ACQUISITION OF PAST TENSE IN ALBANIAN:

IMPLICATIONS FOR MORPHOLOGICAL PROCESSING AND REPRESENTATION

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2012

ACQUISITION OF PAST TENSE IN ALBANIAN: IMPLICATIONS FOR MORPHOLOGICAL PROCESSING AND REPRESENTATION

Thesis submitted to the Institute for Graduate Studies in the Social Sciences

in partial fulfillment of the requirements for the degree of

Master of Arts

in

Cognitive Science

by

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Bogazici University

2012

Acquisition of Past Tense in Albanian:

Implications for Morphological Processing and Representation

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September 2012

Thesis Abstract

Dorina Strori, "Acquisition of Past Tense in Albanian: Implications for Morphological Processing and Representation"

This study examines the acquisition of past tense in Albanian, which is a highly inflectional language, especially with respect to its verbal system. The past tense depicts a rather complex picture, involving several components and discrepancies. This process is realized via mandatory suffixation (two suffixes available for the third person singular: '-i' and '-u'), accompanied by the different combinations of two other inflectional dimensions: stem extension (four available affixes for the third person singular: '-v-', '-t-', '-jt-', '-r-'), and stem change. Unlike English, Albanian doesn't offer a clear distinction between 'regular' and 'irregular' inflection, and a 'default-like' past tense process. Rather, it involves several discrepancies between verbs' past tense formation and their phonological structure, such that verbs belonging to the same phonological prototype diverge with respect to their past tense formation. Also, it is one of a limited number of languages that offers the possibility to observe paradigmatic relations and discrepancies between a verb's inflected instances.

The present study deals with production data, collected from 64 monolingual Albanian-speaking children divided into three age groups (age range: 2;8 – 5;8). A picture-cued elicitation technique was used to elicit children's production of the verbs' present and past tense forms, of which only the past tense productions were coded and statistically analyzed. Verbs from different phonological neighborhoods were included, where special attention was paid towards including verbs for each different past tense process, and verbs from the same phonological prototype, that diverged with respect to their past tense formation.

The findings reveal a pronounced tendency of children, regardless of age, to overapply the '-v-' stem extension affix, which is consistently present in the first and second person singular past tense instances of the related verbs, to the third person singular, an instance which is never observed in adult language. This phenomenon suggests effects of paradigmatic analogy. Another major pattern observed was the overgeneralization of a past tense process to verbs that actually employ another past tense formation process. This pattern occurred with verbs whose present tense forms belong to the same phonological neighborhood, therefore indicating effects of phonological similarity on children's processing of the past tense.

The results are discussed with particular attention paid to the accumulating evidence on paradigmatic effects and the analogy between words sharing morpho-phonological and / or semantic properties. We conjecture that the 'v-stem extension overgeneralization' pattern displayed by the Albanian-speaking children is a peculiar phase during their acquisition of the past tense, which promotes their transition to the adult level of processing and representation of this challenging morphological process. Our findings favor morphological processing models in which analogy to other exemplars and intrinsic relations between words play a crucial role.

Tez Özeti

Dorina Strori, “Arnavutça'da Geçmiş Zamanın Edinimi: Biçimbirimsel İşlemleme ve Gösterim açısından Sezdirimler”

Bu çalışmanın amacı, Arnavutça’da geçmiş zamanın edinimini incelemektir. Arnavutça, ekler açısından oldukça zengin bir dildir ve bu zenginlik özellikle fiillerin farklı zamanlara göre çekiminde öne çıkmaktadır. Geçmiş zaman çekimi bileşenleri ve içerdiği farklı süreçler göze alındığında oldukça karmaşıktır. Geçmiş zaman oluşturmada ek ekleme (üçüncü tekil kişi için ‘-i’ ve ‘-u’ ekleri eklenir); fiil kökünde genişleme (üçüncü tekil kişi için dört ek : ‘-v’, ‘-t’, ‘-jt’, ‘-r’ bulunur) ve kök değişimi olmak üzere, temelde üç süreç göze çarpar. İngilizce’den farklı olarak Arnavutça, ‘düzenli’ ve ‘düzensiz’ çekim arasında net bir ayrım yapmaz ve her durumda uygulanabilen (default) bir geçmiş zaman oluşturma sürecine sahip değildir. Arnavutça’da fiillerin sessel (fonolojik) yapıları ile geçmiş zaman çekimleri arasında bazı ilginç farklılıklar göze çarpmaktadır. Aynı fonolojik sınıfa ait fiiller, geçmiş zaman çekimlerinde birbirlerinden farklı davranabilmektedir. Ayrıca, Arnavutça bir fiilin çekilmiş halleri arasında paradigmatik ilişkiler ve çelişkilerin gözlenebileceği nadir dillerden birisidir.

Bu çalışma, ana dili Arnavutça olan 64 çocuktan toplanan veriyi incelemektedir. Çocuklar, yaşlarına göre üç gruba ayrılmışlardır (yaş aralığı: 2;8 – 5;8). Çocukların, istenen fiillerin şimdiki ve geçmiş zaman çekimlerini üretmeleri için Resim Uyaranlı Anlatma yöntemi kullanılmıştır. Toplanan veri içinden yalnızca geçmiş zaman çekimleri analiz edilmiş ve kullanılmıştır. Çalışmaya özellikle farklı fonolojik sınıflardan seçilen fiiller, bir diğer deyişle, farklı geçmiş zaman çekimini temsil eden fiiller ve aynı fonolojik sınıfa ait ama farklı geçmiş zaman çekimleri gösteren fiiller dahil edilmiştir.

Bulgular, çocukların yaştan bağımsız olarak yalnızca birinci ve ikinci geçmiş zaman çekimlerinde kullanılması gereken ‘-v’ ekini yaygın olarak üçüncü tekil şahıs için de kullandıklarını, bir genelleme yaptıklarını ortaya çıkarmıştır. Gözlemlenen olgu, literatürde paradigmatik benzeşme olarak bilinen durumu desteklemektedir. Çalışmanın bir diğer önemli bulgusu ise çocukların edinim sırasında farklı bir geçmiş zaman oluşturma sürecine sahip fiilleri kendilerine uygun olmayan bir geçmiş zaman oluşturma sürecine tabi tutmaları olmuştur. Bu durum, benzer sessel (fonolojik) özellikler gösteren fiillerde gözlemlenmiştir.. Dolayısıyla, fonolojik benzerliğin çocukların geçmiş zaman ediniminde önem taşıdığı sonucuna varılmıştır.

Çalışmanın sonuçları özellikle literatürde paradigmatik etkiler konusunda oluşmuş gözlemlere ve morfofonolojik ve/veya anlamsal özellikler paylaşan sözcükler arasındaki benzerliklerin önemini vurgulayan çalışmaların ışığında tartışılmıştır. Arnavutça konuşan çocukların gösterdiği ‘v-kök genişlemesi’ genellemesinin, geçmiş zaman ediniminde ortaya çıkan, yetişkinlerin geçmiş zaman işleme seviyesine ulaşmalarına yarayan sürecin bir parçası olduğunu tahmin ediyoruz. Bulgularımız, dilde varolan örneklere benzeşme ve sözcükler arasındaki yapısal ilişkilerin ön planda tutulduğu morfolojik işleme modellerini desteklemektedir.

ACKNOWLEDGMENTS

First and foremost, I would like to express my deepest gratitude to my primary advisor and mentor, Assoc.Prof. Mine Nakipoğlu Demiralp, whose endless patience and important insights contributed very much to this work. She was the one to direct my attention to the field of inflectional morphology processing, which soon became a passion. Not only did she follow this work and enriched it with invaluable comments and insights throughout its development, but also continuously supported and motivated me emotionally during the demanding process. I owe her so much intellectually and emotionally.

My second advisor, Assist.Prof. Esra Mungan, can easily be the most positive, helpful and encouraging person one can ever meet. The analysis of this study would not have been successfully completed without her important support and mentoring.

I am deeply grateful to the other members of my committee, whose comments added a lot to the progress of this work: The extraordinary Prof. Ayhan Aksu Koç (God save the Queen!), the brilliant Assist.Prof. Albert Ali Salah, whose rich background and never ending enthusiasm are a true blessing for the Cognitive Science Program, and the one and only, Assist.Prof. Balkız Öztürk Başaran, who has taught me so much about linguistics and has always been there for me.

I would never arrive at this stage of education without the endless support of my parents Flora and Irakli Strori, to whom I owe everything. My beautiful sister Marsida, has continuously supported me with her dear love, serenity and patience. I owe her and her husband, Stiliano, the newest joy of my life, my nephew Matias.

Ahmet, my Love, it was you who held my hand and believed in me even when I had doubts. You always manage to say the right thing, at the right time. Not to mention that you are the person who makes me laugh the most! My sweet bunny, Emir Arbër, watching you grow has been the most priceless experience of my life. I couldn't always be there in your play time, but you were always with me in my classes and study hours. If you weren't the wonderful child you are, I could hardly finish these studies. I am truly blessed to have such a wonderful family.

My dearest friends, Selime Işık Kantar, Feyza Merve Hafızoğlu, and Berna Aslan Uzundağ merit my deepest gratitude for their precious friendship. Thank you for existing and being such true friends girls! I am very indebted to my dear friend, Uğur Mustafa Kaya, for his invaluable help and advice with the statistical analysis of my work, and for his sincere friendship. The guy is truly amazing!

Last, but not least, many sincere thanks and my deepest gratitude go to: the children in "1 Qershori" and "10 Korriku" daycare centers, their dedicated teachers and parents, the undergraduate students of the department of computer science at the University of Tirana, and their brilliant instructor, Dr. Denis Saatçiu. The realization of this work would not have been possible without them.

For my native language, Albanian, which I absolutely adore

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CHAPTER 1

INTRODUCTION

The debate of rule- versus similarity-based accounts of cognition has been central in cognitive science. The classical view of the cognitive system maintains that cognition involves 'mental rules' (Newell & Simons, 1990). These mental rules encode general facts about the world, which in turn can apply to specific cases in cognitive processes. Similarity, on the other hand, provides a different account of cognition. Instead of general rule generation, past experiences regarding the world are stored in an unprocessed way, and reasoning about a new situation depends on its similarity to past experiences (Hahn & Chater, 1998).

Language processing has been hosting such a debate regarding its nature for three decades now. It has been dominant mostly in the area of inflectional morphology, particularly in the processing of the English past tense (Rumelhart & McClelland, 1986; Pinker & Prince, 1988; Pinker, 1999; Marcus, 1995; McClelland & Patterson, 2002; Pinker & Ullman, 2002; Bybee & Slobin, 1982; Bybee, 1985; Kim et al, 1992; Plunkett & Marchman, 1992; Xu & Pinker, 1992; Albright & Hayes, 2003; Yang, 2002; Prasada & Pinker, 1993).

The debate is central to developmental psychology as well, since it questions whether children's linguistic development can be best explained in terms of symbolic rules or processes such as analogy and generalization over stored instances. In particular,

children's acquisition of the English past tense has been frequently used as a test for this debate (Marcus et al, 1992; Ambridge, 2010).

The English past tense has been of wide interest because it involves two very different processes: regular and irregular inflection. Regular inflection (e.g.: talk – talked) is predictable, applies to the vast majority of the verbs and can be easily generalized to novel forms. Irregular inflection (e.g.: go – went) is not predictable, applies to a rather limited number of verbs (approximately 180) and is rarely generalized to novel forms, instead children tend to overgeneralize the regular suffix to the irregular verbs, such as: 'holded' and 'breaked' (Marcus et al, 1992; also cited in Ullman & Pinker, 2002).

A number of theories surround the debate, each with its own strengths and weaknesses (Rumelhart & McClelland, 1986; Pinker & Prince, 1988; Pinker, 1999; Bybee 1985; Plunkett & Marchman, 1991; Plunkett & Juola, 1999; Yang, 2002; Albright and Hayes, 2003; Skousen et al, 2002; Daelemans & Bosch, 2010).

Although the majority of studies have been done for English, crosslinguistic evidence is accumulating, where studies on German and Dutch, and Serbian have enriched the debate with important insights (Clahsen, 1999; Marcus et al, 1995; Hahn & Nakisa, 2000, for German; Baayen et al, 2002; Ernestus & Baayen, 2004; Keeulers et al, 2007; Keeulers & Daelemans, 2007, for Dutch; Mirkovic, Seidenberg, & Joanisse, 2011, for Serbian).

In the area of language acquisition, the picture is similar: the vast majority of the work has been carried out for English (Marcus et al, 1992; Marcus, 1995; Kim et al, 1994; Marchman, 1997; Marchman, Wulfeck, & Weismer, 1999; Ambridge, 2010), with

only a limited number of crosslinguistic studies, mainly for German (Clahsen et al, 1992; Clahsen & Rothweiler, 1993, Clahsen et al, 1996b).

The present study is the first attempt at investigating the acquisition of Albanian past tense, a morphologically rich language and typologically different from English, especially with respect to the verbal inflectional morphology. Acquisition studies, especially from high inflectional and studied languages, are crucial for testing the validity of the proposed models and contributing to their potential improvements. We started this study with two main aims: 1) to start exploring the seemingly complex process of Albanian past tense acquisition by identifying the type of errors that children do, the reasons they might commit these errors, and any peculiar phases they go through during the process, and 2) discuss the findings from this language in the light of the most prominent models that have been proposed so far. It is our belief that the results, coming from a language that is morphologically rich and typologically different from the over-studied English, will potentially add insights to the past tense debate, especially to its ever growing area of cross-linguistic work, and will also contribute to the documentation of the path that Albanian children follow with respect to the acquisition of this language.

CHAPTER 2

LITERATURE REVIEW

Introduction

The question whether language processing in general and inflectional morphology in particular is governed by rules or analogy can be seen as a general caption to a deeper, rich and multifaceted debate. Several facets have contributed to the big picture and describing the debate has increasingly become more challenging as new terms and perspectives join in. It is difficult to come up with any definite conclusions on the issue since the relevant literature has plenty of findings, explanations and alternative explanations by the several camps involved. In the sections below, a general review of the literature and the prominent models proposed will be presented first, followed by a review of the related literature on language acquisition as well as a section dedicated to recent findings about a notion that promises to shed light on our results and final discussion: paradigmatic analogy.

The Models

In 1986 Rumelhart & McClelland published a seminal paper that would serve as the start for a three-decade long debate on the mechanisms underlying language processing (Pinker & Ullman, 2002; McClelland & Patterson, 2002; Pinker & Ullman, 2002b; Pinker, 2006). Until then, the standard view of language processing, starting with

Chomsky, followed by Fodor, Pylyshyn, and Pinker among many others (Fodor & Pylyshyn, 1988; Pinker, 1991, 1999), had maintained that abstract symbolic rules had a crucial role in the human language processing. This view lies within a more general picture that considers the cognitive mechanisms of the human brain to be symbolic, modular, innate, and domain-specific (Pinker, 1991; also cited in McClelland & Patterson, 2002). Rumelhart and McClelland (1986) challenged this long-term view by presenting an alternative, connectionist model that mimicked children's acquisition of the English past tense via a single connectionist system that made use of regularities and analogies between verbs instead of rule application. Their approach lies within the Parallel Distributed Processing (PDP) or connectionist framework, in which cognitive processes are seen as graded, probabilistic, interactive, context-sensitive, and domain-general. In response to this, Pinker & Prince (1988) published a critical paper and the famous debate was started once for good, giving rise to a large number of following papers and several proposed models (Pinker & Ullman, 2002).

*The Dual-Route Model***:** In a number of papers, Pinker and colleagues proposed two mechanisms responsible for the processing of the English past tense in particular and inflectional morphology in general: a system responsible for symbolic rule computation and an associative lexical memory system (Pinker, 1991; Pinker & Prince, 1994; Prasada & Pinker, 1993, Pinker, 1999; Pinker & Ullman, 2002). This model treats regular and irregular inflection as two distinct psycholinguistic phenomena (Pinker & Prince, 1994; Pinker & Ullman, 2002; Pinker, 1999; Pinker, 2006). Accordingly, regular past tense formation is computed via a symbolic rule that adds the past tense suffix '-ed' to the verb stem. Irregular verbs, on the other hand, are unpredictable and therefore stored as individual words in the lexical memory system. This memory system is partly

associative, where features are related to features and words to words. In this respect, it resembles the connectionist models, which capture and model similar features in the input. This means that irregulars are expected to show the types of associative effects that the connectionist models advocate: since similar verbs repeatedly enhance a single set of connections for their matching part(s), families of similar verbs are easier to store and recall (e.g., sling – slung). Furthermore, people can sometimes generalize the irregular inflection to new verbs similar to existing ones that employ the same inflection pattern, because the new verbs contain features that have been associated with existing irregular families (e.g., spling- splung). Whenever memory fails to retrieve an irregular form, irregular inflection is suppressed and regular inflection is applied instead (hence the occasional overgeneralizations by children and adults). While irregular inflection is limited to memorized and stored words, depends on phonological similarity, regular inflection is not sensitive to phonological similarity and can be applied to any word, regardless of its memory status (Pinker & Prince, 1994; Pinker, 2006). Evidence from different areas has been claimed to support the model (see Pinker & Ullman (2002) for a review). Prasada & Pinker (1993) conducted a series of rating and production experiments with novel verbs that were designed to be similar, moderately similar or dissimilar to existing regular and irregular verbs. They found that as the similarity of nonce irregular verbs to real irregulars gradually decreased, the subjects were less likely to inflect them irregularly. This was considered as evidence that irregulars are stored in memory, thus can display analogy effects on nonce forms. A different outcome was observed with respect to regular nonce verbs: the phonological similarity level of the nonce forms to existing regulars had no role in subjects' past tense production across the different similarity groups. Again, this result was interpreted as evidence that regular

forms need not be stored in memory in order to elicit or analogically influence past tense forms. Jaeger et al. (1996) found neurological evidence that different areas of the brain are responsible for processing regular and irregular inflection, a result that supports the dual-route model. A controversial and criticized aspect of the model is its view of the difference between regular and irregular morphology as a structural difference, independent of the type frequency of morphological patterns (Bybee, 1995). Despite being the oldest of the models, it continues to be one of the main players of the debate, maybe because it has been focused mostly on English, a language with a rather clear boundary between regular and irregular morphology and as such, a suitable test case for the model. Crosslinguistic evidence, especially from languages with richer and more complex inflectional morphology than English, might be crucial for the validity of this model, as well as its opponent ones. In recent years, such evidence is gradually growing, with studies on German (e.g., Marcus et al, 1992; Clahsen, 1999), Dutch (e.g., Ernestus & Baayen, 2004; Tabak, Schreuder, & Baayen, 2005a), and recently, Serbian (Mirkovic, Seidenberg, & Joanisse, 2011; Milin, Kuperman, Kostic, & Baayen, 2009). Obviously, more empirical and modeling work of this kind is required for a potential resolution of the debate and a more robust picture of lexical processing. The present acquisition study will be the first contribution on the area from a highly inflectional language, Albanian.

*The Single-Route Model***:** Rumelhart & McClelland (1986) proposed a single system, in the form of a connectionist network that could extract patterns of regularities in the English past tense system and accordingly generate patterns of overgeneralizations in a similar fashion to the errors observed in children. The ultimate aim of such networks is to mimic children's transition from early rote learning (in which past tense forms are produced correctly) to systematic verb treatment (where errors with irregular forms

happen) by using one single connectionist pattern associator system (Rumelhart & McClelland, 1986; Plunkett & Marchman, 1993). In fact, Rumelhart & McClelland (1986) claimed that their network was able to model the classical U-shaped learning pattern of children during the acquisition of the English past tense. This effect was due to an abrupt change in the size of the training set (a few verbs at first, followed by a substantially increased number of verbs in the training set), a property of the model that was thoroughly criticized by Pinker & Prince (1988) as not reflecting plausible, real discrepancy in children's input during acquisition, because: 1) there is little to no evidence for such an immediate increase in the number of verbs to which children are exposed, and 2) during early phases of acquisition, regular and irregular verbs are almost evenly distributed in children's production vocabularies. Later connectionist models attempted to overcome this deficit by eliminating discrepancies in the training procedure, such that the network was trained to learn a considerable number of verbs (some hundreds) concurrently (e.g., Plunkett & Marchman, 1991). Most importantly, Plunkett & Marchman (1991) results showed that the patterns of overgeneralization errors observed were derived purely from the competition between the different types of mappings used in the simulations, provided that there was no discontinuity in the input. Furthermore, their work also showed that the capacity of these types of networks to learn inflectional verb morphology is highly sensitive to input parameters such as the type and token frequency of stems in the input set, as well as the degree to which the phonological shape of the stem is a predictor of a mapping pattern. However, as the authors also noted, it is unlikely that children indeed learn an entire lexicon all at once. In fact, the authors mention evidence that verb acquisition in children most likely, is a gradual process following an incremental learning path (Plunkett & Marchman, 1991).

In order to overcome this flow, Plunkett & Marchman (1993) devised a connectionist network which was trained in an incremental fashion, such that in the initial phase, the network was fed with a small number of frequent stems and in later stages it was gradually supplied with other stems: one lexical item at a time. The results of several simulations with real and novel verbs showed that the network reorganized in a way that produced a shift from a mode of rote learning to a systematic treatment of verbs. Furthermore, it was shown that this transition depended on the number of regular and irregular verbs in the training set and was also sensitive to the phonological sub-regularities in the irregular verbs. Following this model was another one with a wider range of functions, designed to represent the acquisition of the English noun and verb morphology (Plunkett & Juola, 1999). The network was trained to produce the plurals and past tense forms of a large corpus of monosyllabic English nouns and verbs. The developmental trajectory of network performance displayed a number of important features of the acquisition of English noun and verb morphology, such as an initial errorless period of performance on both nouns and verbs, followed by a period of over-regularization of irregular nouns and verbs. In addition, errors in the model showed evidence of phonological conditioning and frequency effects (Plunkett & Juola, 1999). Cottrell & Plunkett (1991) devised a network that does not only learn to map the base forms to their respective past tense forms, but can also learn and access past tense forms directly. MacWhinney & Leinbach (1991) included semantic properties in their network, such that it could differentiate between homophonous pairs such as: ring, rang versus wring, wrung.

In recent years connectionist networks have been enriched with cross-linguistic evidence. Very recently, a study by Mirkovic, Seidenberg, and Joanisse (2011)

attempted to examine the representation of inflectional morphology in Serbian, a highly inflectional language, which encodes number, gender and case for nouns. In linguistics, this system is usually represented by a complex set of rules, where disagreements about their exact form still exist. The authors analyzed a large corpus of nouns which suggested that Serbian inflectional morphology is quasiregular[1], as is the case for English. It displays several partial regularities represented by neighborhoods that vary in size and consistency. The main interest was whether the Serbian noun inflection system could be learned by a connectionist network, and whether the network's representation of this system captured important aspects in the performance of skilled adult language users. The results suggested that Serbian can be better described by the quasiregular concept than by a rules-and-exceptions dichotomy. The model demonstrated that such a system can be learned by a connectionist network, when an appropriate definition of the input and sufficient training is provided. The model's learning was influenced by factors such as frequency and morpho-phonological similarity that also influence the performance of adult speakers. In dual-route approaches such factors are considered relevant only for the irregular verbs (e.g. Pinker, 1999; Pinker & Ullman, 2002), but this study claimed to have succeeded in showing that in Serbian, these factors have a wider reach. Furthermore, an important implication was that the representation and processing of inflectional information across typologically different languages may be accounted for by common computational mechanisms.

Despite several critiques (e.g., Pinker & Prince, 1988; Pinker & Ullman, 2002; Pinker, 2006), connectionist models signify the birth of an era with respect to language processing and provide useful insights on several important factors that play crucial

[1] Not regular in an absolute way, i.e., regularity is partial and distributed in several verb classes.

roles in language acquisition and language processing, such as morpho-phonological regularities and type frequency effects of linguistic patterns. Each improvement in modeling adds to the claim that all English past tense forms can be acquired and produced by an associative system, without the explicit formulation of a symbolic rule (Bybee, 1995).

