **Contrast: number**	**1SG (am)** 1PL **(im)** **2SG (i)** **3SG (e)** **Contrast: Person**	**1SG (am)pr** - **3SG (e)** **Contrast: Person**	1SG **(am)** 2SG **(i)** **PP** 3SG **(e)**	1SG **(am)** - **3SG (e)**
2;3 2.23	40	SBJV **(be)** PRES **(mi)** NEG/PRES (ne) NEG/SBJV(na) NEG/PRET(na) **Contrast: Mood/ AFF/NEG**	SBJV **(be)** PRES **(mi)** NEG/PRET(na)	SBJV **(be)** PRES **(mi)** NEG/PRES (ne) NEG/SBJV (na) NEG/PRET **(na)** **Contrast: mood/AFF/NEG**	SBJV **(be-)** PRES **(mi)**	**SBJV (be)** NEG/SBJV (na)	PRES **(mi)**	**IMP, AFF (Be-)** IMP NEG **(Na-)**	**1SG (am)** 1PL **(im)** 2SG (i) **2PL (id)** **3SG (e)** - **Contrast: person**	1sg **(am)** 1PL **(im)** 2SG **(i)** 3SG **(e)** 3PL (and)	**1SG (am)p** - 2SG (i)p 2PL (id) 3SG **(e)**	**1 psg (am)** 2SG **(i)** 3PL (and) **PP 3SG (e)**	**1SG (am)** - 3SG **(e)** **Contrast: Person**
2;4 2.56	53	SBJV **(be-)** PRES **(mi)** NEG/PRES**(ne)** NEG/SBJV(na) NEG/PRET(na)	SBJV **(be)** PRES **(mi)** **PI (mi-)** NEG/PRET(na) **Contrast: Mood**	SBJV **(be-)** PRES **(mi-)** **NEG/PRES(ne)** NEG/SBJV (na) NEG/PRET **(na)**	SBJV **(be-)** PRES **(mi)**	SBJV **(be-)** NEG/SBJV (na)	PRES **(mi)**	IMP NEG **(Na-)** IMP, AFF **(Be-)** **Contrast: AFF/NEG**	**1SG (am)** 1PL **(im)** **2SG (i)** 2PL **(id)** 3SG (e) - **Contrast: Person/number**	1sg **(am)** 1PL **(im)** 2SG **(i)** 3SG **(e)** 3PL (and)	1SG **(am)** 2SG (i)p 2PL **(id)** 3SG **(e)**	**1 psg (am)** **2SG (i)** 3PL (and) **PP 3SG (e)** **Contrast: person**	1SG **(am)** 1PL **(im)** 2SG **(i)** 3SG **(e)**
2;6 2.66	55	SBJV **(be)** PRES **(mi)** NEG/PRES **(ne)** NEG/SBJV(na) NEG/PRET(na)	SBJV **(be)** PRES **(mi)** **PI (mi-)** NEG/PRET(na) **Contrast: Aspect/Tense**	SBJV **(be-)** PRES **(mi)** NEG/PRES (ne) NEG/SBJV (na) NEG/PRET **(na)**	SBJV **(be-)** PRES **(mi)**	SBJV **(be-)** NEG/SBJV (na)	PRES **(mi)**	IMP, AFF **(Be-)** IMP NEG **(Na-)**	**1SG (am)** 1PL **(im)** **2SG (i)** 2PL **(id)** 3SG (e) -	**1sg (am)** 1PL **(im)** 2SG **(i)** **3SG (e)** 3PL (and)	1SG **(am)** 2SG (i)p 2PL **(id)** 3SG **(e)**	**1SG (am)** **2SG (i)** 3PL (and) **PP 3SG (e)**	1SG **(am)** 1PL **(im)** 2SG **(i)** 3SG**(e)**
2;8 2.80	61	SBJV **(be)** PRES **(mi)** NEG/PRES (ne) NEG/SBJV(na) NEG/PRET(na) **PI (mi-)**	SBJV **(be)** PRES **(mi)** **PI (mi-)** NEG/PRES (ne) **NEG/ /PRET(na)** **Contrast: AFF/NEG**	SBJV **(be-)** PRES **(mi)** NEG/PRES (ne) NEG/SBJV (na) NEG/PRET **(na)** **NEG/p part** **Contrast: Aspect**	SBJV **(be-)** PRES **(mi)** **Contrast: mood**	SBJV **(be-)** NEG/SBJV (na)	PRES **(mi)**		**1SG (am)** 1PL **(im)** **2SG (i)** 2PL **(id)** 3SG **(e)** -	1SG **(am)** **1PL (im)** 2SG **(i)** 3SG **(e)** 3PL (and) **Contrast: Number**	1SG **(am)** **2SG (i)p** 2PL **(id)** 2SG (i)pr 3SG **(e)** **Contrast: Person**	**1SG (am)** **2SG (i)** 3PL (and) **PP 3SG (e)**	1SG **(am)** 1PL **(im)** **2SG (i)** 3SG **(e)** **Contrast: Person**

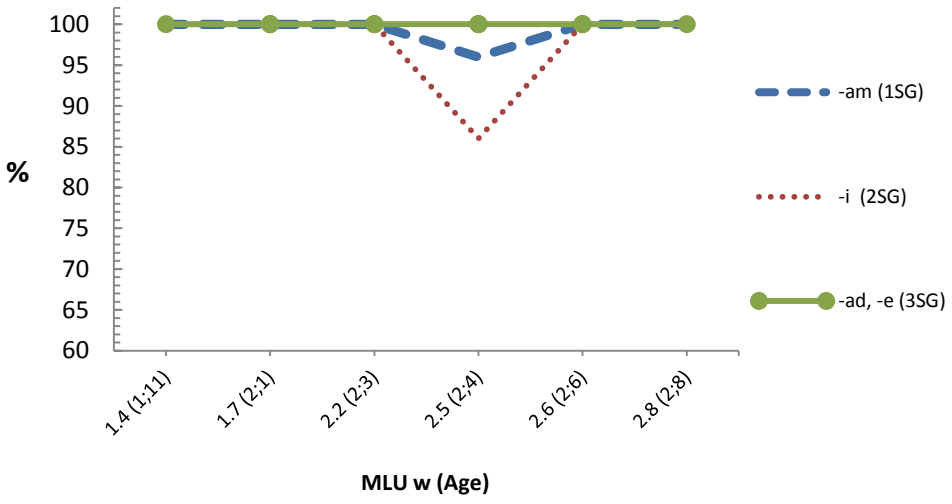
Lilia's first contrast is a Person/Aspect contrast, which occurs at 1;11 (MLU 1.4) in the PRET. This is followed by an AFF/NEG contrast in 3SG, a tense contrast in 1SG, a number contrast in SBJV and more Person contrasts in NEG and PRES forms at 2;1 (MLU 1.7). She first contrasts Mood at 2;3 (MLU 2.2) in 1SG and 3SG when she also makes another AFF/NEG contrast in these two persons.

As with Elly and Melika, to determine the acquisition of verbal morphemes their productive and contrastive use within at least two morphological paradigms is investigated along with establishing their use in the context for which they are clearly required.

5.2.3.1 Use of Lilia's Verbal Morphemes in Obligatory Context

Figure 5-14 shows the percentage of morphologically correct occurrences of person/number inflections as a function of MLU (w) and age.

Figure 5-14 Lilia's Production of suffixes in obligatory contexts

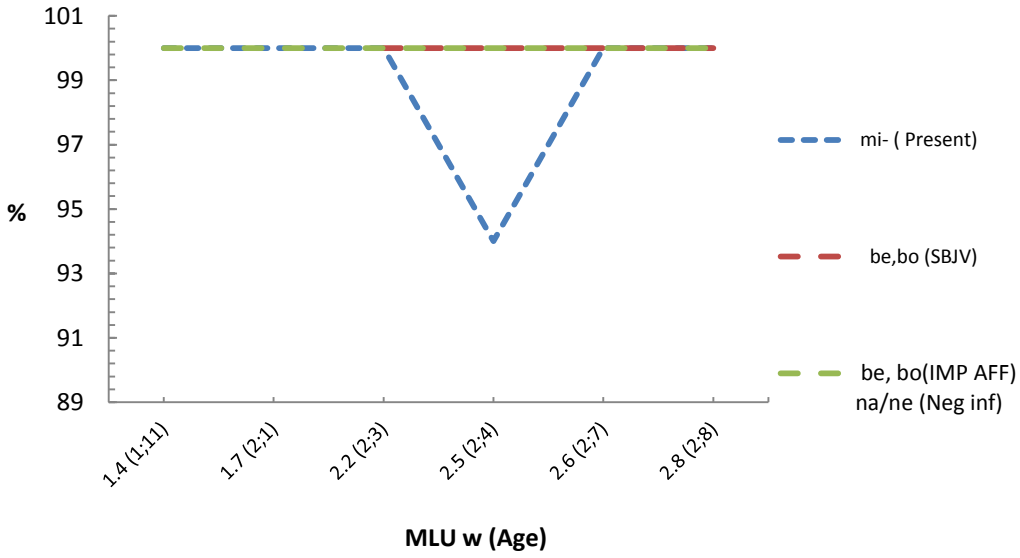


In Lilia's production of morphemes, 1SG and 3SG are produced in over 90% of obligatory contexts through all the samples. However, the production of 2SG in obligatory contexts which was 100% at 2;1 (MLU 1.7) reduced to 86% at 2;4 (MLU 2.5) and therefore as in the other two children, the correct use of this morpheme in obligatory contexts in three successive samples could not be determined.

In the above graph as in Elly and Melika's graphs, the samples that contained fewer than five contexts of obligatory use were not shown. In the cases of 1PL and 2PL, all of the available samples but the first and the third samples respectively, contain less than five contexts of obligatory use therefore the above morphemes' 90% correct use in obligatory context could not be established. In the same way, there was no context for the use of 3PL.

Figure 5-15 shows the percentage of morphologically correct occurrences of prefixes as a function of MLU (w) and age.

Figure 5-15 Lilia's production of prefixes in obligatory contexts



According to Figure 5-15, in Lilia's production of prefixes, PRES inflection *-mi* started to be used in over 90% of obligatory contexts from 1;11 (MLU 1.4) while SBJV inflection *be-/bo-* showed over 90% of correct use in obligatory context from 2;3 (MLU 2.2). IMP (AFF) *be-/bo* and the negation inflections *na-/ne* were produced 100% in obligatory contexts from 1;11 (MLU 1.4).

5.2.3.2 Lilia's Acquisition of suffixes

Following the criterion of productivity, as can be seen from Table 5-3, 1SG inflection was used productively and contrastively within two paradigms from 2;1 (MLU 1.7). Another index of acquisition is given by the 90% correct production of this morpheme in obligatory contexts from 1;11 (MLU 1.4). Thus it can be said that at 2;1 (MLU 1.7) the production of 1SG meets all the criteria of acquisition, indicating that the child acquired this morpheme by 2;1 (MLU 1.7). Similarly 3SG was produced productively and contrastively in at least two paradigms from 2;1 (MLU 1.7); furthermore, Lilia's correct use of 3SG in obligatory context in all the samples was over 90%. Therefore, following the criteria of acquisition in this study, Lilia can be credited with the acquisition of 3SG at 2;1 (MLU 1.7).

The 2SG first became productive and was used contrastively at 2;1 (MLU 1.7) within the PRES paradigm only. At 2;4 (MLU 2.5) Lilia started using this inflection productively and contrastively in the SBJV and PRET forms as well; however, Lilia's use of this inflection in obligatory contexts did not meet the 90% of correct use in three successive samples. Therefore she cannot be credited with the acquisition of 2SG following the acquisition criteria in this study.

At 1;11 (MLU 1.4), 1PL started to be used productively by using *bezarim* 'let's put' and *bazi bokonim* 'let's play' (the only available sample with more than five obligatory contexts), within the SBJV form. However, no contrastive use was established for this morpheme until 2;1 (MLU 1.7). This morpheme started to be used contrastively in two paradigms by 2;8 (MLU 2.8). Furthermore, since there were not enough contexts to determine its correct use in obligatory context, the acquisition of 1PL could not be established. The 2PL started to be used productively at 2;3 (MLU 2.2) in the SBJV mood and its only contrastive use was established in the same mood by 2;4 (MLU 2.5); furthermore, there were not enough contexts for the obligatory use of this morpheme in the available samples. On the other hand, no evidence of productive use and contrastive knowledge was reported for 3PL.

5.2.3.3 Lilia's acquisition of prefixes

As was previously discussed, Lilia started using PRES inflection *mi-* productively and contrastively in two persons (1SG and 3SG) from 2;3 (MLU 2.2). This morpheme was also used in 90% of obligatory contexts from 1;11. Therefore the child can be credited with PRES inflection at 2;3. SBJV inflection, which meets the 90% criterion of acquisition at 2;3 (MLU 2.2), started to be used productively and contrastively at 2;3 (MLU 2.2) in the 1SG and 3SG; however, it should be noted that although SBJV inflection is used productively also in the 2PL, it does not establish any contrast within this person. By 2;3 (MLU 2.2), Lilia also fills in the NEG that she uses productively and contrastively in the 1SG and 3SG and in 100% of obligatory contexts. By 2;4 (MLU 2.5) Lilia also shows a productive and contrastive command of the IMP in NEG and AFF forms in 100% of obligatory contexts. As was previously noted, since the IMP form does not take any suffixes, the criterion of

usage in more than one paradigm does not apply to this morpheme; thus the child can be credited with the IMP morpheme at 2;4 (MLU 2.5). By 2;6 (MLU 2.6), Lilia develops productive and contrastive use of PI *mi-* in 2SG only; furthermore, since there was only one obligatory context for the use of these morpheme by 2;8 (MLU 2.8), its acquisition could not be established.

From these data, if we want to make a categorical statement regarding sequence of development of inflection in terms of productive and contrastive use only, we would have to say that in Lilia's speech, person and aspect contrasts develop before Number and AFF/NEG and tense contrasts and they in turn develop before mood contrast. Thus, the picture of development can be schematized as follows:

Person, Aspect >AFF/NEG, Number, Tense> Mood

Table 5-4 to 5-6 show the sequence verbal morphemes appeared, first became productive, first established contrastive knowledge, started to be used productively and contrastively in two paradigms and finally were acquired by the three children following the full criteria of acquisition (i.e., the productive and contrastive use of the morpheme in two morphological paradigms as well as the 90% use in obligatory contexts) set for this study.

Table 5-4 Individual forms developed by Elly

	Verbal Inflections	Form	Emergence (MLU w)	First Productivity (MLU w)	Contrastive Knowledge (MLU w)	Productive & Contrastive in two paradigms (MLU w)	90% Use in Obligatory Contexts	Acquisition (MLU w)
Suffixes	1SG	-am	1.3	1.3	1.3	1.5	1.5	1.5
	2p SG	-i	1.3	1.5	1.5	2	—	—
	3SG	-ad, -e	1.3	1.3	1.3	1.5	1.3	1.5
	1p PL	-im	2	2	2	—	—	—
	2p PL	-id	—	—	—	—	—	—
	3p PL	-and	1.8	1.8	1.8	2	—	—
	PP	-e	1.3	2	2	—	—	—
Prefixes	SBJV	Bo-/be-	1.3	1.3	1.3	1.5	1.3	1.5
	PRES	Mi-	1.3	1.3	1.3	1.5	1.5	1.5
	IMP AFF	Bo-/be-	1.3	1.5	1.5		1.3	1.5
	IMP NEG	Na-	1.3	1.5	1.5		1.3	1.5
	NEG	Na-/ ne-	1.5	1.5	1.5	1.5	1.3	1.5
	PI	mi-	1.5	2	2	—	—	—

Table 5-5 Individual forms developed by Melika

	Verbal Inflections	Form	Emergence (MLU w)	First Productivity (MLU w)	Contrastive knowledge (MLU w)	Productive & Contrastive in two paradigms (MLU w)	90% Use in Obligatory Contexts	Acquisition (MLU w)
Suffixes	1SG	-am	1.0	1.3	1.3	1.9	1.9	1.9
	2p SG	-i	1.3	1.9	1.9	2.0	—	—
	3SG	-ad, -e	1.3	1.3	1.3	1.9	1.3	1.9
	1p PL	-im	2.0	2.0	2.0	2.0	—	—
	2p PL	-id	1.3	2.0	2.0	—	—	—
	3p PL	-and	1.9	2.0	2.0	2.6	—	—
	PP	-e	1.9	2.0	2.0	—	—	—
Prefixes	SBJV	Bo-/be-	1.0	1.9	1.9	1.9	1.3	2.0
	PRES	Mi-	1.3	1.9	1.9	1.9	1.3	1.9
	IMP AFF	Bo-/be-	1.0	1.9	1.9		1	1.9
	IMP NEG	Na-	1.9	1.9	1.9		1.3	1.9
	NEG	Na-/ ne-	1.3	1.3	1.9	1.9	1.3	1.9
	PI	mi-	2.0	2.0	2.0	2.7	—	—

Table 5-6 Individual forms developed by Lilia

	Verbal Inflections	Form	Emergence (MLU w)	First Productivity (MLU w)	Contrastive knowledge (MLU w)	Productive & Contrastive in two paradigms (MLU w)	90% Use in Obligatory Contexts	Acquisition (MLU w)
Suffixes	1SG	-am	1.4	1.4	1;4	1.7	1.4	1.7
	2p SG	-i	1.4	1.7	1.7	2.5	—	—
	3SG	-ad, -e	1.4	1.7	1.7	1.7	1.4	1.7
	1p PL	-im	1.4	1.4	1.7	2.8	—	—
	2p PL	-id	2.2	2.2	2.5	—	—	—
	3p PL	-and	2.2	—	—	—	—	—
	PP	-e	1.4	1.4	1.4	—	—	—
Prefixes	SBJV	Bo-/be-	1.4	1.4	2.2	2.2	2.2	2.2
	PRES	Mi-	1.4	1.7	1.7	2.2	1.4	2.2
	IMP AFF	Bo-/be-	1.4	2.2	2.5		1.4	2.5
	IMP NEG	Na-	1.4	2.5	2.5		1.4	2.5
	NEG	Na-/ ne-	1.4	1.7	1.7	2.2	1.4	2.2
	PI	mi-	2.5	2.6	2.6	—	—	—

Following the results illustrated in Table 5-4 to Table 5-6 the categorical sequence of the development of verbal morphemes in the three children of this study is schematized in Table 5-7:

Table 5-7 Sequence of development of forms

Levels of develop-ment	Child	Development of Morphemes
Emergence	Elly	1SG, 2SG, 3SG, PP, SBJV, PRES, IMP AFF, IMP NEG> NEG, PI > 3PL >1PL
	Melika	1SG, SBJV, IMP AFF > 2SG, 3SG, 2PL, PRES, NEG> 3PL, PP, IMP NEG >1PL, PI
	Lilia	1SG, 2SG, 3SG,1PL, PP, SBJV,PRES, IMP AFF, IMP NEG, NEG > 2PL, 3PL > PI
First Productivity	Elly	1SG, 3SG, SBJV, PRES > 2SG, IMP AFF, IMP NEG, NEG > 3PL > 1PL, PP > PI
	Melika	1 SG, 3SG, NEG > 2SG, SBJV, PRES, IMP AFF, IMP NEG> 1PL, 2PL, 3PL,PP, PI
	Lilia	1SG, 1 PL, PP, SBJV > 2SG, 3SG, PRES, NEG > 2PL, IMP AFF > IMP NEG> PI
Contrastive Knowledge	Elly	1SG, 3SG, SBJV, PRES > 2SG, IMP AFF, IMP NEG, NEG > 3PL > 1PL, PP, PI
	Melika	1SG, 3SG > 2SG, SBJV, PRES, IMP AFF, IMP NEG, NEG > 1PL, 2PL, 3PL, PP, PI
	Lilia	1SG, PP > 2SG, 3SG, 1PL, PRES, NEG > SBJV > 2PL, IMP AFF, IMP NEG > PI
Productive & Contrastive use in two paradigms	Elly	1SG, 3SG, SBJV, PRES, NEG > 2SG, 3PL
	Melika	1SG, 3SG, SBJV, PRES, NEG > 2SG,1PL > 3PL > PI
	Lilia	1SG, 3SG > SBJV, PRES, NEG > 2SG > 1PL
Acquisition	Elly	1SG, 3SG, SBJV, PRES, IMP AFF, IMP NEG, NEG
	Melika	1SG, 3SG, PRES, IMP AFF, IMP NEG, NEG > SBJV
	Lilia	1SG, 3SG > SBJV, PRES, NEG > IMP AFF, IMP NEG

As can be seen in Table 5-7, 1SG, 2SG and 3SG are among the early suffixes which emerged in the productions of all the three children of this study. At 'first productivity' and 'contrastive knowledge' levels, 1SG and 3SG became productive and established contrastive knowledge earlier than 2SG in both Elly's and Melika's productions and they in turn developed productivity and contrast before 1PL, 2PL (for Melika), 3PL and PP. Similarly at 'Productive and Contrastive use in two paradigms level', for all the three children, 1SG and 3SG developed before 2SG and Plural forms. As Table 5-4 to Table 5-6 show, 1SG and 3SG are the only suffixes in all the three children of this study which met the 90% criterion, and therefore by meeting the full criteria of acquisition, moved to the next level of development (i.e., acquisition).

In the case of prefixes, in Elly's and Lilia's productions, SBJV and PRES became productive and established contrastive knowledge earlier than IMP AFF and IMP NEG and they in turn developed productivity and contrast before PI. In all the three children of the study, SBJV, PRES and NEG morphemes moved to the next level of development (i.e., productive and contrastive use in two paradigms).[6] Furthermore, by meeting the 90% criterion, SBJV, PRES, NEG, IMP AFF and IMP NEG have all met the full criterion of acquisition in three children of this study.

According to Table 5-7, the developmental pattern of suffixes for Lilia looks different from that of the other two children at 'first productivity' and 'contrastive knowledge' levels. Lilia developed productivity for 1SG and 1PL earlier than 2SG and 3SG, while she established contrastive knowledge for 1SG before 2SG and 3SG. Furthermore, PP developed productivity and contrastive knowledge before 2SG,

[6] The criterion of usage in more than one paradigm does not apply to IMP AFF & IMP NEG in this study.

