Age Effects in the Acquisition of English Onset Clusters by Turkish Learners
Age Effects in the Acquisition of English Onset Clusters by Turkish Learners: An Optimality-Theoretic Approach

By

Yasemin Yildiz
Age Effects in the Acquisition of English Onset Clusters by Turkish Learners:
An Optimality-Theoretic Approach,
By Yasemin Yildiz

This book first published 2010
Cambridge Scholars Publishing
12 Back Chapman Street, Newcastle upon Tyne, NE6 2XX, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Copyright © 2010 by Yasemin Yildiz

All rights for this book reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright owner.

This book is dedicated to my Mother, Kâmile, and Father, Mehmet.
Table of Contents

Acknowledgements ........................................................................................................ x

Chapter One ..................................................................................................................... 1
Introduction

Chapter Two ..................................................................................................................... 6
Approaches to Problems of Language Learning
  2.1. Acquisition of L1 Phonology
  2.2. Acquisition of L2 Phonology
  2.3. The Availability of UG and Age Effects in L2 Acquisition

Chapter Three .................................................................................................................. 20
Optimality Theory and Language Learning
  3.1. Overview to Optimality Theory
  3.2. Optimality Theoretic Approach to L2 Grammars
  3.3. Learning Algorithms
  3.4. OT and the Inadequacy of Previous Theories

Chapter Four ................................................................................................................... 36
English and Turkish Syllable Structure
  4.1. English Cluster Inventory
  4.2. /s/-clusters
  4.3. Analysis of Turkish Syllable Structure
  4.4. Prosodic Development

Chapter Five .................................................................................................................... 98
The Study
  5.1. Subjects
  5.2. Methodology
  5.3. Hypotheses
  5.4. Research Questions
# Table of Contents

Chapter Six ................................................................. 105
Results
  6.1. Non-/s/-clusters
  6.2. /s/-clusters

Chapter Seven ...................................................... 223
Optimality Theoretic Analysis of the Data and Implications
  7.1. Research Questions
  7.2. Implications for the role of *COMPLEX-ONSET in Present-Day Turkish
  7.3. Future Research
  7.4. Conclusion

Appendix A ............................................................. 265
List of Subjects

Appendix B ............................................................. 268
Experimental Stimuli

Appendix C ............................................................. 270
Non-/s/-clusters between-groups in Task 1

Appendix D ............................................................. 277
Non-/s/-clusters within-groups in Task 1

Appendix E ............................................................. 297
Non-/s/-clusters between-groups in Task 2

Appendix F ............................................................. 317
Non-/s/-clusters within-groups in Task 2

Appendix G ............................................................. 334
/s/-clusters between-groups in Task 1

Appendix H ............................................................. 336
/s/-clusters within-groups in Task 1

Appendix I ............................................................. 344
/s/-clusters between-groups in Task 2
Appendix J........................................................................................................... 367
/s/-clusters within-groups in Task 2

Appendix K ........................................................................................................... 407
Additional Data

Appendix L........................................................................................................... 419
List of Constraints and Abbreviations

References ........................................................................................................... 424

Notes..................................................................................................................... 440

Index.................................................................................................................... 442
ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Dr Wyn Johnson, for her academic as well as personal support towards the completion of this dissertation. She has not only provided me with invaluable feedback on my work but also with constant encouragement during difficult times. Most importantly, she has always been there for me when I needed her support and very kindly devoted her invaluable time for office visits, which I gratefully appreciate. I would also like to thank her for inspiring me with the wonders of phonology.

I am also indebted to the rest of my research committee, Dr Dave Britain, Professor Andrew Spencer, Dr Enam Al-Wer and Dr Rebecca Clift for their support. I would also like to thank Professor Roger Hawkins for guiding me with my PhD research proposal. Thanks are also due to the rest of the teaching and administrative staff at the Department of Language and Linguistics, at the University of Essex, for their support during my doctoral study.

I would also like to thank all teaching staff at the Department of English Language at Boğaziçi University, Marmara University, and Yeditepe University in Istanbul, Turkey, for giving me the opportunity to collect my data. Without their co-operation I would not have been able to gain access to my subjects. I would also like to thank my university student subjects for their participation. I am also indebted to the English teachers at Private Coşkun Çamlıca Primary School, Private Burç Nursery School, and Private Milenyum Child Play Centre in Istanbul for allowing me to gain access to their pupils for data collection.