*The Network Model***:** This model was put forward by Bybee (1985, 1988, 1995, 2001) and shares a lot with the single-route, connectionist models of morphological processing. It was designed to account for cross-linguistic, diachronic and acquisition patterns in complex morphological patterns (Bybee, 1995, 2001). The main claim is that morphological properties of words, paradigms and morphological patterns that are often described as rules emerge from associations made among related words in lexical representation. One of the main differences with the dual-route model, as well as similarities with the connectionist models, is that in this model, usage in terms of both type and token frequency has a crucial role in forming, manipulating and maintaining lexical representations.[2] Furthermore, contrary to the dual-route model and similarly to the connectionist ones, this model retains that the structural difference drawn between regular and irregular inflection as irrelevant, and treats both types in the same way with respect to processing. Namely, it claims that the observed differences are not due to different processing mechanisms, but rather due to frequency effects and the strength of lexical analogies in the network, formed upon usage of the forms. The words entering the lexicon have varying degrees of lexical strength, due to their token frequency. Words

[2] 'Type frequency' corresponds to the number of members of the class that a verb is in, whereas 'token frequency' to the frequency of usage of a verb.. In English for example the class of regular verbs has the highest type frequency, whereas the class of irregulars has the highest token frequency.

with high lexical strength are easy to access, serve as the bases for morphological relations and display an autonomy that provides them with resistance to change, and prone to semantic independence. Lexical strength explains why irregulars are usually of high token frequency. Words in the lexicon are related to other words via sets of lexical connections between identical or similar phonological and semantic features. Even though words entering the lexicon are not decomposed into their constituent morphemes, their morphological structure emerges from their connections with other words in the lexicon. Parallel sets of phonological and semantic connections, if repeated across multiple word sets, become morphological relations (i.e., generalizations). Lexical connections may differ in strength according to the number and type of features shared (Bybee, 1995, 2001). An important insight of the model is that it allows for a *product-oriented* view of morphological generalizations, according to which, people form generalizations not only about the relation between inputs and outputs (e.g., present tense form – past tense form), but also about the outputs themselves (e.g., past tense form – past tense form) (Bybee, 2001). According to Bybee (1995), connectionist models can be considered as testing some of the properties of the network model, but the later one is more complex and encompasses a wider range of phenomena than any connectionist model.

*Recent Models***:** In the recent years, other models describing the processing of inflectional morphology have joined the debate. Each one brings its own novelty, but also shares aspects with the older models.

*The Multiple Rules Model***:** Albright and Hayes (2003) proposed a model which uses only multiple stochastic rules to generate the past tense of verbs. Their model employs inductive learning to find out multiple rules, to which it assigns confidence

scores based on their performance in the lexicon. The experimental data on rating and production of novel English past tense forms indicated that participant ratings of novel verbs' past tenses depend on the phonological shape of the stem for both irregulars and interestingly, regulars. According to the authors, this finding could not be explained under the dual mechanism approach, which derives all regulars with a single rule. The alternative hypothesis that all morphological processing is due to analogy was also evaluated, by implementing a purely analogical model and testing it against experimental data. The authors reported that this model also failed in two important tasks: it could not locate patterns for which abstract structural generalization was necessary, and it provided implausible responses based on single, very similar exemplars. Albright and Hayes (2003) claim that morphological patterns can be generalized based on abstract structural properties, the appropriate description of which is made possible via rules. The basic principle of their model is that rules can be gradually built up from the lexicon through successive generalization over pairs of forms (verb stem & its past tense). As a starting point, the model takes each learning pair and transforms it into a word-specific rule. In later iterations generalization over rules is realized by comparing rules with one another and merging those that perform the same change. The first stages of generalization tend to produce arbitrary and idiosyncratic rules, but when the process is successively repeated, more general rules can be induced. In the final stages of the inductive learning process, rules emerge that are general enough to cover all of the pairs in the learning set that share a particular change. Furthermore, in order to deal with the redundant and less general also generated by model, each rule is assigned a confidence level depicting its accuracy with respect to correct past tense generation. The rules that fall within a specified range of accuracy level are retained in

the model. As Albright and Hayes (2003) also note, at a first sight it might seem like the model they propose is very similar to an analogical one, where each analogy to existing forms is replaced by a context-based rule. However, they point out that their concept of a context-based rule is rather differs from that of analogy in an important aspect: their rules require new forms to be similar to existing forms in exactly the same way, not partially or prototype-like as in the case of analogy. Therefore, similarity of a form to a set of existing forms is based on a uniform structural description, while in the case of analogy; each form may be similar to existing ones in its own way.

*The Rules and Competition Model***:** After systematically analyzing several findings of English language acquisition studies, Yang (2002) put forward the 'Rules and Competition Model'. In a rather generative fashion, Yang (2002) proposed an 'all rules' model, according to which irregular forms also are generated via rules, as had been continuously assumed in generative grammar. However, contrary to the rule applied to the regular forms, these rules apply to a limited set of lexical items and are not productive over novel forms. As in the dual-route model, a frequency-dependent associative memory is involved in morphological processing, but in this model, association takes place between words and rules, not between words and words (stems and their past tense forms), such that, instead of memorizing word stems and their respective inflected forms, people memorize these rules and the list of verbs to which they apply. One of the crucial claims of the model is that rule application is not absolute, such that each irregular rule that applies to a verb class is associated with a certain weight (or probability). This probability of application might be less than 1 during the initial stages of acquisition, due to the gradual nature of the learning process. During the learning process, each irregular rule competes with the default, regular rule, where the

rule with the highest probability (weight) wins the competition and is preferred in that turn. Each time the rule applies in the right context, its probability value is gradually increased, until it reaches the value of 1, after which it can be applied confidently.

*Analogical Modeling of Language (AML)***:** Proposed by Skousen (Skousen, 1989, Skousen, 2002) and advocated by others (e.g., Eddington, 2000), AML is one of the most prominent examples of analogy-based linguistic theories and maybe the most interesting from a computational point of view. Basically, it is a model of how memory instances of linguistic use may be used to predict new linguistic behavior. It has been considered as a psycholinguistically relevant account of human language acquisition and processing, particularly as an alternative to dual-route models (Eddington, 2000; Derwing & Skousen, 1989). Like in connectionist models, in AML, a single system is responsible for both regular and irregular inflection. However, contrary to connectionist models that predict only one outcome for a given context, AML predicts the probability that more than one outcome may be chosen. Furthermore, while connectionist models require extensive training and feedback, AML needs neither training, nor feedback. Another important difference is the way information is represented: in connectionism, words are not represented individually, since information is stored as patterns of activation in a network of connected nodes, while in AML, information is stored in a database of exemplars of language use, mimicking the contents of the mental lexicon. When some linguistic behavior is to be predicted (e.g.: choice of an allomorph, suffix, etc.), the database is searched, looking for instances analogous to the new item, starting with the entries most similar to the related context and gradually expanding the search to less similar entries. The decision for the new item is extrapolated from the set of

analogous items resulting from the database search. The model has also been successfully used in computational linguistics (Eddington & Lonsdale, 2007).

Memory-Based Language Processing (MBLP): This approach was put forward by Daelemans & colleagues (Daelemans, 2002; Keuleers & Daelemans, 2007; Keuleers et al., 2007; Daelemans & van den Bosch, 2010). The central claim of this model is that decisions about new facts are based on the re-use of stored past experiences. In this approach, learning is basically the storage of exemplars in memory, and processing is made possible via analogical reasoning on stored exemplars. Like Analogical Modeling of Language (AML), it is an approach to modeling language learning and language processing based on the idea that linguistic behavior is guided by the direct reuse of memory traces of previous linguistic experiences, rather than by rules extracted from that experience. However, contrary to AML, which is based on natural[3] statistics, MBLP uses algorithms and metrics taken from statistical pattern recognition and information theory. With regard to inflectional morphology, a memory-based approach considers morphological generation to be a function of either lexical retrieval or similarity based reasoning on lexical representations of words, where the computation of similarity is defined according to the phonological, orthographical, or semantic representation features. This model has been claimed to successfully model the Dutch plural inflection (Keuleers et al., 2007; Keuleers & Daelemans, 2007).

[3] Psychologically plausible

Children have been known to be productive with the regular pattern, using the regular past tense suffix with both irregulars (e.g., sing - *singed) and novel verbs, the past tense of which is elicited experimentally (e.g., wug – wugged; Berko, 1958; also cited in Ambridge, 2010). On the other hand, errors where children redundantly apply or misapply irregular patterns are very rare (Xu & Pinker, 1995). It is a common report that children tend to follow a U-shaped pattern of development with respect to the English past tense acquisition (Marcus et al., 1992; Pinker & Prince 1988; Rumelhart & McClelland, 1986; Plunkett & Marchman, 1993).

This developmental pattern is characterized by the following three phases: children's first productions of English past tense are generally correct, regardless of the forms' regularity status. Following this first phase is a period when irregular forms are inflected incorrectly and overregularization errors occur, e.g. 'goed'. In the third phase, the frequency of such errors decreases, as irregular forms are understood as exceptions to the dominant regular pattern. Explaining overregularization errors is crucial for both developmental psychology and cognitive science. Usually these errors has been considered as evidence for the existence of rules and each phase of the U-shaped developmental pattern is interpreted as representing the application of different mechanisms for past tense formation during the course of rule acquisition (Pinker & Prince, 1988; Marcus et al., 1992). The first stage consists of the operation of a rote learning mechanism that stores both regular and irregular forms, as independent items in the mental lexicon. In this stage, both irregular and regular forms are produced correctly. Furthermore, potential systematic patterns in the input are not encoded yet, and thus are

not generalized to novel forms by the child. The second stage represents the child's identification of patterns of regularity, explicitly represented as procedures which join stems and the past tense suffix to form the past tense of a verb. The redundant application of such rules results in the production of overgeneralization and in the regularization of nonsense forms. Finally, the third stage is about discovering the exceptions to the rules and organizing the irregular forms as independent entries in the mental lexicon, to which rules need not apply. This final phase, hence, advocates the existence of two distinct mechanisms responsible for children's knowledge of the English inflectional system. One mechanism involves the default application of a symbolic rule, responsible for the generation of the regular paradigm. The other mechanism unveils exceptions and prompts the child to consult its knowledge store when producing and comprehending past tense forms.

Recent dual-mechanism hypothesis explain overgeneralization via the "blocking principle," i.e., it is when the memory for irregular verbs fails to block the application of the regular rule that overregularizations occur. With growing linguistic experience, the lexical memory strength for the irregular verbs increases and the possibility of overgeneralization errors decreases (Marcus et al., 1992, Pinker, 1999). Marcus et al. (1992) analyzed the spontaneous speech of 83 children and some of the main findings were that: 1) overregularization errors occur more rarely than previously thought; 2) their occurrence frequency displays a U-shaped pattern; 3) they don’t correlate with the increase in the frequency of regular verbs in parental or children speech input; verbs are protected from overregularization by phonologically similar irregulars, but are not attracted to overregularization by phonologically similar regular forms; 4)

irregularization[4] errors are even more rare than overregularization ones. Marcus et al. (1992) interpreted these findings as support for the dual-route mechanism and claimed that a single-route connectionist model cannot explain and model the fact that children qualitatively differentiate between regular and irregular forms.

Plunkett & Marchman (1993) note that while the view that children overgeneralize the regular pattern to irregular forms has achieved a lot of attention, in fact there is little to no evidence that children overgeneralize indiscriminately, to all irregulars in their current vocabulary. Instead, children tend to overgeneralize the past tense suffix to only a small portion of irregular verbs and meanwhile correct irregular past tense forms are also produced. Plunkett & Marchman (1993) argue that the absolute nature of the dual-mechanism approach doesn't capture the selective nature of the developmental pattern that children display with respect to inflectional morphology acquisition, which seem to derive from associative processes.

Marchman (1997) studied the productivity of past tense morphology in school-aged children (3 years, 8 months to 13 years, 5 months) using an elicited production task. Findings revealed that almost all children were productive with both regular and certain irregular patterns. Overall errors decreased with age, but certain types of irregularization errors displayed increasing patterns in the older groups. Most importantly, analyses across items indicated that all error types were predicted by combinations of item frequency and phonological characteristics of stem and past tense forms. Marchman (1997) interpreted the results in favor of a phonologically-based constraint satisfaction system similar to that represented by connectionist models. In an

[4] Either over application of irregular patterns to regular verb or inappropriate application of irregular patterns to the wrong irregular verbs.

elicited production task with both normal, school-aged children, and those with specific language impairment (SLI), Marchman, Wulfeck, and Weismer (1999) found that overregularization errors were more common for irregular verbs that are similar to regulars than those that are not, while the study by Marchman (1997) found no such effect.

Ambridge (2010) conducted a study in which children rated (on a 5-point scale) the acceptability of a regular and an irregular past tense form of a set of novel verbs, which was basically the same as the one used in Albright and Hayes' (2003) adult study. The novel verbs were chosen to vary in terms of similarity to existing regular and irregular forms. The major findings were: 1) a developmental progression observed in the acceptability of novel regulars, such that it increased as a function of similarity to existing regulars, with the increase in age, and 2) no developmental progression in the acceptability of novel irregulars, which increased as a function of similarity to existing irregulars. Three current models of past tense acquisition: the single-route model, the dual-route model, and the multiple rules model proposed by Albright and Hayes (2003), were considered for the interpretation of the results and it was concluded that the empirical findings supported the multiple rules model of Albright and Hayes (2003).

Clahsen and colleagues investigated two instances of German inflection, past participle inflection and noun plurals, from a multidisciplinary point of view, by conducting studies with both children and adult subjects. Their main aim was to provide evidence to the past tense debate from a language other than English and with a richer inflectional morphology (Clahsen, Rothweiler, Woest, & Marcus, 1992; Clahsen, 1999). Clahsen (1999) notes that like in English, German past participles and noun plurals are easy to study, but most importantly, they don't involve confounding variables such as

word structure and frequency effects, as is the case in English. German participle is formed via two endings: '-n' which appears on all participle forms of so-called 'strong' (irregular) verbs, and '-t' appears on participle forms of all other verbs. But, '-n' ending behaves like irregular past tense forms and '-t' like the default, regular '-ed' ending in English. German plurals are formed via five different endings, where none of them is statistically predominant and their occurrence with specific nouns is not readily predicted by standard inflectional rules. Despite its overall irregularity, the German plural system has a default process that applies whenever accessing irregular forms fails.

Marcus et al. (1995) maintain that according to their linguistic criteria, '-s' plurals represent the default class, even though they are really rare in the German language compared to other plural forms. The '-s' plural applies when the phonological environment does not allow for any other plural allomorph (Clahsen, 1999). The results from the various adult experiments indicated that the processing of inflected words is correlated to their morphological structure, i.e., inflected forms that have stem and affix representations are usually computed via their constituent morphemes, while inflected forms that are represented as structured lexical entries display frequency and similarity effects in processing.

In the studies with children that Clahsen and colleagues conducted, children's performance was found to be very similar to that of adults, such that regular and irregular inflectional processes are differentiated in the same way: regular inflection is overapplied in default conditions, while irregular inflection is overgeneralized by means of analogy only. According to Clahsen (1999), these results indicate that the linguistic system, including its dual structure, doesn't seem to change very much over time. The observed discrepancies in performance between children and adults, and the

developmental patterns are most probably due to the child's gradual acquisition of lexical entries. Clahsen (1999) interprets the overall results from adult and child language processing experiments in favor of a dual-mechanism for language processing that has a rule-based component for regular forms and another one for irregulars that involves lexical storage.

As can be inferred from the above review of some of the most important acquisition studies, the empirical evidence has led to diverging conclusions and perspectives regarding the nature of the language faculty in general and inflectional morphology processing in particular. Despite the attempts to enrich the issue with cross-linguistic evidence, there is yet a lot more to be done in this camp in order to contribute to a potential resolution of the existing controversies.

Paradigmatic Analogy

Accumulating evidence in the literature supports the hypothesis that paradigmatic relations of words have a crucial role in lexical representation and lexical processing. The term *inflectional paradigm* refers to the set of the inflected variants of a certain word stem (e.g., sing, sang, sung, sings, singing). Experimental work has shown that the probability distribution of all the distinct forms in a word's inflectional paradigm affects lexical processing (e.g., Kostic, Markovic, & Baucal, 2003; del Prado Martin, Kostic, & Baayen, 2004; Tabak, Schreuder, & Baayen, 2005a; Milin, Kuperman, Kostic, and Baayen, 2009). Namely, the study examples just mentioned, employ concepts from what has been coined as *'information theory'* to explain aspects of morphological organization and lexical processing. A basic insight from information theory applied to

lexical processing is that the amount of information carried by a lexical entity (e.g., an inflected form or an inflectional paradigm) is negatively correlated with the occurrence probability of this entity, and positively correlated with processing costs. Therefore, a common assumption is that lexical units that have a higher information load are more costly to access in long-term memory. Hence, the processing costs are expected to be proportional to the amount of information. The word frequency effect is a good example for this prediction: higher frequency words, which have lower information loads, are processed faster than low-frequency, high-load information words. Occurrence probabilities of the lexical units are calculated from their relative frequencies of occurrence, such that the probability of an inflected word is estimated as the ratio of its form-specific occurrence frequency (i.e., or surface frequency) over the sum of the frequencies of all the distinct inflected variants of its stem (i.e., base frequency). Apart from the information carried by a single inflected word, there is also the information carried by its inflectional paradigm.[5] The information carried by a paradigm is associated with the distribution of occurrence probabilities of its inflected variants and is often called the *entropy* of the paradigm. Namely, the entropy value is the expected amount of information in a paradigm, expressed as the weighted probability distribution of its inflected members. The entropy increases with the number of members of the paradigm. It also increases when the probabilities of the members are similar to each other. For a given number of members, the entropy is maximal when all probabilities are the same. Alternatively, the entropy value also represents the average number of binary

[5] The term inflectional paradigm refers to the set of inflected variants of a word (stem), and the term inflectional class to refer to a set of words that use the same set of inflectional components in their inflectional paradigms.

decisions needed to recognize a member of the paradigm (i.e., to reduce all uncertainty about which member of the paradigm is at issue). The entropy of the inflectional paradigm of a word provides informative support for the recognition of that word, and as such, has facilitatory effects on its discrimination latency. Namely, it has been observed that higher paradigmatic entropies lead to shorter response latencies in lexical decision and visual word naming tasks (e.g., del Prado Martin, Kostic, & Baayen, 2004; Milin, Kuperman, Kostic, and Baayen, 2009).

In addition to the above concepts, there is also the information load carried by an inflectional component (e.g., suffix), which is calculated as the distribution of the occurrence probabilities of the component, weighted for the number of its functions and meanings within the inflectional class.[6] This weighted information load is predicted to decrease with occurrence probability, and to increase with the number of functions and meanings of the component. Accordingly, the inflectional components that carry a greater average amount of information are more difficult to process.

Further to the above theoretical measures, del Prado Martin, Kostic, and Baayen (2004) introduced the notion of *information residual* of a word, quantitatively expressed as the difference between the information load of the word and the total entropy from its inflectional paradigms. The information load of an inflected word represents its occurrence frequency and is considered to express the difficulty (processing cost) involved in its recognition. The total paradigmatic entropy reflects the support that the word receives from all its inflectional paradigms. In these terms, the information residual measure is predicted to have an inhibitory effect on the recognition of the word

[6] Weighted = divided. Weighting is done in order to control for the fact that inflectional components differ in their number of functions and meanings in an inflectional class.

and be positively correlated with the related response latencies. After the reanalysis of several published work on the matter, del Prado Martin, Kostic, and Baayen (2004) claimed that the information residual measure was a better predictor for response latencies in visual lexical decision tasks, than traditionally used measures (e.g., surface and base frequency, morphological family size, etc.).

All the above information theory concepts have been shown to be successful in predicting response latencies in lexical processing tasks (e.g., Kostic, Markovic, & Baucal, 2003; del Prado Martin, Kostic, & Baayen, 2004; Tabak, Schreuder, & Baayen, 2005a; Milin, Kuperman, Kostic, and Baayen, 2009).

Milin et al. (2009) notes that, although the information theoretic measures proposed capture only part of the multidimensional complexity of lexical processing, information theory promises to provide appropriate tools for investigating and modeling the organization of the mental lexicon. However, one needs to be cautious in the interpretation and generalization of the evidence obtained so far. First, the majority of the results reported come from visual comprehension tasks (e.g., lexical decision, word naming). Consequently, they are prone to change in the case this line of research is extended to other tasks and across modalities. Second, the size of inflectional paradigms has not been investigated systematically. For instance, the studies on Serbian have been conducted exclusively with nominal paradigms. Although the nominal inflectional classes of Serbian are far more complex than those of English or Dutch, the complexities of verbal paradigms can be orders of magnitude larger. Therefore, from an information theoretic perspective, the entropy of the complex verbal paradigms of Serbian must be much larger than the entropy of nominal paradigms, and one would expect this difference to be reflected in longer processing latencies for inflected verbs. As an

example that might support this prediction, Milin et al. (2009) cites a study by Traficante and Burani (2003), in which it was observed that inflected verbs in Italian elicited longer processing latencies than inflected adjectives. Third, in addition to Milin et al. (2009)'s observations, we note that all the reported studies within this line of research, either comprehension or production in nature, have been exclusively conducted with adult subjects. We didn't come through any reported study that aimed at exploring potential paradigmatic effects in acquiring children.

Tabak, Schreuder, and Baayen (2005a) did a lexical statistical survey of the distributional properties of regularity for Dutch verbs. The results revealed that the regularity of a verb can be predicted not only from its frequency (irregulars tend to be more frequent), but also from family size (regulars tend to have more small and large family sizes than intermediate ones), neighborhood density (regulars tend to live in denser similarity neighborhoods), argument structures (regulars tend to have less argument structures than irregulars), auxiliaries (a certain auxiliary was underrepresented for the regulars), inflectional entropy (regulars tend to have greater entropies), and the spoken-written frequency ratio (regulars tend to have a higher spoken frequency). The combination of these distributional variables is more predictive than verb's frequency only. One of the most important achievements of this study is that it shows that regularity is part of a conspiracy of variables dependent on both form and meaning, not only form, as it has usually been assumed (e.g., Pinker, 1999; Pinker & Ullman, 2002).

Paradigmatic analogy is also crucial for understanding a version of morphology that disregards rules. For example, in Dutch, the traditional analysis of the regular past tense requires exception marking for a large subset of verbs. However, paradigmatic

analogy not only can explain the distribution of regular past tense formation without requiring the usage of exception markers, but also explains the cases in which paradigmatic pressure leads to language change such as when native speakers do not obey to the norms of the standard language and produce inappropriate forms. Furthermore, the strength of the analogical pressure is also reflected in production of the regular past tense. Ernestus and Baayen (2004) addressed the question to what extent the production of regular past tense forms in Dutch is affected by analogical processes. In the experiment, native speakers of Dutch listened to existing regular verbs and had to decide which of the two past tense allomorphs was appropriate for the verbs. Standard generative analyses maintain that the choice between past tense allomorphs is entirely regular and is predicted by the properties of the verb's stem-final segment, therefore no analogical effects are predicted. Contrary to this, in connectionist and analogy-based approaches, phonological similarity in the lexicon is expected to influence lexical processing. The results of Ernestus and Baayen (2004) supported the later view: all the subjects produced more non-standard past tense forms and responded more slowly in the case of verbs with stronger analogical support for the non-standard forms.

In another study, Ernestus and Baayen (2007) report two lexical decision experiments investigating the role of paradigmatic effects in auditory word recognition. The first experiment showed that listeners classified a certain form (e.g., singular form of a word) with an incorrectly voiced final obstruent[7] more readily as a word if the obstruent is realized as voiced in other forms of that word's morphological paradigm (i.e., in its plural form). Moreover, if such was the case, the exact probability of

[7] A sound, such as a stop, fricative, or affricate, that is produced with complete blockage or at least partial constriction of the airflow through the nose or mouth.

paradigmatic voicing emerged as a significant predictor of the response latencies. A greater probability of voicing correlated with longer response latencies for words correctly realized with voiceless final obstruents. A similar effect of this probability was observed in the second experiment for words with completely voiceless or weakly voiced (incompletely neutralized) final obstruents. Ernestus and Baayen (2007) interpreted the results as demonstrating the importance of paradigmatically related complex words for the processing of morphologically simple words in auditory word recognition.

A nice practical example of the importance of paradigms would be that of the design and teaching of spelling systems. Sandra and Fayol (2003) examined an interesting phenomenon in the orthographies of French and Dutch, where even highly educated writers commit morphological spelling errors, despite the fact that the spelling rules for complex words are considered to be simple and transparent. The most appropriate explanation is that analogical memory interferes, allowing inappropriate but more frequent homophones in the paradigm to take advantage (Sandra & Fayol, 2003; also cited in Hay & Baayen, 2005).

From the perspective of cognitive psychology, the emerging results on the importance of inflectional paradigm and paradigmatic analogy for lexical processing are interesting in that they provide further evidence for the importance of structured lexical connectivity. From the perspective of linguistic morphology, they might support the theoretical concepts of paradigms and inflectional classes. Combined with the presence of a strong effect of the word frequency, these results provide strong support for exemplar-based approaches to lexical processing (Milin et al., 2009).

Paradigmatic effects suggest that the relations between words play an intrinsic role in lexical representation and processing, and consequently should be given the deserved importance in related theories. Rule-based models would encounter severe difficulties in explaining such effects, since they represent only words and some symbolic rules acting upon them, and disregard the actual relations between words (Hay & Baayen, 2005).

Conclusion

The review of some of the most prominent theories, empirical evidence and controversies surrounding the so-called 'past tense debate', apart from providing us with a general picture of the issue, highlights two crucial points: 1) the continuously increasing need for cross-linguistic evidence, especially from languages typologically different from English and with richer and more complex inflectional morphology, and 2) the recently acknowledged importance of paradigmatic analogy as a crucial factor in morphological processing. Although some ideas regarding the later have been put forward some decades earlier (Bybee 1988; Bybee, 1995), it has only recently come to deserved attention, with evidence accumulating from morphologically richer languages such as Dutch, Serbian and as will be evident in this study, Albanian. Furthermore, to our present knowledge, the related literature lacks evidence of paradigmatic effects in children, during a certain period of their acquisition. In this respect, our study may be considered as one of the first steps towards the exploration and documentation of this phenomenon.