3SG and the plural forms; as a result of this, unlike the other two children, Lilia developed contrast for Aspect earlier than AFF/NEG, Number, Tense and Mood.

To sum up, the results show that although some individual differences in the development of verbal inflections can be observed among the children of the study, they have all acquired the same inflections by the end of the study (1SG and 3SG from suffixes) and (SBJV, PRES, NEG, IMP AFF and IMP NEG from prefixes).

The results in Table 5-7 also show that 1SG, 3SG, SBJV, PRES and NEG are developed productively and contrastively in two paradigms earlier than 2SG and the plural forms. Although some similarity in the sequence of development of morphemes can been seen among the children, there is no evidence to support a claim that prefixes develop earlier than suffixes, or vice versa; however, while five out of six adult prefixes were acquired by the children, only 1SG and 3SG among the seven adult suffixes met the full criteria of acquisition. This could be due to the errors made by the children and/or the lack of obligatory contexts for the production of these morphemes. A detailed analysis of errors is presented in section 5.2.5. According to Table 5-4 to Table 5-6, 2SG has developed to the level of productive and contrastive use in two paradigms in all the three children; however, it has not met the 90% criterion and is therefore not "acquired". In Lilia's case this is due to the error she made at 2;4 (MLU 2.5), when she dropped the 2SG in utterance 95) in section 5.2.6 and used the verb in the IMP AFF form in lieu of the PRES form on two occasions. For Melika, there were not enough contexts of obligatory use (i.e., at least five) in three consecutive samples to establish the 90% criterion, while for Elly both the aforementioned factors (i.e., lack of the required number of obligatory contexts in three consecutive samples and the errors) delayed the acquisition of 2SG.

The errors occurred in Elly's productions at 2;9 (MLU 2.3), where the child used 1SG in lieu of 2SG in utterances (48) and (49). Similarly, the lack of the required number of obligatory contexts for the production of 1PL, 2PL, 3PL and PP seems to have gotten in the way of measurement of the acquisition of these morphemes here. In other words, similar to Krajewski et al's. (2012) study of a Polish child's inflectional noun morphology, the reason behind the child's producing limited number of inflections could be the absence of a range of linguistic contexts in which to use them in rather than the child's inability to produce certain combinations. As pointed out previously, the child seems to acquire the constraints of obligatory use only gradually. However, it could also be that the sampling is not dense enough to provide the opportunity for an adequate number of obligatory contexts for inflections that occur with low frequency. These inflections therefore could simply be labelled as 'not analysable' (Tomasello and Stahl, 2004).

With regards to sampling size, for inflections that occurred with high frequency in the samples used in the study, similar increases in productivity would be expected if a larger cumulative speech sample were available. Nevertheless, for inflections with low frequency a larger cumulative speech sample might demonstrate a different picture of development.

5.2.4 Continuity between lexical and morphological development

One of the aims of the study was to examine the relation between the lexical and morphological development of verbs. The following figures compare the rate of cumulative verb learning shown by each child with the rate of increase in the contrast index.

Figure 5-16 Elly's rate of verb production vs emergence of contrasts

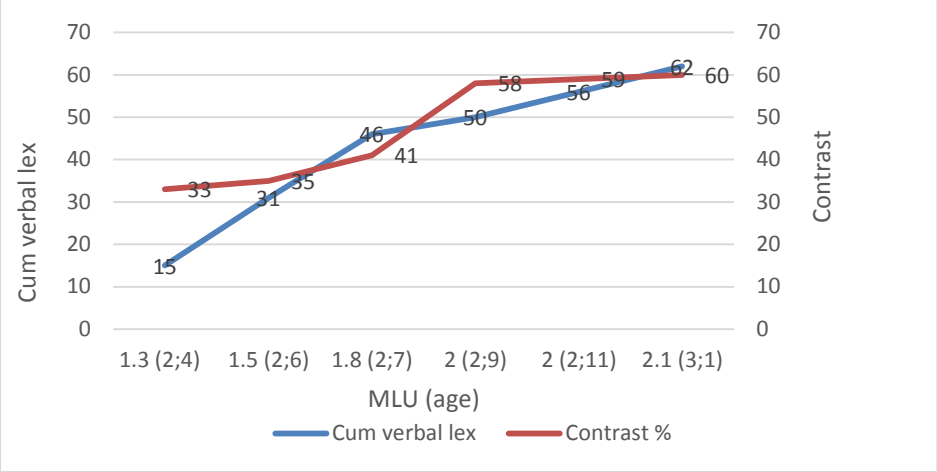


Figure 5-17 Melika's rate of verb production vs. emergence of contrasts

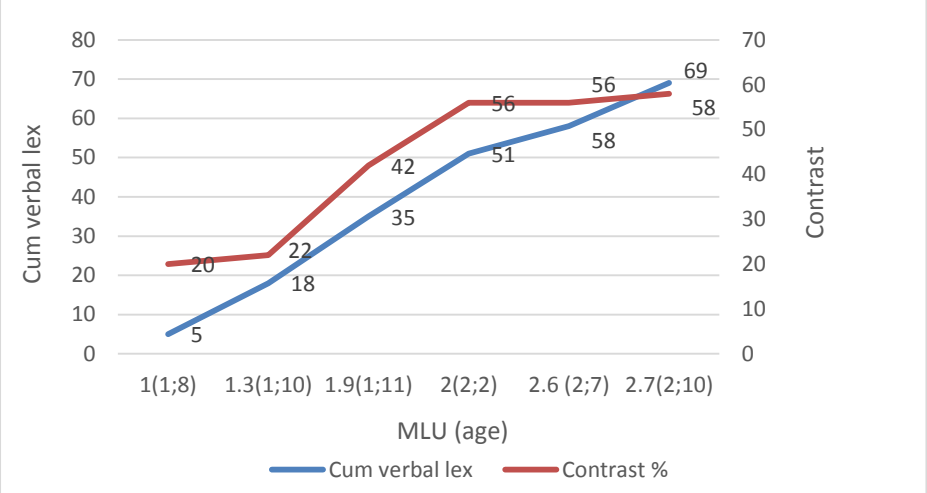
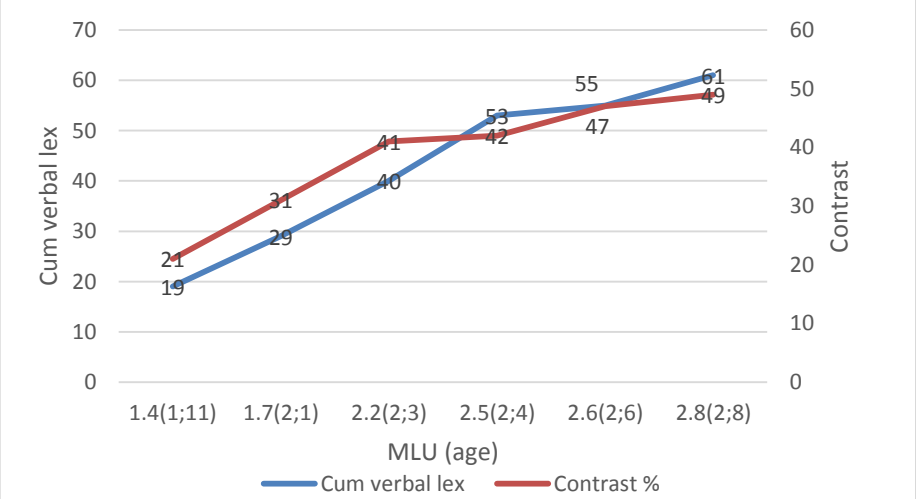


Figure 5-18 Lilia's rate of verb productions vs. emergence of contrasts



It is apparent from Figure 5-16 to 5-18 that three periods can be identified in each graph. In Elly's case, during the early period from 2;4 (MLU 1.3) to 2;7 (MLU 1.8) the rate of verbal contrast increases more slowly than the rate of verb learning. Although for a short period from 2;7 (MLU 1.8) to 2;9 (MLU 2) the rate of contrast seems to surpass the rate of verb learning, from 2;9 MLU 2 (i.e., when the cumulative verbal lexicon reaches 56) the rate of contrast seems to fall behind the rate of verb learning. A similar pattern is seen in Melika's morphological development; during the early period, from 1;8 (MLU 1) to 1;10 (MLU 1.3), verbal contrast develops more slowly than verb learning. However, in the second period (i.e., after the first session) from 1;10 (MLU 1.3) to 2;2 (MLU 2), the rate of verbal contrast increases linearly with the rate of verb learning before it again flattens when Melika's verbal lexicon reaches 51. In Lilia's production, a different pattern of development is observed. During the first period, from 1;11 (MLU 1.4) to 2;3 (MLU 2.2) the rate of verbal contrast increases linearly with the rate of verb learning. However, the rate of contrast flattens when the cumulative verb lexicon reaches 40 in Lilia's productions before it rises again to continue to develop more slowly than the rate of verb learning.

It should be noted that although the three children differ in their pattern of learning of contrasts, for all of them the rate of contrast starts to level off at a similar developmental stage (between MLU 2 and MLU 2.2). Furthermore, although the rate of contrast increases as the children are adding to their verbal lexicon, these results do not give support to the Marchman and Bates' (1994) 'critical mass hypothesis'. In other words, the children are able to apply their inflections to a wider range of verb types as their language develops but this phenomenon is not prompted by a critical

increase in the size of their verbal lexicon. On the other hand, the gradual, piece-meal learning of the verbs is followed by an even more gradual learning of morphological contrasts after some months of experience with production.

In order to obtain a more detailed description of morphological development of verbs in the children of this study, the data was also examined for errors in the production of verbal morphemes. Reliability checks were conducted by the investigator by recoding all the errors in the data analysed. Utterances which included ambiguous contexts were excluded from the analysis and therefore the target forms were the forms which were most easily identified from the linguistic context. It should be noted that there were not many cases of ambiguity due to the nature of Persian morphemes and therefore no separate category was designed for such cases.

5.2.5 Errors of omission and commission

5.2.5.1 Errors of omission

As noted earlier, the bare verb stem occurs in Persian only in 3SG PRET form; in other words, the children are not exposed to bare stems except the 3SG PRET; rather, they hear prefixes and suffixes frequently used together with the same stems in the input; however, as verb forms begin to appear, verb stems lacking either a Prefix *or* a Suffix tend to occur in children's speech. These will count as omission errors.

5.2.5.2 Errors of commission

Errors of commission occur when the forms used are wrong for the intended meaning. These include both minimal substitutions, such as uses of the wrong

personal ending (*e.g., –am, -i*) with a correct prefix, uses of the wrong prefix (e.g., *mi-, be-*) with a correct personal ending, and uses of the wrong stem with a correct inflection; and maximal substitutions where both prefixes and affixes are replaced, such as using 1SG SBJV in lieu of 3SG PRES.

5.2.6 Morphological errors in Elly' production

5.2.6.1 Errors of omission

Elly substitutes IMP AFF form for 2SG SBJV and 1 SG SBJV by dropping 2SG and 1 SG respectively at 2;4 (MLU 1.3) when 15 different verb types have been used and the contrast index is 33%, (utterances 38 and 39):

38) Mi -xah -am *be-zar* inja. (for *be-zar-**i***) [2;4 /MLU 1.3]
PRES-want- 1SG IMP-put here. [7] 2SG
'I want you to put it here'

39) *Be -ro* jelo.(for *be-ra-**am***) [2;4/ MLU 1.3]
IMP-go forward. 1SG
'(I want to) go forward'.

40) Ghermez *be-xar* (for *be-xar-**im***) [2;9/MLU 2]
Red IMP-buy 1PL
'let's buy it in red'.

The error in utterance (38) occurs when 2SG was not yet established productively in Elly's speech; therefore she seems to be using a simpler form (i.e., IMP AFF), which is semantically and structurally the closest to the target form. A similar error occurs in utterance (40), when the child had not yet established 1PL in SBJV form. On the other hand, in utterance (39) 1SG, which was already established in the SBJV by this

[7] The intended utterance is glossed

sample, is omitted; one explanation for this error could be that the child is attempting to say *be- bar jelo* 'move (it) forward' while she was sitting in a toy cart, asking her mother to pull it forward; in that case she is using IMP correctly but with the wrong lexical stem. This is indeed possible as the child is assumed to have the knowledge of this inflection by this time.

Another omission error for Elly at 2;4 (MLU 1.3) occurs when she omits PRES prefix *mi-* in the following utterance:

41) *Xah-am* xoshk bo-kon-am. (for ***mi****-xa-am*) [2;4/ MLU 1.3]
Want-1SG dry SBJV-do-1SG PRES
'I want to dry it'

At 2;4 (MLU 1.3) there were seven errorless occurrences of PRES prefix *mi-* with the same lexical stem (i.e., *xah*) within the same Personal marker (i.e., 1 SG). *Mi-* was also used productively and contrastively in this session. So why is the child making this error? This may be explained in terms of processing load. The data of this session shows that this utterance has the largest number of established inflections following *mi-xah-am,* as in the rest of the utterances *mi-xa-am* is used on its own or is followed by only 2 or 3 analyzed or unanalyzed morphemes. The only utterances containing more than 3 morphemes following *mi-x-am* are utterances (41) and (42).

42) Mi -xah- am *be -andaz* ***-i*** un tu. (for be-*andaz*-***am***) [2;4/MLU1.3]
PRES- want- 1 SG SBJV-drop- 2SG there inside.
'I want to drop (it) there'.

However, in utterance (42), neither of the verbal inflections (i.e., *be-* and *–i*) has yet been established as productive, while in utterance (41) *xah-am* is followed by 4

morphemes including the verbal inflection (i.e., *bo-* and *–am*), which are both analyzed and established as productive by this age. Thus they are not rote-learned and hence add to the child's processing load; in other words, we can say that in (42) *mi-xah-am* is followed by three unanalysed units, while in (41) it is followed by four analysed units. This will probably result in dropping *mi-* from the beginning of the utterance as, according to Bloom's (1990) explanation of subject-object asymmetry, the beginning of the sentence imposes a higher processing load than the rest of the sentence does - if this omission cannot be explained through distributional properties of the input in terms of frequency (see Freudenthal et al., 2007).

In another attempt at 2;6 (MLU 1.5), Elly drops *mi-* in the PRES which was established as productive at 2;4 (MLU 1.3); it should be noted that *mi-* is placed between *na-* and *a-m :*

43) *Na - tan- am*; baz kon. (for *ne-**mi**-tun-am*) [2;6/ MLU 1.5]
NEG-can-1SG open do
'I can't; open it'.

5.2.6.2 Errors of commission

In Elly's data the larger numbers of errors were functional commission errors, where the forms used were wrong for the intended meaning. The utterances in which Elly makes minimal commission errors are given below (utterances 44 to 64):

44) *Mi -xah **-i*** bazi bo -kon –am. (for *mi-xah-**am***) [2;4/MLU 1.3]
PRES-want-2 SG play SBJV -do -1SG
'I want to play'.

*45) Xord -**am*** . (for *xord-**im***) [2;6/MLU 1.5]
Ate -1 SG
'we ate (it)'.

46) Ahang ino *mi-zan-**i*** (for *mi-zan-**im***)
Music this PRES-play-2SG [2;6/MLU1.5]
'we play this music'

47) Xob *be -bin **-i.*** (for *be-bin-**im***) [2;9 / MLU 2]
Then SBJV -watch- 2SG
'Let's watch then'.

48) motore-to mi- da- am bazi *kon-**am*** (for *koni-**i***) [2;9 / MLU 2]
Motorbike –POSS IMPF-give-1SG play do-1SG
'I would give your motorbike to play'

49) charx-am-o mi-da-am bazi *kon-**am*** (for *koni-**i***) [2;9 / MLU 2]
Bike –POSS IMPF-give-1SG play do-1SG
'I would give you my bike to play'

50) Mi -xah- am *be -andaz **-i*** un tu. (for be-*andaz-**am***) [2;4/MLU1.3]
PRES- want-1 SG SBJV -drop-2SG there inside.
'I want to drop (it) there.'

51) Ax *mi -gir -**am***? (for *mi-gir-**i***) [2;7/MLU1.8]
Photo PRES-take-1SG
(are) you taking a photo?

52) Man injuri *mi-zan-**an*** (for *mi-zan-**am***) [2;7/MLU1.8]
I this way PRES-press-3PL
'I press it this way'.

*53) Mi-xor-**am*** (for *mi-xor-**and***) [2;7/MLU1.8]
PRES-eat-1SG
'they eat'

54) Chi mi -iar -i man *bo-xor **–i***? (*for bo-xor-**am***) [2;9 / MLU 2]
What PRES -bring-2 SG I SBJV-eat-2SG.
'what will you bring (me) to eat?'

55) Alio *be-bin-**i*** (for *be-bin-**am***) [2;11/MLU 2]
Ali SBJV-see-2SG
'I want to see Ali'

56) *Dar -**e*** ba baba-am ax mi-gir-am. (for *dar-**am***) [3;1/MLU 2.1]
Aux-3 SG with dad- POSS photo PRES-take-1SG.
'I am taking a photo with dad'.

57) Boos *bo –kon –**am***. (for *bo-kon-**e***) [3;1/MLU 2.1]
Kiss SBJV- do -1 SG
'He wants to kiss (you)'.

58) Mi-xa-am ino *be-band-**im*** (for *be-band-**i***) [3;1/MLU 2.1]
PRES-want-1SG this SBJV-close-1PL
'I want you to close this'

59) ***mi-****xor-am.* (for ***bo****-xor-am*) [2;4/MLU 1.3]
PRES-eat-1SG
'I want to eat (this)'.

60) Jish ***bo****-kon-am.* (for ***mi****-kon-am*)
Wee SBJV-do-1SG [2;4/MLU 1.3]
'I wee'

61) Man ino ***mi-*** *zan- am.* (for ***be****-zan-am*) [2;7/MLU 1.8]

I this PRES_touch-1SG
'I touch this'

62) Erika-ro hala ***be****-ia-ad.* (for ***mi****-ia-ad*) [2;9/ MLU 2]
Erika now SBJV-come-3SG
'Erika will just come'

63) Mi- xa -am be- xab- am ***be-*** *ia- am*(for ***mi****-ia-am*) [2;11/MLU 2]
PRES-want-1SG SBJV-sleep-1SG SBJV-come-1SG
'I want to sleep then I will come'

64) ***Be-****gir-e* (for ***mi****-gir-e*) [3;1/MLU2.1]
SBJV-arrest-3SG
'(police) will arrest him'

As can be seen in utterances (51) to (64), the inflections which were already established as productive and contrastive were replaced by other forms which were also established as productive and contrastive; for example, in utterance (52) the use of 2SG was established as productive and contrastive within the PRES paradigm by 2;6 (MLU 1.5); however, it was replaced by 1PL at 2;7 (MLU 1.8); the only exception is the error in utterance (50) where 1SG within the SBJV paradigm has been replaced by 2SG at 2;4 (MLU 1.3) whereas 2SG would not become productive and contrastive until 2;9 (MLU 2).

The utterances in which maximal commission errors occurred are given in 65 and 66:

65) Goft happy-birth ***<u>be</u>****-xar.* (*for* ***mi****-xar-****e****/*IMP for PRES) [3;1/ MLU 2.1]
PRET happy-birth IMP-buy.
'(he) said (he) will buy happy-birthday'.

66) Barf dar -**<u>e</u>** *amad*. [3;1/ MLU 2.1]
Snow Aux-3SG came (for ***mi****-ia-****ad*** /PRET for PRES)
'It is snowing.'

As can be seen, the larger number of Elly's errors are minimal commission errors. The only two maximal errors (i.e., errors which did not share any affixes) occurred at 3;1 (MLU 2.1).

The error in (66) occurred in PROG Aspect (*dar* + 3SG mi-PRES STEM + 3SG). Elly first used PROG in 2;7 (MLU1.8) in 3SG, *dar-e mi-re* 'she is leaving', referring to the investigator who was leaving. At 3;1 (MLU 2.1) she used AUX *dar-e* with 4 verb types. It should be pointed out that according to the error made in (56), AUX *dar-e* seems to have remained unanalysed by Elly.

It should be noted that while there may be some explanation for the individual errors occurred in Elly's speech, no generalization can be made until the verb production of other participants is analysed.

5.2.7 Morphological errors in Melika's production

5.2.7.1 Errors of Omission

Melika substitutes IMP AFF form for 1SG SBJV and 2SG SBJV by dropping 1SG and 2SG respectively in utterances (67) to (71):

67) *Be- par* (for *be-par-**am***) [1;10/ MLU 1.3]
IMP-jump
'(I want to) jump'

68) *Be -shin* (for *be-shin-**am***) [1;10/ MLU 1.3]
IMP- sit
'(I want to) sit'.

69) gole sar *be-zan*(for *be-zan-**am***) [2;7/ MLU 2.6]
hair pin IMP-use
'(I want to) use hair pin'

70) man mi-xah- am *be- ia* jelo (for *be-ia-**i***) [2;7/ MLU 2.6]
I PRES-want-1SG IMP-come forward
'I want you to come forward'

71) hala bayad mahi *be-kesh*(for *be-kesh-**i***) [2;7/ MLU 2.6]
now must fish IMP-draw
'Now you must draw a fish'

72) Kush kush peida *na-kard*(for *na-kard-**am***) [2;0/ MLU 1.9]
Where where find NEG-did
'Where is it? I couldn't find it'.

73) dorost *kard* man(for *kard-**am***) [2;0/ MLU 1.9]
Fix did I
'I fixed it'

74) lop- esh-o injur *kon-e (*for ***mi**-kon-e*) [2;3 / MLU 2]
cheek-her-ACC this way do-3SG
'She does this with her cheeks'

In utterances (72) and (73), Melika omits 1SG from the past stem *kard*. The only prefix dropped in Melika's speech is *mi-*, which is omitted from *mi-kon-e* at 2;3 (MLU 2.1) in utterance (74). It should be noted that all of the omitted inflections in Melika's productions were already established as productive and contrastive in her speech.