Next, I would like to thank my fellow phonologists at the University of Essex, Nabila Louriz and Paula Reimers for their support and useful feedback during the phonology workshops.

Special thanks go to Charlotte Owen and Farhana Barbhuiyan for their support, encouragement and close friendship.

Least, but not last, I would like to thank my mother, Kâmile, and my father, Mehmet, for their faith and encouragement and constant emotional support during difficult times. Without their support I would not have been able to complete this dissertation.

The study reported here has been supported by the Economic and Social Research Council Scholarship.
CHAPTER ONE

INTRODUCTION

1. Introduction

This dissertation has three main goals. The first goal is to contribute to the literature of Second Language (L2) phonology, both theoretically and empirically. The reason behind this motivation is because in the field of L2 acquisition there have been relatively fewer studies of L2 phonology than of L2 syntax and First Language (L1) phonology. Despite some of the recent advances in L2 phonology (e.g. Ioup & Weinberger, 1987; Yavaş, 1994), previous studies in L2 have focused mainly on trying to develop theories that could predict where a learner’s errors might occur rather than attempting to create a model of L2 acquisition similar such to those posited for L1 acquisition (i.e. Smith, 1973; Kiparsky & Menn, 1977).

Theories of L2 phonology range from Contrastive Analysis (Lado, 1957), which compared the areas where the L2 differed from the L1 to determine what would be difficult for the learner, to Error Analysis (Corder, 1967), which advocated looking only at the developing grammar of the learner to ascertain where difficulties existed, to a series of theories that argued that universal (i.e. unmarked) structures would emerge in a learner’s speech when s/he could not cope with a structure in the L2 phonology (Tarone, 1980; Eckman, 1987; Major, 1987). However, neither of these theories appeal to formal linguistic theory, and nor can they explain how children or adults acquire languages. In addition, although these theories may be able to foresee which phonological structures will cause difficulties for the learners, they are rarely able to predict the actual errors that learners will exhibit. However, if theoretical L2 research is to have practical application, knowing what the errors will be can help both researchers and instructors develop a methodology that can help L2 learners become more efficient.

Because of the inadequacy of these theories of L2 phonological acquisition, characterizing the process involved in acquiring a second language has been problematic. As a result, a framework that both appeals
to phonological theory and provides a learning model is required. In this dissertation, I propose to explain how *Optimality Theory* (Prince & Smolensky 2004, see Chapter 3, henceforth OT), which has been used to model phonology, L1 acquisition, loan phonology, and historical change, can also be a useful tool in modelling the developmental paths in L2 acquisition. Interpreting the current L2 data with the appropriate descriptive tool will fulfil the first goal of this dissertation.

The second and main goal of this dissertation is to investigate the acquisition of English onset clusters by native Turkish speakers. For the purpose of this study I am particularly interested in Turkish L2 learners since to date there has been very limited work on the acquisition of English phonology by Turkish learners. Similarly, there are studies that address the acquisition of syntactic rules by Turkish-speaking children (Aksu-Koç & Slobin, 1985; Ekmekçi, 1979), yet reports on their acquisition of L1 phonology (Topbaş, 1988, 1991; Acarlar & Ege, 1996; Kündük, 1989) also remain very limited. While these limited studies on Turkish L1 phonology identify the main repair strategies which Turkish children adopt, they do not look at the prosodic development as a whole. In other words, the conceptualisation of speech has been restricted to the phonetic level. This in turn has hindered our general understanding of Turkish L1 prosodic development, and had an effect on the development of the diagnostic description of phonological disorders and the design of the educational curriculum. However, it is a welcoming fact that recent research on Turkish L1 phonology has looked at the acquisition of Turkish coda clusters both in normal (Topbaş, 1997) and delayed development (Topbaş, 1997; Kopkallı-Yavuz & Topbaş, 1997; Topbaş & Konrot, 1997). Despite this improvement, at present there is still no research which has investigated the acquisition of Turkish onset clusters by Turkish children. This limitation may be attributed to the fact that Turkish onset clusters do not consist of native Turkish words or old borrowings, which are fully integrated into the Turkish lexicon in the same way as Turkish coda clusters.