CHAPTER 3

ALBANIAN PAST TENSE

Introduction

Albanian is an Indo-European language which constitutes its own unique branch within the family, without any other participating language. It has a rather rich inflectional morphology, both with respect to nouns and verbs. In their inflectional paradigm, verbs are marked for tense (aspect), person, number, and voice.[1] It is outside the scope of this work to provide a detailed and thorough explanation of Albanian verbal inflectional morphology. For further details, the interested reader is directed to Newmark, Hubbard, and Prifti (1982). In what follows, I will provide the most relevant aspects of the past tense formation process in Albanian. The first section will be a general overview of the process, presented in a comparative fashion between Albanian and English. The second section will provide a detailed explanation of Albanian past tense. Following it will be a section dedicated to the classification of verbs according to their phonological similarity. Finally, some concluding remarks in the last section will point out the most relevant aspects of the entire process and the way we treat it, explain their importance for the present study, and come up with related predictions.

[1] Active or Non-Active Voice. All the verbs included in the present study are in Active Voice. From now on, this detail won't be specified again.

Albanian versus English Inflectional Morphology

Unlike English, where the dissociation between regular and irregular inflection is clearly defined, in Albanian it is almost impossible to draw a line between morphological regularity and irregularity. In standard terms, the vast majority of the verbs can be called 'regular', with only a very limited number of 'irregular' ones. While in English regular past tense formation involves suffixation only (e.g., walk / walk-ed), in Albanian it involves three inflectional dimensions: suffixation, stem change, and stem extension. In English, irregular inflection is mostly realized via stem change (e.g., know / knew), while in Albanian this process occurs frequently with what would classify as 'regular' in standard terms (e.g., *pret* 'waits' / *prit-i* 'waited').

In Albanian irregular verbs are those that undergo either total or radical stem change. They are rather scarce in number, have high usage frequency, and are further divided into two groups: suppletive (e.g., rri (stays) / ndenj-i (stayed)) and non-suppletive irregulars (e.g., thotë (says) / tha (said)) (Newmark, 1982). Things can get even more complicated once one realizes that irregularity can occur among the so-called 'regulars' that fall within the same phonological similarity cluster and maybe expected to form the past tense in the same way, but indeed, do not (e.g., pret (waits) / prit-i (waited); vret (hurts) / vra-u (hurt)).

Not surprisingly then, the terms applied to English past tense processing cannot be readily adapted to Albanian past tense. This makes sense considering that English has a poor inflectional morphology, while Albanian has a richer and more complex one. In Albanian, the verb has a dense inflectional paradigm with respect to mood, tense (aspect), person and number. Furthermore, there is no bare infinitive (uninflected) form

of verbs, as is the case in English or Turkish, for example. Usually the verbs mentioned for reference are given in what is often called 'the representative form', which corresponds to the verb's first person singular, present tense, active voice form. The following is a comparative example involving inflectional paradigms of these languages in both present and past tense. The suffixes after the separation mark represent the tense-person marker combinations (for Table 1), and stem extension, tense-person marker combinations (for Table 2).

Table 1. Inflectional Paradigm of Verb *puno-j* 'work' in Present Tense

Albanian	English
(unë) puno-j	(I) work
(ti) puno-n	(you) work
(ai/ajo) puno-n	(he/she) work-s
(ne) puno-jmë /punɔjmə/	(we) work
(ju) puno-ni	(you) work
(ata/ato) puno-jnë / punɔjnə /	(they) work

Table 2. Inflectional Paradigm of the Verb *puno-j* 'work' in Past Tense

Albanian	English
(unë) puno-v-a	(I) work-ed
(ti) puno-v-e	(you) work-ed
(ai/ajo) puno-i	(he/she) work-ed
(ne) punua-m	(we) work-ed
(ju) punua-t	(you) work-ed
(ata/ato) punua-n	(they) work-ed

This is only one of the vast examples illustrating the significant discrepancies in the inflectional paradigms in both languages. In the case of the present tense, we can see that in English, the only instance of variation in inflection is in the third person singular, where the '-s' suffix is added. On the other hand, in Albanian variation in endings exists throughout the inflectional paradigm. The difference becomes even sharper in the case

of past tense inflection paradigms: no variation at all in English (only adding the past tense suffix to the verb stem invariably, throughout the paradigm), while in Albanian variation in endings, stem vowel and stem extension is present throughout the paradigm.

Past Tense Formation in Albanian

Explaining the past tense formation in Albanian in a compact and comprehensive way is difficult, because as it will be apparent soon, it is a rather complicated process involving several inflectional components that vary throughout the inflectional paradigm. In describing it, as is usually the case, we are bound to the usage of several linguistic terms. From these, the notion of 'stem' and 'suffix' are widely familiar to the reader, as frequently used linguistic terms across a vast number of languages. However, the notion of 'stem extension affix' may not be that familiar. This term is used in grammar books on standard Albanian for describing a certain aspect of the past tense. All the descriptions of the past tense formation provided in this study are the ones conveyed by these grammar books (e.g., Newmark, Hubbard, & Prifti, 1982; Camaj, 1984).

A note is necessary at this point. A very common assumption is that a past tense form is *derived* in real time from its present tense stem. Surprisingly, this is one of the few assumptions that many connectionist models (e.g., Rumelhart & McClelland, 1986; Plunkett & Marchman, 1991; MacWhinney & Leinbach, 1991) share with symbolic theories, such as the dual-route account. However, there is accumulating evidence indicating that this very common assumption is wrong. Namely, Stemberger and colleagues suggested that inflected forms are not derived in this generative sense. Their evidence, based on speech errors, indicates that in English present and past tense forms

are both activated and enter into a competition process that is modulated by the occurrence probabilities of the stem vowels, as well as by infuences of the vowels in preceding words (Stemberger, 2002; Stemberger & Middleton, 2003; Stemberger, 2004). This evidence seems interesting and insightful and while an exhaustive discussion of its implications for our data is outside the scope of this study, we will return to it in the final chapter, where we discuss our findings. For now we note that the above evidence has come from English, in which it is relatively easy to distinguish between *inflected* forms and *less inflected* forms. On the other hand, an interesting aspect of Albanian verbal system is that it lacks the presence of *bare infinitives*, or *uninflected* forms: every verbal form comes with a certain inflectional profile involving mood, tense, aspect, and number. Therefore, for Albanian it might not be easy to differentiate between *inflected* forms and *less inflected* forms, as is the case for English, since basically, inflection is always present. At this stage, we feel the need to describe the complex process depicted by the Albanian past tense as a transition from the verb's present tense form to its past tense form. In such terms, this process involves three inflectional dimensions: 1) suffixation, 2) stem extension, and 3) stem change.[2] Suffixation is mandatory in all cases, while the other two inflectional components are not always so. It's this diversity in the combination of these components that renders the whole process complex. For the first dimension, there are two available past tense suffixes: *'-i'* and *'-u'*. Although formal reports of frequency of usage for the suffixes are lacking for the moment, our closed inspection of a considerable number of verbs seems to suggest that the first suffix is

[2] Unless otherwise specified, all the references to verbs and their inflectional components will be done for the third singular. Obviously, the verbs in the stimulus set used in the elicited production task are in third person singular as well.

vastly used with a certain type of verbs, which fall into the same phonological cluster and constitute the most productive class of verbs in Albanian (Newmark, Hubbard, & Prifti, 1982).[3] A potential assumption would be that the first suffix applies to a larger number of verbs and therefore has a higher usage frequency.[4]

The second inflectional dimension of past tense formation, stem extension, co-occurs only with the *'-i'* past tense suffix, never with *'-u'*. Verbs extend their stems with one of the four possible affixes: *'-v-'*, *'-t-'*, *'-jt-'*, and *'-r-'*. Examples for each of the affixes are given in Table 3.

Table 3. Examples of the Stem Extension Options in Albanian Past Tense

'-v-'	*'-t-'*	*'-jt-'*	*'-r-'*
puno-v-a (I worked) *puno-v-e* (you worked)	*arri-t-i* (he arrived / reached)	*mba-jt-i* (he kept / held)	*hy-r-i* (he entered)

The examples under the *'-v-'* affix are given intentionally in the first and second person singular and not in the third person singular, as is the case for the other extension affixes. This affix is *'special'* as it behaves differently from the other ones. When present, the *'-v-'* extension affix occurs only in the first and second person singular of the verb's past tense inflectional paradigm.[5] It is never present in any other instances of the paradigm. Therefore, one should never encounter a past tense form such as: **puno-v-*

[3] These verbs' stem ends in the vowel '-o-', such as in: puno- (work); mendo- (think); mbro- (protect); beso- (believe), etc.

[4] Also referred to as 'token frequency'.

[5] The entries in the table under this extension reflect this important property: the only instances of its usage are in the first and second person singular..

i (*he worked) in adult language production, as is indeed the case.[6] The distribution of the other three stem extension affixes throughout the past tense inflectional paradigm of a verb is not restricted in the same way. The *'-t-'* and *'-jt-'* extensions occur in all the instances of the paradigm, whereas *'-r'* occurs with all the singular instances only.[7] An important note seems necessary at this point. The above description of the stem extension process depicts a complex picture of the distribution of these affixes. Apart from being relatively high in number (four distinct options), some of them also display diversity in their own distribution along the past tense inflectional paradigm of the related verbs (as is the case for *'-v-'* and *'-r-'* affixes). This complexity seems to suggest that defining the boundaries between what is perceived as stem and what as affix / suffix might not be an easy and straightforward task. Therefore, it wouldn't be unreasonable to conjecture that children face confusion and challenge during the acquisition of this apparently complicated process. At certain acquisition stages they might perceive the stem and the stem extension affix (e.g., *'-v-'*) as one single entity, and at other stages as separate lexical units. This would further imply that children's representations have a dynamic nature and are prone to change, as the child defines and redefines them along the acquisition process.

The third inflectional dimension, stem change, can co-occur with both past tense suffixes, *'-i'* and *'-u'*. It may involve vowel change, consonant change, and occasionally, both of these changes. For a clearer idea of the complex past tense formation process in

[6]Such incorrect forms were not present at all in the data from the adult control subjects.

[7] First, second, and third person singular. Although more limited than '-t-' and '-jt-', its range of usage in the verb's past tense inflectional paradigm is still wider than that of '-v', which can occur only in the first and second person singular instances.

Albanian, consider the following examples that illustrate each of the inflectional dimensions explained above, occurring either alone, or in combination with the others.[8]

Table 4. Several Examples of the Past Tense Formation Process in Albanian

Present Tense Form (third person singular)	Past Tense Form (third person singular)	Explanation
hap (opens)	*hap-i* (opened)	suffixation only: '-i' (a default-like operation)
hedh /hɛð/ (throws)	*hodh-i /hɔðˈi/* (threw)	stem vowel change: 'e' to 'o' + suffixation: '-i'
pjek /pjek/ (bakes)	*poq-i /pɔci/* (baked)	stem change: no 'j', the last consonant becomes 'q', and the vowel changes from 'e' to 'o' + suffixation: '-i'
shkrua-n /ʃkruan/ (writes)	*shkro-i /ʃkrɔi/* (wrote)	stem vowel cluster change: 'ua' to 'o' + suffixation: '-i'
ble-n (buys)	*ble-u* (bought)	suffixation: '-u'
thye-n /θyɛn/ (breaks)	*the-u /θɛu/* (broke)	stem vowel cluster change: 'ye' to 'e' + suffixation: '-u'
vret (kills / hurts)	*vra-u* (killed / hurt)	stem vowel changes from 'e' to 'a' + suffixation: '-u'
mba-n (keeps)	*mba-jt-i* (kept)	stem extension: '-jt-' + suffixation: '-i'
vë /və/ (puts)	*vu-r-i* /vuri/ (put)	stem vowel change: 'ë' to 'u' + stem extension by '-r-' + suffixation: '-i'

[8] Albanian is pronounced in the same way as it is spelled. For special letters, peculiar to this language, the appropriate pronunciation with standard IPA characters is given next to the spelled form.

Distribution of Albanian Verbs According to Phonological Similarity

As mentioned above, the terms and notions used for defining the English past tense can hardly apply to Albanian past tense. First of all, the notion of 'regularity' used in English makes little sense in Albanian. As explained above, the 'regular' past tense formation is a complex one, involving several variables and their different combinations. On the other hand, 'irregular' past tense is represented by a very small number of verbs, further divided into suppletive and non-suppletive irregulars. Maybe, the most interesting point about the whole process is noticing that there exist discrepancies in past tense formation among regular verbs whose present tense forms share similar phonological properties.

With this in mind, in the beginning of our study, we aimed at a systematic analysis of the distribution of a considerable number of Albanian verbs.[9] First, we clustered them according to their present tense form phonological properties, such that phonologically similar verbs formed a separate phonological cluster. Thus, each cluster had a certain phonological prototype that comprised the shared phonological properties of the verbs. Further on, we computed the past tense forms of all the verbs and probed for potential discrepancies in past tense formation within the clusters. Several such discrepancies were observed.[10] Consider the illustrative examples given in the following tables.

[9] About 140 verbs in total. Although the exact or formal usage frequencies are actually not available, all the verbs involved are active in everyday usage and it is predicted that their usage frequency varies from high, to moderate and low.

[10] Some of the largest and most discrepancy-hosting phonological clusters are provided in the Appendix B.

Table 5. Past Tense Formation Discrepancy in the Phonological Cluster with the Prototype "C(C)a-n"[11]

Present Tense Form (third person singular)	Past Tense Form (third person singular)	Explanation
nda-n (divides)	*nda-u*	Past Tense Formation: '-u' suffix
la-n (washes)	*la-u*	Past Tense Formation: '-u' suffix
tha-n /θan/ (dries)	*tha-u /θau/*	Past Tense Formation: '-u' suffix
ça-n /ʧan/ (splits)	*ça-u /ʧau/*	Past Tense Formation: '-u' suffix
mba-n (keeps)	*mba-jt-i*	Past Tense Formation: 'jt 'stem extension + '-i' suffix

Table 6. Past Tense Formation Discrepancies in the Phonological Cluster with the Prototype "C(C)(C)e-t "

Present Tense Form (third person singular)	Past Tense Form (third person singular)	Explanation
shet (sells)	*shit-i*	Past Tense Formation: stem vowel change ('e' to 'i') + '-i' suffix
pret (waits)	*prit-i*	Past Tense Formation: stem vowel change ('e' to 'i') + '-i' suffix
zbret (comes down)	*zbrit-i*	Past Tense Formation: stem vowel change ('e' to 'i') + '-i' suffix
nget (drives)	*nga-u*	Past Tense Formation: stem vowel change ('e' to 'a') + '-u' suffixation
vret (kills / hurts)	*vra-u*	Past Tense Formation: stem vowel change ('e' to 'a') + '-u' suffixation
shket (slips)	*shka-u*	Past Tense Formation: stem vowel change ('e' to 'a') + '-u' suffixation

[11] C: consonant; (C): the second consonant, which may or may not be present; n: the 3.sing. present tense ending. The prototype represents the verbs which start with either a consonant or a consonant cluster and have 'a' as their stem vowel in present tense.

Table 7. Past Tense Formation Discrepancy in the Phonological Cluster with the Prototype "C(C)(C)o-n / CVCo-n / CVCVC-on"

Present Tense Form (third person singular)	Past Tense Form (third person singular)	Explanation
ço-n (conveys)	*ço-i*	Past Tense Formation: '-i' suffix
puno-n (works)	*puno-i*	Past Tense Formation: '-i' suffix
vizaton-n (draws)	*vizato-i*	Past Tense Formation: '-i' suffix
rro-n (lives)	*rro-jt-i*	Past Tense Formation: stem extension by '-jt-' + '-i' suffix
mbro-n (defends)	*mbro-jt-i*	Past Tense Formation: stem extension by '-jt-' + '-i' suffix

Table 8. Past Tense Formation Discrepancy in the Phonological Cluster with the Prototype "C(C)(C)ua-n / CVCua-n"

Present Tense Form (third person singular)	Past Tense Form (third person singular)	Explanation
gatua-n (cooks)	*gato-i*	Past Tense Formation: stem vowel change ('ua' to 'o') + '-i' suffix
shkrua-n /θan/ (writes)	*shkro-i*	Past Tense Formation: stem vowel change ('ua' to 'o') + '-i' suffix
krua-n /ʧan/ (scratches)	*kro-i*	Past Tense Formation: stem vowel change ('ua' to 'o') + '-i' suffix
lua-n (plays)	*lua-jt-i*	Past Tense Formation: 'jt' stem extension + '-i' suffix
gjua-n (hits)	*gjua-jt-i*	Past Tense Formation: 'jt' stem extension + '-i' suffix
vua-n (suffers)	*vua-jt-i*	Past Tense Formation: 'jt' stem extension + '-i' suffix

In Table 5, we see that all the verbs in the phonological cluster, except for the last one, form their past tense via the same process. The last verb in the group forms its past tense

form by means of a different process. In Table 6, half of the verbs form their past tense via one process, and the other half via another process. An interesting aspect of the above discrepancies that may deserve attention is that they involve different past tense suffixes, i.e., while one side of the contrast involves the '-i' suffix, the other side involves the '-u' suffix. The phonological cluster in Table 7 represents the most productive class of verbs in Albanian. The table mentions only a few of the vast number of examples. The important thing to notice is that only two verbs (the last two entries in the table) form their past tense via stem extension and '-i' suffixation. All the other hundreds (thousands) of verbs in this phonological neighborhood form their past tense via '-i' suffixation only, as illustrated by the first three entries of the table. The verbs in Table 8 represent a phonological cluster in which an avid *'competition'* exists between the two past tense processes involved, such that half of the verbs form their past tense via stem change and '-i' suffix, the other half form their past tense via stem extension and '-i' suffix. In the elicitation verb set, we included verb groups representing each of the above discrepancies.

Conclusion

The phenomena observed above contribute to the view that Albanian past tense formation cannot be described in the same way and via the same concepts as in English. The rich inflectional morphology, the variations in verb's inflectional paradigm and the discrepancies in past tense formation of phonologically similar regular verbs don't seem to allow for this. Instead of the absolute, global, and sharp regularity and irregularity notions that have been heavily used as two sides of a coin in English, the related notions

that would best apply to Albanian past tense would rather be: relative, local, partial regularity and irregularity. The additional inflectional and phonological factors constrain the standard notions of regularity and irregularity as used for English, rendering them useless for inflectionally rich languages such as Albanian, and requiring their redefinition. Paying the deserved attention to the appropriate definition of these concepts proves useful in the analysis of Albanian verbs and their highly variable inflectional paradigms.

The classification process of verbs according to their phonological similarity allows for identifying discrepancies in past tense formation and testing for potential analogical effects. It seems reasonable to predict that the discrepancies may be confusing and cause errors in the acquiring children, which in turn would shed light on possible analogical effects involved in Albanian past tense acquisition. Furthermore, the past tense inflectional paradigm of Albanian verbs might play a role in the processing of this tense, leading us towards expecting children's errors to suggest the presence of paradigmatic effects. The pilot study conducted with a significantly smaller number of children, was indicative of such effects, allowing us to expect to see them even more pronounced in the real study.

CHAPTER 4

METHOD

Introduction

The present study is the first attempt at examining the acquisition of Albanian past tense. No prior empirical or statistical evidence on the matter was available during all the phases of the study: design, experimental implementation and analysis of the findings. Hence, its results will be the first to contribute to the documentation of the process as well as open the path for further studies on the area. The experiment carried out is a picture-cued elicited production one. The focus is on the production of past tense forms; however children were encouraged to produce both the present and past tense forms of the verb set. This was done in order to examine their transition from present to past tense, and to see whether both forms were available for the child. Every participating child performed the picture-cued elicited production task individually.[1] The answers were recorded, classified and statistically analyzed. The focus of the statistical analysis was twofold: 1) examining the error types produced by children, and 2) identifying potential developmental patterns alongside these error types. In the following sections, I will lay out the design and the procedure applied in the experiment.

[1] In a quiet room, in the presence of the experimenter only.

Design

We were mainly interested in these error categories: 1) suffixation mismatches (using one suffix instead of the other); 2) stem change errors (not changing the stem when necessary, or changing it in the wrong way); 3) stem extension errors (not extending the stem when required); extending when not required (overapplying stem extension); stem extension mismatch (using one extension instead of another)); 4) errors involving combinations of the above categories, and 5) errors due to similarity or analogical effects between phonologically similar verbs that formed the past tense via different routes. The verb set used in the experiment was designed in such a way that would create necessary conditions for such potential errors to occur.

Participants

Prior to the real experiment, a pilot study with 15 children was conducted. It revealed that the children were familiar with the verbs involved in the elicited production study, and that the employed method was successful in eliciting children's production of present and past tense forms of the verbs.

The real experiment pool consisted of 64 children belonging to middle and high socioeconomic classes. All the children were monolingual Albanian speakers and were recruited from several daycare centers in a medium city in Albania. Parental consent was obtained for all the participants prior to the experiment. Initially the subject pool consisted of 74 children, but 8 of them were excluded due to unsuccessful attendance of

the task for several reasons: lack of the necessary attention and patience, fuzziness, and shyness. The other 2 children were excluded because they were not monolingual speakers of Albanian. The children were divided into 3 age groups: 21 3-year-olds (7 boys, 14 girls, ranging from 2;8 to 3;9, M = 3;4, SD = 3.5 months), 22 4-year-ods (7 boys, 15 girls, ranging from 3;10 to 4;10, M = 4;4, SD = 3.5 months), and 21 5-year-olds (8 boys, 13 girls, ranging from 4;11 to 5;8, M = 5;3, SD = 2.6 months).[2] The test was also delivered in written form to 22 adult controls who were undergraduate students enrolled in a computer science course (ranging from 18 – 21 years, M = 19, SD = 0.6 years). They obtained extra credit for their participation.

Materials

The materials consisted of a set of 54 pairs of pictures which were presented to the child serially, in a Power Point Presentation (PPP) format. Each pair of pictures represented the action or state of being depicted by an Albanian verb in two states: 1) ongoing (present tense), and 2) completed (past tense). Only the third person singular in both tenses was elicited for all the verbs. Special attention was paid to the verbs' usage frequency and familiarity to the children. The pilot study performed with children belonging to the same age range as that in the real experiment, indicated that children were familiar with all the verbs in the stimulus set and that the employed picture-cued presentation method was successful for eliciting both the present and past tense forms of the verbs. Most of the pictures were taken from the World Wide Web, and they were

[2] We were not interested in examining sex effects; therefore no special attention to the number of boys and girls was paid.

carefully chosen to express the related action as well and unambiguously as possible, and also capture the child's attention and interest.[3] A number of pictures were shot by the experimenter, due to unavailability or inappropriateness of the online images to accurately depict a certain verb action or state of being. All the images used involved mostly children, babies, toys, animals, cartoon characters and other entities familiar to children.

The selection of the verbs was done in a way that would allow for the investigation of the main error categories described in section 4.2. The verbs were chosen according to the following criteria:

1) Verbs that form their past tense in third person singular via each of the two available suffixes, *'-i'* and *'-u'* (e.g., *lexon - lexo-i; ndan – nda-u*).[4] This would allow us to see whether children produce suffix mismatch errors, i.e., if they use the wrongly use one suffix instead of the required one.

2) Verbs that undergo stem change and / or stem extension in their past tense formation (apart from suffixation, which is always mandatory for the 'regulars'). This would allow the examination of the acquisition of the stem change / extension subprocesses. Do children have problems with these inflectional components of the past tense and is this expressed via not applying them when necessary or overapplying when not? Special attention was paid to include all the stem vowel change types, indicated in the following table.

[3] The frequently used internet site 'http://images.google.com/' was the main resource for the images used in the experiment.

[4] These verbs may form their past tense not necessarily via suffixation only, the other past tense formation subprocesses: stem change and / or stem extension may also be involved. What is important is that both the past tense suffixes are inlcuded.

Table 9. The Stem Vowel Changes in Albanian Past Tense

Stem Vowel Changes	*e - o*	*e – i*	*e – a*	*ye - e*	*ua – o*
Examples[5]	*hedh /hɛð/ - hodh-i /hɔði/* (throw)	*pret – prit-i* (wait)	*vret – vra-u* (kill / hurt)	*lye-n – le-u* (dye)	*shkrua-n – shkro-i* (write)

Regarding the cases that involve stem extension, verbs that made use of each of the three available options were included.[6] Table 10 illustrates some examples used:

Table 10. Examples of Verbs that Extend Their Stem via One of the Three Options

Stem Extension	*t*	*jt*	*r*
Examples	*arri-n – arri-t-i* (arrive)	*mba-n – mba-jt-i* (keep / hold)	*hyn – hy-r-i* (enter)

3) Verbs that undergo either total or radical stem change in the past tense form. These verbs were chosen from the limited set of the irregulars, suppletive and non-suppletive. We were interested to see whether children would have difficulties and commit any overregularization errors with these verbs. Since their number is rather limited, it would be reasonable to expect children to memorize them and produce few errors. Nevertheless, due to the radical change that these verbs undergo when forming their past tense, the occurrence of overregularization errors is always possible.