5.2.7.2 Errors of commission

75) hama-ro *be-zan-**i*** (for *be-zan-**im***) [1;10/MLU1.3]
all-ACC SBJV-polish-2SG
'Let's polish them all'

*76) mi- xor- **i*** (for *mi-xor-**am***) [1;10/MLU1.3]
PRES-eat-2SG
'I eat'

*77) mi-kan-**i*** (for *mi-kan-**am***) [2;0/MLU 1.9]
PRES-pick-2SG
'I pick'

78) az ina *xord-**e*** (for *xord-**am***) [2;0/MLU 1.9]
from these ate-3SG
'I ate from these'

*79) be- bin- **i*** (for *be-bin-**im***) [2;0/MLU 1.9]
SBJV-see-2SG
'(we can) watch'

80) man *be-bin-**e*** (for *be-bin-**am***) [2;0/MLU 1.9]
I SBJV-see-3SG
'I want to see'

*81) mi- oft- **e*** (for *mi-oft-**am***) [2;0/ MLU 1.9]
PRES-fall-3SG
'I will fall'

82) rad *be- shav-**e*** man (for *be-shav-**am***) [2; 0/ MLU 1.9]
pass SBJV- get- 3SG I
'I get passed'

83) naqashi ***mi**-kesh-am* (for ***be**-kesh-am*) [2; 0/ MLU 1.9]
picture PRES-draw-1SG
'I (want to) draw a picture'

84) badkonak ***mi**- iar - am*(for ***be**-iar-am*) [2; 0/ MLU 1.9]
balloon PRES-bring-1SG
'I (want to) bring a balloon'

85) badkonak foot ***mi**-kon-am*(for ***bo**-kon-am*) [2; 0/ MLU 1.9]
balloon blow PRES-do-1SG
'I (want to) blow the balloon'

86) salam ***mi**-kon-am* (for ***bo**-kon-am*) [2; 0/ MLU 1.9]
Hello PRES-do-1SG
'I (must) say hello'

87) befarmayi ***mi**-gu-am* (for ***be**-gu-am*) [2; 0/ MLU 1.9]
welcome PRES-say-1SG
'I (must) say welcome'

88) dorost ***mi**-kon-am*(for ***bo**-kon-am*) [2; 0/ MLU 1.9]
fix PRES-do-1SG
'I (want to) fix'

89) ba ina chi dorost **mi**-kon-am (for ***bo**-kon-am*) [2; 3/ MLU 2.1]
with these what make PRES-do-1SG
'what to make out of these'

90) mi- xast negah ***<u>mi</u>***- *kon- e* (for ***bo****-kon-e*) [2; 7/ MLU 2.6]
PRES-wanted look PRES-do-3SG
'He/she wanted to look'

91) *mi-dun-****<u>e</u>*** ina bara chie (for *mi-dun-****am***)
PRES-know-3SG these this [2; 3/ MLU 2.1]
'I know these are for this'

92) naughty step ***<u>be</u>***- *rav- am* (for ***mi****-rav-am*) [2; 3/ MLU 2.1]
naughty-step SBJV-go-1SG
'I will go to naughty-step'

As can be seen in utterances (80) to (92) the inflections which were already established as productive and contrastive were replaced by other forms which were also established as productive and contrastive; for example, in utterances (83) to (89) the SBJV marker which was established as productive and contrastive within the 1SG paradigm from 2;0 (MLU 1.9) was replaced by the established PRES marker. While in utterance (75) and (76) non-productive inflections have been replaced by other non-productive inflections, in utterances (77) and (78) the productive 1SG within the PRES and PRET paradigms, respectively, have been substituted by non-productive 2SG and P/PART. The only utterance where a productive inflection has been used in lieu of a non-productive one is utterance (79). It should be noted the majority of errors which occurred in Melika's production are commission errors, all of a minimal nature.

5.2.8 Morphological errors in Lilia's production

The only omission error in Lilia's production is in utterance (95) when Lilia used the IMP AFF form in lieu of PRES form by dropping the PRES and 2SG markers from

the verb stem. The other two errors are minimal commission errors, where Lilia has used wrong suffixes in obligatory contexts.

93) jish *mi-kon-**i*** (for *mi-kon-**im***) [1;11/ MLU 1.4]
wee PRES-do-2SG
'we wee'

94) be- ia- ad in o *be- pors- **e*** chi -e(for *be-pors-**am***)[2;4/ MLU 2.5]
SBJV-come-3SG this ACC SBJV-ask-3SG what-is
'(I'm expecting) him to come so I can ask him what this is'

95) xodet goft-i mæn o negah *kon* (for ***mi**-kon-**i***) [2;4/ MLU 2.5]
you said-2SG me ACC look do
'you said you will look at me'

It should be noted that IMP AFF and SBJV prefixes are homonymous in Persian, so by dropping the 1SG in utterances (39), (67), (68), (69) and 2SG in utterances (38), (70), (71) and 1PL in utterance (40) Elly and Melika are in fact using the IMP AFF form. In other words, although Elly and Melika are dropping inflections, the forms they produce are not bare stems, as in all the erroneous utterances they replace one form with another form by dropping the personal endings. This is in line with other studies done on morphologically rich languages such as Spanish and Italian, in which children produce no bare verb stems. In utterance (95), however, although a bare stem has been produced by Lilia by dropping PRES and 2SG markers, since the verb *kon 'do'* can be used without an IMP AFF marker, the production is not ungrammatical.

The analysis of errors in the productions of the three children of this study shows that in the majority of cases, the omission errors occurred when a productive and contrastive inflection was dropped; similarly, in most of the commission errors a

productive and contrastive inflection was replaced by another productive and contrastive inflection. This gives evidence to the co-occurrence of correctly inflected forms of some verbs alongside the incorrect use of others. For example, in the case of Melika, contrastive and productive use of 1SG in the SBJV was established from 1; 10 (MLU 1.3) but she still sometimes made erroneous productions by dropping this morpheme until 2;7 (MLU 2.6). Similarly, as can be seen in utterance (55), Elly at 2;11 (MLU 2) used 1SG in lieu of 2SG, which was established as productive and contrastive within the SBJV paradigm at 2;9 (MLU 2).

5.3 Discussion

The first fact that emerges from the results is that in all three children there is a temporal gap between the emergence of verbal inflections and the sessions in which they are established as acquired. We can be sure that there were some inflected forms in subjects' speech before data collection began, so that the time elapsing between first occurrences and an acquired form is unknown and could be even longer than is documented here.

According to Table 5-4 to Table 5-6, in Elly's production, inflections were acquired by 2;6 (MLU 1.5) while for Melika, the acquisition occurred between 2 (MLU 1.9) and 2;3 (MLU 2) and for Lilia between 2;1 (MLU 1.7) and 2;4 (MLU 2.5). However, as was observed, we might only be able to credit the child with productive command of a particular person for a particular mood or tense (1SG in SBJV mood only at 2;4 for Elly) or a particular mood, tense or aspect for a particular person and number (PRES inflection in 1SG only at 2;4 for Elly). That is, a person distinction in one tense or mood does not necessarily carry over to another tense or mood.

Similarly, a tense or mood contrast in one person does not necessarily carry over to another person. Although looking for the productive and contrastive use of inflections in two paradigms was implemented, this may mask the fact that the child is still not using a given morpheme across the board; rather, she is using it only for particular paradigms or persons.

The pictures of development of contrasts observed among the three children (i.e., for Elly : Mood > Person, AFF/NEG, Tense > Number > Aspect, for Melika : Person > Mood, AFF/NEG, Tense > Number, Aspect and for Lilia : Person, Aspect > AFF/NEG, Number> Mood, tense) show that the patterns of development of contrasts in Melika is similar to Elly as in both Person and Mood contrasts developed before AFF/NEG and Tense contrast followed by Number and Aspect contrasts. It was also observed that, 1SG and 3SG became productive and established contrastive knowledge in one paradigm earlier than 2SG in both Elly's and Melika's productions and they in turn developed productivity and contrast before 1PL, 2PL (for Melika), 3PL and PP. Furthermore, in all the three children of the study, 1SG and 3SG established productivity and contrast in two morphological paradigms before 2SG and Plural forms.

In terms of prefixes SBJV and PRES became productive and established contrastive knowledge earlier than IMP AFF and IMP NEG and they in turn developed productivity and contrast before PI in both Elly's and Lilia's productions. Furthermore, in all the three children of the study, SBJV, PRES and NEG established productive and contrastive use in two paradigms earlier than 2SG and Plural form. However, as discussed earlier, although some similarity in the sequence of development of morphemes was observed among the children, the evidence does

not support the claim that Persian morphemes develop earlier than suffixes, or vice versa.

Furthermore, the results show that the only suffixes which met the full criteria of acquisition in children's productions are 1SG and 3SG, whereas all the target prefixes except for PI were acquired by the end of the period of study. A closer look at the data reveals that the lack of required number of obligatory contexts for the production of 1PL, 2PL, 3PL and PP got in the way of measurement of the acquisition of these suffixes while the acquisition of 2SG appeared to be delayed as a result of one error in each of Lilia's and Elly's production as well as insufficient obligatory contexts for the production of this morpheme for both Melika and Elly. A reason behind the child's producing a limited number of inflections can be the lack of a range of linguistic contexts to use them in as the child seems to acquire the constraints of obligatory use only gradually. As discussed previously, sampling also may not have been dense enough to provide the opportunity for an adequate number of obligatory contexts for inflections which occur with low frequency. However, as discussed earlier, for inflections which occurred with high-frequency similar increases in productivity would be expected if a larger cumulative speech sample was available. Nevertheless, as has been pointed out, for inflections with low frequency a larger cumulative speech sample may demonstrate a different picture of development.

The analysis of errors in the productions of the three children of this study shows that in the majority of cases, the omission errors occurred when a productive and contrastive inflection was dropped; however, by omitting a verbal morpheme the children did not produce ungrammatical constructs; in other words the produced constructs were grammatically correct but functionally wrong for the intended

meaning; similarly, in most of the commission errors a productive and contrastive inflection was replaced by another productive and contrastive inflection producing another grammatical construct that was wrong for the context. This gives evidence of the co-occurrence of correctly inflected forms of some verbs alongside the incorrect use of others. Furthermore, according to the results, the majority of errors occurring in children's productions are commission errors indicating that the child has a tendency to replace grammatical morphemes rather than omitting them; this supports the claim that in morphologically rich languages as in Persian similar to Polish "morphological development should be conceived of as the acquisition of the ability to REPLACE grammatical morphemes according to the rules of the language rather than the ability to ADD them to the basic forms when required" (Smoczyńska, 1985:596).

Another finding is that the majority of the omission and commission errors occur in suffix position. Although no order for the earlier development and acquisition of prefixes before suffixes was reported in children' productions in this study, the more frequent occurrence of errors in suffix position can be taken to suggest that children find suffixes more challenging to supply correctly in obligatory contexts than prefixes. This could be due to the opaque nature of suffixes in Persian, which encode person and number simultaneously (see Chapter 3).

According to results of the analysis in this Chapter it can be claimed that although the productions of the children in this study may suggest some order in the development of productivity and contrastive knowledge of Persian verbal inflections, it is not possible to talk about distinct stages in the acquisition of verbal morphemes such that we could say that number or aspect is established after tense or person or

the like. In other words, none of the productive use and contrasts emerges in a general, across-the-board fashion. Furthermore, errors in some of the productively established forms in the data showed that correctly inflected forms of some of the verbs co-occurred with the incorrect use of others. Therefore, it can be suggested that, as in Gathercole's (1999) study of Spanish, Persian children gain command of Persian verbal morphology in a piecemeal fashion. In other words the development of verbal categories (person, number, tense, mood, aspect, negation) follows a scattered pattern. The growth of such piecemeal contrasts leads to real productivity and finally the acquisition of the morphological system. As was seen, the three children differ in their pattern of learning of morphological contrasts; however, for all of them the rate of contrast starts to level off at a similar developmental stage (between MLU 2 and MLU 2.2). Furthermore, it was observed that the rate of contrast increases as the children are adding to their verbal lexicon but these results do not support Marchman and Bates' (1994) 'critical mass hypothesis'. In other words, although the children are able to apply their inflections to a wider range of verb types as their language develops, this phenomenon is not prompted by a critical increase in the size of their verbal lexicon. This indicates that they are expanding the rules of morphological system to a wider range of verbs across different paradigms and persons, but this is a gradual process. Therefore, although some early productive and contrastive uses of verbal forms can be identified, it will presumably take a lot longer for an inflectional system to be established.

It is possible that the constructs used by a child are directly related to those that she hears in the input. To what extent is there a correlation between the frequency with which the parent uses forms and the order in which these are used productively by

the child? In order to explore the extent to which Elly, Melika and Lilia's verbal morphemes were related to those found in the input, the speech of their mothers is examined in the next chapter.

6 Input Analysis and Results

6.1 Introduction

Within the constructivist framework, one of the factors that have been associated with the studies of the acquisition of morphology is the role of input. From a usage-based perspective, children build their grammars primarily out of the phonological–lexical strings that they receive from the input rather than analysing that input in terms of abstract, linguistic categories.

As was previously discussed in Chapter 2, according to the various naturalistic studies of children's language acquisition, the more frequently children hear a construction, the earlier they acquire that construction and use it productively. Frequencies also interact with other factors such as semantic or prosodic salience of items in the input which can enhance or reduce frequency effects of the forms.

To investigate the frequency effects of input on the course of development of verbal morphemes in children's speech in this study, child directed speech (CDS) was examined.

The predictions were as follows. If frequency of input has a determining role in the order in which children acquire verbal morphemes, then there should be a strong *negative* correlation between the frequency of the morphemes used in the input and the order in which the morphemes emerged and reached productivity in the speech of the children. In other words, it was predicted that the more frequent a morpheme is in the input, the earlier it would emerge and become productive. However, as was discussed above, there could still be a *negative* correlation between frequency of input and the order of productivity without frequency of input being the determining

factor. It could be that both frequency of input and order of acquisition correlate with factors such as transparency and/or salience of morphemes.

6.2 Method

Ten-minute selections from two of the CDS transcripts for each child were analyzed. For each child, one of the input transcripts was an early one, when the child had a lower MLU and showed little productive use of verbal morphemes, and the other was from a session when the child had a higher MLU and more productive use of morphemes. The logic behind this sampling was to find out whether the input changed in terms of frequency in response to the children's linguistic level. In the case of Elly the first ten minutes of sessions 1 and 4 were examined, in the case of Melika and Lilia, the first ten minutes of sessions 2 and 5 were analysed. The samples were selected on the basis of clarity of mothers' speech and minimum intervention from other speakers. It should be noted that in Lilia's case the input samples included Lilia's brother's speech as well. Lilia's brother was 6 years old at the time of data collection and his speech was mostly errorless. Pearson Correlation was calculated to compare the frequency of forms of early samples with late samples for each mother in terms of type and token frequency. Since a positive correlation between the forms for type and token frequency of the samples was found for all the mothers, the two samples for each were combined.

Three types of analyses were carried out on the data. First, Spearman correlations were calculated, comparing the order of emergence, productive use and contrastive knowledge of each of the 13 morphemes in the children's speech with their frequency of use in their input speech. The frequency with which each morpheme was used was calculated, for both types and tokens. In this analysis correlations for

the morphemes (i.e., prefixes or suffixes such as PRES marker *mi-* or 3SG *e, ad*) were calculated regardless of the accompanying suffixes or prefixes. For example, the frequency of PRES marker *mi-* in the input was calculated in total and compared with the order of its emergence and productivity in the child's speech, regardless of the suffix it was used with, as shown in Table 5-4 to Table 5-6.

Second, the morphemes that were used were examined; taking into account the prefix or suffix they combined with. For example, the frequency of prefix *mi-* in the input was separately calculated as it occurred in combination with the different personal endings (i.e., *-am, i, e/ad, im, id, and*) and compared with the order of emergence and productive use for each combination in the respective children. The frequency with which each verb form was used was again calculated both for types and tokens (Appendix 4).

Pearson Correlation was calculated comparing the frequency of the morphemes of the three input samples. Since positive correlations between types and tokens of morphemes of the three input samples were found, the input samples were combined and the above first and second analyses were repeated in order to examine the correlations in view of a larger and therefore a more representative sample. (see Appendix 5).

Finally, for each verb that was used by both the child and her mother, the correlation between the exact form of that verb in their respective speech was examined in order to find out to what extent the forms used by the parent for each particular verb influences the forms used by the child for that same verb. The input verbs of the combined sample are shown in Appendix 5.

If frequency of input plays a determining role in the order children acquire verb forms, then there should be a strong negative correlation between the frequency of the use of forms used by the mothers and the order of productive and contrastive use of the forms in their respective children. In other words the morphemes which are used more frequently are expected to emerge and become productive and establish contrast earlier than less frequent morphemes. If order of acquisition could also be explained in terms of an alternative factor such as salience or transparency, then the case for the frequency of input is weakened.

6.3 Results

The results of the correlations between the order of emergence and productivity of morphemes in the three children and type and token frequency of morphemes in the individual and combined input samples are shown in Table 6-1.

Table 6-1 Correlation between input frequency and children's order of morphological development

Spearman Correlations		Elly			Melika			Lilia		
		Emergence	Productivity	Contrastive Knowledge	Emergence	Productivity	Contrastive Knowledge	Emergence	Productivity	Contrastive Knowledge
First Analysis using individual CDS data (forms are examined regardless of the combination they are used with)										
CDS TYPE	r	-.467	-.341	-.341	**-.627***	**-.568***	**-.598***	**-.639****	-.476	-.539
CDS TOKEN	r	**-.651***	-.441	-.441	**-.696****	**-.586***	**-.645***	**-.639****	-.344	-.362
	N	**11**	11	11	**13**	**13**	**13**	**13**	12	12
First Analysis using combined CDS data										
CDS TYPE	r	-.410	**-.652***	**-.652***	**-.619***	**-.626***	**-.657***	**-.622***	**-.576***	**-.635***
CDS TOKEN		-.471	**-.578***	**-.578***	**-.644****	-.457	**-.532**	**-,592***	-.360	-.375
		12	**12**	**12**	**13**	13	**13**	**13**	12	12
Second Analysis using individual CDS data (forms are examined individually in prefix-suffix combinations)										
CDS TYPE		**-.459****	-.080	-.095	**-.717****	**-.333***	**-.412***	**-.426****	**-.457****	**-.391***
CDS TOKEN		**-.469****	-.136	-.140	**-.734****	**-.109**	**-.182**	**-.437****	**-.494****	**-.397***
		41	30	30	**55**	**37**	**36**	**49**	**35**	**34**
Second Analysis using combined CDS data										
CDS TYPE		**-.723****	-.341	-.334	**-.735****	-.183	-.231	**-.492****	**-.336***	-.310
CDS TOKEN		**-.635****	-.237	-.247	**-.774****	-.124	-.142	**-.483****	**-.360***	-.251
		41	30	30	**55**	37	36	**49**	**35**	34

**. Correlation is significant at the 0.01 level (1-tailed).

*. Correlation is significant at the 0.05 level (1-tailed).

Significant correlations are highlighted

According to the results shown in Table 6-1, following the first analysis, when forms are examined regardless of the combination they are used in, type and token frequency of both individual and combined input, influence the order of emergence of morphemes in the productions of Melika and Lilia; however, for Elly only token frequency in individual input data shows a strong correlation with the emergence of morphemes ($r=.651$, $p<0.05$).

On the other hand, the influence of type and token frequency on the order of productivity and contrastive use of the morphemes is less obvious when analysing the individual input samples; according to the first analysis only in Melika's case a strong negative correlation is reported between type and token frequency and the order of productivity and contrastive use of the morphemes in the child's productions (for type: $r=568$, $p<0.05$), (for token: $r=586$, $p<0.05$). On the other hand, when the three input samples are combined, significant correlations between type frequency and productive and contrastive use of morphemes for Melika and Lilia are found. This could be due to the fact that the larger sample may be more representative whereas small samples can be biased in many ways. However, the correlations between frequency in input and the order of emergence may simply reflect distributional biases in language use. In other words, high frequency items are more likely to appear to be 'acquired' first as they are also more likely to appear in any sample of language.

According to the second analysis, when forms were examined considering prefix-suffix combinations they were used in, as summarised in Table 6-1, type and token frequency of input influence the order of emergence of morphemes in the productions of all three children in both individual and combined input samples. For

example, on closer examination of Elly's data following the second analysis using individual input, it can be seen that 1PSG *–am,* which first emerged in the *SBJV, PRES* and *PRES (no prefix)* forms (see Table 5-1) was also frequently used by the mother in the above forms; in addition, the PRET NEG form of 1SG as well as the PI form (as in *mi-dad-am* 'I was giving'), which did not occur in the input samples, were either absent in Elly's output (in case of the PRET NEG form) or emerged later (in case of the PI form). However, similar to the first analysis, type and token frequency do not equally influence the order of productivity of the morphemes in the three children. Type and token frequency show a significant negative correlation with productivity of morphemes in Lilia's output in both individual and combined samples. On close examination of Lilia's data following the second analysis using the individual input sample, it can be seen that 1SG *-am* which became productive first in the PRET form (see Table 5-3), was also most frequently used in the PRET form in the input in terms of both type and token; furthermore, 1PL *–im* , used only in the SBJV form by the mother, also first emerged and became productive in the SBJV form; similarly PRES *mi-*, used most frequently in the 3SG form in the input, was first used productively by Lilia in the 3SG form. Furthermore, a strong negative correlation between type and token frequency and productivity of morphemes is observed for Melika in individual input analysis while type frequency shows to have a stronger influence on developing contrastive knowledge.

Based on Table 6-1, frequency of the forms in the input seems to have an influence on the order of emergence and perhaps productivity and contrastive use of morphemes. However, this influence can be weakened if the order is explained through alternative factors such as perceptual salience and morphological

transparency. The results of the analyses in Chapter 5 did not support the prediction that prefixes would develop earlier than suffixes due to their salience and greater transparency as compared to suffixes, which are also salient but opaque. On the other hand, the findings gave support to the influence of input frequency on the acquisition of verbal morphemes. However, it was also observed that most of the omission and commission errors occur in suffix position. Therefore, as previously discussed, although the development of verbal morphemes in the children's productions cannot be explained by typological factors, the more frequent occurrence of errors in suffix position can still be taken to suggest that children find suffixes more challenging to supply correctly in obligatory contexts than prefixes. These results highlight the influence of frequency in the development of Persian verbal morphemes. A regression analysis would be a useful tool to examine the relative contribution of each factor to children's acquisition of verbal morphemes, but a larger amount of data would be needed to run the analysis. This limitation could be addressed by recruiting more children and collecting more frequent samples.