Similarly, limited work has also been carried out on Turkish L2 learners. Most of the literature documented on L2 Turkish learners is often within the field of bilingual development and in most cases the studied L2 is non-English. Often these bilingual studies have focused on the acquisition of L2 German or L2 Dutch syntax (Jansen, et al., 1981; Belders, et al., 1980; Auer, 1998; Backus, 1992, 1996), while research on phonological development remains very limited both in number and scale (e.g. Türker, 1998; Norwegian-Turkish bilinguals). Studies looking at English-Turkish bilingual speech are also very limited and at present there
is only one study by Yıldız (2001) which provides an in-depth account of the phonological behaviour of English-Turkish bilingual speech.

The most fundamental research gap, which directly concerns this current study, is the fact that studies looking at the acquisition of English phonology by Turkish learners are extremely limited in comparison to L2 English syntax. Nonetheless, recent research in L2 syntax has also stressed the importance of phonological analysis in L2 acquisition. For instance, Goad and White (2004), who have investigated the acquisition of English syntax by Turkish learners, have shown that certain types of syntactic behaviour cannot be explained without prior knowledge of the L2 learner’s L1 phonology. At present there is only one study by Davidson (1997), who has looked at the acquisition of English coda clusters by Turkish learners. However, this study is limited to the acquisition of English coda clusters only and at present there is still no research which has investigated the acquisition of English onset clusters by Turkish L2 learners. A further limitation of Davidson’s research is that it is limited to one adult Turkish speaking L2 learner, thus wider generalisations can not be drawn from this research.

A further limitation as regards Turkish learners in L2 phonology is the fact that at present there is no research which has investigated child Turkish L2 learners. Based on this limitation, the third goal of this research is to investigate age effects in L2 phonology. Past research in L2 phonology, which has investigated age effects in L2 acquisition, has often looked at the “end-state” of acquisition in order to test the Critical Period Hypothesis (Lenneberg, 1967, hereafter CPH) and examine whether the L2 learner has attained native-like pronunciation; and often the general consensus is that after puberty attainment of native accent becomes impossible (e.g. Scovel, 1988; Long, 1990). The primary concern of this concern of this study, by contrast, is not to test the CPH, as we are interested in identifying the developmental paths in L2 phonology, rather than examining the “end state” of acquisition. This new and alternative approach, I believe, will yield insightful L2 data and contribute to our understanding of markedness and age effects in L2 phonology, including the availability of universal principles (i.e. Universal Grammar; hereafter UG). Further, within an OT framework we will also be able to gain a better understanding of the phonological grammar of both age groups (i.e. pre-pubertal and post-pubertal) and both levels (i.e. beginner and intermediate) and identify where the re-ranking of certain constraints is blocked. This will in turn give a probabilistic indication of the end-state. Therefore the results may or may not bear on the CPH; if they do, the evidence they provide can only be of a probabilistic kind.
In order to investigate age effects in L2 phonology the subjects under investigation will therefore consist of child and adult Turkish speaking learners of English. The data for this study will be collected from Turkish speakers learning English in Istanbul, Turkey, and there are three main reasons for this. Firstly, this will allow us to work with a homogenous group since all learners will be learning English under the same conditions- e.g. target language will not be used outside the classroom. Secondly, collecting data from Turkish speaking learners of English living in the United Kingdom might lead into the direction of bilingual research and not L2 phonology, thus we must avoid falling into this trap.

The third and most important reason as to why the data is collected from Turkish speaking learners of English being taught in Turkey is directly related to the current radical changes in the Turkish education system. The growing number of private schools in Turkey since 1998 has also meant that pupils are now taught English at a younger age, usually at the age of 4. Due to the popularity of this new educational reform, State schools (most if not all) have also started to follow this new trend and have started to teach English at the age of 4 instead of 11. Current educational reforms of this kind also mean that there can be no better time to investigate age effects in L2 phonology.

Overall, this dissertation will provide new and original data from Turkish speaking L2 learners of English and the reason for this is two-fold. Firstly, it will look at the acquisition of English onset clusters, an area where there is a huge research gap. Secondly, unlike previous L2 phonology studies, which have usually looked at adult L2 learners only, this study will look at both child and adult L2 learners.

The research is organized as follows:

Chapter 2 contains a literature review of the approaches to the problem of L1 and L2 phonology. The final part of Chapter 2 also reviews previous work on the availability of Universal Grammar (UG) in L2 acquisition and provides a review of previous studies looking at age effects in L2 phonology.