4) Verbs that in their past tense formation *contrast* with other verbs from the same phonological prototype. Namely, these are the verbs that form their past tense differently from the majority of the verbs in their phonological neighborhood (e.g., *pret* (waits) –

[5] The verbs mentioned in the examples were actually used in the experiment.

[6] Remember the important fact that the other stem extension affix,' *v'*, never occurs in third person singular, past tense.

prit-i (waited); *zbret* (comes down) – *zbrit-i* (came down); *vret* (kills / hurts) – *vra-u* (killed / hurt)). In this case verbs corresponding to each of the different past tense forms within the phonological neighborhood were included, i.e., the contrasting verb together with one or more other exemplars from the related phonological neighborhood. Our interest is in probing for the effects that such *phonological similarity – past tense formation* discrepancies might have on the acquiring children. Does similarity to other forms play a role in their production of past tense forms of the verbs displaying these discrepancies? Do children generalize a certain past tense formation process to the verb that doesn't normally apply it, because of its phonological similarity to the other verbs in the neighborhood that apply it?

5) Verbs that form their past tenses via suffixation only (i.e., the default-like process) were also included (e.g., *kap – kap-i*; *hap – hap-i*). No errors were expected with such forms, due to their relatively simple past tense forms, in comparison to the more complex ones.

6) A *special* pair of verbs, (*pret*$_1$ (cuts)*; pret*$_2$ (waits)) was also included. In the present tense, these verbs are *homonyms*, i.e., they have the same spelling and pronunciation, but different meanings. A corresponding example from English would be (lie$_1$ (to say something untrue); lie$_2$ (to be in a horizontal position).[7] The interesting thing for our purposes is that they form their past tense differently: *pret*$_1$ (cuts) – *pre-u* (cut); *pret*$_2$ (waits / catches) – *prit-i* (waited / caught). The same is observed in the English pair as well: (lie$_1$ – lied; lie$_2$ – lay). We wondered whether form or meaning would govern children's past tense productions in this particular case.

[7] Definitions taken from the Oxford Dictionary Online.

A list of the verbs (present and past tense, third person singular) used in the experiment is provided in the Appendix.

Procedure

Children viewed a series of picture pairs in the form of a Power Point Presentation (PPP). The first picture of a pair represented the action of the verb as an ongoing, unfinished activity (present tense). The second picture depicted the same action in its completed state (past tense). It is reasoned that this contrast over time in the completion status of the verb's action, represented by each picture pair, is successful in eliciting the concept of an activity that unfolds over two time extremes: present and past. The same reasoning stands behind similar methods in use for eliciting past tense forms in both normal children and those with specific language impairments (SLI) (e.g., Rice, 2000; Rice & Wexler, 1996). The order of the test items used was thoroughly randomized. The children were tested individually, in a quiet room in their daycare center. Their performance was videotaped for later transcription and coding, and a handwritten log of each child's responses was also kept by the experimenter during the task. In order to make children feel as comfortable as possible and overcome any potential shyness issues, the first minutes of the encounter were reserved to natural conversation, in which general information about the child was collected (e.g., name, surname, age, mother / father name, siblings (if any) and their names, favorite play activity and playmate(s), recent activities, etc.). Following this short introduction was a 'warm-up' period, in which the child practiced the picture-cued elicitation procedure used in the experiment with 3 sample verbs. After this practice period, the real task was delivered. For the older

groups (4 and 5-year-olds) the task lasted 25-30 minutes for each child and took place in one session, without any necessary interruptions. However, the youngest group (3-year-olds) completed the task in a relatively longer time (30 – 45 minutes) and occasional interruptions were involved.[8] Therefore, for some of the youngest children, the task was completed in two sessions.

The child was shown the picture-cued context pairs serially. Often, the context under inspection was verbally described by the experimenter to cue the child's attention to the specific action of a target verb, represented by that context. Then a prompt question was asked by the experimenter for each picture presented. These questions were of two types:

1) Questions targeting an ongoing, unfinished action, such as: *"Çfarë po ndodh këtu?Më thuaj çfarë po ndodh këtu."* (What is happening here? Tell me what is happening here.); or *"Çfarë po bën ky djali / vajza?"* (What is this boy / girl doing?).[9] In these contexts, after the child's response, the experimenter often produced sentences stressing the fact that the action under inspection was not finished yet. This prepared the child for the second picture-cued context of the pair, which depicted the same action in its completed state.

[8] These interruptions occurred mostly due to child's loss of attention / interest and on his / her own request to return to the classroom.

[9] The particle *'po'* is peculiar to verb constructions representing an ongoing action at the moment of reference. It may be considered as a syntactic cue to describing an uncompleted present tense activity, and as such it is assumed to promote the elicitation of the present tense form of a verb. Also, note that the corresponding English questions employ what is often called the 'present continuous tense', to describe the action of the verb as ongoing at the moment of reference. In the case of Albanian, this is accomplished by the usage of the construction : particle *'po'* + present tense form of the verb (third person singular).

2) Questions targeting a completed, finished action, such as: *"Çfarë ndodhi pak më parë?"* (What just happened?); or *"Çfarë bëri djali / vajza?"* (What did the boy / girl do?). The child was often aided with the experimenter's comments on the completion of the action.

If the child didn't respond when first asked or looked puzzled, the prompt question was repeated once or twice and it was waited until the child responded. When necessary, the child was verbally aided by the experimenter's comments on the context and the action it represented. In the few cases when the child insisted on not responding or responded with *"Nuk e di"* (I don't know) to a certain context, the task continued with the following pair(s) of pictures, and after a while the experimenter returned to the previously unanswered context and attempted again to elicit the child's response, via the same method. In sum, each child responded to 54 context pairs, involving 54 target verbs in both present and past tense forms, resulting in a total production of 108 forms. Of these, only the past tense forms were coded for analysis.[10] After the completion of the task, each child was rewarded with candies and accompanied to his / her classroom.

Coding

All the elicited responses were transcribed and coded by the experimenter (DS). Since the focus of the study is on children's production of past tense forms, only these forms were analyzed and classified accordingly. Nevertheless, the present tense productions were also considered during the analysis of the corresponding past tense forms. This was

[10] As already mentioned, the present form of target verbs was also considered during the coding process, in order to capture potential errors, mostly those involving stem change, during the transition to past tense.

done to see whether both these forms were available in the child's language and if the transition from present to past tense was done properly. Furthermore, the pilot study suggested a tendency of children to occasionally use the past tense stem of the verb instead of the required present tense stem. Consider an example where the child is elicited to produce the present tense form *'troket'* (knocks), but instead answers with the stem of the corresponding past tense form, *'trokit'*.[11]

Table 11. Example of a Mismatch in Verb Stem – Tense

Verb	Present Tense Form (third person singular)	Past Tense Form (third person singular)	Child's Present Tense Production (third person singular)
troket (knock)	*troket*	*trokit-i*	**trokit*

Given the rich and variable inflectional morphology involved with the Albanian past tense and the fact that we included a variety of verb types, each with its peculiar properties with respect to past tense formation, we expected a considerable number of error types in children's responses. That was exactly what we observed and it rendered the coding scheme somewhat demanding. However, since this is the first work on Albanian past tense acquisition and any relevant prior findings on the matter were absent, it was one of our intentions to perform a fine-grain analysis and document the error types that the children produced.

First, we organized the verbs into clusters according to the past tense formation process. There resulted 9 such clusters, of variable size. In total, 25 error types were

[11] Apparently, this doesn't happen because the child doesn't understand that the action being asked is in present tense, since in all such cases the children's responses were of the form *'po trokit'*, where the particle *'po'* is peculiar to constructions involving verbs in present tense. Not to mention the fact that the prompt questions that the child hears prior to producing a form all involve the present tense particle *'po'* and unambiguously refer to an ongoing, not completed action. Such response occurrences were coded as errors representing *stem change deficiency*.

indentified throughout children's past tense productions, which, together with the correct response category made for a total of 26 response categories.[12] As the logic also implies, the error types were not evenly distributed across the 9 clusters. We were not expecting every error to occur in each cluster and all the errors to occur at once in any one of the clusters. As expected, this was indeed the case. The important thing for us to analyze is the occurrence of the response categories in every cluster, which can be properly realized by analyzing each cluster separately. Table 12 presents the coding scheme used.

Table 12. Profile of the Coding Scheme Employed

Independent Variable (IV)	Cluster Type: C_i, (i = [1 : 9]) C_1, C_2, C_3,……, C_1
Dependent Variable (DV)	Response Type: R_j, (j = [0 : 25]) R_0, R_1, R_2,….., R_{25}
Measured Variable	Combination of IV and DV: C_i R_j C_1 R_0, C_1 R_1,...,C_1 R_{25}, C_2 R_0, C_2 R_1,…,C_2 R_{25},…...,C_9 R_0, C_9 R_1,…, C_9 R_{25}
Number of Measured Variable Types	(Number of Clusters) x (Number of Response Types) 9 x 26 = 234 C_iR_j's
Between Subj.Var.	Age (G_1, G_2, G_3)

[12] A list of the all error types that occurred in children's production can be found in the Appendix, together with the corresponding explanation. However, a number of these error types will be presented in the Results section, as will be the definition of each of the 9 verb clusters involved.

We arranged the responses (C_iR_j's) collected for each child in a huge matrix, consisting of 64 rows (number of children) and 234 columns (the number of C_iR_j types). This is illustrated in Table 13.

Table 13. A Graphical Illustration of Our Within Subjects Variables and Data Storage

Child ID	C_1R_0	….	C_1R_{25}	C_2R_0	…	C_2R_{25}	……	C_9R_0	…	C_9R_{25}
Child 1										
Child 2										
….										
Child 64										

Each entry in the matrix represents for every child, the occurrence frequency of a response type within a certain verb cluster. First, the values of these occurrences were calculated as integer numbers, such that they represented the number or times the child had produced a response R_i with the verbs in cluster C_j. Afterwards, we divided each integer frequency value by the size of the respective cluster in which they occurred, and thus obtained the *normalized* C_iR_j frequency values. The later, was the input format used for statistical analysis of the data.

Our analysis focused on two main dimensions: the within-subjects and between-subjects variables. The within-subjects variable of interest was the occurrence of a certain response type in a certain cluster, i.e., the C_iR_j ($i = [1 : 9]$; $j = [0 : 25]$). The between-subjects variable of interest was the age group, G_i ($i = [1 : 3]$). The statistical analysis was done using SPSS 20.0 (Statistical Package for the Social Sciences).

CHAPTER 5

RESULTS

Introduction

This chapter presents the findings of this study, statistically analyzed using SPSS 20.0 (Statistical Package for Social Sciences). As already mentioned, our set of target verbs is rich in diversity and encompasses several factors, the exploration of which we deem necessary at this first step of studying the seemingly complex process of Albanian past tense acquisition. We thought that this design would potentially provide a wide perspective on the process and open novel paths for future investigation. Nevertheless, it comes with the increased cost of the challenge and effort employed in the organization and analysis of the elicited production data collected.

We organized the set of target verbs into 9 clusters, according to the way they formed their past tense. Then, we performed two-way Repeated Measures Analysis of Variance (ANOVA) for each cluster. The within-subjects factor was the dependent variable, a combination of cluster and response type, C_iR_j ($i = [1 : 9]$; $j = [0 : 25]$). The between-subjects variable was age, such that the children were equally divided into 3 age groups: G_1 (21 3-year-olds, M = 3;4), G_2 (22 4-year-olds, M = 4;4), and G_3 (21 5-year-olds, M = 5;3). The adult control group was not included in the between-subjects analysis part, and was analyzed separately via one-way ANOVA, with response type being the within-subjects variable.

The following procedure was followed during the analysis of each cluster via SPSS 20.0:

I. We constructed the graph depicting the mean occurrence ratio of the error types within the cluster, such that all the error types occupied the horizontal axis and their corresponding mean frequency values the vertical axis. We examined the graph and probed for the response types whose mean frequency values were different from 0, i.e., for existing response types in the cluster.

II. We ran one-sample t-test with all the response types identified, where their occurrence frequency mean values were compared to the value 0 in order to see whether each individual mean value was significantly different from 0. If yes, it was included in the subsequent two-way Repeated Measures ANOVA analysis, otherwise it was discarded from further analysis. Since we ran this test multiple times, we did not use the default %95 confidence interval, but adjusted it using the Sidak coefficient[1].

III. We ran two-way Repeated Measures ANOVA with the response types (their corresponding frequency mean values) that survived the one-sample T-test performed in advance. The response type served as the within-subjects, and age group as the between-subjects variable.

[1] This is done in order to control what can be called 'redundancy in significant values' effect that can result from the multiple runs of the T-test. If the default confidence interval is used, there exists the risk that redundant significant values occur, such that after a certain point, everything tested comes out significant. The strict Sidak coefficient is meant to prevent this.

The following sections will present the results obtained in each cluster, organized around the two dimensions of our analysis: the within-subjects and between-subjects factors.

Results for Cluster 1

The verbs in this cluster form their past tense via: i) stem change, and ii) '-i' suffix (e.g., *troket* (knocks) – *trokit-i* (knocked); *del* (comes out / emerges) – *dol-i* (came out / emerged); *flet* (speaks / talks) – *fol-i* (spoke / talked). There are 11 verbs in this cluster, chosen to represent various stem change instances and from several phonological clusters.

The related graph inspection revealed the presence of 7 response types, of which only 3 were significantly different from 0, and as such were included in the two-way Repeated Measures ANOVA. These response types were: i) correct response [$t(63)=39.44$; $p< 0.007$]; ii) error type representing the absence of the mandatory verb stem changes [$t(63)=6.18$; $p< 0.007$], and iii) error type representing both absence of the required stem change and usage of the wrong type of suffix ('-u' instead of '-i') [$t(63)=4.58$; $p< 0.007$]. For the sake of convenience, we will refer to the first error type as 'lack of stem change' (LSC), and to the second one as 'lack of stem change and suffix mismatch' (LSC_SM). The following examples explain better the observed error types:

Table 14. Examples of the Dominant Error Types Observed in Cluster 1

Verb (present tense, third person singular)	Past Tense Form Required (third person singular)	Past Tense Form Produced (third person singular)	Error Type
pret (waits)	*prit-i* (waited)	*pret-i*	Lack of Stem Change (LSC)
djeg /djeg/ (burns)	*dogj-i* /dɔɟi/ (burnt)	*djeg-u* /djegu/	Lack of Stem Change and Suffix Mismatch (LSC_SM)

A mixed design two-way Repeated Measures ANOVA was performed with response type as the within-subjects variable and age group as the between-subjects variable [response type (CR, LSC, and LSC_SM) X age (G_1, G_2, and G_3)]. Table 12 presents the descriptive part of the analysis, the mean and standard deviations in each condition. As it can be seen, overall the frequency of correct responses (CR) prevails as a response type across children (M = 0.842; SD = 0.17), and it shows increase throughout the age groups. The LSC-type response (M = 0.122; SD = 0.16) occurs more than LSC_SM-type response (M = 0.023; SD = 0.04) across children, and it seems to decrease with age increase.

Table 15. Descriptive Statistical Results for Cluster 1

Response Type	Mean Frequency Value				Standard Deviation			
Correct Responses (CR)	G_1 0.71	G_2 0.87	G_3 0.95	Adults 1.000	G_1 0.19	G_2 0.13	G_3 0.084	Adults 0.000
Lack of Stem Change (LSC)	G_1 0.25	G_2 0.087	G_3 0.035	Adults 0.000	G_1 0.18	G_2 0.12	G_3 0.07	Adults 0.000
Lack of Stem Change and Suffix Mismatch (LSC_SM)	G_1 0.026	G_2 0.029	G_3 0.013	Adults 0.000	G_1 0.042	G_2 0.043	G_3 0.033	Adults 0.000

The results revealed a main effect for response type [$F(2, 122) = 660.91$; $p < 0.05$; MS[2] $= 22.59$; $\eta_p^2 = 0.916$][3]. Pairwise comparisons between the three instances of the response type variable revealed that:

i. Correct response occurred significantly more than LSC-type response (MD[4] = 0.719; SE = 0.034; $p < 0.05$).

[2] MS = Mean Square, an important term in statistics, the report of which is usually required. This value will be reported in all the related cases.
[3] In all the analyses, the Greenhouse-Geisser correction was employed, but the full degrees of freedom are reported.
[4] MD = Mean Difference. This value will be reported in all the related cases.

ii. Correct response occurred significantly more than LSC_SM-type response (MD = 0.819; SE = 0.020; $p < 0.05$).

iii. LSC-type response occurred significantly more than LSC_SM-type response (MD = 0.1; SE = 0.017; $p < 0.05$).

iv. There is something interesting with respect to LSC_SM error type in this cluster. An item-based analysis revealed that it occurs exclusively with one of the verbs, the verb *djeg* (burns/scorches). Namely, 16 (25%) children produced this error with this verb. The fact that it occurred only with this particular verb might be related to phonotactics principles or analogy to words ending in the '-gu' sequence (e.g., *bregu* (the shore), *tregu* (the market), *pragu* (the doorstep), *lag-u* (wetted)). Obviously, more in-depth analysis is needed to confirm this observation, such as the number of such words and their usage frequencies. This is beyond the scope of the present study, but the above observation remains nevertheless interesting, since it seems to indicate potential effects of either phonotactics principles or similarity to existing words.

No main effects for age group was observed [$F(2, 122) = 1.097$; $p > 0.05$; MS = 0.0; $\eta_p^2 = 0.035$], however an interaction effect was observed [$F(4, 122) = 14.68$; $p < 0.05$; MS = 0.50; $\eta_p^2 = 0.325$]. Simple effects of age for each level of the response type variable revealed that the age groups significantly differed in their performance with the correct responses [$F(2, 122) = 15.417$; $p < 0.05$; MS = 0.309; $\eta_p^2 = 0.336$], and LSC-type response [$F(2, 122) = 14.816$; $p < 0.05$; MS = 0.258; $\eta_p^2 = 0.327$]. Hence, the oldest and the middle groups, G_3 and G_2 produced significantly more correct responses than the youngest group, G_1, while there were no significant differences between G_2 and G_3. The youngest group, G_1 produced the LSC-type error significantly more than both the middle

and oldest groups, G_2 and G_3, while no significant differences were observed between G_2 and G_3's performance with respect to this error type. These results seem to suggest that: i) stem change errors are the most frequent (LSC-type response), and ii) they are most common in the youngest group (3-year-olds). Probably, children's performance with the past tense of the verbs that require a stem change starts to significantly improve after the age of 3 and around the age of 4, and it continues to improve[5] until the age of 5.

Results for Cluster 2

The verbs in this cluster form their past tense via: i) no stem change, and ii) '-i' suffix (e.g., *ço-n* /ʧɔn/ (carry) – *ço-i* /ʧɔi/ (carried)). There are 4 verbs in this cluster, chosen from the largest and most productive verb class in Albanian: the verbs whose stem ends in the vowel *'-o'* and take the *'-n'* person marker in 3.person singular, present tense (e.g., *shko-n* /ʃkɔn/ (goes) – *shko-i* /ʃkɔi/ (went)).

The related graph inspection revealed the presence of 2 different response types other than the correct response, of which only 1 were significantly different from 0, and as such were included in the two-way Repeated Measures ANOVA. The identified response types were: i) correct response [$t(63) = 12.692$, $p < 0.017$]; ii) error type representing overapplication of the stem extension 'v', which normally never occurs in 3.person singular, but only in the 1. and 2.person singular past tense form of the related verb [$t(63) = 9.611$, $p < 0.017$]. For the sake of convenience, we will refer to this error type as 'v-Stem Extension Overgeneralization' (vSEOG). The example given in Table 16 explains better this error type.

[5] Although this improvement (from G2 to G3) is not significant as the one observed between the youngest group and the middle one (from G1 to G2).

Table 16. Example of the Dominant Error Type Observed in Cluster 2

Verb (present tense, third person singular)	Past Tense Form Required (third person singular)	Past Tense Form Produced (third person singular)	Error Type
shko-n /ʃkɔn/ (goes)	*shko-i* / ʃkɔi/ (went)	*shko-v-i* / ʃkɔvi /	v-Stem Extension Overgeneralization (vSEOG)

A mixed design two-way Repeated Measures ANOVA was performed with response type as the within-subjects variable and age group as the between-subjects variable [response type (CR and VSEOG) X age (G_1, G_2, and G_3)]. Table 14 presents the descriptive part of the analysis, the mean and standard deviations in each condition. Here, two observations seem of interest: i) the overall occurrence frequency of the vSEOG-type error (M = 0.43; SD = 0.358) seems rather close to that of the correct responses (M = 0.57; SD = 0.357), and ii) surprisingly, the youngest and oldest age groups, G_1 and G_3, seem to show the same performance with respect to these response types.

Table 17. Descriptive Statistical Results for Cluster 2

Response Type	Mean Frequency Value				Standard Deviation			
Correct Responses (CR)	G_1 0.55	G_2 0.60	G_3 0.55	Adults 1.00	G_1 0.34	G_2 0.38	G_3 0.37	Adults 0.00
Stem Extension Overgeneralization (vSEOG)	G_1 0.45	G_2 0.39	G_3 0.45	Adults 0.00	G_1 0.34	G_2 0.38	G_3 0.37	Adults 0.00

The results revealed no main effect for response type [F (1, 61) = 2.244; p> 0.05; MS = 0.587; η_p^2 = 0.035]. Accordingly, no significant difference between the occurrence frequencies of the two response types was revealed. In other words, children seem to produce the v-stem extension overgeneralization error in almost the same levels as the

correct response, implying a considerably high occurrence frequency of this error type. No main effects were observed for age [F (2, 61) = 0.953; p> 0.05; MS = 0.0; η_p^2 = 0.030], and no interaction effects [F (2, 61) = 0.201; p> 0.05; MS = 0.053; η_p^2 = 0.007] were observed.

Results for Cluster 3

The verbs in this cluster form their past tense via: i) no stem change, and ii) '-u' suffix (e.g., *çan* (split) /ʧʌn/ - *ça-u* /ʧʌu/ (splitted); *pret* (cuts) – *pre-u* (cut); *pi* (drinks) – *pi-u* (drank)). This cluster contains 10 verbs, chosen from several phonological clusters.

The related graph inspection revealed the presence of 5 different response types other than the correct response, of which only 2 were significantly different from 0, and as such were included in the two-way Repeated Measures ANOVA. The observed response types were: i) correct response [t (63) = 10.683, p< 0.01]; ii) error type representing overapplication of the 'v' stem extension and usage of the wrong type of suffix ('-i' instead of '-u') [t (63) = 10.196, p< 0.01]; and iii) error type representing overapplication of 't' stem extension and usage of the wrong suffix type ('-i' instead of '-u') [t (63) = 8.221, p< 0.01]. For ease of reference, we will refer to these error types as: 'v-Stem Extension Overgeneralization_Suffix Mismatch' (vSEOG_SM), and 't-Stem Extension Overgeneralization_Suffix Mismatch' (tSEOG_SM) type errors, respectively.

Table 18. Example of the Dominant Error Type Observed in Cluster 3

Verb (present tense, third person singular)	Past Tense Form Required (third person singular)	Past Tense Form Produced (third person singular)	Error Type
nda-n (divides)	*nda-u* (divided)	*nda-v-i*	vSEOG_SM
fry-n (blows)	*fry-u* (blew)	*fry-t-i*	tSEOG_SM

One may wonder why we considered these errors to belong to different categories, since the difference between them is apparently small: different types of stem extension overgeneralization, but nevertheless the same type of process, stem extension overapplication. The difference is indeed meaningful and important for our purposes. As mentioned previously, 'v' stem extension occurs only in the first and second person singular and in no other instances of the verb's past tense paradigm, third person singular included. On the other hand, 't' stem extension, whenever present, occurs in all 6 instances of the verb's past tense paradigm. However, in the present cluster, neither of the extensions should normally be present in the third person singular instance of the verbs' past tense. Nevertheless these verbs extend their stem with 'v' extension in their past tense (first and second person singular only), while 't' extension normally does not occur at all. From this perspective, it seems reasonable to conjecture a paradigmatic effect with the 'v-stem extension overgeneralization' error type, due to the potential influence of two instances of the verb's past tense inflectional paradigm (first and second person singular). The same cannot be postulated for the other stem extension overgeneralization error type. Since 'paradigmatic analogy effects' are suspected to play an important role in our findings, it is necessary that we draw this distinction between the two different types of the 'stem extension overgeneralization' process.

A mixed design two-way Repeated Measures ANOVA was performed with response type as the within-subjects variable and age group as the between-subjects variable [response type (CR, vSEOG_SM, and tSEOG_SM) X age (G_1, G_2, and G_3)]. The descriptive part of the analysis, the mean and standard deviations in each condition, can be observed in Table 19.