So far the influence of verb types and tokens on the order of emergence and productivity of verbal morphemes has been examined. However, no verb-to verb analysis was done to examine at the effect of individual verbs on the productive use of morphemes.

6.4 Particular Verb Forms

If it is true that children learn verbs as "islands" (Tomasello, 1992), it may be that taking broad views of the forms used by children and correlating their order of

productivity with their mothers' use of such forms will not give us a full picture of the influence of input on children's productions. Both child and mother may use one verb exclusively in, for example, the past form, while they use another verb exclusively in the imperative form.

Therefore, all of the verbs used by both the mother in the selected samples and the child in all the sessions were extracted and two verb-by-verb comparisons were made. The findings are summarised in the following section.

6.4.1 Elly

The results show that 51 out of 187 (i.e., 27%) verbal constructs (Prefix + STEM + Suffix) used by Elly have also been used by her mother. However, only 4 verb types out of Elly's 62 verb types (*did-i* 'you saw', *gereft* 'he/she got', *bash-e* 'be', *be-xun* 'read') were exclusively used in the same forms by both Elly and her mother. The above 27% ratio is increased to 48% when comparing Elly's verbs with the combined samples of the three mothers, while *did-i* 'you saw' happens to be the only verb which was exclusively used in the same form by both Elly and her mother in this larger sample.

Looking closely at the emergence and productivity of inflections in Elly's data in order to examine the effect of frequency of verbal morphemes in input on the productive use of morphemes reveals that at 2;4 (MLU 1.3) when 1PSG *–am* emerged and was used productively in the SBJV form, it was most frequently used with verbs *be-zar-am* 'I (want to) put' and *be-deh-am* 'I (should) give' in the

mother's input (3 and 4 tokens each, respectively); however, these two verbal combinations were both absent in Elly's output at 2;4 (MLU1.3); on the other hand, Elly used *be*-STEM-*am* most frequently with *be-band-am* 'I (want to) fasten' and *bo-kon-am* 'I (want to) do' (4 tokens each), which were also both absent from the input. Looking at the emergence of contrast reveals that the child contrasted *–am* by using *be-gir-am* 'I (should) take' vs. *be-gir* 'take'. Although *be-gir-am* 'I (want to) take' was only used once by the mother in *Ashero be-gir-am* 'I (want to) take Asher', as shown above, the child was already using *be*-stem-*am* with verbs which were recorded in the input; in other words, it seems that in place of the varying stem a slot had emerged on the basis of type frequency. Furthermore, following frequent exposure to *be-gir* 'take' (6 tokens), the child established the contrast for *–am*.

Similarly 1SG *–am* in the PRESENT form which emerged at 2;4 (MLU 1.3) and started to be used productively at 2;6 (MLU 1.5), was most frequently used with *mi-xah-am* 'I want' in both sessions while this verb type was not used in the input samples. At 2;6 (MLU 1.5), the child made a contrast for *–am* in the PRES form by using *mi-kon-am* 'I do' vs. *mi-kon-e* 'he/she does' and *mi-bor-am* 'I cut' vs. *mi-bor-e* 'he/she cuts', while frequent use of *mi-kon-e* 'I do' in the input was evidenced, no occurrence of *mi-bor-e* 'he/she cuts' was reported; however, as Table 5-4 shows, *mi*-STM-*e* was already established by 2;6 (MLU 1.5).

So in the above examples, although type and token frequency in Elly's mother's input speech do not seem to contribute directly to Elly's productive and contrastive use of the morphemes (see Table 6-1), they have a significant role in the emergence of morphemes and provision of morphological contrasts for verbs.

These comparisons reveal indirect relationships between the forms used by the mother and the child on a verb by verb basis.

6.4.2 Melika

Two verb-by-verb comparisons between Melika's verbs and her mother's input show that 74 out of Melika's 202 verbal constructs (36%) were also used by her mother. However, no verbs were exclusively used in the same forms by both Melika and her mother. The above ratio is increased to 42% when comparing Melika's verbs with the combined samples of the three mothers.

The pattern of emergence and productivity of inflections shows that at 2;0 (MLU 1.9) when 1SG *–am* was first used productively in the PRES form it was most frequently used with verbs *mi-kon-am* 'I do', *mi-ia-am* 'I come' and *mi-tars-am* 'I fear'; while *mi-kon-am* 'I do' was the most frequent verb in the input among the others in such a combination (i.e., *mi*-STEM-*am*), *mi-ia-am* 'I come' and *mi-tars-am* 'I fear' were both absent from the input. Melika established a contrast for *–am* at 2;0 (MLU 1.9) by using *mi-kon-e* 'he/she does' vs. *mi-kon-am* 'I do', *mi-zan-e* 'he/she hits' vs. *mi-zan-am* 'I hit', *mi-shav-e* 'it become' vs. *mi-shav-am* 'I become' and *mi-bin-e* 'he/she sees' vs. *mi-bin-am* 'I see'. Among these verbs *mi-kon-e* 'he/she does' and *mi-shav-e* 'he/she becomes' are the most frequently used verbs in this combination in the input and therefore their frequency seems to have an influence on their emergence and therefore their contrast with *mi-kon-am* 'I do' and *mi-shav-am* 'I become'. Furthermore, according to Table 5-2, *mi*-STEM-*e* is established as productive and contrastive by 2.0 (MLU 1.9) which in itself can explain the presence of different verbs in that form.

6.4.3 Lilia

The results of the two verb-by-verb comparisons between Lilia's verbs and the verbs in the input show that 44 out of Lilia's 115 constructs (38%) were also used in her mother's input. However, only two verbs out of Lilia's 65 verb types were exclusively used in the same forms by both Lilia and her mother. The above ratio is increased to 62% when comparing Lilia's verbs with the combined samples of the three mothers.

Looking closely at the emergence and productivity of inflections reveals that at 1;11 (MLU 1.4) when 1PL *–im* emerged and became productive in the SBJV form it was most frequently used with *be-zar-im* 'we (should) play', however while stem *zar* was used in *be-zar* 'play' and *be-zar-e* 'he/she (should) play' in the input, it's use with *-im* was not reported. Furthermore, the contrast for *im* was established when the child used *be-zar-im* 'we (should) play' and *be-zar* 'play' contrastively at 1;11 (MLU 1.4) by *nanai be-zar* 'play music' and *nanai be-zar-im* 'let's play music'. Although *be-zar-im* 'we (should) play' was absent in the input *be-zar* 'play' was very frequently used (12 tokens). It can be therefore hypothesized that frequent exposure to *be-zar* 'play' had an influence on the emergence of this verbal combination in the child's output and as a result helped the child establish the contrast with *be-zar-im* 'we (should) play'.

6.5 Discussion

Three types of analyses were conducted on the data in this chapter. First, correlations between input and children's output for morphemes regardless of the accompanying suffixes or prefixes they were used with (i.e., prefixes or suffixes such as PRES

marker *mi-* or 3SG *e, ad*) were calculated. Second, the first analysis was repeated but this time looking at morphological combinations (i.e., prefix-STEM-suffix). Third, the input samples were combined and the above first and second analyses were repeated in order to examine the correlations in view of larger input samples. Finally, for each verb that was used by both the child and her mother, the correlation between the exact form of that verb in their respective speech was examined.

Based on the results summarised in Table 6-1, type and token frequency of the forms in the input seem to have an influence on the order of emergence and perhaps productivity of morphemes. The results of the first analysis suggest that type and token frequency of morphemes, regardless of the morphological combination they occur in, seem to have an influence on the emergence and perhaps productivity of contrastive use of morphemes, at least in Melika's case. When the input data sample was widened by combining the three mothers' input, the effect of type frequency on the productivity of morphemes and establishing morphological contrast is highlighted. According to the second analysis, when correlations are examined in morphological combinations a slightly different picture emerges. The results show the influence of type and token frequency on the emergence of morphemes in all the three children; however, the effect of frequency of tokens on productive and contrastive use of morphemes seems to have increased only for Lilia.

To sum up, the results of Table 6-1 show that input frequency has an influence on the development of verbal morphemes at different levels of morphological development, from emergence to productivity and establishing contrastive knowledge. Although this influence was not consistent across the board depending on the kind of analysis and different stages of development of verbal morphemes, its

role in the emergence, productivity and establishing morphological contrasts was documented in all three children of this study. However, as was discussed earlier this influence would be weakened if the order of development of verbal morphemes is explained through alternative factors such as perceptual salience and morphological transparency. It was discussed in Chapter 3 that the relation between the form and the meaning is transparent in Persian prefixes as they encode only one function at a time; furthermore, they attract stress and as a result they are perceptually salient as well as transparent; therefore, it was predicted that they appear and become productive earlier in children's productions than suffixes which are perceptually salient but structurally opaque. However, the results of the analyses in Chapter 5 revealed no evidence for the earlier development and acquisition of prefixes before suffixes in productions of the children of the study; these results highlight the influence of input frequency in the order of development of verbal morphemes in this study.

The results of the verb-by-verb analysis show that around 30% to 40% of the verbal constructs in children's speech are used by their mothers, indicating a relatively low amount of overlap in the verbal constructs of children and their mothers. Furthermore, fewer than 6% of the children's verbs are exclusively used in the same form as their mothers. It was discovered that the frequency of tokens in the input containing shared stems had an influence on the development of contrasts in the child's productions although the input samples do not themselves demonstrate full productivity. In other words, the children were not just repeating their mothers' verbal constructs and they seemed to be beyond the stage of purely rote-learned forms as there does not seem to be a correlation on a verb by verb basis in most cases. On the other hand, the productive use of morphemes seems to be a process

that occurs gradually, following considerable exposure to the input in different variations in terms of types and tokens. In other words, having learned a number of lexically specific patterns from the input, the child starts to abstract over them to form a more general category; in the meantime, frequency of same-stem verbal tokens seems to play a role in establishing contrast. This indicates an indirect relationship between the frequency of input and productivity even where this relationship is not clearly demonstrated statistically.

7 Discussion

7.1 Theoretical Background

This thesis was motivated by the attempt to describe the order of development and acquisition of verbal morphology in Persian, as well as to examine the role of input and typological factors in the process of acquisition. There are two major theoretical positions in the realm of child language acquisition, generative vs. constructivist approaches. According to the generative approach, children's knowledge of grammar, which encompasses inflectional morphology, consists of innate knowledge of formal rules affecting grammatical features. The innate knowledge assumed by this position is held to be part of Universal Grammar (UG), which applies to all the world's languages. The second, constructivist theoretical position assumes that children do not have innate knowledge of grammar (i.e., they are not born with grammatical categories or principles) but acquire that knowledge by generalising from the speech that they hear; therefore constructivist approaches are generally input-based. The constructivist usage-based account of language acquisition assumes that children's language acquisition is driven by their desire to use language for communicative functions. In this gradual development the effect of phonological neighbourhood along with type and token frequency of input may clarify how children generalize the constructions to new contexts. In addition, typological factors such as the transparency and perceptual salience of items in the input interact with frequency and may increase or decrease its influence on acquisition.

As discussed earlier, the constructivist position results in different predictions about the process of early morphological development. A first set of constructivist theories

proposes that the order of acquisition of inflectional morphemes in children's language can be determined by typological properties of the linguistics structures (i.e., perceptual salience and morphological transparency) in the input (Slobin, 1985; Peters, 1997; Dressler, 1997, Devescovi et al., 2005). It has been argued that stress and position within the word are helpful in the child's initial segmentation task as children tend to preserve stressed and final syllables in their productions while they tend to delete unstressed, non-final syllables (Echols and Newport, 1992; Echols, 1993; Vihman, 1980, 1996; Snow, 1994). Furthermore, Sundara et al. (2011) reported that the children produced third person singular *–s* more accurately on verbs in sentence-final position in comparison with verbs in sentence-medial position. Longobardi (2015) showed that the positional salience of the nouns and the increase in their frequency in utterance-final position with age benefits their early acquisition. In addition, highlighting the relations between form and meaning, Krajewski et al. (2011) suggested that inflections switch by some sort of emergent generalisations on the basis of a pairing of form and meaning. It has also been observed that the structures that are regular and transparent (i.e., with a one-to-one form-to-meaning relation) are acquired more easily and therefore earlier than fusional structures (Bittner et al., 2003). The morphological system of Persian verbs is rich. As was discussed in Chapter 3 Persian verbal morphology has a regular affixal system that requires the combination of prefixes to express different tenses, aspects and moods, stems, and inflections (suffixes) to mark the person/number. While suffixes having a fusional nature (encoding person and number) are placed at the end of the verbs and are therefore positionally salient, prefixes have a transparent nature and are prosodically salient as they attract stress. Therefore it was predicted that prefixes would appear earlier than suffixes in the course of development.

A second set of theories concern the role of type and token frequency on the productivity of inflectional morphology. In usage-based models of language acquisition type and token frequency of a construction in the language input play a dominant role in the productivity and entrenchment of morphological structures, respectively (Dąbrowska 2005, 2006; Dąbrowska and Szczerbiński 2006; Krajewski, 2011). The more often a given form is heard in the input or used in production, the more firmly it will become established in memory (Bybee, 1985, 1995). Therefore, the prediction was that the more frequently verbal morphemes are heard in the mother's input, the earlier they would become established in the child's language. However, frequencies also interact with a number of other factors, such as the semantic or prosodic salience of items in the input, which can increase or decrease the effect of frequency on acquisition (Theakston et al., 2005).

A third set of theories is based on the functionalist integrative model, indicating that linguistic categories appear and develop together with the development of lexical skills. It has been argued that according to the 'critical mass hypothesis' (Bates and Goodman, 1999; Marchman and Bates, 1994) an increase in the size of the lexicon beyond a given level is followed by morphosyntactic development, which supports the proposed interdependence of lexical and morphosyntactic development. Therefore, having learned a critical mass of verb types, the children would be expected able to apply their inflections to a wider range of verb types. On the other hand, Marcus et al. (1992:99) claimed that the beginning of production of overregularization errors could not be explained by increases in the number of verb tokens or types produced by children or their parents. These results disagreed with

the association between the mechanisms of acquisition of lexical and morphological domain.

Finally, it was discussed that the child constructs the linguistic categories in a gradual manner on the basis of various types of linguistic categories and schemas (Tomasello and Brook 1999). It was shown that error rates were considerably higher in low frequency contexts as compared to high frequency contexts, and significantly higher for low frequency than for high frequency verbs (Aguado and Pine, 2015) These results supported constructivist models claiming that children's early knowledge of verb inflection is limited in productivity.

Furthermore, as was previously discussed, in languages such as Spanish and Italian, which have rich verbal morphology, children's knowledge of verb inflection is initially lexically specific (Gathercole, et al., 1999; Pizzuto and Caselli, 1992) and therefore less productive than adults. However, Aguado-Orea and Pine (2015) claim that the limited flexibility of children's knowledge of verb morphology can be a result of the distributional properties of naturalistic speech samples due to sampling issues and not due to the limited nature of children's underlying knowledge as compared to adults. Nevertheless, as previously discussed in Chapter 4, using rigorous methods, a few recent studies comparing the use of children's and adults' use of inflections in matched speech samples report that children's use of inflections is lexically more restricted than adults (Aguado-Orea, 2004; Krajewski, Lieven and Theakston, 2012; Aguado and Pine, 2015). The results of these studies suggest that it would be wrong to assume that the obvious lexical specificity of children's early speech is a sampling issue.

These reviews led to the prediction that children's acquisition of Persian rich morphological structures would also be a piecemeal initially lexically specific process.

The aim of the analyses presented in this study was to shed light on the order of development of inflectional morphology in Persian as well as to test the relevant theories in a language the acquisition of whose verbal morphology has not so far been developmentally studied. The corpus collected for this thesis came from naturalistic, longitudinal speech samples of three monolingual Persian-speaking children.

7.2 Development of verbal morphemes

In order to determine the order in which children acquire the verbal morphological system a methodology was employed to monitor the children's progress and to observe the role of input in the development of morphemes at different levels, from emergence to full acquisition (see Chapter 5).

First, the point of *emergence* of morphemes was recorded. Second, the *first productive use* of verbal inflections was determined using the two-part criterion proposed by Pizzuto and Caselli (1994:156), adjusted to Persian. Third, *contrastive knowledge of morphemes* was reported; and fourth, *the rate of provision of relevant morphemes in obligatory contexts* was calculated. The aim of applying this methodology was to track the gradual development of morphemes by monitoring the path they take from first emergence in children's production until the establishment of productivity and contrast across different paradigms alongside correct use in obligatory contexts.

Based on the results of the analyses some similarity in the sequence of development of morphemes was observed among the children of the study; however, the results did not support the prediction that prefixes would develop earlier than suffixes due to their greater transparency. Nevertheless, prefixes still seemed to be preferred as all except PI *mi-* were acquired by the end of the study, whereas among the seven target suffixes only 1SG and 3SG met the full acquisition criteria; this was mainly due to a lack of the required number of obligatory contexts for the production of those suffixes. As previously pointed out these results can be explained by the density degree of sampling. In other words, our sampling may not be dense enough to provide the opportunity for an adequate number of obligatory contexts for low frequency inflections. Furthermore, the majority of the omission and commission errors in children's productions occurred in suffix position; therefore, although no order for the development and acquisition of prefixes before suffixes could be claimed, producing suffixes in obligatory contexts still seems to be more challenging than producing prefixes. Since the order of development of verbal morphemes in children' productions in this study cannot be explained by typological factors, the influence of input frequency in early language development is highlighted (Dittmar, et al., 2008).

When the relation between the lexical and morphological development of verbs was examined three development periods were identified. For Elly and Melika verbal contrast increased more slowly than the rate of verb learning in the early period. In the second period, the rate of increase of contrast exceeded the rate of verb production (for Elly) or was parallel to it (for Melika); however, following an increase in the size of the cumulative verbal lexicon at MLU 2, the rate of contrast

seemed to fall behind the rate of verb learning. For Lilia, although the first period looks different, given that a linear relation between the two variables can be seen, the rate of verb learning surpassed the rate of verbal contrast at around MLU 2, as with the other two children. According to Table 5-4 by this point the children have already acquired many of the prefixes and two of the suffixes and therefore are using the productive and contrastive inflections across a wide range of paradigms; however, as can be seen in the Figures 5-16 to 5-18 their use of these inflections does not increase across the board. In other words, these results are not wholly in line with Marchman and Bates' (1994) 'critical mass hypothesis'. Instead, they show that after some months of experience with production of different verb types with different inflections, the children only gradually extend the inflectional possibilities to new verbs. In other words, the gradual, 'piecemeal' learning of verbs is followed by a more gradual curve for morphological contrast, which, according to Vihman and Vija (2006:14), 'supports the idea of grammatical knowledge having to be abstracted out of language use'.

7.3 Input

In order to examine the influence of input on the development of morphemes correlations between *frequency* of verbal morphemes in *parental input* and their order of development at different levels (i.e., emergence, first productivity and contrastive knowledge) were calculated. Correlations were tested using both individual and combined CDS data, once between the order of development of forms and input morphemes regardless of the combinations they are used in and once when they occurred in suffix-prefix combinations (see Chapter 6). Furthermore, two verb-

by-verb comparisons were made between the mothers' input and the children's productions.

The results supported the influence of input frequency on the progress of verbal morphemes at different levels of morphological development, from emergence to productivity and the establishment of contrastive knowledge. As discussed in Chapter 6, input effects were distributed consistently across the board depending on the kind of analysis and different stages of development of verbal morphemes. However, the role of input on the emergence, productivity and establishment of morphological contrasts was evident in all three children. The results of the verb-by-verb analysis showed that the child was not just repeating the mother's verbal constructs, as there was no strong correlation on a verb by verb basis in over 90% of cases across all three children; on the other hand, the frequency of same-stem verbal tokens seemed to play a role in establishing contrast in children's productions, although the input samples did not themselves demonstrate full productivity. As previously pointed out, this could suggest a relationship between the frequency of input and the productivity of verbal morphemes, even if this relationship is not statistically evident. In other words, the children seemed to be beyond the stage of purely rote-learned forms; instead, the productive use of morphemes occurs gradually, following considerable exposure to the input in different variations in terms of types and tokens.

The analyses in Chapter 5 revealed no evidence for the earlier development and acquisition of prefixes before suffixes on the basis of typological factors (i.e., salience and transparency). This might be seen as supporting input frequency as the main factor affecting the order of development of verbal morphemes.

7.4 Conclusion

The results presented in this thesis have shown that although the production of verbal morphemes in Persian monolingual children may suggest some similarities in the order of the development of productivity and of contrastive knowledge, it is not possible to talk about a set order in the acquisition of verbal morphemes nor to claim that one morpheme is always acquired after another. In other words, the productive use and contrastive knowledge of verbal morphemes do not emerge and become established in a general, across-the-board fashion. Instead, the acquisition of verbal morphemes was shown to be a gradual process activated only after considerable exposure to the input in different variations in terms of types and tokens; that is, after learning a number of lexically specific patterns from the input, the child gradually begins to abstract over them to form a more general category. The occurrence of errors in some of the productively established forms in the data supports this gradual development by providing evidence that correctly inflected forms of some of the verbs co-occurred with the incorrect use of others. Therefore, it can be suggested that, as in Gathercole's (1999) study of Spanish, Persian children gain command of Persian verbal morphology in a piecemeal fashion. The analogy which Gathercole, Sebastián and Soto (1999:160-161) used for this process adequately captures the developmental characteristics of Persian verbal morphemes as well. In this image, which I favour and therefore quote here again, they compared the early acquisition of Spanish verbal morphology to drops of water falling to form a river, in which "each drop adds to the previous ones, until there is a substantial, critical mass to establish a whole, which both functions as a stable unit in itself, and at the same time continually changes as new drops fall and old ones dry up or roll away. At no point is it possible to say that before that point there was no river, while after it there is."

To conclude, this thesis adds to the limited existing database of Persian child language. Furthermore, a revised method applied to determine the productivity and contrastive knowledge of Persian verbal morphemes can now be used for testing hypotheses pertinent to the acquisition processes in languages which, like Persian, have a rich verbal morphology with prefixes and suffixes on the same verbal stem. It is only with further research on typologically diverse languages that we can widen our understanding of the process of language acquisition.

Appendix 1 Elly's Prefixes

Age & MLU w	PRES (mi-)							PI				SBJV (be- bo-)							NEG					IMP AFF (be- bo-)	IMP NEG (na-)	Verb types in session	Cumulative Verb types	Cumulative Verb types used in 2 + forms\ Contrast index
	SG			PL			V Type	SG			V Type	SG			PL			V Type	SG			PP	V Type					
	1	2	3	1	2	3		1	2	3		1	2	3	1	2	3		1	2	3							
2;4 1.3	4	-	1	-	-	-	5	-	-	-	-	5	1	3	-	-	-	9	-	-	-	-	-	6	1	15	15	5 / **33%**
	2	-	1*	-	-	-	2	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-			
2;6 1.5	7	3	8	-	-	-	12	-	-	1	1	11	(1)	5	-	-	-	14	2	-	3	-	4	11	2	28	31	11 / 35%
	5	-	5	-	-	-	7	-	-	-	-	3	-	3	-	-	-	-	1	-	3	-	-	1	1			
2;7 1.8	8	6	9	-	-	2	15	-	-	(1)		16	(1)	7	-	-	-	20	(2)	-	4	-	5	16	3	26	46	19 / 41%
	(5)	-	6	-	-	-	-	-	-	-	-	4	-	4	-	-	-	-	(1)	-	(3)	-	-	3	2			
2;9 2	11	(6)	14	-	-	3	18	-	-	3	3	18	3	8	1	-	-	21	(2)	**1**	5 (1 mi)	-	7	18	5	29	50	29 / 58%
	9	1	8	-	-	-	-	-	-	2	-	7	1	6	-	-	-	-	(1)	1*	4 (1mi)	-	-	(3)	4			
2;11 2	14	7	16	1	-	6	23	1	-	3	1	21	(3)	10	3	-	-	23	3 (2mi)	1	6(1p) (1mi)		9	19	7	34	57	34 / 59%
	11	1	9	-		-	-	-	-	2	-	9	(1)	7	-		-	-	3(2mi)	1	5 (1p) (1mi)			4	5			
3;1 2.1	(14)	8	(16)	1	-	(6)	25	1	-	(3)	4	(21)	(3)	14	5	-	-	27	5 (3mi)	2	9(1p) (1mi)	1	12	20	(7)	35	62	38 / 61%
	(11)	(1)	9	-	-	-	-	-	-	(2)	-	(9)	(1)	(7)	-	-	-	-	4(2mi)	2	8(1p) (1mi)	1	-	(4)	(5)			
							40%				**6%**							**43%**					**19%**	**32%**	**11%**			

Above: Number of verb types produced in each form, cumulative. Below: Number of verb types used contrastively by that session.
Items in parentheses indicate that there were no occurrences of the form during that session. Items with * are forms in which Verb in 2 forms occurred but the form was produced with only one verb type thus not meeting the second part of productivity criterion.

Elly's Suffixes:

Age & MLU w	PRES (mi-)						PRES (no prefix)				PRET				PI			SBJV (be- bo-)						NEG					Pronominal Object clitic			PP (-e)	Verb types in session	Cumulative Verb types	Cumulative Verb types used in 2 + forms\ Contrast Index
	SG			PL		V Types	SG			PL	SG		PL	V Types	SG		V Types	SG			PL		V Types	SG			P P	V Types	SG		V Types				
	1	2	3	1	3		1	2	3	1	1	2	3		1	3		1	2	3	1	3		1	2	3			2	3					
2;4 1.3	4	-	1	-	-	5	2	-	-	-	-	-	-	-	-	Ø	-	5	1	3	-	-	9	-	-	-	-	-	-	-	-	1	15	15	5
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Ø	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-			33%
2;6 1.5	7	3	8	-	-	12	3	-	-	-	6	-	-	7	-	Ø	1	11	(1)	5	-	-	14	2	-	3	-	4	-	1	1	(1)	28	31	11
	2	2	4	-	-	-	-	-	-	-	3	-		-	-	Ø	-	5	-	3	-	-	-	1	-	1	-	-	-	-		-			35%
2;7 1.8	8	6	9	-	2	15	4	-	1	-	7	1	-	12	-	Ø		16	(1)	7	-	-	20	(2)	-	4	-	5	-	5	5	(1)	26	46	19
	4	4	5	-	1	-	1	-	1	-	(3)	-	-	-	-	Ø	-	9	-	5	-	-	-	(1)	-	(1)	-	-	-	2		-			41%
2;9 2	11	(6)	14	-	3	18	(4)	1	2	-	10	3	-	13	-	Ø	3	18	3	8	1	-	21	(2)	1	5 (1mi)	-	7	-	(5)	5	3	29	50	29
	8	5	10	-	2	-	2	1	1	-	6	2	-	-	-	Ø	-	12	2	7	1 *	-	-	(1)	1	(1)	-	-	-	(2)	-	1			58%
2;1 1 2	14	7	16	1	6	23	(4)	2	2	-	(10)	(3)	2	17	1	Ø	4	21	(3)	10	3	1	23	3 (2mi)	(1)	6(1p) (1mi)	-	9	-	(5)	5	4	34	57	34
	9	6	11	1	4	-	(2)	2	1	-	(6)	(2)	1	-	-	Ø	-	14	(2)	9	3	1	-	(1)	(1)	(1)	-		-	(2)	-	(1)			59%
3;1 2.1	(14)	8	(16)	1	(6)	25	4	2	2	1	(10)	(3)	(2)	(17)	(1)	Ø	(4)	(21)	(3)	14	6	1	26	5(3mi)	2	91p) (1mi)	1	13	2	9	5	9	35	62	38
	(9)	(6)	12	1	(4)	-	2	2	1	1	(6)	(2)	(1)	-	-	Ø	-	(14)	(2)	10	6	1	-	2	2	3	-	-	2	4	-	6			61%

Melika's Prefixes:

Age & MLU w	PRES (mi-)							PI						SBJV (be- bo-)							NEG									IMP AFF (be- bo-)	IMP NEG (na-)	Verb types in session	Cumulative Verb types	Cumulative Verb types used in 2 + forms
	SG			PL			V Types	SG			PL		V Types	SG			PL			V Types	PRES				Past		Past		Past part	V Types				
																					SG			Pl	SG		PL							
	1	2	3	1	2	3		1	2	3	1	2		1	2	3	1	2	3		1	2	3	1	1	3	2	3							
1;8	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	5	-			
1.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	5	5	1 / 20%
1;10	2	1	2	-	-	-	5	-	-	-	-	-	-	3	1	1	-	-	-	3	2 (1mi)	-	2 (1mi)	-	-	-	-	-	-	3	12	-			
1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-		-	-	16	18	4 / 22%
2;0	17	3	12	-	-	-	23	-	-	-	-	-	-	7	2	3	-	-	-	8	5 (4 mi)	-	8 (4mi)	-	2	3	-	-	-	16	13	3			
1.9	5	-	2	-	-	-	-	-	-	-	-	-	-	4	-	2	-	-	-	-	3 (2mi)	-	5 (3mi)	-	2	3	-	-	-	-	3	2	34	35	15 / 42%
2;3	20	4	18	-	-	1	27	-	-	2	-	-	2	16	5	6	3	2	-	17	7 (5mi)	2 (1mi)	8 (4mi)	1	3	3	-	-	1	18	16	4			
2	9	1	7	-	-	-	-	-	-	1	-	-	-	10	1	5	-	-	-	-	6 (4mi)	-	5 (3mi)	-	3	3	-	-	1*		3	3	39	51	29 / 56%
2;7	24	10	18	-	-	3	31	1	-	2	-	1	3	20	6	8	5	4	1	20	10 (8mi)	4 (3mi)	8	1	3	3	1 (impf)	-	1	22	19	6			
2.6	14	1	7	-	-	-	-	1*	-	1	-	-	-	15	1	7	1	-	-	-	8 (6mi)	1 (mi)	5	-	3	3	-	-	1*		5	5	34	58	33 / 56%
2;11	24	11	19	-	-	3	31	3	-	2	2	1	7	23	10	14	5	6	1	27	12 (9mi)	7 (6mi)	8	1	3	3	1	2	1	27	21	7			
2.7	14	3	8	-	-	-	-	1	-	1	-	-	-	15	4	8	1	-	-	-	10 (7mi)	3 (mi)	5	-	3	3	-	-	1*		6	6	48	69	40 / 58%
							45%						**10%**							**39%**										**39%**	**30%**	**10%**			

Melika's Suffixes:

Age & MLU w	PRES (mi-)					PRES (no prefix)					PRET					PI					SBJV (be- bo-)							NEG											PP (-e)	Verb types in session	Cumulative Verb types	Cumulative Verb types used in 2 + forms
	SG			PL	V Types	SG			PL		SG			PL	V Types	SG		PL		V Types	SG			PL			V Types	PRES				Past				Past Part	V Types					
																												SG			PL	SG		PL								
	1	2	3	3		1	2	3	1	2	1	2	3	3		1	3	1	2		1	2	3	1	2	3		1	2	3	1	1	3	2	3							
1;8	-	-	-	-	-	-	-	-	-	-	-	-	ø	-	-	-	ø	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	ø	-		-	-	-	5	5	1 / 20%
1.03	-	-	-	-	-	-	-	-	-	-	-	-	Ø	-	-	-	Ø	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	Ø	-		-	-	-			
1;10	2	1	2	-	5	1	1	1	-	1	1	-	ø	-	2	-	ø	-	-	-	3	1	1	-	-	-	3	2 (1mi)	-	2 (1mi)	-	-	ø	-		-	3	-	16	18	4 / 22%
1.3	-	-	-	-	-	1	1	1	-	1	-	-	Ø	-	-	-	ø	-	-	-	2	1	1	-	-	-		1		1	-	-	ø	-		-		-			
2;0	17	3	12	-	23	1	1	2	-	1	4	1	ø	1	7	-	ø	-	-	-	7	2	3	-	-	-	8	5 (4 mi)	-	8 (4mi)	-	2	ø	-		-	16	1	34	35	15 / 42%
1.9	6	-	5	-		1	1	1	-	1	3	-	Ø	1	-	-	ø	-	-	-	6	2	2	-	-	-	-	2 (1mi)	-	2 (1mi)	-	2	ø	-		-		1			
2;3	20	4	18	1	27	3	1	3	2	1	9	1	ø	2	15	-	ø	-	-	2	16	5	6	3	2	-	17	7 (5mi)	2 (1mi)	8 (4mi)	1	3	ø	-		1	18	4	39	51	29 / 56%
2	8	1	9	1	-	3	1	2	2	1	7	-	Ø	2	-	-	ø	-	-	-	12	5	5	3	2	-	-	4 (3mi)	2 (1mi)	3 (1mi)	1	2	ø	-		1		4			
2;7	24	10	18	3	31	3	1	3	2	1	13	1	ø	3	17	1	ø	-	1	3	20	6	8	5	4	1	20	10 (8mi)	4 (3mi)	8	1	3	ø	1 (IMPf)		1	22	7	34	58	33 / 56%
2.6	11	6	9	2	-	3	1	2	2	1	9	-	Ø	3	-	1	ø	-	-	-	15	6	8	5	4	1	-	5 (4mi)	3 (2mi)	3 (1mi)	1	2	ø	-		1	-	5			
2;11	24	11	19	3	31	3	1	3	2	1	14	8	ø	3	23	3	ø	2	1	7	23	10	14	5	6	1	27	12 (9mi)	7 (6mi)	8	1	3	ø	1	2	1	27	8	48	69	40 / 58%
2.7	12	7	10	2	-	3	1	2	2	1	9	5	Ø	3	-	1	ø	-	-	-	16	10	12	5	6	1	-	5 (4mi)	5 (4mi)	3 (1mi)	1	2	ø	-	-	1	-	5			

Lilia's Prefixes:

Age & MLU w	PRES (mi-)							PI						SBJV (be- bo-)							NEG									IMP AFF (be- bo-)	IMP NEG (na-)	Verb types in session	Cumulative Verb types	Cumulative Verb types used in 2 + forms
	SG			PL			V Types	SG			PL		V Types	SG			PL			V Types	PRES				Past			PP	V Types					
																					SG			PL	SG									
	1	2	3	1	2	3		1	2	3	1	2		1	2	3	1	2	3		1	2	3	2	1	2	3							
1;11	4	1	-	1	-	-	4	-	-	-	-	-	-	-	-	1	2	1	-	3	2 (2mi)	-	1	-	1	-	-	-	4	4	1	19	19	**4**
1.4	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-			**21%**
2;1	5	3	3	1	-	-	7	-	-	-	-	-	-	2	-	1	2	1	-	5	4 (4mi)	-	2 (1mi)	-	2	-	-	-	7	6	3	21	29	9
1.7	-	-	1	1	-	-	2	-	-	-	-	-	-	-	-	-	1	-	-	1	1 (mi)	-	1 (mi)	-	1	-	-	-	3	-	-			31%
2;3	9	3	8	1	-	1	10	-	-	-	-	-	-	3	1	2	2	3	-	9	5 (4mi)	-	4 (3mi)	1	3	1	1	-	12	11	4	28	40	17
2.2	1	-	1	1	-	-	3	-	-	-	-	-	-	1	-	1	1	1	-	4	2 (1mi)	-	2 (1mi)	1	2	-	1	-	7	1	-			41%
2;4	14	4	10	1	-	1	16	-	1	-	-	-	1	8	2	3	3	3	-	15	9 (8mi)	-	5 (4mi)	1	3	1	1	-	17	11	5	33	53	22
2.5	2	1	2	1	-	-	6	-	-	-	-	-	-	2	1	2	1	1	-	6	4 (3mi)	-	3 (2mi)	1	2	-	1	-	10	2	1			42%
2;6	16	4	11	1	-	1	23	-	2	-	-	-	2	11	3	3	3	3	-	16	10 (9mi)	-	6 (5mi)	1	3	1	1	-	19	13	6	24	55	26
2.6	4	1	2	1	-	-	6	-	1	-	-	-	1	4	1	2	1	1	-	7	5 (4mi)	-	3 (2mi)	1	2	-	1	-	11	3	2			47%
2;8	16	5	11	2	-	1	23	1	2	-	-	-	3	11	3	3	4	3	-	17	10 (9mi)	1 (mi)	6 (5mi)	1	6 (1mi)	2	1	1	24	13	6	26	61	30
2.8	4	1	2	1	-	-	6	-	1	-	-	-	1	4	1	2	1	1	-	7	5 (4mi)	1 (mi)	3 (5mi)	1	3	1	1	1	14	3	2			49%
							37%						**5%**							**27%**									**39%**	**21%**	**10%**			

Lilia's Suffixes:

Age & MLU w	PRES (mi-)							PRES (no prefix)				PRET					PI			SBJV (be- bo-)						NEG (na- ne-)							PP (-e)	Verb types in session	Cumulative Verb types	Cumulative Verb types used in 2 + forms
	SG			PL			V Types	SG			PL	SG			PL	V Types	SG		V Types	SG			PL		V Types	PRES			PL	Past			PP	V Types				
																										SG				SG								
	1	2	3	1	2	3		1	2	3	1	1	2	3	3		1	2		1	2	3	1	2		1	2	3	2	1	2	3						
1;11 1.4	4	1	-	1	_	-	4	1	-	-	-	4	-	Ø	-	4	-	-	-	-	-	1	2	1	3	2 (2mi)	-	1	-	1	-	Ø	-	4	2	19	19	**4** / **21%**
	-	1	-	1	_	-	1	-	-	-	-	1	-	Ø	-	1	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	Ø	-	-	2			
2;1 1.7	5	3	3	1	_	-	7	1	-	2	-	7	1	Ø	-	7	-	-	-	2	-	1	2	1	5	4 (4mi)	-	2 (1mi)	-	2	-	Ø	-	7	2	21	29	9 / 31%
	1	2	2	1	_	-	2	1	-	1	-	1	-	Ø	-	1	-	-	-	1	-	-	1	-	1	1 (1mi)	-	1 (1mi)	-	-	-	Ø	-	1	2			
2;3 2.2	9	3	8	1	_	1	10	2	-	2	1	8	1	Ø	1	8	-	-	-	3	1	2	2	3	9	5 (4mi)	-	4 (3mi)	1	3	1	Ø	-	12	2	28	40	17 / 41%
	1	2	2	1	_	-	3	2	-	1	1	3	-	Ø	1	4	-	-	-	2	1	1	1	1	4	2 (1mi)	-	2 (1mi)	-	1	1	Ø	-	3	2			
2;4 2.5	14	4	10	1	_	1	16	3	1	2	1	10	2	Ø	1	10	-	1	1	8	2	3	3	3	15	9 (8mi)	-	5 (4mi)	1	3	1	Ø	-	17	2	33	53	22 / 42%
	3	3	4	1	_	-	6	2	1	1	1	4	1	Ø	1	4	-	-	-	3	2	1	1	1	6	2 (1mi)	-	2 (1mi)	-	1	1	Ø	-	3	2			
2;6 2.6	16	4	11	1	_	1	23	3	1	3	1	14	5	Ø	1	14	-	2	2	11	3	3	3	3	16	10 (9mi)	-	6 (5mi)	1	3	1	Ø	-	19	3	24	55	26 / 47%
	4	2	5	1	_	-	6	2	1	2	1	6	3	Ø	1	9	-	-	1	6	3	1	1	1	7	2 (1mi)	-	2 (1mi)	-	1	1	Ø	-	3	3			
2;8 2.8	16	5	11	2	_	1	23	3	2	3	1	17	5	Ø	1	17	1	2	3	11	3	3	4	3	17	10 (9mi)	1 (mi)	6 (5mi)	1	6 (1 mi)	2	Ø	1	24	4	26	61	30 / **49%**
	5	2	5	2	_	-	6	2	2	2	1	7	3	Ø	1	10	-	-	1	6	3	1	1	1	7	2 (1mi)	-	2 (1mi)	-	1	1	Ø	1	4	4			

Appendix 2

Elly's verbal production

Verb	Verb stem	Gloss	2;4	2;6	2;7	2;9	2;11	3;1
amadan	ia	come	be-ia be-ia-**ad**	be-ia **be-**ia-ad be-ia-**am** xun **mi**-ia-ad xun **na**-ia-ad	be-ia mi-ia-ad na-ia-ad	be-ia be- ia-ad mi-ia-**ad** **mi**- ia-**am**	be-ia **be**-ia-am	be- ia be-ia-ad mi-ia-am (dar-e) mi-ia-ad
amadan	amad	come			amad-...	amad- ... amad-**am**	amad	barf amad-**e**
andaxtan	andaz	drop	be-andaz-i *					
avardan	iar	bring		be-iar-am	be-iar-am-**esh** (dar) mi-iar-i	be-iar **mi**-iar-**e** **be**-iar-**e** be-iar-**am** mi-iar-**i**	be-iar be-iar-am-esh (dar) be-iar-e (dar) be-iar	be-iar-**im**
bardashtan	bardar	take		bardar-am				
bargashtan	bargard	return					bar-mi-gard-am	

bastan	band	close **/tie**	be-band-am	**mi**-band-am	**be**-band **na**-band be-band-am- **esh**		mi-band-**and**	be-band-**im** be-band
bordan	bar						be-bar-am mi-bar-and	
boridan	bor	cut		**mi**-bor-**am** **be**-bor-**am** be-bor-**esh** mi-bor-**e**				
budan	bud	to be		bud-am		bud	bud	
budan	bash	be				bash-e		bash-e
chasbidan	Chasbid						chasbid-and	
dadan	deh	give	be-deh	be-deh mi-deh-i	be-deh	be-deh **mi-**deh-**am** **be**-deh-am		be- deh be-deh-**e**
dadan	dad	give			dad-...	dad-**i**	mi-dad-am	
danestan	dan	know						ne-mi-dun-am
dashtan	dar	have			dar-**e** dar-**am**	dar-e	dar-**i** dar-e dar-am	dar-e dar-am dar-**im** **na**-dar-**am** dar-i **na**-dar-**i** **na-**dar-**e**

didan	bin	see			be-bin be-bin-**am**	be-bin be-bin-am be-bin-**i**	be-bin be-bin-am be-bin-i	be-bin be-bin-am
didan	bin	see			did-i			
gereftan	gir	take	be-gir be-gir-**am**	(ax) **mi**-gir-am	(ax) mi-gir-am	**be**-gir-am	(ax) begir (ax) be-gir-**e** be-gir-**im**	(tavalod) be-gir be-gir-e (daram ax) mi-gir-am
gereftan							dard gereft	
goftan	goft	say		goft-...		goft-**am** goft	goft	goft
goftan	goo	say			be-goo	be-goo	**na**-goo be-goo-**e** **be**-goo	be-goo
gozashtan	(go)zar	put/**let/ play**	be-zar		be-zar-**am** be-zar	be-zar	be-zar-am be-zar-**im**	mi-zar-i be-zar-im-**esh** (pro cl) be-zar-**e**
istadan	ist	stand	vast-am	vaysa be-ist-e				
kandan	kan	take off						be-kan-e