Two preliminary observations may be extracted from the mean frequency values: i) overall, the occurrence frequency of 'v-stem overgeneralization' error type (M = 0.448; SD = 0.352) exceeds that of correct responses (M = 0.414; SD = 0.310) and of 't-stem overgeneralization' error type (M = 0.120; SD = 0.117), across children; ii) all 3 age groups seem to perform rather similarly with respect to the 'v-stem overgeneralization' error type, while the occurrence frequency of 't-stem overgeneralization' error type displays a slight increase across the age groups.

Table 19. Descriptive Statistical Results for Cluster 3

Response Type	Mean Frequency Value				Standard Deviation			
Correct Responses (CR)	G_1 0.414	G_2 0.413	G_3 0.414	Adults 1.00	G_1 0.309	G_2 0.305	G_3 0.310	Adults 0.00
vSEOG_SM	G_1 0.452	G_2 0.464	G_3 0.428	Adults 0.00	G_1 0.361	G_2 0.369	G_3 0.339	Adults 0.00
tSEOG_SM	G_1 0.09	G_2 0.123	G_3 0.148	Adults 0.00	G_1 0.109	G_2 0.134	G_3 0.103	Adults 0.00

The results revealed a main effect for response type [$F (2, 122) = 17.442$; $p< 0.05$; $MS = 3.533$; $\eta_p^2 = 0.222$]. A significant change between the occurrence frequency of CR and tSEOG_SM type responses was present (MD = 0.294; SE = 0.040; $p< 0.05$). The vSEOG_SM type response was also found to occur significantly more than tSEOG_SM type response (MD = 0.328; SE = 0.053; $p< 0.05$). No significant change in the occurrence frequency of vSEOG_SM and CR type responses was found (MD = 0.034; SE = 0.083; $p> 0.05$). This means that children produced the 'v-stem overgeneralization' error type at almost the same level as the correct response, indicating the high occurrence frequency of this error type. No main effect for age [$F (2, 122) = 1.689$; $p> 0.05$; $MS = 0.004$; $\eta_p^2 = 0.052$], and no interaction effects [$F (4, 122) = 0.086$; $p> 0.05$; $MS = 0.018$; $\eta_p^2 = 0.003$] were found.

Now, let us look closer at the occurrence frequencies across all children of the two different types of 'stem overgeneralization' errors. Table 20 presents the results of an item-based, within-subjects analysis of the verbs in the present cluster.

Table 20. Occurrence Percentages of Error Types across Children

Cluster 3 Verbs	vSEOG_SM Error Occurrence (%)	tSEOG_SM Error Occurrence (%)
fshin (wipes)	57.81	0
çan (cracks)	50	0
shtyn (push)	46.875	40.625
pi (drinks)	56.25	0
shkrin (melts)	29.687	0
shtrin (puts down)	32.812	34.375
pret$_1$ (cuts)	42.187	0
ndan (divided)	39.062	1.56
kthen (turns (upside down))	42.187	0
fryn (blows)	51.562	43.75

Here, we may extract the following observation of interest:

i. While all the verbs display comparably high occurrence percentages for 'v-stem extension overgeneralization' error type, this is not the case for 't-stem extension overgeneralization': only 3 verbs (out of 10) display relatively high occurrence percentages with this type of error.

Several factors may play a role in this case, such as verb frequency, phonological analogy to existing forms or components of forms, input from adults, and so on. However, due to the lack of information about verbs' usage frequencies, and in the absence of evidence that adults favor such forms in their language (none of our adult subjects committed this error type), we will mostly concentrate on phonological analogy to existing forms in our discussion of the findings.

Results for Cluster 4

The verbs in this cluster form their past tense via adding the '-i' suffix directly to the present tense form, without any other change required (e.g., *hap* (opens) – *hap-i* (opened); *fal* (give away) – *fal-i* (gave away)). This is the least complicated past tense formation process in Albanian, and it may be also considered as a 'default-like' operation. We expect children to produce very few to no errors with these verbs, given their relatively simple past tense formation process. There are 4 verbs in this cluster.

The related graph inspection revealed only one response type, correct response, so no further analysis was performed on this cluster. As expected, children displayed a rather high performance with these verbs that involve the easiest, 'default-like' past tense formation process.

Results for Cluster 5

The verbs in this cluster form their past tense via: i) stem vowel change, and ii) '-u' suffix (e.g., *lye-n* (spread) – *le-u* (spread); *vret* (hurts) – *vra-u* (hurt)). There are 5 verbs in this cluster, chosen from several phonological clusters, to represent various stem change instances.

The related graph inspection revealed the presence of 9 response types other than the correct response, of which only 6 were significantly different from 0, and as such were included in the two-way Repeated Measures ANOVA. The observed error types were: i) error type representing overapplication of the 'v' stem extension, suffix mismatch (i.e., usage of '-i' instead of 'u'), but no lack of stem change (i.e., the required stem change is realized) [$t(63) = 7.738$, $p < 0.005$]; ii) error type representing overapplication of the 'v' stem extension, suffix mismatch, and lack of stem change [$t(63) = 9.747$, $p < 0.005$]; iii) error type representing stem and person mismatch (present tense stem, 1.singular,

instead of the past tense stem, third person singular), suffix mismatch [t (63) = 4.432, p< 0.005]; iv) error type displaying effects of phonological similarity [t (63) = 14.555, p< 0.005]; v) error type representing lack of stem change [t (63) = 3.189, p< 0.005]; and vi) error type representing lack of stem change and suffix mismatch [t (63) = 4.461, p< 0.005].

Table 21. Examples of the Dominant Error Types Observed in Cluster 5

Verb (present tense, third person singular)	Past Tense Form Required (third person singular)	Past Tense Form Produced (third person singular)	Error Type
thye-n (breaks)	*the-u* (broke)	*the-v-i*	v-Stem Extension Overgeneralization and Suffix Mismatch (vSEOG_SM)
thye-n	*the-u*	*thye-v-i*	v-Stem Extension Overgeneralization and Suffix Mismatch and Lack of Stem Change (vSEOG_SM_LSC)
nget (drives), (first person singular: *ngas*)	*nga-u* (drove)	*ngas-i*	Present Tense Stem Overgeneralization and Suffix Mismatch (PTSOG_SM)
nget	*nga-u*	*ngit-i* (like *pret – priti* in the same phon. prototype)	Phonological Similarity Driven (PSD)
lye-n (spreads)	*le-u* (spread)	*lye-u / ly-u*	Lack of Stem Change (LSC)
lye-n	*le-u*	*lye-i / ly-i*	Lack of Stem Change and Suffix Mismatch (LSC_SM)

A mixed design two-way Repeated Measures ANOVA was performed with response type as the within-subjects variable and age group as the between-subjects variable [response type (6 levels) X age (G_1, G_2, and G_3)]. The descriptive part of the analysis, the mean and standard deviations in each condition, can be seen in Table 22.

Table 22. Descriptive Statistical Results for Cluster 5

Response Type	Mean Frequency Value				Standard Deviation			
vSEOG_SM	G_1	G_2	G_3	Adults	G_1	G_2	G_3	Adults
	0.10	0.20	0.21	0.00	0.15	0.19	0.18	0.00
vSEOG_SM_LSC	G_1	G_2	G_3	Adults	G_1	G_2	G_3	Adults
	0.25	0.20	0.21	0.00	0.19	0.19	0.17	0.00
PTSOG_SM	G_1	G_2	G_3	Adults	G_1	G_2	G_3	Adults
	0.086	0.073	0.00	0.00	0.10	0.12	0.00	0.00
PSD	G_1	G_2	G_3	Adults	G_1	G_2	G_3	Adults
	0.20	0.25	0.30	0.00	0.11	0.16	0.12	0.00
LSC	G_1	G_2	G_3	Adults	G_1	G_2	G_3	Adults
	0.06	0.04	0.03	0.00	0.13	0.08	0.01	0.00
LSC_SM	G_1	G_2	G_3	Adults	G_1	G_2	G_3	Adults
	0.162	0.064	0.019	0.000	0.20	0.11	0.06	0.00

The results revealed a main effect for response type [$F (5, 305) = 23.911$; $p< 0.05$; $MS = 0.685$; $\eta_p^2 = 0.282$]. From pairwise comparisons between the different error types, it resulted that:

i. While vSEOG_SM_LSC-type error occurred more than vSEOG_SM, the difference wasn't significant, meaning that they occurred in comparable levels.

ii. While PSD-type response occurred more than vSEOG_SM and vSEOG_SM_LSC-type response individually, the differences weren't significant. We wondered whether the total occurrence frequency of 'v-stem extension overgeneralization' errors would be significantly different from the occurrence frequencies of the 'phonological similarity driven' error as well as correct response (CR). Therefore we collapsed the two different types of errors that shared the crucial 'v-stem extension overgeneralization' component, into a new variable, vSEOG, which represents the sum of their occurrence frequencies. A one-way ANOVA with response type (CR, PSD and vSEOG) as the within-

subjects variable, revealed that the occurrence frequency of vSEOG-type error (M = 0.394; SD = 0.259), significantly exceeded that of PSD-type error (M = 0.253; SD = 0.139), (MD = 0.140; SE = 0.037; $p < 0.05$), as well as the occurrence frequency of correct response (M = 0.166; SD = 0.224), (MD = 0.228; SE = 0.055; $p < 0.05$). Also, the occurrence frequency of PSD-type error significantly exceeded that of correct response (MD = 0.088; SE = 0.037; $p < 0.05$).

iii. The vSEOG_SM, vSEOG_SM_LSC, and PSD-type responses, occurred each significantly more than PTSEOG_SM-type response (MD = 0.119; SE = 0.025; MD = 0.169; SE = 0.026; MD = 0.200; SE = 0.024; $p < 0.05$), respectively.

iv. The vSEOG_SM, vSEOG_SM_LSC, and PSD-type responses, occurred each significantly more than LSC-type response (MD = 0.131; SE = 0.028; MD = 0.212; SE = 0.018; MD = 0.181; SE = 0.030; $p < 0.05$), respectively.

v. The vSEOG_SM_LSC and PSD-type responses, occurred each significantly more than LSC_SM-type response (MD = 0.141; SE = 0.033; MD = 0.172; SE = 0.027; $p < 0.05$), respectively.

vi. The LSC_SM-type response occurred more than LSC-type response, but not significantly so.

No main effect for age was found, however an interaction effect between age and response type was observed [$F(10, 305) = 2.657$; $p < 0.05$; MS = 0.076; $\eta_p^2 = 0.080$]. Simple effects of age on the different levels of the response type revealed that the age groups differed significantly in their performance with respect to these error types:

i. PTSOG_SM-type error [$F(2, 61) = 5.611$; $p < 0.05$; MS = 0.045; $\eta_p^2 = 0.155$], such that, the youngest and middle group each committed significantly more

errors of this type than the oldest group, (MD = 0.086; SE = 0.028; $p < 0.05$) and (MD = 0.073; SE = 0.027; $p < 0.05$), respectively.

ii. PSD-type error [$F(2, 61) = 3.185$; $p < 0.05$; MS = 0.058; $\eta_p^2 = 0.095$], such that, the oldest group committed more errors of this type than the middle group[6] and significantly more errors than the youngest group (MD = 0.105; SE = 0.042; $p < 0.05$). This seems to be an interesting pattern, since the error's occurrence frequency increases with age, which is not a very common developmental pattern.

iii. LSC_SM-type error [$F(2, 61) = 6.158$; $p < 0.05$; MS = 0.112; $\eta_p^2 = 0.168$], such that the youngest group committed significantly more errors than the middle (MD = 0.098; SE = 0.041; $p < 0.05$) and oldest groups (MD = 0.143; SE = 0.042; $p < 0.05$). No significant difference between the middle and oldest group was observed.

A follow-up, non-parametric correlation test, with Kendall's Tau-b as coefficient revealed that:

i. vSEOG_SM-type error significantly increased with age increase ($\tau_b = 0.223$; $p < 0.05$, 2-tailed).

ii. vSEOG_SM_LSC-type error decreased with age increase, but not significantly.

iii. PTSOG_SM-type error significantly decreased with age increase ($\tau_b = -366$; $p < 0.01$, 2-tailed).

iv. PSD-type error significantly increased with age increase ($\tau_b = 0.286$; $p < 0.05$, 2-tailed).

v. LSC-type error decreased with age increase, but not significantly.

[6] Though not significantly more.

vi. LSC_SM-type error significantly decreased with increase in age (τ_b = -0.391; p< 0.01, 2-tailed).

As already evident, this cluster is one hosting several error types. To put it in a nutshell together and extract a general picture, we may say that the leading error types are 'v-stem extension overgeneralization' and 'phonological similarity driven' error types. Although the latter one apparently occurs more[7] than each of the two instances of the first type, the total occurrences[8] of the 'v-stem extension overgeneralization' error significantly exceed that of the 'phonological similarity driven' error. Importantly, an interaction effect was present between error type and age. Of particular interest seems the developmental pattern displayed by the frequency of PSD-type error, where its occurrence frequency significantly increased with age increase. Although simple effects for age didn't reveal a significant effect on the vSEOG_SM-type error, the related Kendall's Tau-b correlation coefficient showed a significant increase of this error type related to increase in age.

Let us look closer to the 'v-stem overgeneralization' errors and the 'phonological similarity driven' error. A within-subjects item-based analysis conducted with the verbs in the cluster, revealed some interesting facts regarding the occurrence of these 3 error types. Table 23 presents percentage of the children that committed each of the three error types across verbs.

[7] Though not significantly.

[8] The sum of the occurrence frequencies of the two errors sharing the 'v-stem extension overgeneralization' component.

Table 23. Occurrence Percentages of the Major Error Types across Children

Cluster 5 Verbs	vSEOG_SM Error Occurrence (%)	vSEOG_SM_LSC Error Occurrence (%)	PSD Error Occurrence (%)
lyen (spreads)	4.69	60.94	0
vret (hurts)	50	0	3.125
nget (drives)	4.69	0	50
thyen (breaks)	21.875	50	0
shket (slips)	3.125	0	73.44

Here, we observe these apparently interesting facts:

i. The verbs {*vret, nget, shket*} belong to the same phonological similarity cluster (together with several other verbs), as well as to the same past tense formation cluster. However, due to the discrepancies with respect to past tense formation, existing in their phonological similarity cluster, we were expecting errors with respect to past tense formation, driven by phonological similarity, i.e., one of the past tense formation processes applied to verbs that don't indeed use it, due to their phonological similarity to the verbs that do use it. As expected, this is the case. However, as the results in Table 19 show, there is a discrepancy in the occurrence of this 'phonological similarity driven' error across the verbs expected to display it. While the verbs *nget* and *shket* display rather high occurrence percentages of this error type across all children, the same is not true for the verb *vret*, which shows a very low occurrence percentage.

ii. On the other hand, this verb displays rather high occurrence percentages of one of the instances of the 'v-stem extension overgeneralization' error type (vSEOG_SM error), while the other two verbs, *nget* and *shket*, show very low occurrence percentages with this type of error.

iii. Another interesting discrepancy to note is the one between the occurrence percentages of the two ‘v-stem extension overgeneralization’ errors with the verbs *lyen* and *thyen*. Both these verbs display considerably higher occurrence percentages with the vSEOG_SM_LSC error, compared to the vSEOG_SM error, with the verb *lyen* showing a higher tendency for such a discrepancy.

Several factors might be responsible for the above observations, token frequency being one of them. Due to the lack of information about verbs’ usage frequencies, we will mostly concentrate on other potential factors. They will be discussed in the following chapter, where we will thoroughly discuss our findings.

Results for Cluster 6

This is the cluster of the ‘irregular’ verbs, that either totally (suppletive), or radically (non-suppletive) change their present tense stems during past tense formation (e.g., *bie* (stays) – *ra* (stayed); *thotë* /θɔtə/ (tells) – *tha* /θʌ/ (told)). There are 8 verbs in this cluster, 5 suppletive and 3 non-suppletive.

The graph inspection revealed the presence of 7 response types, of which only 5 were significantly different from 0. These response types were: i) correct response [$t(63) = 48.541$; $p < 0.007$]; ii) error type representing aspect or tense mismatch, i.e., usage of the imperfect aspectual past instead of the simple past tense, or usage of the past tense instead of the past tense form [$t(63) = 10.649$; $p < 0.007$]; iii) error type representing redundant application of the ‘t / jt’ stem extensions [$t(63) = 9.596$; $p < 0.007$]; iv) error type representing lack of stem (vowel) change, redundant (over) application of ‘v’ stem extension, and redundant usage of the past tense suffix ‘-i’ [$t(63) = 2.813$; $p < 0.007$]; and v) error type that in standard terms would be generally called ‘overregularization of the irregulars’, involving: lack of radical stem change, occasional redundant usage of the

past tense suffix '–i', and occasional effects of the present tense inflectional paradigm [t (63) = 5.791; p< 0.007]. Examples for each of these error types will provide a clearer idea on them.

Table 24. Examples of the Dominant Error Types Observed in the Irregulars Cluster

Verb (Present Tense, third person singular)	Past Tense Form Required (third person singular)	Past Tense Form Produced (third person singular)	Error Type
do (wants)	*desh-i* (wanted)	*donte* (used to want)	Aspect Mismatch (AM)
rri (stays)	*ndenj-i* (stayed)	*nde-jt-i / ndenj-t-i*	Redundant Stem Extension (RSE)
lë (leaves)	*la* (left)	*lë-v-i*	Lack of Stem (vowel) Change and Redundant 'v' stem extension and Redundant Suffix (LSC_RSE_RS)
jep (1.person singular, present tense form: *jap*)	*dha* (gave)	*jap-i*	Overregularization of Irregulars (ORI)

A mixed design two-way Repeated Measures ANOVA was performed with response type as the within-subjects variable and age group as the between-subjects variable [response type (5 levels) X age (G_1, G_2, and G_3)]. The descriptive part of the analysis, the mean and standard deviations in each condition, can be seen in Table 22. A slight occurrence of RSE-type error is observed in the adults control as well (4 out of 22 control subjects committed this error with one of the irregular verbs in the cluster; the verb *rri* (stays)). However, the one-sample t-test (with 0 as the comparison value) revealed that this occurrence is not significantly different from 0 [t (21) = 2.160; p> 0.017].[9]

[9] This is exactly the same one-sample t-test that was used in all the clusters in order to compare each error's occurrence frequency against 0 as the test value.

Table 25. Descriptive Statistical Results for Cluster 6

Response Type	Mean Frequency Value				Standard Deviation			
CR	G_1	G_2	G_3	Adults	G_1	G_2	G_3	Adults
	0.684	0.761	0.744	0.977	0.140	0.121	0.084	0.049
AM	G_1	G_2	G_3	Adults	G_1	G_2	G_3	Adults
	0.107	0.074	0.101	0.000	0.082	0.063	0.064	0.000
RSE	G_1	G_2	G_3	Adults	G_1	G_2	G_3	Adults
	0.048	0.085	0.089	0.027	0.062	0.059	0.058	0.049
LSC_RSE_RS	G_1	G_2	G_3	Adults	G_1	G_2	G_3	Adults
	0.030	0.006	0.024	0.000	0.067	0.027	0.064	0.000
ORI	G_1	G_2	G_3	Adults	G_1	G_2	G_3	Adults
	0.133	0.051	0.036	0.000	0.104	0.083	0.070	0.000

A main effect for response type was revealed [$F (4, 244) = 707.674$; $p< 0.05$; $MS = 8.820$; $\eta_p^2 = 0.921$]. Correct responses occurred significantly more than each error type:

i) (CR: AM) $MD = 0.636$; $SE = 0.020$; $p< 0.05$;

ii) (CR: RSE) $MD = 0.656$; $SE = 0.017$; $p< 0.05$;

iii) (CR: LSC_RSE_RS) $MD = 0.710$; $SE = 0.017$; $p< 0.05$;

iv) (CR: ORI) $MD = 0.663$; $SE = 0.023$; $p< 0.05$.

Also, AM, RSE, and ORI-type errors each occurred significantly more than LSC_RSE_RS-type error, ($MD = 0.074$; $SE = 0.012$; $p< 0.05$), ($MD = 0.054$; $SE = 0.012$; $p< 0.05$), and ($MD = 0.047$; $SE = 0.014$; $p< 0.05$), respectively. The 'overregularization of irregulars' (ORI) error type didn't occur significantly more than either AM, or RSE-type errors.

There were no main effects for age, but an interaction effect was found [$F (8, 244) = 2.810$; $p< 0.05$; $MS = 0.035$; $\eta_p^2 = 0.084$]. Simple effects of age for each level of the response type variable revealed that the age groups significantly differed in their

performance with the RSE-type error [F (2, 61) = 3.106; p< 0.05; MS = 0.011; η_p^2 = 0.092], and ORI-type error [F (2, 61) = 4.691; p< 0.05; MS = 0.035; η_p^2 = 0.133]. Pairwise comparisons of each age group with respect to these response types revealed that the oldest and middle age groups produced the RSE-type error significantly more than the youngest group, (MD = 0.042; SE = 0.018; p< 0.05) and (MD = 0.038; SE = 0.018; p< 0.05), respectively. The middle and oldest age groups didn't differ significantly in their performance with this error type. With respect to ORI-type error, the youngest group committed this type of error significantly more than the middle (MD = 0.062; SE = 0.026; p< 0.05), and oldest group (MD = 0.077; SE = 0.027; p< 0.05). The performances of the middle and oldest groups with respect to this error type were not significantly different.

As expected, children's performance with the irregulars is relatively high, with the frequency of correct responses significantly prevailing over the error types observed. Most probably, this happens due to the rather limited number of the irregular verbs and their potentially high token frequency. One of the most anticipated error types for this cluster, the 'overregularization of irregulars' occurred in rather moderate levels of frequency and as expected, displayed the tendency to decrease with age increase.

Results for Cluster 7

The verbs in this cluster form their past tense via: i) extending their stems with one of the three stem extension options other than 'v' (i.e., 't', 'jt', and 'r'), and ii) '-i' suffix (e.g., *mba-n* (holds) – *mba-jt-i* (held); *hy-n* (enters) – *hy-r-i* (entered); *mbro-n* (protects) – *mbro-jt-i* (protected)). There are 6 verbs in this cluster, chosen to represent various stem extension from several phonological clusters.

The inspection of the graph revealed the presence of 5 response types, of which only 3 were significantly different from 0. These response types were: i) correct response [t (63) = 32.696; p< 0.01]; ii) error type representing lack of necessary stem extension [t (63) = 5.456; p< 0.01]; and iii) error type representing stem extension mismatch, i.e., usage of the wrong stem extension [t (63) = 4.279; p< 0.01].

Table 26. Example of the Dominant Error Type Observed in Cluster 7

Verb (Present Tense, third person singular)	Past Tense Form Required (third person singular)	Past Tense Form Produced (third person singular)	Error Type
mbro-n (protects)	*mbro-jt-i* (protected)	*mbro-i*	Lack of Stem Extension (LSE)
mba-n (keeps)	*mba-jt-i* (kept)	*mba-v-i*	Stem Extension Mismatch (SEM)

Before moving on, we need to make the following clarification: in the case when SEM-type error involves using ‘v’ instead of the correct stem extension, it might first look as an instance of what we called ‘v-stem overgeneralization’ error type, but this is not so in the terms intended for ‘v-stem overgeneralization’. We considered the ‘v-stem overgeneralization’ error type as potentially reflecting effects of inflectional paradigmatic analogy, an important notion for our findings. However, this particular error, despite showing effects of overapplying the ‘v’ stem extension to verbs that normally don’t use it in their past tense inflectional paradigm, does not reflect effects of inflectional paradigmatic analogy, at least not directly, since ‘v’ stem extension is not present in the past tense inflectional paradigms of the verbs with which this type of error occurs. Instead these verbs extend their stems with one of the 3 other stem extension options available, throughout their past tense inflectional paradigms. However, it might be possible to consider this type of stem extension mismatch as *indirectly* representing

some paradigmatic analogy effects, via the other verbs that use 'v' stem extension in their past tense inflectional paradigms. In this case, of particular interest is the relatively high (as compared to the other verbs) incidence of this 'v' extension overapplication with the verb *mbron* (see Table 12: about 12.5 % of children produced past tense forms involving 'v-stem extension overgeneralization' with this verb). Namely, this verb elicited the highest percentage of the 'v-stem extension overgeneralization' occurrence among the verbs in the cluster. Although this percentage remains modest compared to the percentage of correct response (nearly 48.4 % of the children produced the correct response), and LSE-type response (37.5 % of the children produced the LSE-type response) that children produced with this verb, the fact that it occurred *more* with this particular verb than with the other verbs in the cluster, might be indicative of the effects of the phonological family size to which this verb belongs to. This phonological family is the largest among the verbal phonological families in Albanian, and almost all of its members use the 'v' stem extension in their past tense inflectional paradigm.