kardan	kon	do	na-kon * nesf kon-am bazi **mi**-kon-am bazi **bo**-kon-am	(dorost) mi-kon-**am** (bazi) bo-kon-**am** (aziat) **mi**-kon-**e** (esterahat) **bo**-kon-**e** baz kon	bo-kon-am mi-kon-e bo-kon-e **bo**-kon mi-kon-**an** (negah) mi-kon-**i**	kon-**am** (sorfe) mi-kon-am bazi kon bazi kon-**i** aziat **na**-kon-**i**	kon-am kon	(shane) kon-am (peida) bo-kon-am (kar) bo-kon-e (jam) **na**-kon-**e** bo-kon-**im**
kardan	kard	do			kard-...	kard-... kard-**am** **mi**-kard		gerye kard-... gerye kard-**e**
keshidan	kesh	draw			be-kesh be-kesh-**am**		be-kesh-am	
xabidan	xabid	sleep	xabid-e					xabid-e **na**-xabid-e
xabidan	xab	sleep		be-xab-am	be-xab-**e**		be-xab-**am** be-xab-**and** **be**-xab-e **mi**-xab-e na-xab	be-xab-e (dar-e) mi-xab-e
xandan	xan	read			be-xun			
xarandan	xaran	scratch			mi-xaar-am-esh			
xaridan	xar	buy			mi-xar-**i** **be**-xar-e **mi**-xar-**e**	be-xar-**im** * be-xar	be-xar-**am**	mi-xar-e be-xar be-xar-am
xastan	xah	want	mi-xa-am	mi-xah-am		mi- xa-**am** mi-xa-**ad**	mi-xah-am mi-xah-**i** **ne**-mi-xah-am	mi-xa-am mi-xa-ad

xordan	xord	hit/ eat	bo-xor-e mi-xor-am	**mi**-xor-**e** bo-xor mi-xor-**i**	bo-xor mi-xor-**am** mi-xor-e mi-xor-an-esh	**bo-**xor-**am** **bo-**xor-**i** **bo-**xor-**e** **mi-**xor-am **mi-**xor-**i** **ne-**mi-xor-e	bo-xor	dar-e mi-xor-e mi-xor-am-**et** mi-xor-e bo-xor-i bo-xor
xordan	xord	eat		xord-**am** xord		xord-am **mi**-xord	mi-xord	xord-... xord-**e** Xord-**esh** (emph) xord-**et** (pro obj cli) xord-am-**esh**(pro ob cl)
koshtan	kosh	kill						bo-kosh-esh (pro obj clitic)
mandan	man	stay		be-mun			mi-mun-e	**na**-mun-e
mandan	mand						**na**-mund mund	
neshastan	(ne)shin	sit		be-shin-am	be-shin-**e** be-shin	be-shin-e **na-**shin		
neshastan	Neshast	sit				neshid-e		neshast-e
oftadan	oftad	fall		oftad-am			oftad	oftad
oftadan	oft	fall						be-oft-e
paridan	parid	jump		parid-am				
pooshidan	poosh	put on			be-poosh-am			

raftan	Ro	go	**mi**-rav-e bo-ro **be**-rav-e	(rah) mi-rav-e be-rav-**e** **na**-rav-e be-rav-**am**		na-rav-e (dar-e) mi-rav-e **na**-ro	**be**-rav-am (daram) **mi**-rav-**am** na-rav-e	be-rav-e (dar-e) mi-rav-**e**
raftan	raft	go		raft-**am** raft-...		raft-am raft-**i** raft-**e**	raft raft-**esh**	raft-i raft-e
raghsidan	raghs	dance		mi-raghs-e		mi- raghs-e mi-raghs-**an** *		
raghsidan	Raghsid	dance		mi-raghsid				
rixtan	riz	pour	be-riz	mi-riz-e				
rixtan	rixt	spill					rixt	rixt-**e** rixt-**esh (**emphatic)
shekastan	shekan	break						be-shekan-e
shekastan	shekand	break					shekund-e	
shodan	sho				xaste na-sh-e	**mi**-sh-e	be-sh-am jam mi-sh-**e** jam mi-sh-**and** mi-sh-**im**	(xarab) mi-sh-e
shodan	shod	become				shod-...	shod-**and** shod	(pareh) shod-**e**

shostan	shoor	wash	be-shoor-am			**mi**-shoor-**am** mi-shoor-**e**		
sooxtan	sooz	burn				mi-sooz mi-sooz-e		
tarsandan	tarsan	scare			be-tarsun-am			
tarsidan	tarsid	be scared			tarsid-am			
tavanestan	tavan (tan)	can		na-tavan-am			mi-tun-am **ne**-**mi**-tun-am	
zadan	zan	talk/ **press/** row	(harf) **be**-zan-am **mi-**zan-am	(paru) **na**-zan-**am** **na**-zan-**e** be-zan-**am** **mi**-zan-**e** ... **na-**zan ahang **be**-zan (ahang) mi-zan-**i**	mi-zan-**am** be-zan	be-zan-am (saboon) mi-zan-e		(zang) be-zan-am (dar_e mesvak) mi-zan-e
zadan	zad	hit/ press/ apply		(paru) zad-... (paru) zad-**am**		zad-... (zang) zad-am	(dor) zad-am	zad-**esh** (pron obj clitic)
			5	11	19	29	34	37
		Contrast index	**33%**	**35%**	**41%**	**58%**	**59%**	**60%**

Shaded cells contain verbs used contrastively.

Melika's verbal production

Verb	Verb stem	Gloss	1;8	1;10	2;0	2;3	2;7	2;11
amadan	ia	come	be-ia	be-ia	xun mi-ia-**ad** **ne**-mi-ia-**am** mi-ia-**am** be-ia **ne**-mi-ia-**ad** mi-ia-ad	be-ia	**be**-ia **be**-ia-**ad** **be**-ia-**am** **na**-ia be-ia-**id** **mi**-ia-am ne-mi-ia-am	be-ia be-ia-ad **mi**-ia-ad be-ia-am na-ia be-ia-**i**
amadan	amad	come						amad-**i** dard amad
andaxtan	andaz	thrrow			mi-andaz-am			**be**-andaz-am
avardan	iar	bring	be-iar		dar be-iar mi-iar-am be-iar	be-iar **be**-iar-**am** **mi**-iar-am dar be-iar	be-iar-**in** be-iar-**am** dar be-iar-am	be-iar-**e** dar be-iar dar be-iar-am
avardan	avard	bring		avard-am		avard-am		na-avard-and mi-avard-im dar avord-**i**
bardashtan	bardar	take			bardar	bardar-am-**esh** bardar-**am** bardar-**im**	bar-mi-dar-i bar-dar	bardar-am bardar
bardashtan	bardasht	take						bardasht-i

bastan	band	close				**mi**-band-am be-band-**i** **be**-band-**am** be-band-**esh** be-band		dar-e mi-band-**e** mi-band-**am** **be**-band-am
bastan	bast	close						na-bast-and
bordan	bar	take				be-bar-am		
bordan	bord	take				bord		
boridan	bor	cut					**be**-bor-am be-bor-am-**esh** **mi-**bor-am	
boridan	borid	cut				mi-borid		
budan	bash	be			bash-e na-bash		bash-e	bash-e
budan	bud	be			bud **<u>na</u>**-bud	bud na-bud	bud bud-**am** bud-**an**	bud
charxandan	charxan	turn				be-charxun-am		
chidan	chin	set						be-chin-am
chidan	chid	set						chid-i
dadan	deh	give	be-deh	mi-deh-am	**be**-deh **na**-deh ne-mi-deh-e	be-deh-**i** mi-deh-**e** feshar **be**-deh-**am** feshar **mi**-deh-**am** neshan be-deh	shekast mi-dah-am be-deh-am be-deh be-deh-i **ne**-mi-dah-am	be-deh **be-**deh-i ne-mi-deh-**i**
dadan	dad	give					qol dad-am	
danestan	dan	know			ne-mi-dun-am	ne-mi-dun-am mi-dun-e	ne-mi-dun-am	ne-mi-dun-am

dashtan	dar	have		dar-**e** **na**-dar-**e** **na**-dar-**am** dar-**am**	na-dar-am mail na-dar-am dar-e dust dar-am dust na-dar-am	dar-am na-dar-**i** ejaze dar-am Jish dar-am	dar-am na-dar-am dust dar-e dus-et dar-am dust na-dar-am	dar-am dar-e dust dar-am dust na-dar-am
dashtan	dasht	have				dasht-am dust dasht-am		dasht-am
davidan	do	run		bo-do	mi-dav-e			
didan	bin	see		be-bin-am	**be**-bin-**e** be-bin-**i** **mi**-bin-**e** **mi**-bin-**am** **be**-bin-**am**	be-bin-**im** be-bin-am	be-bin-am mi-bin-am be-bin	be-bin-am be-bin
didan	did	see			did-i		did-**am**	did-am-**esh**
dozdidan	dozd	rob					ne-mi-dozd-am	
gereftan	gir	get	be-gir		dard mi-gir-e	dard **mi**-gir-e be-gir-**am** yad **be**-gir-**e**	ax **be**-gir-**am** gaz-et **mi**-gir-**am** mi-gir-**i** be-gir	mi-gir-am-**esh** be-gir-e be-gir-**in** **ne**-mi-gir-i
gereftan	gereft	get				gereft gereft-**an**		mi-gereft-im
goftan	gu	say			mi-gu-am	mi-gu-**e** mi-gu-**am**	be-gu mi-gu-am mi-gu-e mi-gu-**i**	be-gu
goftan	goft	say					goft-e bud-an	goft-e dasht-am mi-goft-am

gozahstan	gozar	put				be-zar be-zar-**am** kolah be-zar-**im**	be-zar **ne**-mi-zar-i be-zar-am mi-zar-i	be-zar be-zar-**e**
gozashtan	gozasht	put					gozasht-e	gozasht-**i**
istadan	ist	stand						vasta
kandan	kan	detach		be-kan	be-kan mi-kan-i			be-kan-**in** be-kan
kardan	kon	do		mi-kon-e kon kon-**in** kon-**i**	baz kon dorost **mi**-kon-**am** dorost **bo**-kon-**am** dorost **bo**-kon negah mi-kon-**e** zzz mi-kon-e komak kon gush mi-kon-e **ne**-mi-kon-e bazi mi-kon-am jaru mi-kon-e pak mi-kon-am dava mi-kon-am sabr kon	baz bo-kon-am baz be-kon baz **be**-kon-**i** dorost mi-kon-am dorost bo-kon-am dorost bo-kon-**in** dorost bo-kon **na**-kon kon kon-**e** mi-kon-am bo-kon-am kon-**im** **ne**-mi-kon-**am** kon-**am** peida mi-kon-am roshan ne-mi-kon-**i** dava **mi**-kon-e	bazi kon-im bazi kon baqal kon dorost mi-kon-am dorost kon-am gerye kon-**i** gerye mi-kon-am dava-sh kon dava-sh kon-im deldard **be**-kon-e salam mi-kon-am bo-kon be-kon-am masxar-at-un mi-kon-am negah kon negah kon-am negah na-kon negah kon-im pak kon-am pak-esh kon-am peida-ash kon-am qati pati kon-am surax kon	kon-am na-kon kon-i bazi kon-e bazi kon bazi mi-kon-e shoru kon shoru kon-i shoru kardan-e tarif kon vasl kon-im baz-esh kon vel-esh kon

kardan	kard	do			dorost kard bazi kard-**am** bazi kard-**and** tamiz kard-am peida **na**-kard peida **na**-kard-**am**	andazeh **mi**-kard doctori kard gir kard kutah kard doctori Kard Kashi kard-**e** bud Pa kard-am Xarab kard-am	kard-e masxar-at-un **mi**-kard-am bazi kard-am dorost kard-am zabt kard-am	kard-**i** roshan kard-i
keshidan	kesh	draw			**be**-kesh sigar **na**-kesh naqashi **mi**-kesh-am naqashi be-kesh naqashi **be**-kesh-**am**	sigar **mi**-kesh-**e** deraz **be**-kesh-**e**	be-kesh	be-kesh-**i**
keshidan	keshid	draw				sigar keshid naqashi keshid-**am** naqashi **na**-keshid-am		
malidan	mal	rub				mi-mal-e		
mandan	man	stay						be-mun-e
mandan	mand	stay						mund-am
neshastan	neshin	sit		be-shin	be-shin-**am**	**mi**-shin-am **be**-shin-am		
neveshtan	nevesht	write						nevesht-e bud
oftadan	oft	fall			mi-oft-e			
paridan	par	fly		be-par				
pashidan	pashid	throw			pashid			
poxtan	paz	cook		be-paz				
pushidan	push	wear			be-push-am			

raftan	ro	go		bo-ro	mi-rav-e	mi-r-e be-r-**am** be-r-**id** be-r-**im**	be-r-id be-r-in be-r-im **be**-r-am bo-ro mi-r-**i** **mi**-r-**am**	be-r-am **ne**-mi-r-am be-r-im **be**-r-**e** bo-r-o mi-r-am **be**-r-**i** rah be-r-am
raftan	raft	go				raft raft-**am**	raft-**e** bud-an	raft-e
raqsidan	raqs	dance			mi-raqs-am		mi-raqs-**an** be-raqs-**i** be-raqs-**im** be-raqs-**am**	
rixtan	riz	pour				mi-riz-e **na**-riz-am **be**-riz-am		be-riz
shodan	sho	become			**mi**-sh-**e** **be**-sh-e mi-sh-**am** **na**-sh-e bad be-sh-e rad be-sh-e	sard-esh na-sh-**e** sard na-sh-**im** mi-sh-e dava mi-sh-e	xub **be**-sh-am ja mi-sh-e oof mi-sh-e **be**-sh-**im** mi-sh-e **mi**-sh-am be-sh-e	mi-sh-e mi-sh-am
shodan	shod	become		shod	shod **na**-shod shod-**am** **na**-shod-**am**	dorost shod-e dorost **na**-shod-**e** daqun shod oof shod-**e** Xarab shod xarab shod-e	pak shod qat shod-e shod-am xarab na-shod-e xarab shod-e xarab shod	

shostan	shur	wash			mi-shur-am			be-shur be-shur-**e** **na**-shur-am
tarsidan	tars	fear			**ne**-mi-tars-am mi-tars-am			mi-tars-am
tarsidan	tarsid	fear				tarsid		
tavanestan	tavan	to be able		ne-mi-tavan-am mi-tavan-e	mi-tavan-**i** **ne**-mi-tavan-e	**ne**-mi-tun-**am** mi-tun-am	mi-tun-am	ne-mi-tun-am
tavanestan	tavanest	to be able				tunest-**am** tunest	ne-mi-tunest-id	
xandan	xan	read			mi-xun-e		be-xun	be-xun be-xun-**am**
xandan	xand	read					xund-am	
xaridan	xar	buy				mi-xar-am	mi-xar-am	be-xar-e
xastan	xah	want			na-xah-ad mi-xah-am	**mi**-xah-**ad**	mi-xah-**am** ne-mi-xah-**i** **ne**-mi-xah-**am**	mi-xah-am ne-mi-xah-am mi-xah-ad
xastan	xast	want						mi-xast-am
xordan	xor	eat	bo-xor bo-xor-**am**	bo-xor-**am** bo-xor bo-xor-**e** mi-xor-i	**mi**-xor-**am**	sor **bo**-xor-am bo-xor	mi-xor-**i** ne-mi-xor-an bo-xor-**an** bo-xor-am	bo-xor-am **ne**-mi-xor-**i** mi-xor-am **na**-xor **bo**-xor **bo**-xor-**i** **ne**-mi-xor-**am**
xordan	xord	eat			xord-**e** xord-**am**	xord-e		xord-am xord-**i**

zadan	zan	use/hit		be-zan be-zan-**i** ne-mi-zan-e be-zan-**am**	shampoo mi-zan-am mesvak **mi**-zan-**am** dar **be**-zan-am guitar mi-zan-**e**	ampool **be**-zan-**e** harf be-zan-e harf be-zan lak **mi-**zan-e mesvak be-zan-e mesvak be-zan-am muasho mi-zan-e be-zan-am qeichi mi-zan-e qeichi mi-zan-**an**	dast **na**-zan shun-at-un mi-zan-am **be**-zan	dar-e mi-zan-e harf be-zani-i dast mi-zan-am
zadan	zad	use/hit				pich zad-**e** pich zad qeichi zad-**am** zad-e		zad-**esh** zad zad-**at-esh**
			1	**4**	**15**	**29**	**33**	**40**
		Contrast index	**20%**	**22%**	**42%**	**56%**	**56%**	**58%**

Shaded cells contain verbs used contrastively

Lilia's verbal production

Verb	Verb stem	Gloss	1;11	2;1	2;3	2;4	2;6	2;8
amadan	ia amad	come	be-ia-ad mi-ia-am na-ia	**mi**-ia-**ad**	**be**-ia	**be**-ia-**am** **be-**ia-ad	be-ia **mi**-ia-am be-ia-am	
amadan	ia amad	come			amad-**am** amad-**an**		amad-am	amad-am
andaxtan	andaz andaxt	throw			be-andaz ne-mi-andaz-e		mi-andaz-am	
andaxtan		drop				andaxt-am		
avardan	avar avard	bring			**mi**-iar-am be-iar **be**-iar-**am**			
avardan			avard-am	avard-am	na-avord-**i** **na-**avord-**am** avord-am			
bardashtan	bardar bardasht	pick up	bardasht-am					
baxshidan	baxsh baxshid	forgive			**be**-baxsh-id **na**-baxsh-id	be-baxsh-id		
bordan		take				be-bar-am		
budan	bash bud	be		bash-e	bash-e	bash-e		bash-e
budan	bash bud	to be	bud-...	bud		bud	bud-**i**	

dadan	deh	give leak roll	be-de	be-deh	be-deh pas mi-deh-e qel be-deh-**i**	**be**-deh-i **mi**-deh-**i**	be-deh neshun be-dah-**am** hol mi-d-**e**	
dadan	deh dad	give		qol dad-am	qel dad-am		hol dad	dad-**e** dad
danestan	dan danest	know				ne-mi-dun-am		mi-dun-i **ne**-mi-dun-i
dar avardan	iar avard	grow			dar mi-iar-e			
dar avordan		take out				dar avord-i		
dashtan	dar dasht	have	na-dar-e dust dar-am	dar-**e** dust dar-**am**	dar-am dust dar-am dust **na**-dar-**am** eshgal dar-e eshgal **na**-dar-**e**	dust dar-am dust dar**-i**	negah dar var dar	na-dar-am dust na-dar-am farghi dar-e
dashtan		have				dasht	var dasht-**am**	
didan	bin did	see	be-bin	be-bin-**am** be-bin	be-bin	be-bin **mi**-bin-am	**be**-bin-am be-bin	be-bin be-bin-am
didan	bin did	see		did-i	did-i	did-i	did-i	
fahmidan	fahm fahmid	understand		fahmid-am				
farmudan	farma farmud	here xx go			be-farma-**id** be-farma			
gereftan	gir gereft						gereft-am	

goftan	goo goft	say	be-goo-in		na-gu	mi-gu-**e** **na**-gu mi-gu-**am** **be**-gu	be-gu-**i** be-gu	mi-gu-am
goftan	gu goft	say	na-goft-am		goft-**am** goft	goft-am goft-**i**		goft-am goft
gozashtan	gozar gozasht	play put	be-zar-**im** be-zar			be-zar-**i** be-zar	be-zar ne-mi-zar-e	
gozashtan		put				gozasht-**am**		
kardan	kon kard	do	bazi **bo**-kon-im jish **mi**-kon-**im** jish mi-kon-**i**	baz kon komak mi-kon-i	bazi kon-**im** boos kon dorost kon negah kon partab kon-**am** sabr kon	dorost mi-kon-i kon negah kon vel kon	bazi kon-im bazi kon-**e** bazi **ne**-mi-kon-am **bo**-kon **na**-kon **mi**-kon-**am** **bo**-kon-**am** nesf-esh kon-am part **na**-kon	bo-kon-am mi-kon-am pak kon-**i**
kardan			dorost kard-**am** nanai kard-**e** peida kard-am	chaxan kard-am **na**-kard-am negah kard-am tamam kard-am				dorost kard-am
keshidan	kesh keshid	pull		na-kesh		naghashi be-kesh-am		
mundan	mun mund							mund
neshastan	neshin neshast	sit			be-shin ne-mi-shin-e			
neveshtan		write				be-nevis-am		

neveshtan	nevis nevesht							nevesht-e
oftadan	oft oftad	drop				ne-mi-yoft-am		dar-am mi-oft-am
oftadan	oft oftad	drop	oftad-...		oftad			
paridan	par parid	jump		be-par				
paridan	par parid							na-parid-am
porsidan		ask				be-pors-e		
raftan	ro raft	go	ne-mi-rav-am	mi-r-e			bo-ro	be-r-im
raftan	ro raft	go	raft-...					raft-**am**
raghsidan		dance				mi-raghs-**e** mi-raghs-**am** be-raghs-im		
raghsidan	raghs raghsid							**na**-raghsid-i raghsid-i
residan	res resid							resid-am
rixtan	riz rixt	fell	rixt rixt-**e**					
shodan	sho shod	get prepared			dorost mi-sho-e pa sho zabt mi-sho-e	**ne**-mi-sh-e	ne-mi-sh-e	mi-sh-e
shodan	sho shod	recover	peida shod-.. xarab shod	tamam shod	xub **na**-shod zabt shod	tamum shod	shod-**e** shod barande shod-**am**	shod-e **na**-shod-e shod-**am**

tarsidan	tars tarsid	fear			mi-tars-am			
tavanestan	tavan tavanest	be able to	mi-tavan-am	**ne**-mi-tavan-am			ne-mi-tun-am	
tavanestan	tavan tavanest							ne-mi-tunest-am
var dashtan		pick up				var na-dar var dar-am		
xabidan		sleep				be-xab-am		be-xab-am
xandan	xan xand	sing	ne-mi-xun-am					
xandidan	xand xandid	laugh			mi-xand-an			
xaridan	xar xarid	buy		mi-xar-i be-xar	mi-xar-i	mi-xar-i be-xar	mi-xar-i be-xar-**am**	
xastan	xah xast	want			mi-xah-am	**ne**-mi-xah-am mi-xah-am	mi-xah-am ne-mi-xah-am	mi-xah-**am** mi-xah-**im**
xastan	xah xast	want				mi-xast-i		
xordan	xor xord	fit eat		mi-xor-**e** **ne**-mi-xor-**e** bo-xor-am mi-xor-**i** ne-mi-xor-**am**	**bo**-xor-**e**	ne-mi-xor-am **mi**-xor-e	bo-xor-am	bo-xor-am
xordan	xor xord	fit eat		xordam	zamin xord-am	xord-am	xord-**i** kale malag **mi**-xord-i	xord-am **na**-xord-am
zadan	zan zad	hit		harf na-zan	cheshm na-zan harf mi-zan-am	dast **ne**-mi-zan-am mi-zan-am ne-mi-zan-am	mi-zan-am-**et**	dar-am bad mi-zan-am

zadan	zan zad						zad-i zad-am-et	
			19	29	40	53	55	61
	Contrast Index		**21%**	**31%**	**42%**	**41%**	**47%**	**49%**