A mixed design two-way Repeated Measures ANOVA was performed with response type as the within-subjects variable and age group as the between-subjects variable [response type (CR, LSE, and SEM) X age (G_1, G_2, and G_3)]. The descriptive part of the analysis, the mean and standard deviations for each condition, can be seen in Table 24. As it can be observed, the LSE-type error displays a slight occurrence in adults as well (2 out of 22 control subjects produced this response with one of the verbs in the cluster, the verb *mbron* (protects), which is the verb that elicited the largest occurrence frequency of this error type in children as well). However, the one-sample t-test (with 0 as the comparison value) revealed that this occurrence is not significantly different from 0 [$t(21) = 1.45$; $p > 0.017$].

Table 27. Descriptive Statistical Results for Cluster 7

Response Type	Mean Frequency Value				Standard Deviation			
Correct Responses (CR)	G_1 0.674	G_2 0.886	G_3 0.881	Adults 0.985	G_1 0.207	G_2 0.202	G_3 0.199	Adults 0.049
LSE	G_1 0.175	G_2 0.053	G_3 0.087	Adults 0.015	G_1 0.200	G_2 0.119	G_3 0.100	Adults 0.049
SEM	G_1 0.119	G_2 0.038	G_3 0.032	Adults 0.00	G_1 0.159	G_2 0.088	G_3 0.067	Adults 0.00

The results revealed a main effect for response type [F (2, 122) = 359.596; $p < 0.05$; MS = 13.682; $\eta_p^2 = 0.855$]. Correct responses occurred significantly more than LSE (MD = 0.709; SE = 0.038; $p < 0.05$), and SEM-type errors (MD = 0.751; SE = 0.030; $p < 0.05$). The LSE-type occurred more than SEM-type error, but not significantly so.

There were no main effects for age, but an interaction effect was found [F (4, 122) = 6.960; $p < 0.05$; MS = 0.265; $\eta_p^2 = 0.186$]. Simple effects of age for each level of the response type variable revealed that the age groups significantly differed in their performance with each response type: [F (2, 61) = 9.966; $p < 0.05$; MS = 0.308; $\eta_p^2 = 0.246$] for CR; [F (2, 61) = 3.923; $p < 0.05$; MS = 0.084; $\eta_p^2 = 0.114$] for LSE; and [F (2, 61) = 4.025; $p < 0.05$; MS = 0.050; $\eta_p^2 = 0.117$] for SEM-type error. Pairwise comparisons of each age group with respect to these response types revealed that the oldest and middle age groups produced each significantly more RSE-type errors than the youngest group, (MD = 0.042; SE = 0.018; $p < 0.05$) and (MD = 0.038; SE = 0.018; $p < 0.05$), respectively. Pairwise comparisons of each age group with respect to each response types revealed that:

i. The oldest group produced significantly more correct responses than the youngest group (MD = 0.206; DE = 0.054; $p < 0.05$), but not the middle group.

ii. The youngest group produced the LSE error significantly more than the middle group (MD = 0.122; SE = 0.045; $p < 0.05$), but not the oldest group.

iii. The youngest group committed the SEM error significantly more than both the middle group (MD = 0.081; SE = 0.034; $p < 0.05$), and oldest group (MD = 0.087; SE = 0.034; $p < 0.05$). There was no significant difference between the performance of the middle and oldest group with respect to this error type.

Let us have a closer look at the distribution of the error types in the cluster. Table 28 presents the occurrence percentages across all children for each verb in the cluster.

Table 28. Occurrence Percentages of Response Types across Children

Cluster 7 Verbs	Correct Response Occurrence (%)	LSE Error Occurrence (%)	SEM Error Occurrence (%)
mban	75	15.625	6.25
arrin	90.625	1.562	3.125
gjuan	90.625	4.687	4.687
mbron	48.44	37.5	12.5
gjen	96.875	0	1.562
hyn	87.5	3.125	9.375

The verb *mbron* displays yet another interesting phenomenon, represented by the high occurrence percentage of the LSE-type error with this verb. This is of particular interest to us, since it might signify effects of phonological similarity to other exemplars. As mentioned, this verb belongs to the large phonological cluster of verbs whose stems end in the vowel 'o' in present tense. This is the largest and most productive phonological cluster of verbs in Albanian. Almost all of its verbs form their past tense (third person singular) via dropping of the person marker and '-i' suffixation, without extending their stems (e.g., *puno-n* (works) – *puno-i* (worked)). The verb *mbro-n* is one of the rare exceptions that involve stem extension in its past tense form. Therefore there exists the

possibility that it displays the effects of the 'phonological similarity pressure' that the high number of verbs in the phonological cluster exerts on it in past tense form. The relatively high occurrence percentage of the LSC error type with this verb across children, together with its slight incidence in the adult control subjects, seem to support this possibility.

Results for Cluster 8

The verbs in this cluster form their past tense via: i) stem vowel change, ii) stem extension, and ii) '-i' suffix (e.g., *vë* /və/ (puts) – *vu-r-i* /vuri/ (put); *ngre* (lifts) – *ngri-t-i* (lifted)). There are 4 verbs in this cluster.

The inspection of the graph revealed the presence of 7 response types, of which only three were significantly different from 0: i) correct response [t (63) = 22.902; p< 0.007]; ii) error type representing lack of necessary stem change and stem extension mismatch [t (63) = 6.565; p< 0.007]; iii) error type representing lack of necessary stem change [t (63) = 4.392; p< 0.007]. Examples of each error type are presented in Table 29.

Table 29. Examples of the Dominant Error Types Observed in Cluster 8

Verb (Present Tense, third person singular)	Past Tense Form Required (third person singular)	Past Tense Form Produced (third person singular)	Error Type
fle (sleeps)	*fje-t-i* (slept)	*fle-jt-i*	Lack of Stem Change and Stem Extension Mismatch (LSC_SEM)
vë /və/ (puts)	*vu-r-i* /vuri/ (put)	*vë-r-i* /vəri/	Lack of Stem Change (LSC)

A mixed design two-way Repeated Measures ANOVA was performed with response type as the within-subjects variable and age group as the between-subjects variable

[response type (CR, LSC_SEM, and LSC) X age (G_1, G_2, and G_3)]. The descriptive part of the analysis, the mean and standard deviations for each condition, can be seen in Table 30.

Table 30. Descriptive Statistical Results for Cluster 8

Response Type	Mean Frequency Value				Standard Deviation			
Correct Responses (CR)	G_1 0.607	G_2 0.773	G_3 0.786	Adults 1.000	G_1 0.280	G_2 0.230	G_3 0.214	Adults 0.000
LSC_SEM	G_1 0.083	G_2 0.102	G_3 0.119	Adults 0.000	G_1 0.121	G_2 0.126	G_3 0.128	Adults 0.000
LSC	G_1 0.203	G_2 0.080	G_3 0.071	Adults 0.000	G_1 0.269	G_2 0.162	G_3 0.179	Adults 0.000

Two preliminary observations emerge from these values: i) correct response seems to prevail as a response type and children's performance seems to increase with age increase, and ii) children's production of LSC-type errors seems to decrease with age.

The results revealed a main effect for response type [$F(2, 122) = 141.488$; $p < 0.05$; $MS = 10.938$; $\eta_p^2 = 0.699$]. The occurrence of correct responses was significantly higher than that of LSC_SEM-type error ($MD = 0.620$; $SE = 0.038$; $p < 0.05$), and LSC-type error ($MD = 0.604$; $SE = 0.053$; $p < 0.05$). While LSC occurred more than LSC_SEM-type error, the difference was not significant. There was no main effect for age, but an interaction effect was found [$F(4, 122) = 2.803$; $p < 0.05$; $MS = 0.217$; $\eta_p^2 = 0.084$]. Simple effects of age on each level of the response type variable revealed that the performance between the age groups differed significantly only in the case of correct responses [$F(2, 61) = 3.553$; $p < 0.05$; $MS = 0.209$; $\eta_p^2 = 0.104$]. Pairwise comparisons between the age groups, for each response type revealed that: i) the oldest and middle groups didn't significantly differ from each other in their production of correct responses, however each of them produced significantly more correct responses than the

youngest group, (MD = 0.179, SE = 0.075; p< 0.05) and (MD = 0.166; SE = 0.074; p< 0.05), respectively; ii) the youngest group produced the LSC-type error significantly more than the oldest group (MD = 0.131; SE = 0.064; p< 0.05).

Results for Cluster 9

The verbs in this cluster form their past tense via: i) stem vowel change, and ii) '-i' suffix (e.g., *shkrua-n* /ʃkruʌn/ (writes) – *shkro-i* /ʃkrɔi/ (wrote) ; *krua-n* (scratch) – *kro-i* (scratched)). There are only 2 verbs in this cluster, but they represent a phonological cluster that is interesting with respect to the discrepancy in the past tense process: half of the verbs in the cluster form their past tense via stem extension and '-i' suffix (same as the verbs in cluster 8), and the other one via stem change and '-i' suffix (as the verbs in the present cluster).

The graph inspection revealed the presence of 7 response types, of which only two were significantly different from 0: i) error type displaying effects of phonological similarity [t (63) = 16.458; p< 0.007]; and ii) error type representing lack of necessary stem change [t (63) = 4.465; p< 0.007]. Surprisingly, the occurrence frequency of the correct response type was not significantly different from 0. Table 28 presents examples for each error type observed.

Table 31. Examples of the Dominant Error Types Observed in Cluster 9

Verb (Present Tense, third person singular)	Past Tense Form Required (third person singular)	Past Tense Form Produced (third person singular)	Error Type
krua-n (scratches)	*kro-i* (schratched)	*krua-jt-i* (same as *gjua-n* – *gjua-jt-i* in the same phonological cluster)	Phonological Similarity Driven (PSD)
shkrua-n (writes)	*shkro-i* (wrote)	*shkrua-i*	Lack of Stem Change (LSC)

A mixed design two-way Repeated Measures ANOVA was performed with response type as the within-subjects variable and age group as the between-subjects variable [response type (PSD and LSC) X age (G_1, G_2, and G_3)]. The descriptive part of the analysis, the mean and standard deviations for each condition, can be seen in Table 32.

Table 32. Descriptive Statistical Results for Cluster 9

Response Type	Mean Frequency Value				Standard Deviation			
Phonological Similarity Driven (PSD)	G_1 0.548	G_2 0.704	G_3 0.857	Adults 0.523	G_1 0.384	G_2 0.333	G_3 0.231	Adults 0.243
Lack of Stem Change (LSC)	G_1 0.286	G_2 0.159	G_3 0.024	Adults 0.000	G_1 0.338	G_2 0.284	G_3 0.109	Adults 0.000

Two preliminary observations of particular interest emerge after an inspection of the above values:

i. The high occurrence frequency of the PSD-type response in the adult control group. The usual one-sample t-test (with 0 as the comparison value) revealed that this occurrence value is significantly different from 0 [$t(21) = 10.095$; $p < 0.017$], as obviously expected.

ii. The opposing developmental patterns that the error types seem to display, with respect to each other. Namely, while the PSD-type error seems to increase with age, the LSC-type error seems to decrease with age increase.

Results revealed a main effect for response type [$F(1, 61) = 68.935$; $p < 0.05$; $MS = 9.567$; $\eta_p^2 = 0.531$]. The PSD error type occurred significantly more than the LSC error type ($MD = 0.547$; $SE = 0.066$; $p < 0.05$). There was no main effect for age, however an interaction effect was observed [$F(2, 61) = 6.177$; $p < 0.05$; $MS = 0.857$; $\eta_p^2 = 0.168$].

Simple effects of age on each error type revealed that the performance between the age groups differed significantly for both PSD error [$F(2, 61) = 4.83$; $p < 0.05$; $MS = 0.503$; $\eta_p^2 = 0.137$], and LSC error type [$F(2, 61) = 5.211$; $p < 0.05$; $MS = 0.36$; $\eta_p^2 = 0.146$]. Pairwise comparisons between the age groups, for each response type revealed that: i) the oldest group produced the PSD error type significantly more than the youngest group ($MD = 0.31$; $SE = 0.1$; $p < 0.05$), but not significantly more than the middle group; ii) the youngest group produced the LSC error type significantly more than the oldest group ($MD = 0.262$; $SE = 0.081$; $p < 0.05$), but not significantly more than the middle group. Now, let us comparatively examine the distribution of the occurrence percentages of each error type across children and adults. Table 33 presents the results.

Table 33. Occurrence Percentages of Error Types across Children and Adult Subjects

Children	Correct Response Occurrence (%)	PSD Error Occurrence (%)	LSC Error Occurrence (%)
shkruan	0	65.625	25
kruan	6.25	75	6.25
Adults			
shkruan	86.36	13.64	0
kruan	9.1	90.91	0

Several discrepancies emerge from the above values:

i. While the occurrence percentage of the PSD error type across children is comparably high for both the verbs in the cluster, the occurrence percentage of LSC error type for the verb *shkruan* (writes) seems higher than the slight percentage observed for the verb *kruan* (scratches).

ii. An even greater discrepancy between the verbs exists in the case of the adult subjects. The verb *shkruan* elicits more correct responses across adults than the

verb *kruan*, with the difference in occurrence percentages being rather high. The opposite is true with respect to PSD error type: the verb *kruan* elicits the PSD-type error more than the verb *shkruan,* with the difference in occurrence percentages being rather high. This sharp discrepancy brings to mind the possibility that the PSD-type error might have become the new 'correct form' for the verb *kruan*. Most probably this change has happened due to the phonological similarity effects that display a sharp discrepancy with respect to past tense formation: half of the verbs form the past tense in the way intended for the verbs *shkruan* and *kruan* (i.e., *shkro-i* and *kro-i*, respectively), and the other half, in the way displayed by PSD-type error (e.g.: *gjua-n (hits) – gjua-jt-i* (hit); *lua-n* (plays) – *lua-jt-i* (played)).[10] The question is why this doesn't seem to be the case for the verb *shkruan* as well. Furthermore, another question might be that why don't children display such a sharp discrepancy in their performance with these verbs? Namely, both verbs seem to elicit comparably high occurrence percentages for the PSD-type response, and similarly, they elicit comparably low occurrence percentages for correct responses across children. We will discuss in greater detail these findings in the following chapter.

[10] The verb *gjuan* (hits) is included in our verb set, due to the obvious discrepancy in past tense formation with respect to two of the other members of its phonological cluster, the verbs *shkruan* (writes), and *kruan* (scratches).

Conclusion

This chapter presented the findings of this study and it was dense in the variety of results across the 9 verb clusters involved. If we were to put in a nutshell, the produced error types that have the highest occurrence rates and are common to several clusters are: i) the 'v-stem extension overgeneralization' error type (observed in cluster 2, cluster 3, and cluster 5); ii)) the 'phonological similarity driven' error types (observed in cluster 3, cluster 7, and cluster 9); and iii) the 'lack of necessary stem change' error type (observed in cluster 1, cluster 5, cluster 8, and cluster 9). In particular, the 'v-stem extension overgeneralization' error type displayed high patterns of occurrence frequency in all the clusters it was present. A two-way repeated measures ANOVA conducted with this error type as the within subjects variable (3 levels, each representing the occurrence of this error type in one of the 3 clusters involved), and age (3 groups) as the between-subjects variable, revealed no main effect for error type.[11] Pairwise comparisons revealed no significant differences between the occurrence frequencies of this overgeneralization process in each cluster. Also, no main effects for age and no interaction effects were present, meaning that the three age groups produced similar levels of the 'v-stem overgeneralization' error types.

In addition to the above results, we observed two phenomena that seem noteworthy:

[11] For cluster 5, in which two different instances of the 'v-stem extension overgeneralization' process occur (i.e., two different errors, but both share the crucial 'v-stem extension overgeneralization' process), the variable representing the sum of the occurrence frequencies of these instances was included in the two-way ANOVA test.

1. All stem extension overgeneralizations, regardless of the type (‘v’ or ‘t’), that children produced, occurred with the past tense suffix ‘-i’ and never with the suffix ‘-u’. This seems to indicate that children display some knowledge of phonotactics principles guiding verb stem extension in Albanian past tense. As already mentioned, stem extension in Albanian past tense occurs exclusively with the ‘-i’ past tense suffix. There is no instance in the language, in which past tense stem extension co-occurs with the suffix ‘-u’.
2. We had included a homonym verb pair in our set of target verbs: {$pret_1$ (cuts); $pret_2$ (waits)}. The verbs are structurally the same, have different meanings, and different past tense forms as well {$pret_1 – pre\text{-}u;\ pret_2 – prit\text{-}i$}. We found that there were no (*past tense form – verb meaning*) mismatches in children’s productions of the pair’s past tense forms. Namely, in no case did children use the past tense form of one of the verbs for the other verb of the pair. Even in the case of errors with the past tense forms, children produced errors appropriate for the verb’s own past tense profile and not that of its pair mate. This phenomenon seems to indicate that *meaning* (semantics) might play a role in the past tense processing, such that this process may not be entirely about *structure*, as maintained by some versions of the dual-route model (e.g., Pinker, 1999; Pinker & Ullman, 2002).

CHAPTER 6

DISCUSSION AND CONCLUSION

Introduction

In this chapter, we discuss our findings, with special attention to the most prominent ones. First a short summary of the results will be provided, followed by the discussion of each major finding.

Summary of the Results

The most dominant past tense error type that children produced was the so-called 'v-stem extension overgeneralization', which represents an incorrect and over application of the 'v' past tense affix to the third person singular, past tense form of a target verb, an instance that normally doesn't allow for this affix to occur. It was observed in three clusters (2, 3 and 5). The nice aspect of this overgeneralization process is that it doesn't occur randomly, but exclusively with those verbs that actually extend their stems with the 'v' affix in the first and second person singular instances of their past tense inflectional paradigm. This fact together with the relatively high occurrence frequency of the overgeneralization phenomenon signal effects of paradigmatic analogy. We did not observe significant effects of age on this error type, meaning that it was present in comparable levels, across the three age groups tested. Furthermore, it was totally absent among the adult control subjects, suggesting that the 'v-stem extension

overgeneralization' is a process peculiar to children and can be considered as a particular phase in their past tense acquisition.

We observed 'phonological similarity driven' error types with the verbs conjectured to display such a phenomenon, in three clusters (5, 7, and 9). Namely, these were the verbs that *diverged* in their past tense formation from their phonologically similar friends. The developmental patterns observed were interesting in that, the rate of this error type significantly *increased* with age. Interestingly, one of these error types (The non-standard past tense form used bears the marks of the competing past tense process in the respective phonological neighborhood, where about half of the verbs form their past tense according to this process (e.g., *luan* (plays) – *luajti* (played)).

Another error type that occurred across several clusters was 'lack of necessary stem change' error, which represents the absence of necessary stem changes in the relevant past tense forms. It was observed in four clusters (1, 5, 8, and 9). This error type displayed a tendency to decrease significantly with age (cluster 1, 8, and 9), and was totally absent in adult subjects.

Children's overall performance with the 'irregular' verbs was as conjectured: high levels of correct responses and low levels of error types. One of the most anticipated error types for these verbs was the so-called 'overregularization of irregulars', meaning: application of aspects of regular inflection to the irregular verbs, i.e., their *regularization*. In line with reports from acquisition studies of English, this error occurred in rather low levels. It also displayed the tendency to significantly decrease with age.

In the majority of the cases, the developmental patterns observed involved significant differences in performance between the youngest (3-year-olds) and the oldest

group (5-year-olds), while the middle one (4-year-olds) did not display significantly different performances compared to each of the other two groups.[1]

Discussion

We discuss now each major finding separately. The discussion of the first major result will rely on a recent and promising line of research that seems to be intrinsically related to this particular finding. However, the discussions of both the first and second major findings seem to converge on one crucial point: the importance of the *relations between inflected words* and *analogy to other exemplars* in the processing of inflectional morphology.

Inflectional Paradigmatic Effects

Accumulating evidence in the literature continues to contribute to the idea that morphologically complex words leave traces in lexical memory. The most frequently used diagnostic for the presence of memory traces in long-term memory has been the word frequency effect. Namely, higher frequencies of use allows for shorter processing latencies in both visual and auditory comprehension (Baayen et al., 2003) and lower rates of speech errors in production (Stemberger and MacWhinney, 1986). The effect of word frequency is usually stronger for irregular complex words than for regular complex words, and stronger for derived words than for inflected words. But even for regular inflected words, the effect of prior experience clearly emerges (Baayen et al., 2008b).

[1] Except for an error type in cluster 7, where the youngest and the middle group differed significantly in their production of that error, such that the youngest group produced that error type significantly more than the middle group.

The attested effects of word frequency seem to indicate that large numbers of complex words might be available in the mental lexicon. The later prediction is one of the main building blocks of the Word and Paradigm model of morphology, according to which, inflected words are available in the lexicon and form the basis for analogical generalizations.

The psycholinguistically relevant question with respect to inflectional paradigms is whether there is indeed behavioral evidence supporting the claim that morphology processing is sensible to the relations between inflected words, linguistically expressed as inflectional paradigms. In the recent years, several researchers have come up with theoretical probabilistic measures belonging to the so-called 'information theory', which are claimed to tap into the effects of paradigmatic relations on lexical processing. All these measures have as basis the relative occurrence frequencies of the inflected words, and are expressed as functions of either a word's probability of occurrence (for single inflected instances), or distribution of probabilities of the inflected words considered to constitute an inflectional paradigm (see chapter 2, the section *Paradigmatic Analogy*).

The fundamental assumption in information theory is that each lexical entity (e.g., an inflected word or an inflectional paradigm) carries a certain amount of information, which is considered to have an impact on its processing. This amount of information is quantitatively expressed as a function of the lexical entity's occurrence probability. One of the most important insights from the application of the theoretical measures and concepts of the theory to lexical processing is that the amount of information carried by a lexical entity is negatively correlated with the occurrence probability of this entity, and positively correlated with processing costs. Therefore, the common assumption is that lexical units that have a higher information load have a

lower occurrence probability and are more costly to access in long-term memory, hence more difficult to process. The amount of information associated with a certain inflectional paradigm is usually expressed via the theoretical probabilistic measure named as the *inflectional entropy* of the paradigm. Basically, the inflectional entropy of a paradigm is the weighted sum of the occurrence probabilities of its members. Lexical comprehension studies (e.g., lexical decision, word naming tasks) have reported that the entropy of the inflectional paradigm is negatively correlated to the response latencies in the recognition of an inflected variant of the paradigm, such that higher entropy values correspond to shorter response times (e.g., Moscoso del Prado Martin, Kostic, & Baayen, 2004; Tabak, Schreuder, & Baayen, 2005; Milin, Kuperman, Kostic, and Baayen, 2009). Hence, a paradigm with high inflectional entropy is supposed to have a *facilitatory effect* on, and provide support for the processing of its inflected variants.

How do the above concepts relate to our study? One of the major findings of the study was the high occurrence rate of the so-called 'v-stem extension overgeneralization' phenomenon, in which children produced the third person singular past tense forms of a considerable number of verbs with the 'v' affix, while in normal adult language this is not observed (e.g., **lexovi* instead of correct form *lexoi*; **pivi* instead of correct form *piu*). As mentioned, this particular overgeneralization process doesn't happen randomly, but occurs *exclusively* with those verbs that actually use the 'v' stem extension affix in their past tense inflectional paradigms, namely, in the first and second person singular instances. Therefore, the observed phenomenon seems to indicate the presence of *inflectional paradigmatic analogy*, which brings to mind the above concepts of information theory, and the related empirical support that they have received as good predictors of lexical processing performance. We thought that it might

be interesting and innovative to use these concepts in explaining potential reasons behind children's overgeneralization pattern. However, despite the evidence obtained in favor of these theoretical measures, we need to be careful with their usage.

First of all, we lack information about the building block of these measures, the *occurrence frequency values*, so no real attempt at calculating these measures can be done at this stage. Second, these measures have been used to predict and explain the lexical processing performance of *adult* subjects, mostly in visual *comprehension* tasks. Our subjects are young acquiring *children*, and ours is an elicited *production* task. There are some contradictory reports on the nature of the effects of the paradigmatic entropy (facilitatory versus inhibitory), depending on the nature of the task (comprehension versus production). While the majority of comprehension studies reports *facilitatory effects* of paradigmatic entropy, some production studies report *inhibitory effects* (e.g., Bien, 2007; Baayen, Levelt, Schreuder, & Ernestus, 2008). However, even in such studies, facilitatory effects of the paradigmatic entropy are also reported alongside the inhibitory effects. For example, Baayen et al. (2008) reported inhibitory effects of entropy only for the non-plural nouns, and facilitatory effects of relative entropy only for the plural nouns. Furthermore, these effects were not observed in all the production tasks involved, but in certain types of tasks only, indicating that differences (i.e., delayed versus non-delayed word naming task) within the same task category (i.e., production) may have an effect on the observed presence or absence of paradigmatic entropy effects. Baayen et al. (2008) concluded that the observed entropy effects show that in production, knowledge of the probabilities of the individual inflected forms plays a role, although indirectly. Whether facilitatory, or inhibitory, these effects highlight the importance of paradigmatic organization of the inflected forms in the mental lexicon.