Shaded cells contain verbs used contrastively

Appendix 3

Elly's production of person/number inflections in obligatory contexts

			Required	Produced	Required	Produced	Required	Produced	Required	Produced	Required	Produced
Session 1	**Age**	**2;4**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**3 p pl -and, an**	
			33	29	1	0	5	5	0	0	0	0
	MLU w	**1.3**	**87%**		0		**100%**		0		0	
			Obligatory Context Use									
Session 2	**Age**	**2;6**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**3 p pl -and, an**	
			38	37	3	3	22	22	1	0	0	0
	MLU w	**1.5**	**97%**		100%		**100%**					
			Obligatory Context Use									
Session 3	**Age**	**2;7**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**3 p pl -and, an**	
			23	22	12	11	19	19	0	0	4	3
	MLU w	**1.8**	**95%**		**91%**		**100%**		**0**		**75%**	
			Obligatory Context Use									
Session 4	**Age**	**2;9**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**3 p pl -and, an**	
			39	38	10	8	29	28	3	1	1	1
	MLU w	**2**	**97%**		**80%**		**96%**		**33%**		100%	
			Obligatory Context Use									
Session 5	**Age**	**2;11**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**3 p pl -and, an**	
			32	31	4	4	12	12	3	3	7	7
	MLU w	**2**	**96%**		**100%**		**100%**		**100%**		100%	
			Obligatory Context Use									
Session 6	**Age**	**3;1**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**3 p pl -and, an**	
			38	37	7	6	56	53	7	7	0	0
	MLU w	**2.1**	**97%**		**86%**		**94%**		**100%**		0	

Elly's production of mood/tense/aspect inflections in obligatory contexts

			Required	Produced	Required	Produced	Required	Produced	Required	Produced	Required	Produced
Session 1	**Age**	**2;4**	**PRES -mi**		**SBJV be- bo**		**IMP be-, bo-**		**NEG na- ne-**		**PP -e**	
			14	11	19	18	14	14	5	5	1	1
	MLU w	**1.3**	**78%**		**94%**		**100%**		**100%**		**100%**	
			Obligatory Context Use									
Session 2	**Age**	**2;6**	**PRES -mi**		**SBJV be- bo**		**IMP be-, bo-**		**NEG na- ne-**		**PP -e**	
			20	19	24	24	20	20	6	6	2	0
	MLU w	**1.5**	**95%**		**100%**		**100%**		**100%**		**100%**	
			Obligatory Context Use									
Session 3	**Age**	**2;8**	**PRES -mi**		**SBJV be- bo**		**IMP be-, bo-**		**NEG na- ne-**		**PP -e**	
			27	27	19	18	39	39	6	6	0	0
	MLU w	**1.8**	**100%**		**94%**		**100%**		**100%**		**0**	
			Obligatory Context Use									
Session 4	**Age**	**2;9**	**PRES -mi**		**SBJV be- bo**		**IMP be-, bo-**		**NEG na- ne-**		**PP -e**	
			42	41	22	22	17	17	7	7	1	1
	MLU w	**2**	**97%**		**100%**		**100%**		**100%**		**100%**	
			Obligatory Context Use									
Session 5	**Age**	**2;11**	**PRES -mi**		**SBJV be- bo**		**IMP be-, bo-**		**NEG na- ne-**		**PP -e**	
			19	18	20	20	10	10	6	6	1	1
	MLU w	**2**	**97%**		**100%**		**100%**		**100%**		**100%**	
			Obligatory Context Use									
Session 7	**Age**	**3;1**	**PRES -mi**		**SBJV be- bo**		**IMP be-, bo-**		**NEG na- ne-**		**PP -e**	
			30	27	38	38	27	27	15	15	16	16
	MLU w	**2.1**	**90%**		**100%**		**100%**		**100%**		**100%**	

Melika's production of person/number inflections in obligatory contexts

			Required	Produced	Required	Produced	Required	Produced	Required	Produced	Required	Produced	Required	Produced
Session 1	**Age**	**1;8**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**2 p pl -id, in**		**3 p pl -and**	
			1	1	0	0	0	0	0	0	0	0	0	0
	MLU w	**1.01**	**100%**		0		**100%**		0		0		0	
			Obligatory Context Use											
Session 2	**Age**	**1;10**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**2 p pl -id, in**		**3 p pl -and**	
			17	15	0	0	8	8	1	0	1	1	0	0
	MLU w	**1.3**	**88%**		0		**100%**		0		**100%**		0	
			Obligatory Context Use											
Session 3	**Age**	**2;0**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**2 p pl -id, in**		**3 p pl -and**	
			88	81	4	4	57	57	1	0	0	0	2	2
	MLU w	**1.9**	**92%**		**100%**		**100%**		**0**		**0**		**100%**	
			Obligatory Context Use											
Session 4	**Age**	**2;3**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**2 p pl -id, in**		**3 p pl -and**	
			125	124	4	4	35	35	4	4	3	3	2	2
	MLU w	**2.09**	**99%**		**100%**		**100%**		**100%**		**100%**		**100%**	
			Obligatory Context Use											
Session 5	**Age**	**2;7**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**2 p pl -id, in**		**3 p pl -and**	
			115	113	12	11	16	15	8	8	8	8	3	3
	MLU w	**2.6**	**98%**		**91%**		**93%**		**100%**		**100%**		**100%**	
			Obligatory Context Use											
Session 6	**Age**	**2;11**	**1p s -am**		**2p s -i**		**3p s -e, -ad**		**1 p pl -im**		**2 p pl -id, in**		**3 p pl -and**	
			73	73	25	25	35	35	4	4	2	2	2	2
	MLU w	**2.7**	**100%**		**100%**		**100%**		**100%**		**100%**		**100%**	

Melika's production of mood/tense/aspect inflections in obligatory contexts

			Required	Produced	Required	Produced	Required	Produced	Required	Produced	Required	Produced	Required	Produced
Session 1	Age	1;8	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			0	0	1	1	18	18	0	0	0	0	0	0
	MLU w	1.01	0		100%		100%		0		0		0	
			Obligatory Context Use											
Session 2	Age	1;10	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			7	7	6	6	8	8	9	9	0	0	0	0
	MLU w	1.3	100%		100%		100%		100%		0		0	
			Obligatory Context Use											
Session 3	Age	2;0	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			92	91	24	18	21	21	20	20	0	0	0	0
	MLU w	1.9	99%		75%		100%		100%		0		0	
			Obligatory Context Use											
Session 4	Age	2;3	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			64	63	73	72	20	20	27	27	4	4	2	2
	MLU w	2.09	98%		98%		100%		100%		100%		100%	
			Obligatory Context Use											
Session 5	Age	2;7	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			57	57	53	52	36	36	25	25	5	5	1	1
	MLU w	2.6	100%		98%		100%		100%		100%		100%	
			Obligatory Context Use											
Session 6	Age	2;11	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			45	45	43	43	23	23	29	29	9	9	6	6
	MLU w	2.7	100%		100%		100%		100%		100%		100%	

Lilia's production of person/number inflections in obligatory contexts

			Required	Produced	Required	Produced	Required	Produced	Required	Produced	Required	Produced	Required	Produced
Session 1	Age	1;11	1p s -am		2p s -i		3p s -e, -ad		1 p pl -im		2 p pl -id, in		3 p pl -and	
			13	13	0	1	5	5	8	7	1	1	0	0
	MLU w	1.4	100%		0		100%		87%		100%		0	
			Obligatory Context Use											
Session 2	Age	2;1	1p s -am		2p s -i		3p s -e, -ad		1 p pl -im		2 p pl -id, in		3 p pl -and	
			22	22	8	8	8	8	0	0	0	0	0	0
	MLU w	1.7	100%		100%		100%		0		0		0	
			Obligatory Context Use											
Session 3	Age	2;3	1p s -am		2p s -i		3p s -e, -ad		1 p pl -im		2 p pl -id, in		3 p pl -and	
			31	31	7	7	14	14	2	2	6	6	4	4
	MLU w	2.2	100%		100%		100%		100%		100%		100%	
			Obligatory Context Use											
Session 4	Age	2;4	1p s -am		2p s -i		3p s -e, -ad		1 p pl -im		2 p pl -id, in		3 p pl -and	
			31	30	15	13	13	13	1	1	1	1	0	0
	MLU w	2.5	96%		86%		100%		100%		100%		0	
			Obligatory Context Use											
Session 5	Age	2;6	1p s -am		2p s -i		3p s -e, -ad		1 p pl -im		2 p pl -id, in		3 p pl -and	
			41	41	8	8	5	5	4	4	0	0	0	0
	MLU w	2.6	100%		100%		100%		100%		0		0	
			Obligatory Context Use											
Session 6	Age	2;8	1p s -am		2p s -i		3p s -e, -ad		1 p pl -im		2 p pl -id, in		3 p pl -and	
			33	33	5	5	6	6	2	2	0	0	0	0
	MLU w	2.8	100%		100%		100%		100%		0		0	

Lilia's production of mood/tense/aspect inflections in obligatory contexts

			Required	Produced	Required	Produced	Required	Produced	Required	Produced	Required	Produced	Required	Produced
Session 1	Age	1;11	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			7	7	8	8	7	7	5	5	3	3	0	0
	MLU w	1.4	100%		100%		100%		100%		100%			
			Obligatory Context Use											
Session 2	Age	2;1	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			21	21	2	2	10	10	13	13	0	0	0	0
	MLU w	1.7	100%		100%		100%		100%		0		0	
			Obligatory Context Use											
Session 3	Age	2;3	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			18	18	6	6	27	27	13	13	0	0	0	0
	MLU w	2.2	100%		100%		100%		100%		0		0	
			Obligatory Context Use											
Session 4	Age	2;4	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			34	32	11	11	27	27	13	13	0	0	1	1
	MLU w	2.5	94%		100%		100%		100%		0		100%	
			Obligatory Context Use											
Session 5	Age	2;6	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			23	23	9	9	14	14	17	17	2	2	1	1
	MLU w	2.6	100%		100%		100%		1005		100%		100%	
			Obligatory Context Use											
Session 6	Age	2;8	PRES -mi		SBJV be- bo		IMP be-, bo-		NEG na- ne-		PP -e		PI mi-	
			18	18	3	3	17	17	11	11	22	22	1	1
	MLU w	2.8	100%		100%		100%		100%		100%		100%	

Appendix 4

Frequency of inflections in input

Input	PRES (mi-)						PRES (no prefix)						PRET					PI					SBJV (be- bo-)						NEG						PP (-e)	No. of Input Utterances
	SG			PL			SG			PL			SG		PL			SG		PL			SG			PL			SG			PL				
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	1	2	3	1	2	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3		
Elly	2	6	7	3	0	0	1	2	3	1	0	0	1	8	3	1	1	0	0	0	0	0	6	3	3	6	1	0	0	1	1	0	0	0	6	218
	2	18	12	5	0	0	3	3	7	1	0	0	2	17	4	1	1	0	0	0	0	0	12	3	6	10	1	0	0	1	3	0	0	0	12	
Melika	13	11	12	2	4	5	1	2	2	1	1	1	3	6	3	1	0	0	0	0	0	0	11	12	9	5	7	4	8	7	5	1	0	1	6	244
	19	44	35	5	7	8	6	19	9	8	3	2	6	15	6	1	0	0	0	0	0	0	20	21	10	13	8	6	8	11	8	1	0	1	9	
Lilia	5	7	8	0	1	0	2	1	3	1	0	0	8	8	1	0	0	1	1	0	0	0	5	3	2	3	0	0	2	1	2	0	0	0	4	227
	9	16	19	0	1	0	3	1	11	3	0	0	16	11	2	0	0	2	2	0	0	0	9	3	4	5	0	0	3	1	3	0	0	0	6	
Mixed Input	14	15	19	4	5	5	2	2	4	1	1	1	10	15	6	1	1	1	1	0	0	0	14	14	10	9	7	4	8	9	7	1	0	1	10	689
	30	78	66	10	8	8	12	23	27	12	3	2	24	43	12	2	1	2	2	0	0	0	41	27	20	28	9	6	11	13	14	1	0	1	27	

Above: Number of verb types produced in each form.

Below: Number of verb tokens produced in each form.

Appendix 5

Elly, Melika and Lilia's input verbs (mixed sample)

Verb	Verb stem	Gloss	Verb Inf/ PRES stem	Verb inf/ Past stem
amadan	ia amad	come	be-ia mi-ia-ad be-ia-ad be-ia-im mi-ia-i be-ia-id mi-ia-id be-ia-i ne-mi-ia-i	amad-am na-amad-am
andaxtan	andaz andaxt	throw		ax andaxt-im
avardan	iar avard	bring	mi-iar-i mi-iar-e be-iar-e be-iar be-iar-id mi-iar-am be-iar-am be-iar-im	

bar dashtan	bar dar bardasht	take	bar mi-dar-i bar dar bar-mi-dar-am bar-mi-dar-e bardar-am	
bordan	bar bord	take	be-bar-am ne-mi-bar-am-esh	
budan	bash bud	be	bash-e na-bash-i bash	bud-i bud bud-im na-bud bud-am
charxidan	charx charxid	turn	na-charx na-charx-i	
dadan	deh dad	give	be-deh-am mi-deh-am be-deh mi-deh-i be-deh-i ne-mi-deh-am be-deh-im na-deh mi-deh-e ne-mi-deh-i be-deh-esh	dad-i dad-e dad-am
danestan	dan danest	know	mi-dun-i mi-dun-am ne-mi-dun-am	

dar avardan	dar iar avard	Take off		daresh avord-i
dashtan	dar dasht	have	dar-i na-dar-am dar-e na-dar-i na-dar-e	dard dasht dasht-i
davidan	dav david	run	bo-do	
didan	bin did	see	be-bin be-bin-im be-bin-am be-bin-i mi-bin-i	did-i
fahmidan	fahm fahmid	understand	be-fahm-am ne-mi-fahm-am be-fahm-e	fahmid-am
farmudan	farma farmud	go	be-farma-id	
gashtan	gard gasht	serach	be-gard-e	

gereftan	gir gereft	get	be-gir be-gir-am be-gir-i mi-gir-e	dard gereft na-gereft-am
goftan	gu goft	say	be-gu-am be-gu mi-gu-e be-gu-im be-gu-id mi-gu-in ne-mi-gu-i mi-gu-i be-gu-i	goft-i goft mi-goft goft-am goft-e
gozashtan	gozar gozasht	put	be-zar-am be-zar-im mi-zar-im be-zar-i mi-zar-an mi-zar-e be-zar-e be-zar	gozasht-im gozasht-am-esh gozasht gozasht-am
istadan	ist istad	stand	vaista	

kardan	kon kard		kon-im kon mi-kon-e kon-i na-kon-i kon-e mi-kon-i kon-am mi-kon-am bo-kon-id kon-id mi-kon-id mi-kon-an kon-an na-kon-e na-kon bo-kon-am	kard-e kard kard-and kard-i mi-kard kard-id kard-im kard-am
keshidan	kesh keshid		mi-kesh-e	
malidan	mal malid		be-mal-i	
mundan	man mand			mund-e
neshastan	neshin neshast		be-shin be-shin-e be-shin-i	neshast-e bud-i neshast neshast-i
oftadan	oft oftad		mi-oft-e na-oft-i	na-oftad-e oftad na-oftad

paridan porsidan	par parid pors porsid		be-par-i ne-mi-par-e be-pors	
pushidan	push pushid			pushid-i
raftan	ro raft		boro be-rav-am be-rav-im mi-rav-am mi-rav-i mi-r-e be-r-i	raft-im raft-i raft-e
raqsidan	raqs raqsid		mi-raqs-an be-raqs be-raqs-an mi-raqs-e	
rixtan	riz rixt		be-riz mi-riz-e	
shenidan	sheno shenid		ne-mi-shnav-am be-shenav-am	

shodan	sho shod		mi-sh-e ne-mi-sh-e be-sh-am be-sh-e mi-sh-am be-sh-i mi-sh-an be-sh-an mi-sh-i sh-e	shod-e shod shod-am shod-i
suzandan	suzan suzand		mi-suzun-i na-suzun	
tavanestan	tavan tavanest		mi-tun-im ne-mi-tun-e ne-mi-tun-an ne-mi-tun-am mi-tun-i mi-tun-e	
xabidan	xab xabid		be-xab-e	xabid-e
xandan	xand xandid		be-xun be-xun-im	
xaridan	xar xarid		be-xar-i	xarid-im xarid-i

xastan	xah xast		mi-xah-ad mi-xah-i mi-xah-im mi-xah-id mi-xah-am ne-mi-xah-ad	mi-xast-am xast-i
xordan	xor xord		bo-xor-am mi-xor-i bo-xor-esh bo-xor-an bo-xor-in bo-xor-e ne-mi-xor-am bo-xor bo-xor-i mi-xor-e ne-mi-xor-e mi-xor-in	mi-xord mi-xord-i xord-i xord-am
zadan	zan zad		be-zan mi-zan-e be-zan-i mi-zan-i mi-zan-am be-zan-an mi-zan-im ne-mi-zan-im na-zan-i be-zan-e be-zan-am be-zan-in	zang zad-i zang zad zad-e

Abbreviations

1SG	First person singular subject agreement
2SG	Second person singular subject agreement
3SG	Third person singular subject agreement
1PL	First person plural subject agreement
2PL	Second person plural subject agreement
3PL	Third person plural subject agreement
SBJV	Subjunctive
PRES	Present
PRET	Preterit
PI	Past imperfect
PP	Past participle
NEG	Negative
AFF	Affirmative
IMP	Imperative
PROG	Progressive
SOV	Subject-Object-Verb
MLU	Mean length of utterance
EM	Elly's mother
MM	Melika's mother
LM	Lilia's mother
UG	Universal grammar
CDS	Child directed speech
LARSP	Language Assessment, Remediation and Screening Procedure

References

Abbot-Smith, K., Lieven, E. and Tomasello, M. (2001). What preschool children do and do not do with ungrammatical word orders. *Cognitive Development,* 16, 1–14.

Abbot-Smith, K., Lieven, E. and Tomasello, M. (2004). Training 2;6-year-olds to produce the transitive construction: The role of frequency, semantic similarity and shared syntactic distribution. *Developmental Science,* 7, 48–55.

Aguado-Orea, J. (2004). *The acquisition of morpho-syntax in Spanish: Implications for current theories of development*. University of Nottingham.

Aguado-Orea, J. and Pine, J. (2015). Comparing different models of the development of verb inflection in early child Spanish. *PLoS One,* 10(3).

Aguirre, C. (2003). Early verb development in one Spanish-speaking child. In: Bittner, D., Dressler, W. and Kilani-Schoch, M. eds. *Development of verb inflection in first language acquisition: A cross-linguistic perspective* Berlin, Germany: Mouton de Gruyter, pp. 1–26.

Akhtar, N. and Tomasello, M. (1997). Young children's productivity with word order and verb morphology. *Developmental Psychology,* 33(6), 952-965.

Aksu-Koç, A. (1998). The role of input vs. universal predispositions in the emergence of tense/aspect morphology: evidence from Turkish. *First Language*, 18, 255-280.

Alegre, M. and Gordon, P. (1999). Frequency effects and the representational status of regular inflections. *Journal of Memory and Language*, 40, 41–61.

Ambridge, B. and Lieven, E. (2011). *Child language acquisition: contrasting theoretical approaches*. Cambridge: Cambridge University Press.

Ambridge, B. and Rowland, C. (2013). Experimental methods in studying child language acquisition. *Wiley Interdisciplinary Reviews-Cognitive Science,* 4(2), 149-168.

Ambridge, B., et al. (2006). The distributed learning effect for children's acquisition of an abstract grammatical construction *Cognitive Development,* 21, 174-193.

Bassano, D. (2000). Early development of nouns and verbs in French: Exploring the interface between the lexicon and grammar. *Journal of Child Language*, 27, 521–559.

Bassano, D. and Eme, P. (2001). Development of noun determiner use in French children: Lexical and grammatical bases. In: Almgren, M., et al. eds. *Research on child language acquisition* Sommerville, MA: Cascadilla Press, pp. 1207–1220.

Bates, E. and Goodman, J. (1999). On the emergence of grammar from the lexicon. In: MacWhinney, B. ed. *The emergence of language* Mahwah, NJ: Erlbaum, pp. 29–79.

Bates, E. and MacWhinney, B. (1987). Competition, variation and language learning. In: MacWhinney, B. ed. *Mechanisms of Language Acquisition*. Hillsdale, NJ: Erlbaum, pp. 157-193.

Behrens, H. (1993). *Temporal reference in German child language: form and function of early verb use*. Amsterdam: University of Amsterdam.

Bittner, D. (2000). Early verb development in one German-speaking child. *ZAS Papers,* (18), 21-38.

Bittner, D., Dressler, W. and Kilani-Schoch, M. (2003). *Development of verb inflection in first language acquisition: Cross linguistic perspective*. Berlin, New York: Mouton de Gruyter.

Bloom, L. (1970). *Language development: Form and function in emerging grammars*. Cambridge, MA: MIT Press.

Bloom, L., Lifter, K. and Hafitz, J. (1980). Semantics of the verbs and the development of verb inflection in child language. *Language,* 56, 366–412.

Bloom, P. (1990). Subjectless Sentences in Child Language. *Linguistic Inquiry,* 21(4), 491-504.

Bowerman, M. (1973). *Early syntactic development: a cross-linguistic study with special reference to Finnish.* Cambridge: Cambridge University Press.

Braine, M. (1976). Children's first word combinations. *Monographs of the Society for Research in Child Development,* 41, 1-97.