Noting that our elicited production task is different from the reported production tasks (e.g., not the name of a noun, but the action of a verb in different tenses was elicited, and there was no limit on the exposure time of the pictures / contexts shown), we will free our reasoning from distinguishing between the nature of the tasks used (production versus comprehension), or the profile of the participants (adults versus children), when discussing the effects of information load of an inflected word or paradigm. At the present state of knowledge and evidence, we can posit that what matters in our case is the *processing* of the inflected forms, and the effects of the *paradigmatic relations* between them on this *processing*.

Despite the lack of necessary information It is our belief that this line of research has the potential and right insights needed for a plausible theoretical support of our findings, therefore it might be worth the challenge to discuss them under the perspective it provides. We start from that little that we actually know about the distribution of Albanian verbs, and then try to infer potential frequency estimations.

From now on, we will concentrate on the singular portion (i.e., half) of the past tense inflectional paradigm, which includes the first, second, and third person singular instances of the inflected verb(s) in question. This is done for the following reasons:

1. In our task, the third person singular was elicited and the observed ‘v’ stem extension overgeneralization process is reminiscent of potential analogies from the first and second person singular past tense instances, where this affix exclusively occurs. Hence, the plural portion would be irrelevant for our purposes. Our *region of interest* is the *singular portion of the past tense inflectional paradigm*.

2. In some cases, the verb in question undergoes stem vowel change in the plural instances of its past tense inflectional paradigm, which is something not accounted for by the present state of art of information theory.[2] This means that even if we were to conceptually apply related concepts to the plural instances of the past tense paradigm, this would not make sense given the present inability of the information theory concept to capture this variability.

Now, let us consider the regions of interest of three verbs, each representing one of the three clusters where the 'v-stem extension overgeneralization' occurred. Table 34 provides them.

Table 34. Examples of the Singular Portion of the Past Tense Paradigms and the Respective Errors across the Related Verb Clusters

Cluster 2: *shko-n* 'goes'	Cluster 3: *nda-n* 'divides'	Cluster 5: *lye-n* 'spreads'
shko-v-a 'I went'	*nda-v-a* 'I divided'	*le-v-a* 'I spread'
shko-v-e 'you went'	*nda-v-e* 'you divided'	*le-v-e* 'you spread'
shko-i '(s)he went' (**shko-v-i*)[3]	*nda-u* '(s)he divided' (**nda-v-i*)	*le-u* '(s)he spread' (**le-v-i / lye-v-i*)[4]

All the above paradigms share two important aspects: 1) the presence of 'v' stem extension affix in first and second person singular instances, and 2) its absence in the third person singular instance. They differ in only one aspect: the past tense suffix in the third person singular, which is '-i' for the verb in the first paradigm, and '-u' for those in

[2] Remember that information theory can capture a limited range of inflectional paradigms, all of which are nominal and don't display stem variation. As the heads behind the theory also admit (e.g., Milin et al. (2009)), the verbal inflectional paradigms are much more complex and variable and the concepts need to be revised in order to be successfully applied to them.

[3] The incorrect form produced by children, displaying the 'v-stem extension overgeneralization' phenomenon.

[4] The pair represents the two error instances that occurred in cluster 5, which differ only in the necessary stem change being performed or not. Obviously, what matters for the present discussion, is the 'v-stem extension overapplication' component that they share.

the second and third paradigms. Nevertheless, despite this difference, we see a recurring pattern in all the error instances produced: the word final *'-vi'* segment. At this stage, we feel the need to provide the following remark: As the reader might have noticed, in describing the different ways in which verbs form their past tense forms, we have used a language that might seem as describing this process in a 'rule-like' fashion. We note that this is done for purely descriptive reasons. Obviously, we are in no way implying that the actual process takes place in the brain as it is linguistically described. Accordingly, when we term the overgeneralization processes observed in linguistic terms, such as *'v-stem extension overgeneralization'*, we are not intending that children specifically perform an operation such as: "insert a 'v' and then an 'i' to a certain stem." We need the descriptive power of the linguistic terms used in order to explain the complex picture depicted by the Albanian past tense and its abundant details. Henceforth, by 'v-stem extension overgeneralization' phenomenon we intend that a common, recurrent, incorrect verb final pattern, *'vi'*, was observed instead of the normally occurring patterns, *'i'* and *'u'*. It is our belief that approaching the empirical evidence in this way is safer and more neutral with respect to the related theories.

This explanation being made, we now proceed to some 'within-paradigm' occurrence frequency analysis. Namely, within the defined region of interest (ROI), the occurrence probability of an instance inflected with the *'v'* affix is:

(1) P(v) = *[number of inflected instances with the 'v' affix] / [total number of inflected instances]* = 2/3.

Similarly, the occurrence probability within the paradigm, of an instance not inflected with the *'v'* affix would be:

(2) P(~v) = *[number of inflected instances without the 'v' affix] / [total number of inflected instances]* = 1/3.

Obviously, P(v) > P(~v), meaning that the chance that an inflected instance occurs with the 'v' affix within the paradigm is significantly greater than the chance that it occurs without this affix. For our purposes, this would translate to: the chance that children hear an instance of this paradigm type, inflected with the 'v' affix, is greater than the chance they hear an instance without the 'v' affix. Despite the lack of information about the exact occurrence frequencies of the verbs in spoken language, we do know that the largest and most productive class of verbs in Albanian employs the 'v' stem extension affix in their past tense paradigm, with very rare exceptions.[5] In addition, the 'v' affix is also present in the past tense paradigms of other verb classes as well.[6] Therefore, it is not very difficult to predict that the overall occurrence frequency of past tense instances inflected with this affix is high in spoken language. On the other hand, a general belief about children is that they tend to abundantly talk in first person singular for describing actions or situations related to them. Furthermore, the parent-child or peer-to-peer communication that children engage in, often hosts questions in which the second person singular of the verbs is interchangeably used. Hence, the possibility that the child is exposed to hear, and elicited to produce the first and second person singular of verbs in spoken language, can be estimated to be relatively high. In information theoretical terms, the occurrence probability of a word is a function of its relative occurrence frequency.

[5] The verbs in question verbs are those whose stem ends in the vowel 'o' in present tense, all three singular instances. Actually, these exceptions are even more than very rare: only 2 out of a vast number of such verbs. One of these is the verb *mbro-n* (defends), which we will separately discuss in the next section.

[6] The verbs in cluster 3 and cluster 5 are representatives of these classes.

Provided that the stem frequency would be constant for both the inflected versions with respect to the ‘v’ affix (i.e., either with, or without it), and that the occurrence frequency of a past tense form inflected with the ‘v’ affix is estimated to be higher than that of a past tense form inflected without the ‘v’ affix, one can expect the occurrence probability of a past tense form inflected with the ‘v’ affix to be higher than that of a past tense form inflected without the ‘v’ affix.

Now consider the *information load* that each of the inflected past tense instance types (inflected with or without the affix ‘v’). According to the fundamental principles of information theory, the information load of a lexical unit is negatively correlated with its occurrence probability, and positively correlated with its processing costs. Therefore, a word with a higher occurrence probability is expected to have a lower information load and processing costs than a word with lower occurrence probability. In our specific case, this would mean that a past tense form inflected with the ‘v’ affix has a lower information load and lower processing costs than a past tense form inflected without this affix. Hence, for the child, it might be more *convenient* to produce the ‘v- inflected’ version of the third singular past tense form of the verb, rather than the standard, ‘non v-inflected’ version.

Alternatively, let us widen the perspective from inflected item-based information load to inflectional paradigm-based entropy. Namely, the entropy of a paradigm is the expected amount of information in a paradigm, expressed as the weighted probability distribution of its inflected members. Effects of paradigmatic relations between the inflected forms of a word on lexical processing have been already reported for adult subjects (e.g., Ernestus & Baayen, 2007). Namely, Ernestus and Baayen (2007) report two lexical decision experiments investigating the role of paradigmatic effects in

auditory word recognition. The first experiment showed that listeners classified a certain form (e.g., singular form of a word) with an incorrectly voiced final obstruent[7], more readily as a word if the obstruent is realized as voiced in other forms of that word's morphological paradigm (i.e., in its plural form). Moreover, a greater probability of voicing correlated with longer response latencies for words correctly realized with voiceless final obstruents. A similar effect of this probability was observed in the second experiment as well. Our findings are crucial since they reveal the presence of paradigmatic effects in young children as well, during the acquisition of the past tense in Albanian. In this respect, the present study represents an important first step towards investigating the organization of the mental lexicon and lexical processing in a continuum: from child acquisition to adult processing.

Paradigmatic entropy is usually assumed to increase with the number of members of the paradigm. It also increases when the probabilities of the members are similar to each other. For a given number of members, the entropy is maximal when all probabilities are the same. With respect to lexical processing, higher paradigmatic entropy has facilitatory effects on the lexical processing of its members, and is associated with lower processing costs. If we apply this reasoning to our paradigms, we see that: a paradigm in which all three members are inflected with the 'v' affix is more uniform and has higher entropy than a paradigm that has a discrepancy with respect to the presence of the 'v' affix throughout its members. Consequently, a paradigm with all its members inflected with this affix provides more support and facilitation for the

[7] A sound, such as a stop, fricative, or affricate, that is produced with complete blockage or at least partial constriction of the airflow through the nose or mouth.

lexical processing of its members, than one in which the members don't behave uniformly with respect to the presence of the 'v' affix inflection.

The possibility that discrepancies within morphological paradigms can effect lexical processing has been reported in the literature. Clahsen et al. (2001) reported results from two cross-modal morphological priming experiments investigating regular person and number inflection on finite verbs in German. They found asymmetries in the priming patterns between different affixes that represented the two sides of an existing discrepancy within the structure of the paradigm. They also reported data from language disorders which indicated that inflectional errors produced by language-impaired adults and children tend to occur within a given paradigm dimension, rather than randomly across the paradigm. Their conclusion was that morphological paradigms are not only useful descriptive linguistic tools, but that they may also contribute to a better understanding of how inflected word forms are processed by the human brain.

We engaged in the above reasoning scheme, supported by concepts and principles of information theory, in an attempt to explore the potential reasons behind the observed overgeneralization pattern in Albanian-speaking children during the acquisition of past tense. Now we are in a position to conjecture the following scenario: First of all, the 'v' pattern overgeneralization is a process peculiar to Albanian-speaking children, and can be considered as a particular, transitory phase they go through during the acquisition of the past tense in their native language. The fact that there were no age effects and no significant differences among the three age groups tested, suggests that this phase is present at 3 years of age and seems to persist until at least the age of 5. Our present intuition is that whenever present, this pattern might persist until the first year(s) of education. Not every child necessarily goes through such a phase; however a

considerable number from the children that we tested display it. We predict that if the number of children is significantly greater and / or the stimulus set consists exclusively of verbs that have the potential for the occurrence of this process, the overgeneralization pattern will be in even more pronounced levels than it already is.

Regarding the potential reasons behind such a pattern, we conjecture that its presence has *facilitatory effects* in the past tense acquisition of the verb types it occurs with. We attempted to theoretically support this claim via the relevant concepts of information theory, which have received considerable support as good predictors of lexical processing performance in adults. Namely, we reasoned that within the region of interest in a verb's past tense paradigm, a past tense form inflected with the 'v' affix has a lower information load and consequently, lower processing costs than a past tense form inflected without this affix. Furthermore, a paradigm in which all three members are inflected with the 'v' affix is more uniform with respect to the distribution of its members, and has higher entropy than a paradigm which contains a discrepancy with respect to the presence of the 'v' affix among its members.[8] Higher paradigm entropy means more support and facilitation effects for the processing of its members. As a consequence, in processing terms, it might be more *convenient* for the acquiring child to prefer the redundant presence of the 'v' pattern in an inflectional instance in which it doesn't normally appear. It seems like the child is filling in the gap with the dominant pattern in the paradigm, in order to create a more uniform set of morpho-phonological relations between the past tense instances involved. This preference is expressed by the related overgeneralization errors produced.

[8] As is the case for the real, normally occurring paradigm, i.e.,{ *-va, -ve, -i / -u}*

Again, we think that some caution is needed with the terms used and the potential implications emerging from them. We are not implying that inflectional paradigms exist in the child brain in the literal sense conveyed by linguistic descriptions: organized blocks of inflected variants of a certain verb. This claim would be too strong and far-reaching for the scope of this study, so we remain agnostic about its truth value. We find it psycholinguistically more feasible to conceive the content of an inflectional paradigm as relations between the inflected variants of a stem, organized around the same main meaning (conveyed by the verb stem involved), and expressing the realization of this meaning under different circumstances (i.e., first person singular past tense, or third person plural present tense). The more the structural and / or semantic features that two forms share, the stronger is the connection (relation) between them. In information theoretical terms this would translate to increasing entropy and decreasing of the uncertainty regarding which paradigm a certain inflected item belongs to.

Based on our findings and those reported from some of the lexical processing studies with adult speakers that we reviewed (e.g., Ernestus & Baayen, 2004; Ernestus & Baayen, 2007; Clahsen et al., 2001), we find it reasonable to posit at this stage that: children as well (aged between 3 and 5 years old) seem to be sensitive to the relations between inflected words, and the potential analogies emerging from them. This is expressed by their overgeneralization of a recurrent pattern in these relations (e.g., 'v' stem extension affix), to an instance within the same relation net in which that pattern doesn't occur in adult language. The figures below provide a simplistic graphical representation of our conception of the relations between inflected words.[9]

[9] Only the relations of interest (i.e., the first three singular instances of the past tense paradigm) are presented.

The first figure is a rough illustration of the way adults would represent the relations between inflected variants of a certain verb stem. The second one illustrates the way a child with the tendency to overgeneralize the 'v' pattern, would represent such relations. As seen, the child's tendency to overgeneralize a certain pattern is represented by the higher number of analogies (connections) present in the respective representation.

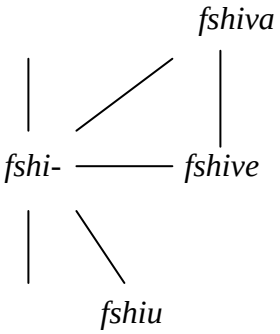


Fig.1 Adult representation

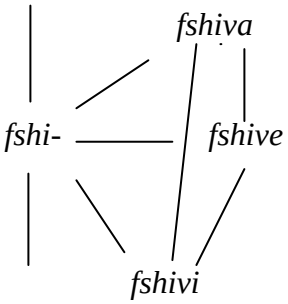


Fig.2 Child representation

Importantly, the overgeneralization pattern might indicate children's efforts towards a kind of *abstraction* of these relations. The complex distribution of stem extension affixes within the past tense inflectional paradigm renders it challenging for the child to distinguish between what counts as *stem* and what as *inflectional*

component(s).[10] It might be the case that children perceive the 'v' stem affix as part of the stem, not as a separate component that occurs with it only in certain inflectional instances of the past tense paradigm. Therefore, for these children, the 'v' pattern is present in the third person singular as well. While any claim about the exact nature of the representations of inflected words and the relations between them would be too strong, our findings seem to suggest that children's representations have a *dynamic* nature, prone to change during the course of acquisition. It seems like children go back and forth in representing these relations, defining and redefining them, until reaching the adult representation level. Our intuition about the transition from the child representation to the adult one, is that it happens gradually, with prolonged exposure to the correct forms, growth of the lexicon, cognitive development, and education being the first factors to come to mind.

Now, let us discuss two other phenomena regarding the 'stem extension overgeneralization' process in children. The first one is an error type that occurred in cluster 3, which we called the 't-stem extension overgeneralization'. We have already explained in the previous chapter, that this error type is qualitatively different from the 'v-stem extension overgeneralization' error, because its occurrence doesn't represent paradigmatic effects. Furthermore, it occurred *significantly less* than the 'v-stem extension overgeneralization', and *exclusively* with three verbs: *fry-n – *fry-t-i* (correct form: *fry-u*); *shty-n – *shty-t-i* (correct form: *shty-u*); and *shtri-n – *shtri-t-I* (correct form: *shtri-u*). These facts bring to mind the possibility that the occurrence of this error type might be related to the fact that the word final sequence *'-yti'* is a plausible and

[10] For a detailed picture of the distribution of the past tense stem extension affixes in Albanian, please consult chapter 3 of this study.

potentially a preferred one in Albanian. It occurs in the word-final position of several instances in the language: e.g., *mbyt-i* (strangled); *fyti* (the throat); *yti* (yours); *zhyt-i* (immerged); *(i) dyti* (second), etc. Therefore, analogy to such existing forms, as well as a preference for this sequence, might count as potential factors behind the occurrence of this error type. The adult subjects we tested did not display any evidence for this error type; however we have informally attested its presence with the above verbs in adult spoken language on occasions. Hence, there exists also the possibility that children receive such erroneous forms as input from adult spoken language. This possibility demands further investigation with adult speakers. In the case that the occurrence incidence among adult speakers of these forms reaches a certain value, this would manifest the preference of Albanian speakers to use the *'-yti'* sequence in a word final position. In time, this preference may lead to instances of *language change*, in which native speakers of a language chose to use an alternative form instead of the form implied by the standard language.

Second, as noted earlier, the stem extension overgeneralization error types occurred exclusively with the *'-i'* past tense suffix, and in no case with *'-u'*, even when the later was the legitimate suffix for the past tense form in question.[11] This phenomenon brings to mind the possibility that children are sensitive to the *allowed* sequences in the language, i.e., certain phonotactic principles peculiar to Albanian. As mentioned earlier, no type of the stem extension processes peculiar to past tense occurs with the *'-u'* suffix in standard and adult language. Therefore, patterns of the type: *'verb stem-stem*

[11] We considered such cases as representing suffix mismatch apart from the stem extension overgeneralization factor. This was also expressed in the naming scheme we designed for the error types (SM: suffix mismatch)

extension affix-u' are totally absent from the language input that a child receives. However, there is always the possibility that children themselves create such forms. The fact that they don't, may reflect their sensitivity to phonotactic principles and occurrence probabilities regarding the distribution of *allowed* patterns in the language. An alternative explanation may derive from the possibility that *'-i'* past tense suffix is more frequent than *'-u'* suffix. Even if this is the case, it still wouldn't exclude the possibility that children might occasionally produce past tense forms ending in the pattern *'stem extension affix - u'*. Therefore, frequency effects might be able to explain maybe the fact that children perform *plenty* of stem extension overgeneralization errors with the '-i' suffix, but *frequency effects alone* don't seem to be able to explain the fact that children *never* produce such error types with the '-u' suffix, while they could at least occasionally do so.

Phonological Similarity Effects

The three error types observed in three separate clusters (cluster 5, 7, and 9) are reminiscent of effects of phonological similarity between existing forms, hence we named them under the general caption: *'Phonological Similarity Driven'*. They occurred in the expected cases (with an exception in cluster 5), with the verbs that had the potential to display such a phenomenon. Furthermore, all the instances of this error type share an interesting aspect: the fact that it seems driven by phonological similarity between the *present tense* forms of the verbs under inspection. The reader might recall that in the case of the other major error type discussed above, analogical effects emerged from the paradigmatic relations between the *past tense* instances of a verb.

Let's consider each phonological similarity driven error type separately.

Cluster 5: We observed this type of error with two of the three verbs expected: *nget – ngit-i* (correct form: *nga-u*); *shket – shkit-i* (correct form: *shka-u*). The other verb expected to display this error type, but didn't, was the verb: *vret – vrit-i* (correct form: *vra-u).* All these verbs belong to the same phonological neighborhood with respect to present tense, third person singular instances. Namely, this neighborhood can be characterized by the general prototype: "C (C)…(V)…(C)*et*", which may capture both monosyllabic and multisyllabic instances.[12] Examples of its members would be: *{nget* (drives); *shket* (slips); *vret* (hurts); *pret* (waits); *zbret* (comes down); *troket* (knocks on); *godet* (hit); *bërtet* (yells); *thërret* (calls); *kërcet* (crunches); *rrëshket* (slides); *pëlcet* (explodes)*}*. All of these members, except the first three, form their past tense by changing the last stem vowel from 'e' to 'i' (in all the instances of their past tense paradigm), and suffixation ('-i' for the third person singular). Consider the singular portion (first, second, and third person singular instances) of the past tense paradigms for each of the two different past tense formations involved, given in Table 35:

Table 35. Examples of the Two Past Tense Formation Processes in the Phonological Cluster of Prototype "C (C)…(V)…(C)*et*"

Process 1 (dominant) *'pret'*	Process 2 *'vret'*
prit-a (I)	*nga-v-a* (I)
prit-e (you)	*nga-v-e* (you)
prit-i (he / she)	*nga-u* (he / she)

The fact that this type of error occurred in significant levels with the majority of the expected verbs is not surprising, because first of all, the past tense process it represents is the dominant one in this phonological neighborhood. Alternatively, as can be deduced from the inspection of the two past tense paradigms above, the past tense

[12] This prototype represents the third person singular, present tense instances.

paradigm belonging to process 1 seems more uniform (no discrepancies involved) compared to that of process 2, which we are already familiar with. Assuming the relative occurrence frequencies of the instances in both paradigms are comparable, via the same line of reasoning engaged above, we may predict the entropy of the first paradigm to be higher than that of the second. This would mean that the processing facilitation that the first paradigm provides to the processing of any of its members (in our case this being the third person singular) would be greater than that provided by the second paradigm to the processing of any of its members. Therefore, producing the past tense form compatible with this past tense paradigm would be more feasible and convenient for the acquiring child.

Regardless of how we view it, the important thing to notice here is the fact that this error type seems to be triggered by the *phonological similarity* between the *present tense* forms of the verbs involved. In order to produce this type of error with respect to the past tense, the child first has to notice the phonological similarities between the present tense form of the verb in question and those of its phonological neighbors.

Now, let us turn our attention to the discrepancy observed among the three verbs expected to display this error type. While the verbs *nget* (drives) and *shket* (slips) show high occurrence rates of the 'phonological similarity driven' error type among children, this is not the case with the verb *vret* (hurts).[13] Instead, this verb displays high occurrence rate of the 'v-stem overgeneralization' error type.[14] While there may be

[13] Namely, 50 % of the children produced the 'phonological similarity driven' error type with the verb *nget*, about 73 % with the verb *shket*, and only 3 % with the verb *vret*.

[14] Namely, 50 % of the children produced the 'v-stem extension overgeneralization' error type with the verb *vret*, about 5 % with the verb *nget*, and only 3 % with the verb *shket*. The occurrence percentages for each verb and error type in cluster 5 are given in Table 20, chapter 5.

several reasons behind this phenomenon, our present intuition leads to predict that the verbs' *occurrence frequency* may play a role in this case. Namely, we suspect that Albanian children tend to use the first person singular, past tense form instance of the verb *vret* more frequently than the other two, to express something that they experience frequently: getting hurt during play or other daily activities. We have informally witnessed a relatively high occurrence frequency of this particular instance of the verb among Albanian children in naturalistic contexts. For example, children tend to produce frequently utterances such as: "Vrava dorën (I hurt my hand)", or "U vrava (I got hurt)".[15]

Cluster 7: The verb for which a certain error type would imply potential phonological similarity effects, is *mbro-n* (defends). We explained in the previous chapter that this verb has a 'special' status with respect to past tense formation. While it is a member of the largest phonological cluster of Albanian verbs, it is also one of the only two exceptions that diverge from the group with respect to the past tense formation.[16] While the vast majority of its phonological friends form the past tense via '*-i'* suffixation only (e.g., *shko-n* (goes) – *shko-i* (went); *puno-n* (works) – *puno-i* (worked)), the past tense of *mbro-n* (defends) involves an extra stem extension: *mbro-jt-i* (defended). This brings to mind the following main possibilities: 1) this particular past tense form is correctly produced in the majority of cases, due to its rather distinctive status in the cluster; 2) the large size of the phonological cluster it belongs to may exert

[15] Note that 'vrava' is the first person singular, past tense instance of the verb in question.
[16] This cluster is phonologically organized with respect to the present tense forms of verbs, whose stems end in the vowel 'o'. The phonological clustering according to the present tense instances of the verbs actually holds for all the phonological clusters that we systematically identified at the beginning of the study. In Albanian, there are no bare infinitive forms and verbs are formally presented in present tense, first person singular (the so-called *representative form*), but for our purposes, the third person singular, present tense instances were relevant.

some *'phonological pressure'*, which in turn, may give rise to the production of the 'cluster dominant' paste tense form: *mbro-i*; and 3) if *'phonological pressure'* is a potential factor affecting this verb's past tense form, it might bring with it some *'side effects'*, or *byproducts*, such as the production of 'v-stem extension overgeneralization' error type, whose occurrence probability with the verbs of this phonological cluster is relatively high. Our evidence seems to indicate the presence of all the above possibilities, though in varying levels. Namely, for this verb: about 48 % of the children produced the correct response; 37.5 % produced the error type that indicates 'phonological similarity effects'; and 12.5 % of children produced the past tense of the verb with the wrong stem extension: *mbro-v-i*, instead of the correct form *mbro-jt-i*. The percentage of correct response production seems relatively high, as does that of the 'phonological similarity driven' error type production, on the other hand. Furthermore, although moderate, the occurrence percentage of 'v-stem extension overgeneralization' error type (i.e., productions of the form: *mbro-v-i*) indicates a slight presence of the predicted *'side effects'* from the also predicted *'phonological similarity pressure'*. The potential effect of phonological similarity was observed in adult responses as well, although in rather low occurrence levels (namely, 2 out of 22 adults produced the form *mbro-i*, instead of the correct form *mbro-jt-i*). The 'special' status of this verb might have either facilitatory or inhibitory effects with respect to its correct past tense production (i.e., this status either promotes the correct past production, or inhibits it by promoting error types driven by phonological similarity). Our present evidence seems to be not sufficient for any accurate conclusions on the matter. Further investigation with this verb, with a higher number of children and adult subjects, is necessary for a better understanding of the processes behind its 'special' past tense status.