Brown, R. (1973). *A first language; the early stages*. Cambridge, Mass.: Harvard University Press.

Bybee, J. (1985). *Morphology: a study of the relation between meaning and form*. Typological studies in language. Amsterdam; Philadelphia: J. Benjamins.

Bybee, J. (1995). Regular Morphology and the Lexicon. *Language and Cognitive Processes,* 10, 425-455.

Bybee, J. (2001). *Phonology and language use*. Cambridge: Cambridge University Press.

Bybee, J. and Moder, C. (1983). Morphological classes as natural categories. *Language,* 59, 251–270.

Bybee, J. and Newman, J. (1995). Are stem changes as natural as affixes? *Linguistics,* 33(4), 633–654.

Bybee, J. and Schreibman, J. (1999). The effect of usage on degrees of constituency: the reduction of don't in English. *Linguistics*, 37(4), 575-596.

Bybee, J. and Slobin, D. (1982). Rules and schemas in the development and use of the English past tense. *Language,* 58(2), 265-289.

Caselli, M., Casadio, P. and Bates, E. (1999). A comparison of the transition from first words to grammar in English and Italian. *Journal of Child Language,* 26, 69–111.

Cazden, C. (1968). The acquisition of noun and verb inflections. *Child Development,* 39, 433-448.

Childers, J. and Echols, C. (1996). Infants' attention to stressed and word-final syllables: Implications for word-level segmentation. *Infant Behavior and Development,* 19, 391-391.

Childers, J. and Tomasello, M. (2001). The role of pronouns in young children's acquisition of the English transitive construction. *Developmental Psychology,* 37, 739–748.

Choi, S. (1998). Verbs in early lexical and syntactic development in Korean. *Linguistics,* 36(4), 755-780.

Chomsky, N. (1959). Review of B.F. Skinner, *Verbal Behavior*. *Language,* 35, 26-58.

Chomsky, N. (1965). *Aspects of the theory of syntax*. Cambridge, Mass: MIT Press.

Clahsen, H. and Felser, C. (2006). Grammatical processing in language learners. *Applied Psycholinguistics,* 27, 3-42.

Clark, R. (1974). Performing without competence. *Journal of Child Language,* 1, 1–10.

Clark, R. (1982). Theory and method in child language research: Are we assuming too much? In: Kuczaj, S. ed. *Language development: Syntax and semantics*. Vol. 1. NJ: Erlbaum, pp. 1–36.

Cole, R. and Jakamik, J. (1980). A Model of Speech Perception. In: Cole, R. ed. *In Perception and Production of Fluent Speech*. Hillsdale, NJ: Erlbaum, pp. 133-163.

Dąbrowska, E. (2001). Learning a morphological system without a default: The Polish genitive. *Journal of Child Language,* 28, 545-574.

Dąbrowska, E. (2004). Rules or schemas? Evidence from Polish. *Language and Cognitive Processes,* 19, 225-271.

Dąbrowska, E. (2005). Productivity and beyond: mastering the Polish genitive inflection. *Journal of child language,,* 32, 191-205.

Dąbrowska, E. and Szczerbiński, M. (2006). Polish children's productivity with case marking: The role of regularity, type frequency, and phonological diversity. *Journal of Child Language,* 33, 559–597.

De Villiers, J. and De Villiers, P. (1985). The acquisition of English. In: Slobin, D. I. ed. *The cross-linguistic study of language acquisition*. Vol. 1. pp. 27–139.

Devescovi, A., et al. (2005). A crosslinguistic study of the relationship between grammar and lexical development. *Journal of Child Language,* 32, 759-786.

Dittmar, M., et al. (2008). German children's comprehension of word order and case marking in causative sentences. *Child Development* 79**,** 1152-1167.

Dressler, W. ed. (1997). *Studies in Pre- and Protomorphology* Wien: Verlag der Österreichischen Akademie der Wissenschaften.

Dressler, W. (2004). Morphological typology and first language acquisition: Some mutual challenges. *On-line Proceedings of the Fourth Mediterranean Morphology Meeting* [Online], 8–20.

Dressler, W. (2007). Introduction. In: Laaha, S. and Gillis, S. eds. *Typological perspectives on the acquisition of noun and verb morphology*. Vol. 112. Antwerp pp. 3-9.

Dressler, W. and Karpf, A. (1995). The theoretical relevance of pre- and protomorphology in language acquisition. *Yearbook of Morphology*, (1994), 99-122.

Dressler, W., Kilani-Schoch, M. and Klampfer, S. (2002). How does a child detect morphology? Evidence from production. *Trends in Linguistics. Studies and Monographs*, 151.

Dressler, W., et al. (1987). *Leitmotifs in Natural Morphology*. Amsterdam: Benjamins.

Echols, C. (1993). A perceptually-based model of children's earliest productions. *Cognition*, 46, 245-296.

Echols, C. and Martin, C. (2004). The Identification of Words and their Meanings: From Perceptual Biases to Language-Specific Cues. In: Hall, D. and Waxman, S. eds. *Weaving a Lexicon*. Cambridge, MA: The MIT Press, pp. 41-78.

Echols, C. and Newport, E. (1992). The Role of Stress and Position in Determining First Words. *Language Acquisition*, 2, 189-220.

Eddington, D. (2009). Spanish verbal inflection: A single- or dual-route system? *Linguistics*, 47, 173–199.

Ellis, N. (2006a). Language acquisition as rational contingency learning. *Applied Linguistics*, 27, 1–24.

Endress, A. and Hauser, M. (2011). The influence of type and token frequency on the acquisition of affixation patterns: Implications for language processing.Journal of Experimental Psychology *Learning, Memory and Cognition*, 37 (1), 77-95.

Ferguson, C. (1957). Word Stress in Persian. *Language*, 33, 123–135.

Freudenthal, D., Pine, J. and Gobet, F. (2006). Modelling the development of children's use of optional infinitives in English and Dutch using MOSAIC. *Cognitive Science*, 30, 277-310.

Freudenthal, D., Pine, J. and Gobet, F. (2007). Understanding the developmental dynamics of subject omission: The role of processing limitations in learning. *Journal of Child Language*, 34, 83-110.

Gábor, B. and Lukács, A. (2006). Early productivity in Hungarian morphological acquisition: The role of locality, syntactic category and variability. *12th Morphology Meeting*. Budapest.

Galleas, G. (1998). *The parameters of Natural Morphology*. Padova: Unipress.

Gathercole, V., Sebastián, E. and Soto, P. (1999). The early acquisition of Spanish verbal morphology: Across-the-board or piecemeal knowledge? *International Journal of Bilingualism,* (3), 133-182.

Gathercole, V., Sebastián, E. and Soto, P. (2002). The Emergence of Linguistic Person in Spanish-Speaking Children. *Language Learning*, 52 679-722.

Gertner, Y., Fisher, C. and Eisengart, J. (2006). Learning words and rules: Abstract knowledge of word order in early sentence comprehension. *Psychological Science*, 17, 684–691.

Grinstead, J. (1998). *Subjects, sentential negation and imperatives in child Spanish and Catalan*. University of California.

Grinstead, J. (2000). Tense, number and nominative case assignment in child Catalan and Spanish. *Journal of Child Language*, 27, 119–155.

Hoeffner, J. (1996). *A single mechanism account of the acquisition and processing of regular and irregular inflectional morphology*. Unpublished doctoral dissertation, Department of Psychology. Pittsburgh, PA: Carnegie Mellon University.

Hoekstra, T. and Hyams, N. (1995). The syntax and interpretation of dropped categories in child language: A unified account. In: *Proceedings of WCCFL XIV*. Stanford University: CSLI Publications.

Ingram, D. (1978). The Role of the Syllable in Phonological Development. In: Alan, B. and Hooper, j. eds. *Syllables and Segments*. Amsterdam: North- Holland, pp. 143-155.

Karpf, A. (1991). Universal Grammar needs organization. *Folia Linguistica,* 25, 339–360.

Kempe, V. and Macwhinney, B. (1998). The acquisition of case marking by adult learners of Russian and German. *Studies in Second Language Acquisition,* 20**,** 543–587.

Keren-Portnoy, T., et al. (2010). The role of vocal practice in constructing phonological working memory. *Journal of Speech, Language, and Hearing Research*.

Kidd, E. and Lum, J. (2008). Sex differences in past tense overregularization. *Developmental Science*, 11, 882– 889.

Kilani-Schoch, M. and Dressler, W. (2002). The emergence of inflectional paradigms in two French corpora: An illustration of general problems of pre- and protomorphology. In: Voeikova, M. and Dressler, W. eds. *Pre and Protomorphology: early phases of morphological development in nouns and verbs*. München: Lincom, pp. 45-59.

Kilani-Schoch, M. and Dressler, W. (2005). *Morphologie naturelle et flexion du verbe français*. Tübingen Narr.

Klein, H. (1981). Productive strategies for the pronunciation of early polysyllabic lexical items. *Journal of Speech, Language and Hearing Research,* 24, 389–405.

Krajewski, G., Lieven, E. and Theakston, A. (2012). Productivity of a Polish child's inflectional noun morphology: a naturalistic study *Morphology,* 22(1), 9-34.

Krajewski, G., Lieven, E. and Tomasello, M. (2010). The role of word order and case marking in Polish children's comprehension of transitives.Unpublished MS.

Krajewski, G., et al. (2011). How Polish children switch from one case to another when using novel nouns: Challenges for models of inflectional morphology. *Language and Cognitive Processes,* 26 (4), 830-861.

Krug, M. (1998). String frequency. A cognitive motivating factor in coalescence, language processing, and linguistic change. *Journal of English Linguistics,* 26, 286–320.

Laaha, S. and Gillis, S. (2007). *Typological perspectives and the acquisition of noun and verb morphology*. Antwerp: University of Antwerp.

Langacker, R. (1987). *Foundations of Cognitive Grammar. Volume 1: Theoretical Prerequisites*. Stanford, CA: Stanford University Press.

Langacker, R. (1988). A usage-based model. In: Rudzka-Ostyn, B. ed. *Topics in Cognitive Linguistics*. Amsterdam: John Benjamins.

Langacker, R. (2000). A dynamic usage-based model. In: Barlow, M. and Kemmer, S. eds. *UsageBased Models of Language* Stanford, CA: CSLI Publications, pp. 1-63.

Lazard, G. (1992). *A Grammar of Contemporary Persian*. A Grammar of Contemporary Persian. English translation, Costa Mesa, California: Mazda Publishers.

Lieven, E., Pine, J. and Baldwin, G. (1997). Lexically-based learning and early grammatical development. *Journal of Child Language,* 24, 187–219.

Lieven, E., et al. (2003). Early syntactic creativity: A usage-based approach. *Journal of Child Language,* 30, 333-370.

Lieven, E. and Tomasello, M. (2008). Children's first language acquisition from a usage-based perspective. In: Robinson, P. & Ellis, N. eds. *Handbook of Cognitive Linguistics and Second Language Acquisition.* pp. 168-196.

Longobardi, E., et al. (2015). Children's acquisition of nouns and verbs in Italian: contrasting the roles of frequency and positional salience in maternal language. *Journal of Child Language,* 42(1), 95-121.

MacWhinney, B. (1978). The acquisition of morphophonology. *Monographs of the Society for Research in Child Development,* 43, Whole no. 1, 1-123.

MacWhinney, B. (2000). *The CHILDES Project: Tools for Analyzing Talk. 3rd Edition*. Mahwah, NJ: Lawrence Erlbaum Associates.

Mahootian, S. (1997). *Persian*. New York: Routledge.

Maratsos, M. (2000). More overregularizations after all: New data and discussion on Marcus, Pinker, Ullman, Hollander, Rosen and Xu. *Journal of Child Language,* 27, 183-212.

Marchman, V. (1997). Children's productivity in the English past tense: The role of frequency, phonology, and neighborhood structure *Cognitive Science,* 21, 283-303.

Marchman, V. and Bates, E. (1994). Continuity in lexical and morphological development: A test of the critical mass hypothesis. *Journal of Child Language,* 21, 339-366.

Marcus, G., et al. (1992). *Overregularization in language acquisition*. Monographs of the Society for Research in Child Development. Chicago: University of Chicago Press.

McClelland, J. and Patterson, K. (2002). Rules or connections in past-tense inflections: what does the evidence rule out? *Trends in Cognitive Science,* 6, 465–472.

McClure, K., Pine, J. and Lieven, E. (2006). Investigating the abstractness of children's early knowledge of argument structure *Journal of Child Language,* 33, 693–720.

Megerdoomian, K. (2000). Persian computational morphology: A unification-based approach. *NMSU, CRL, Memoranda in Computer and Cognitive Science (MCCS-00-320).*

Mithun, M. (1989). The acquisition of polysynthesis. *Journal of Child Language,* 16(2), 285-312.

Naigles, L. (1990). Children use syntax to learn verb meaning. *Journal of Child Language,* 17, 357-374.

Ninio, A. (2005). Testing the role of semantic similarity in syntactic development. *Journal of Child Language,* 32**,** 35–61.

Noble, C., Rowland, C. and Pine, J. (2011). Comprehension of argument structure and semantic roles: Evidence from English-learning children and the forced-choice pointing paradigm. *Cognitive Science,* 35(5), 963-982.

O'Grady, W. and Cho, S. (2001). First Language Acquistion. In: O'Grady, W., et al. eds. *Contemporary Linguistics*. Boston: Bedford/St. Martin's, pp. 409-448.

O'Grady, W., et al. (2011). An emergentist perspective on heritage language acquisition. *Studies in Second Language Acquisition,* 33, 223-245.

Orsolini, M. and Marslen-Wilson, W. (1997). Universals in morphological representation: Evidence from Italian. *Language and Cognitive Processes,* 12, 1-47.

Peters, A. (1983). *The Units of Language Acquisition*. Cambridge: Cambridge University Press.

Peters, A. (1985). Language Segmentation: Operating Principles for the Perception and Analysis of Language. In: Slobin, D. ed. *The Crosslinguistic Study of Language Acquisition*. Hillsdale, NJ: Erlbaum.

Peters, A. (1997). Language typology, individual differences and the acquisition of grammatical morphemes. In: Slobin, D. ed. *The crosslinguistic study of language acquisition* Vol. Vol. 5 Hillsdale, NJ: Erlbaum, pp. 135–197.

Pine, J., et al. (2008). Tense Over Time: Testing the Agreement/Tense Omission Model as an account of the pattern of tense-marking provision in early child English. *Journal of Child Language,* 35, 55-75.

Pine, J., et al. (2013). Do young children have adult-like syntactic categories? Zipf's law and the case of the determiner *Cognition,* 127, 345–360.

Pine, J. and Lieven, E. (1993). Reanalysing rote-learned phrases: Individual differences in the transition to multi-word speech. *Journal of Child Language,* 20, 551-571.

Pine, J. and Lieven, E. (1997). Slot and frame patterns and the development of the determiner category. *Applied Psycholinguistics,* 18(2), 123-138.

Pine, J. and Lieven, E. (1997). Slot and frame patterns in the development of the determiner category. *Applied Psycholinguistics*, 18 123-138.

Pine, J., Lieven, E. and Rowland, C. (1998). Comparing different models of the development of the English verb category. *Linguistics,* 36, 807-830.

Pinker, S. (1984). *Language learnability and language development*. Cognitive science series. Cambridge, Mass: Harvard University Press.

Pinker, S. and Prince, A. (1992). Regular and irregular morphology and the psychological status of rules of grammar. In: Sutton, L., Johnson, C. and Shields, R. eds. *Proceedings of the 17th Berkeley Linguistics Society*. pp. 230-251.

Pizzuto, E. and Caselli, M. (1992). The Acquisition of Italian Morphology - Implications for Models of Language-Development. *Journal of Child Language,* 19(3), 491-557.

Pizzuto, E. and Caselli, M. (1993). The Acquisition of Italian Morphology - a Reply to Hyams. *Journal of Child Language,* 20(3), 707-712.

Pizzuto, E. and Caselli, M. (1994). The Acquisition of Italian Verb Morphology in a Cross-Linguistic Perspective. *Other Children, Other Languages*, 137-187.

Plunkett, K. and Marchman, V. (1993). From rote learning to system building: Acquiring verb morphology in children and connectionist nets. *Cognition,* 48, 21–69.

Plunkett, K. and Nakisa, R. (1997). A connectionist model of the Arabic plural system. *Language and Cognitive Processes*, 12, 807-836.

Pye, C. (1983). Mayan Telegraphese: Intonational Determinants of Inflectional Development in Quiche Mayan *Language,* 59, 583-604.

Ragnarsdóttir, H., Simonsen, H. and Plunkett, K. (1999). The acquisition of past tense morphology in Icelandic and Norwegian children. An experimental study. *Journal of Child Language,* 26, 577-618.

Ramscar, M. and Yarlett, D. (2002). The role of meaning in inflection: Why the past tense does not require a rule. *Cognitive Psychology,* 45, 45–94.

Ramscar, M. and Yarlett, D. (2007). Linguistic selfcorrection in the absence of feedback: A new approach to the logical problem of language acquisition. *Cognitive Science,* 31, 927-960.

Rubino, R. and Pine, J. (1998). Subject-verb agreement in Brazilian Portuguese: What low error rates hide? *Journal of Child Language,* 25, 35–59.

Rumelhart, D. and McClelland, J. (1986). On learning the past tense of English verbs. In: McClelland, J., Rumelhart, D. and the PDP Research Group eds. *Parallel Distributed Processing*. Vol. ii. Cambridge, MA: MIT Press, pp. 216-271.

Samadi, H. and Perkins, M. (1998). P-LARSP: A developmental language profile for Persian. *Clinical Linguistics and Phonetics,* (12), 83-103.

Skinner, B. (1957). *Verbal Learning*. New York: Appleton-Century-Crofts.

Slobin, D. (1973). Cognitive prerequisites for the development of grammar. In: Ferguson, C. and Slobin, D. eds. *Studies of Child Language Development*. New York, Holt: Rinehart and Winston, pp. 175–208.

Slobin, D. (1985). Crosslinguistic evidence for the Language-Making Capacity. In: Slobin, D. ed. *The crosslinguistic study of language acquisition*. Vol. 2. Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 1157-1256.

Slobin, D. (1997b). The origins of grammaticizable notions: Beyond the individual mind. In: Slobin, D. ed. *The crosslinguistic study of language acquisition*. Vol. 5. Hillsdale, NJ: Erlbaum, pp. 265–323.

Smoczynska, M. (1985). The acquisition of Polish. In: Slobin, D. ed. *The Crosslinguistic Study of Language Acquisition: the Data*. Vol. 1. Hillsdale, NJ: Lawrence Erlbaum, pp. 595–683.

Snow, D. (1994). Phrase-final syllable lengthening and intonation in early child speech. Journal of Speech and Hearing Research *Journal of Speech and Hearing Research,* 37, 831–840.

Stoll, S. (2015). Inflectional morphology in language acquisition. In: Baerman, M. ed. *Handbook of inflectional morphology*. Oxford: Oxford University Press.

Storkel, H. (2004). Do children acquire dense neighborhoods? An investigation of similarity neighborhoods in lexical acquisition. *Applied Psycholinguistics,* 25, 201–221.

Sundara, M., Demuth, K. and Kuhl, P. (2011). Sentence-position effects on children's perception and production of English 3rd person singular -s. *Journal of Speech, Language, and Hearing Research,* 54, 55-71.

Theakston, A., et al. (2004). Semantic generality, input frequency and the acquisition of syntax. *Journal of Child Language,* 31, 61–99.

Theakston, A., et al. (2005). The acquisition of auxiliary Syntax: BE and HAVE. *Cognitive Linguistics,* 16, 247–277.

Tomasello, M. (1992). *First verbs: a case study of early grammatical development*. Cambridge [England] ; New York, NY, USA: Cambridge University Press.

Tomasello, M. (1995). Language is not an instinct. *Cognitive Development,* 10, 131–156.

Tomasello, M. (2003). *Constructing a language: a usage-based theory of language acquisition*. Cambridge; Mass; London: Harvard University Press.

Tomasello, M. (2006). Acquiring linguistic constructions. In: Kuhn, D. and Siegler, R. eds. *Handbook of Child Psychology: Cognition, Perception, and Language*. Vol. 2. 6 ed. New York: Wiley, pp. 255-298.

Tomasello, M., et al. (1997). Differential productivity in young children's use of nouns and verbs. *Journal of Child Language,* 24, 373–387.

Tomasello, M. and Brooks, P. (1999). Early syntactic development: A construction grammar approach. In: Barrett, M. ed. *The Development of Language*. Hove, UK: Psychology Press, pp. 161-189.

Tomasello, M. and Stahl, D. (2004). Sampling children's spontaneous speech: How much is enough? *Journal of Child Language,* 31(1), 101–121.

Ullman, M. (1999). Acceptability Ratings of Regular and Irregular Past-tense Forms: Evidence for a Dual-system Model of Language from Word Frequency and Phonological Neighbourhood Effects. *Language and Cognitive Processes,* 14(1), 47-67.

Vihman, M. (1980). Sound change and child language. In: Traugott, E., La Brum, R. and Shepherd, S. eds. *Papers from the 4th International Conference on Historical Linguistics*. John Benjamins, pp. 303-320.

Vihman, M. (1996). *Phonological Development*. Oxford: Blackwell.

Vihman, M., Ferguson, C. and Elbert, M. (1986). Phonological development from babbling to speech: Common tendencies and individual differences. *Applied Psycholinguistics,* 7, 3–40.

Vihman, M. and Vija, M. (2006). The acquisition of verbal inflection in Estonian: Two case studies. In: Gagarina, N. and Gluzow, I. eds. *The acquisition of verbs and their grammar: The effect of particular languages* Dordrecht: Springer, pp. 263–295.

Wilson, S. (2003). Lexically specific constructions in the acquisition of inflection in English. *Journal of Child Language*, 30, 75-115.

Windfuhr, G. (1987). Persian. In: Comrie, B. ed. *The World's Major Languages*. New York: Oxford University Press, pp. 523-546.

Yang, C. (2011). Computational models of syntactic acquisition. *Wiley Interdisciplinary Reviews: Cognitive Science*, 35-39.