Cluster 9: We observed a rather high occurrence frequency of 'phonological similarity driven' error type, and a very low frequency of the correct response (as posited by standard language). Furthermore, the occurrence frequency of this error type was high in the adult subjects as well, for one of the two verbs involved: *krua-n* (scratches). The phonological cluster the two verbs belong to is an interesting cluster with respect to the discrepancy regarding the past tense formation processes available. Namely, about half of the verbs in the cluster form their past tense via one process: '-jt-' stem extension and '-i' suffix (e.g., *lua-n – lua-jt-i* (play)); while the other half via another process: stem change and '-i' suffix (e.g., *pagua-n – pago-i* (pay)). The fact that the chances for the occurrence of each past tense formation process within the cluster are almost the same, might contribute to a potential increase in the uncertainty about which process is to be engaged with verbs that are phonologically rather similar. This in turn, might cause the emergence of the dominance of one of the processes over the other. In our case, both children and adults displayed a pronounced preference for one process type, the first one described above, i.e. they produced *krua-jt-i* instead of the correct form *kro-i*. While children display comparable production levels of this error type for both the verbs in the cluster, adults show productivity with this error only for one of the verbs, *krua-n* (scratches). This seems surprising, because the verbs are phonologically very similar. Several factors might be responsible for the observed discrepancy. Our intuition is that adult subjects may be exposed to the correct form of the other verb (i.e., *shkruan-n* (writes)) more than to that of the verb *krua-n*. The increased exposure might occur during the relatively long educational period, during reading and writing of the language. Since this kind of exposure is not available to the young acquiring children, they might not discriminate between the verbs in their productivity with this error type.

On the other hand, the fact that adults display significant productivity with this error type for one of the verbs involved seems to suggest that analogy based on phonological similarities between exemplars sometimes leads to instances of *language change*, such that the non-standard form is preferred and used instead of the standard one. Similar effects have been reported in the literature. For example, Ernestus and Baayen (2004) addressed the question to what extent the production of regular past tense forms in Dutch is affected by analogical processes. Their results were indicative of analogical effects: all the subjects produced more non-standard past tense forms and responded more slowly in the case of verbs with stronger analogical support for the non-standard forms.

We would like to conclude this section with a remark on the crucial aspect that all these 'phonological similarity driven' error types share: the fact that they seem to be triggered by the *phonological similarity* between the *present tense* forms of the verbs involved. In order to produce this type of error with a certain past tense form, the child first would have to notice the phonological similarities between the present tense form of the verb in question and those of its phonological neighbors. Interestingly, the observed developmental pattern revealed that the occurrence frequency of 'phonological similarity driven' error types significantly *increases* with age increase. This may indicate that the discovery of phonological similarity patterns among forms that don't necessarily share the same meaning may not be quite developed since the early stages of acquisition, but rather follow a gradually increasing path, in parallel with age increase.[17]

[17] In our case, *early stage of* acquisition refers to the age of 3 years old

Other Types of Past Tense Production Errors

Another error type observed in several clusters was what we termed 'lack of necessary stem change', which represents the fact that a necessary stem change in the transition from present to past tense, has not been performed on the verb.[18] Alternatively, we could also think of this error as: usage of the wrong stem in the wrong tense, such as usage of the present tense stem instead of the past tense stem (e.g., the incorrect past tense production **troket-i*, instead of the correct form *trokit-i* (knocked), where the present tense stem *troket* is used instead of the past tense stem *trokit*). Note, that the notion of 'present / past stem' can relatively safely apply in this case, since it is not difficult to identify the present and past tense stems for the majority of the verbs involved (especially those in cluster 1). As noted earlier, in some cases of the Albanian verbal inflectional system, it seems difficult to define clear boundaries between a verb's stem and its inflectional components.

This error type occurred in moderate (not high) levels and was observed in four clusters (cluster 1, 5, 8, and 9). Its presence may reflect effects of a *competition* between present and past tense stems, in line with the ideas proposed by Stemberger and colleagues (Stemberger, 2002; Stemberger, 2004; Stemberger & Middleton, 2003, for English; Tabak, Schreuder, & Baayen 2005b; Tabak, Schreuder, & Baayen 2010, for Dutch), where normally, the stem with the highest occurrence frequency for the child producing this error type, would *temporarily* take advantage and win the competition. Such competition effects have been attested in adult speech production tasks.

[18] In the majority of cases the change involves a vowel.

For example, Stemberger and Middleton (2003) presented irregular verbs in the progressive form (is falling), and asked subjects to respond with the simple past (fell). They found out that when the vowel of the past tense is more frequent in the language in general, compared to the vowel of the present tense, *overregularization* errors (e.g., falled instead of fell) decreased. When it is less frequent, *overtensing* errors (e.g., felled istead of fall) were more likely. This evidence was interpreted as suggesting that the present and past tense forms are in *competition*, and that this competition is modulated by the *occurrence probabilities* of the *vowels* in these verb forms.

Tabak, Schreuder, and Baayen (2005b) obtained further evidence for competition between the past and present tense forms using a task in which subjects were shown a present or a past tense form, and were asked to say out loud the corresponding past or present tense form (cross-tense naming task). The results revealed that the ratio of the frequency of the form seen to that of the form said was inhibitory. Importantly, this inhibitory effect was the same for both irregular and regular verbs. The authors interpreted the findings as showing that in normal situations, the two inflectional variants are not considered jointly, which would be necessary if one form is to be derived from the other. Instead, the targeted form is retrieved from memory without noticeable interference from its counterpart in the opposite tense.

We will not engage in a detailed discussion of this literature and its implications for models of morphological processing and representation, since it would be out of the scope of this study. Nevertheless, we think that the main idea proposed in this literature, i.e., *competition* between forms, may be useful for explaining the alternative interpretation of the so-called 'lack of necessary stem change' error type that we observed.

The occurrence frequency of this error type decreased significantly with age. This developmental pattern suggests that although young children of around 3 years of age, display difficulties with using the appropriate stem in the tense under inspection (i.e., past tense), their performance is gradually improved during the course of development. Using the above idea, we could say that if present, effects of *competition* between present and past tense stems seem to occur from a relatively early age (around 3 years), and decrease with time, indicating that with increased exposure to the correct forms and the lexicon growth, children learn to overcome such effects and associate the appropriate stem with a certain tense.

Children's performance with the irregulars resulted as expected: relatively high. The occurrence frequency of correct responses significantly prevailed over the error types observed. Most probably, this happens due to the rather *limited number* of the irregular verbs and their potentially *high usage frequency*. One of the most anticipated error types for this cluster, the 'overregularization of irregulars', occurred in rather moderate levels of frequency and displayed the tendency to significantly decrease with age increase, as expected. This finding is in line with other ones reported for English-speaking children (e.g., Marcus at al., 1992).

The absence of potential errors regarding the homonym pair {$pret_1$ (cuts); $pret_2$ (waits)} suggests that *meaning* (semantics) may play a role in the processing of past tense, and that this process may not be entirely related to *structure*, as maintained by some versions of the dual-route model (e.g., Pinker, 1999; Pinker & Ullman, 2002). Namely, these verbs are structurally the same, but have different meanings and different past tense forms, as well {$pret_1$ *– pre-u;* $pret_2$ *– prit-i*}. We found that there were no mismatches of the type *'past tense form – verb meaning'* in children's productions of the

pair's past tense forms. In no case did children use the past tense form of one of the verbs for the other verb of the pair. Even in the case of errors with the past tense forms, children produced errors appropriate for the verb's own past tense profile and not that of its pair mate.

Implications for Models of Morphological Processing and Representation

When explaining the Albanian past tense (in chapter 3), we maintained that describing the process in the terms used for English past tense inflection(e.g., 'default' rules for *regulars* and associative memory for *irregulars*, as posited by dual-mechanism models), would not be appropriate and sound, given the inflectional complexity and diversity of the Albanian verbal system. First of all, Albanian neither offers the option of a 'default' past tense rule, nor distinguishes between *regularity* and *irregularity* in the clear and sharp way that English does. In fact, this is a common characteristic of highly inflectional languages. Therefore, discussing the implications of theoretical models proposed for English, on findings from Albanian, may not make much sense, at a first sight. Nevertheless, leaving aside such a discussion would rule out the chance to criticize (if necessary) these models and request for improvements, in the light of new evidence and related implications from a different, and most importantly, highly inflectional language, Albanian.

Let us first start with the notion of *rule*. We will not give exact definitions and discuss the nature of a rule *per se*. Our interest lies in the way this notion is used in the related literature. Generative accounts of inflectional morphology consider past tense forms to be *derived* from their respective present tense forms, via certain manipulations

usually termed as ‘rules’. This assumption is endorsed by the rule-based accounts (dual-route (e.g., Pinker, 1999); multiple rules (Albright & Hayes, 2003); rule competition (Yang, 2002)), and surprisingly, by many connectionist models (e.g., Rumelhart & McClelland, 1986; Plunkett & Marchman, 1991; MacWhinney & Leinbach, 1991). However, there is accumulating evidence indicating that this very common assumption is wrong. Namely, Stemberger and colleagues suggested that inflected forms are not derived in this generative sense. Their evidence, based on speech errors, indicates that in English, present and past tense forms are both activated and enter into a *competition* process that is modulated by the occurrence probabilities of the stem vowels, as well as by infuences of the vowels in preceding words (e.g., Stemberger & Middleton, 2003; Stemberger, 2004). This hypothesis has received evidence from Dutch as well (e.g., Tabak, Schreuder, & Baayen, 2005b; Tabak, Schreuder, & Baayen, 2010).

Usually, this evidence is interpreted in favor of the view that the inflected past tense forms are not derived from the present tense stem, but are accessed independently. It also supports the so-called *Word and Paradigms* model of morphology, which takes the word, rather than its components, to be the basic meaningful unit of a language, and focuses on the paradigmatic organization of inflected words (Blevins, 2003). Furthermore the reviewed studies about the effects of the inflectional paradigms on lexical processing (e.g., Milin et al., 2009) also claim to favor this model. While the debate on *storage* versus *computation* models of morphological processing and representation is a rather interesting one, its detailed and explicit discussion is out of this study’s scope. The interested reader is directed to Baayen (2007) for a comprehensive picture on the topic. For the moment being, we will draw attention to the fact that the above evidence comes mostly from studies on English, and Dutch (more recently),

whose inflectional richness and complexity can be hardly compared to that of Albanian. Therefore, any implications from this evidence to the present findings is done with caution and where seen appropriate.

Of interest to the present discussion is the observation that if inflection is indeed not driven by 'derivational' rules, the dual-mechanism model of inflection (e.g., Pinker, 1999; Pinker & Ullman, 2002) as well as alternative rule-based models (e.g., Albright & Hayes, 2003; Yang, 2002) face serious trouble. Similarly, a model in which present tense and past tense forms are in competition is also problematic for many connectionist models adopting the assumption that *marked* forms are derived from *less marked* forms (e.g., Rumelhart and McClelland, 1986; MacWhinney and Leinbach, 1991; Plunkett and Marchman, 1993; Plunkett and Juola, 1999). On the other hand, the *network model* advocated by Bybee (1985, 1988, 1995, 2001), which endorses a *non-derivational* approach to morphological processing, would be in line with the above hypothesis. An important insight of the network model is that it allows for a *product-oriented* view of morphological generalizations, according to which, people form generalizations not only about the relation between inputs and outputs (e.g., present tense form – past tense form), but also about the outputs themselves (e.g., past tense form – past tense form) (e.g., Bybee, 2001).

What does the evidence from Albanian tell us about the existence of *rules*? Our major findings highlight the importance of analogy in a dual fashion: 1) as emerging from inflectional paradigmatic relations between past tense instances of a verb; and 2) as emerging from the phonological similarities between present tense instances of different verbs. The finding about paradigmatic analogy effects displays the importance of relations between *past tense* forms (i.e., first, second, and third singular past tense

instances of the inflectional paradigm), which is in line with the product-oriented view employed by Bybee's network model. The finding about phonological similarity effects indicates that phonological similarities between third person singular, *present tense* forms of different verbs may play a role in the processing of their respective past tense forms. At first sight, this finding may seem as favoring *source-oriented* (i.e., derivational) models, in which phonological analogies are considered to play a role in inflectional processing (e.g., several connectionist models; Albright and Hayes (2003)).

However, it is important to notice that the corresponding third person singular, *past tense forms* of the verbs that belong to the same phonological similarity neighborhood organized around their third person singular, present tense forms, are also phonologically similar to each other (e.g., *zbriti, priti, rrëshkiti, trokiti,…; çoi, lexoi, punoi,…; gjuajti, vuajti, luajti,…*), which might have triggered the related phonological similarity error types in children and in some cases, adults as well (e.g., **ngiti*, **shkiti; *mbroi; *kruajti*, **shkruajti*). Therefore, in line with the claims of the network model, a product-oriented generalization type may apply in these cases as well. Whether triggered by source-oriented (present tense forms), or product-oriented (past tense forms) analogies, the crucial aspect of this finding for our purposes, is that it points at the the importance of phonological similarities between words, which don't necessarily (in fact, almost never) share the same meaning (semantics). Furthermore, the network model (its recent versions, e.g., Bybee, 2001) allows for both types of analogies and generalizations: source and product-oriented.

Our findings don not support the notion of *rules* in the way applied in Pinker and collegues' classical dual-mechanism model, which posits a strictly *derivational*, 'default' rule for regular inflection. This rule is blind to any kind of analogy between

phonologically similar forms and word frequency effects. Only irregular inflection is sensitive to phonological similarities between forms, since only irregulars are stored in associative memory. Albanian is a good example of a language that wears out the usually discussed dichotomy between regular and irregular inflection. Therefore it doesn't make much sense to either talk about two distinct processing mechanisms responsible for the processing of Albanian past tense, or posit any 'default' derivational rules.

Albright and Hayes' (2003) *Multiple Rules* model represents an improvement of the dual-machanism model in an important aspect: it recognizes the effect of analogical similarity (islands of reliability in their terminology) for *regular* inflection as well. However, this model also employs a strictly derivational view of rules and accredits rules with even more importance and relevance for morphological processing than the traditional generative view. Its derivational rule-based nature, renders it rather difficult for this model to account for potential product-oriented generalizations. In fact, the authors recognize this fact as well, reporting the presence of this kind of generalization in their findings. Therefore, this model also would not be able to account for the *paradigmatic analogy effects* (*product-oriented generalizations*, in the terms applied by the network model) that we observed.

The same reasoning would apply to Yang's (2002) 'all-rules' model. Maybe, an interesting aspect of this model would be the notion of *competition* that it involves. As mentioned, we observed an error type ('lack of necessary stem change'). When alternatively interpreted as stem-tense mismatch, i.e., usage of the wrong stem in a certain tense (e.g., present tense stem instead of the past tense stem), it seems reminiscent of *competition effects* between the present and past tense stems of the related

verb. However, while Yang (2002) advocates a competition among *derivational rules*, our interpreation of the phenomenon involves competition between different stem instances of a verb, which seems in line with the *non-derivational* competiton notion proposed by Stemberger and colleagues (e.g., Stemberger & Middleton, 2003; Stemberger, 2004; Tabak, Schreuder, & Baayen, 2005b).

With the connectionist and analogy-based models (Skousen's AML, Daeleman's MBLP model), our findings share a major component: the importance of analogy and similarity to other exemplars). However, we suspect that the connectionist models which employ a *derivational* type of reasoning in the mapping process from present to past tense forms would encounter difficulties in explaining two of our findings: 1) the paradigmatic effects among the past tense instances of a verb, and 2) the so-called 'lack of necessary stem change', which we alternatively interpreted as stem-tense mismatch, and tried to explain in terms of the *non-derivational* competiton hypothesis proposed by Stemberger and colleagues (e.g., Stemberger & Middleton, 2003; Stemberger, 2004; Tabak, Schreuder, & Baayen, 2005b).

In sum, while being in line with certain aspects of some of the models discussed above, our findings seem to provide more support for, and favor models of morphological processing and representation in which *relations* (morpho-phonological, inflectional, semantic) among different words, as well as among different inflected variants of the same word (commonly conceived as *paradigms*), play the *dominant* role in the processing and representation of lexical items. Under this perspective, Bybee's *network model* seems to be the most relevant one among the several models inspected.

With respect to other acquisition studies that we reviewed, our major findings don't support a common view endorsed by proponents of the dual-mechanism model

(e.g., Clahsen et al., 1992; Clahsen, 1999), according to which children's performance with regular and irregular past tense inflection is *very similar* to the performance of adult speakers, and as such it implies that the linguistic system and linguistic representations don't change much over time. Instead, our prominent findings reveal error type patterns peculiar to children, which depending on the type, may either persist for a moderately long amount of time (the 'v' pattern overgeneralization, persistent in comparable levels, from 3 years to 5 years of age (at least)), or display a decreasing tendency with age (the 'phonological similarity driven' error types). Based on these observations, we argued for a *dynamic* nature of children's representations for words, which is prone to change, such that children may oscillate (go back and forth) in the way they represent relations between words: defining and redefining, evaluating and re-evaluating these relations during the course of the acquisition process, until reaching an adult-like representation level. Furthermore, a certain error type that occurred in relatively high levels with the adult subjects as well ('phonological similarity driven' error type, in cluster 9) seems to suggest that adult representations are also prone to change, illustrated by their preference for *non-standard* forms, which in turns gives rise to what are usually called instances of *language change*.

We also note that our major findings bear similarities with those of other acquisition studies conducted with English-speaking children (e.g., Marchman, 1997; Marchman, Wulfeck, & Weismer, 1999). Namely, these studies present evidence of English-speaking children's sensitivity to combinations of *verb frequency* and *phonological* properties of stem and past tense forms, which has been interpreted in favor of connectionist models. However, to our present knowledge, our study may be the first one to report effects of *paradigmatic analogy* among different past tense instances

of a verb (comprising the singular portion of the verb's past tense inflectional paradigm), in Albanian-speaking children, during their acquisition of the past tense.

Conclusion

Our findings, via different ways, converge at one point: the importance of the relations between words that share similar morpho-phonological, semantic, or both properties. Furthermore, analogy to existing forms is retained crucial in the creation, representation, manipulation, and maintenance of these relations. Our first major finding highlights the importance of a particular type of morpho-phonological and semantic relation between inflected instances of a verb, described under the linguistic term *inflectional paradigm* of the verb. In our case, children extended a pattern present in two past tense instances of the verb's paradigm to a third instance of the paradigm, where this patter is normally absent. We explained this finding in terms of *paradigmatic analogy effects*, emerging from the intrinsic relations among the paradigm members. Our second major finding points at effects of phonological similarities among *present* (and / or *past) tense* instances of different verbs, whose present tense, third person singular forms were observed to belong to the same phonological neighborhood. *Phonological similarity* among present (and / or past) tense instances of these verbs seems to be the most prominent factor behind the related past tense error types that children produce.

Taken together, the implications of these findings may be regarded as representing two facets of the same coin: while the first finding displays a facet in which analogy among different past tense instances of the same verb leads to a relatively high occurrence of a certain pattern overgeneralization; the second finding displays another

facet, in which analogy derived from the phonological similarities among the present (and / or past) tense forms of different verbs, seems to play a role in children's production of the related past tense error types. Both these facets belong to the same coin, which in turn represents the importance of: relations between words that share similar inflectional, morpho-phonological and / or semantic properties; and analogy to existing exemplars, as the most potential factors influencing the processing of Albanian past tense.

The Importance of the Study

This is the very first study done on the acquisition of Albanian past tense. As such, it has the privilege to be the first one to discover and report the different error types that Albanian children tend to produce during the acquisition process. It is also the first to report the developmental path that children follow in the presence, or absence of any error types. Furthermore, it is highly probable that this study is the first one to report the presence of the so-called *paradigmatic analogy effects* in young acquiring children. As such, it might retain a special place in the rapidly accumulating literature on the effects of morphological paradigms.

Limitations and Future Research

Being the first stone has limitations as well. Our study lacks the exact information about an important factor: the occurrence frequencies of the verbs involved. Although we tried to estimate potential frequency levels (e.g., high) based on certain known facts about the distribution of Albanian verbs, and on our pragmatics-based intuition, obviously, it

would have been better if we had access to the exact frequency values of each verb under consideration. This would also allow us to directly test the predictions and validity of the information theoretic concepts we employed in our arguments, and consequently to make stronger and more robust claims regarding the observed phenomena. Obviously, this absence raises the need for the creation of large electronic corpuses consisting of Albanian words (nouns, verbs, etc.), in order to calculate the related occurrence frequencies.

An important aspect of the present study is that the obtained evidence raises important questions about morphological processing and representation in Albanian in particular, as well as for highly inflectional languages in general. For example, in several cases it seems difficult to define clear boundaries between the *stem* of a word (verb) and its *inflectional components.* We posited that this would cause challenge and confusion to children during the acquisition process. However, for a better understanding of the phenomenon, further acquisition studies with larger number of children, tapping on different, peculiar aspect of morphological processing in Albanian, are necessary. In addition, it would be ideal if these acquisition studies would be supported by related lexical processing studies conducted with adult subjects, such as: lexical decision, word / picture naming, and production tasks with nonce verbs.

Another emerging question that might deserve attention and future work is: What is *stored* and what is *computed* in a highly inflectional language such as Albanian, which displays a complex inflectional system, accompanied by numerous discrepancies and diversities?

APPENDIX

ALBANIAN VERBS USED IN THE ELICITED PRODUCTION TASK

Table 36. The Practice Verbs Used in the Elicited Production Task

Present Tense (third person singular)	Past Tense (third person singular)
vrapon (runs)	*vrapoi* (run)
blen (buys)	*bleu* (bought)
bërtet (yells)	*bërtiti* (yelled)

Table 37. The List of the Albanian Verbs Used in the Elicited Production Task, in the Randomized Order of Presentation to Children

Present Tense (third person singular)	Past Tense (third person singular)	Present Tense (third person singular)	Past Tense (third person singular)
1. sjell (brings)	*solli*	*28. lë* (places)	*la*
2. ha (eats)	*hëngri*	*29. do* (wants)	*deshi*
3. fshin (wipes)	*fshiu*	*30. flet* (talks)	*foli*
4. fal (gives away)	*fali*	*31. merr* (takes)	*mori*
5. shkruan (writes)	*shkroi*	*32. fle* (sleeps)	*fjeti*
6. çan (splits)	*çau*	*33. shkrin* (melts)	*shkriu*
7. plas (bursts)	*plasi*	*34. vret* (hurts)	*vrau*
8. rrëshket (slides)	*rrëshkiti*	*35. gjuan* (hits)	*gjuajti*

Table 37. continued

9. hedh (throws)	*hodhi*	*36.shtrin* (lays down)	*shtriu*
10. hap (opens)	*hapi*	*37. mbron* (defends)	*mbrojti*
11. lyen (spreads)	*leu*	*38. nget* (drives)	*ngau*
12. djeg (scorches)	*dogji*	*39. del* (comes out)	*doli*
13. shtyn (pushes)	*shtyu*	*40. kruan* (scratches)	*kroi*
14. kap (grabs)	*kapi*	*41. pret$_1$* (cuts)	*preu*
15. troket (knocks)	*trokiti*	*42. rri* (stays)	*ndenji*
16. shkon (goes)	*shkoi*	*43. zbret* (comes down)	*zbriti*
17. thotë (says)	*tha*	*44. ndan* (divides)	*ndau*
18. mban (holds)	*mbajti*	*45. pret$_2$* (grips)	*priti*
19. jep (gives)	*dha*	*46. lexon* (reads)	*lexoi*
20. pi (gives)	*piu*	*47. ngre* (lifts)	*ngriti*
21. mbledh (collects)	*mblodhi*	*48. gjen* (finds)	*gjeti*
22. vë (puts)	*vuri*	*49. çon* (carries away)	*çoi*
23. arrin (reaches)	*arriti*	*50. hyn* (enters)	*hyri*
24. shikon (sees)	*pa*	*51. kthen* (turns upside down)	*ktheu*
25. zë (catches)	*zuri*	*52. thyen* (breaks)	*theu*
26. vjen (comes)	*erdhi*	*53. shket* (slips)	*shkau*
27. bie (falls)	*ra*	*54. fryn* (blows)	*fryu*

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