Chapter 3 provides an in-depth explanation of OT. In the first section of Chapter 3, the reader will be introduced to the conventions used in OT and the basic principles that guide the theory. The second section will provide a brief overview of the three main OT learning algorithms (i.e. Constraint Demotion Algorithm, Gradual Learning Algorithm and Biased Constraint Demotion Algorithm) and discuss their applicability to L2 phonology. The final part of Chapter 3 will also examine the credibility of OT in comparison to previous acquisitional theories.
Chapter 4 contains an extensive OT analysis of English and Turkish syllable structure. This will provide the necessary background for understanding the learner’s starting point for acquiring English. Particular emphasis is given on the phonological behaviour of initial /s/-clusters, both in developing and developed systems, due to the special status of /s/-clusters. The second section of Chapter 4 contains a series of predictions regarding the course of language development that can be made by Turkish L2 learners. The third section will provide a review of the previous studies on Turkish learners of English L2 phonology. The final section of Chapter 4 will include a literature review on L1 and L2 prosodic development and all of the relevant factors under investigation will also be outlined.

In Chapter 5, the subjects, design and procedure, hypotheses and research questions are presented.

Chapter 6 contains the results, which are interpreted within an OT framework and the results are divided into two sub-parts. The first part examines the acquisition of non-/s/-clusters and the second part examines the acquisition of /s/-clusters, both in Stage 1 and Stage 2. For both cluster types, Task 1 and Task 2 results are also analysed separately. Chapter 7 includes a detailed discussion of the wider implications of the results and addresses the research questions and outlines areas for further research. A conclusion is also drawn up in Chapter 7
CHAPTER TWO

APPROACHES TO PROBLEMS OF LANGUAGE LEARNING

This section will examine previous models of L1 and L2 phonological acquisition. Undoubtedly, the most significant difference between the two types of acquisition is the fact that second language learners are not starting from a “blank slate” like children presumably do, but rather from the already formed phonological grammar of their native language. Hence, the processes and the end result may be different. Nonetheless, studies of several aspects of interlanguage phonologies have revealed universal tendencies (e.g., Broselow & Finer, 1991; Hancin-Bhatt & Bhatt, 1997). In this respect, it has become apparent that studies of L2 phonology can make contributions to the study of universals in the same way as studies on L1 phonology.

2.1 Acquisition of L1 Phonology

This section will discuss previous models of child language acquisition in preparation for an explanation of how they might be relevant to a theory of second language acquisition.

2.1.1 Previous Theories of L1 Phonology

Up until the seventies most reliable data for L1 phonology was very limited and often obtained from sporadic diary accounts mainly by scholar parents. Due to this limitation competing models of phonological development were drawn up mainly on theoretical grounds. Consequently, frameworks employed to explain L1 phonology have paralleled theoretical phonological frameworks. For instance, Jakobson (1941) linked diary studies of child utterances with the typological study of the sound systems of the world’s languages, and he was the first to propose on the notion of implicational universals of adult phonological systems. A typical example
is where the acquisition of fricatives presupposes the acquisition of stops in child language since in linguistic systems of the world the former cannot exist unless the latter exist as well.

Moreover, Jakobson was the first to introduce the idea of “markedness” into the discussion of language acquisition. Based on the structural contrasts in his theory, Jakobson suggested that the most unmarked forms would be the earliest acquired and would also occur in all the world’s languages. The rarer the sound in the languages of the world, the later it would be acquired by the learner. For instance, all languages have stops (317/317-100%; based on a set of sample languages), but not all languages have fricatives (296/317-93.4%) (Maddieson, 1984). Unsurprisingly, L1 acquisition research findings also show that fricatives are acquired later than stops (Locke, 1973; Vihman, 1996).

The underlying principle of Jakobson’s theory is that there is a universal order of acquisition, largely based on phonological oppositions and phonetic properties of segments. Nonetheless, the main criticism of Jakobson’s theory is his claim that there is a discontinuity between babbling and speech (i.e. the onset of speech/phonology is the point at which a child begins to acquire phoneme contrasts). Ferguson and Macken (1983) oppose this view; however a more detailed analysis of both arguments is beyond the scope of this dissertation since we are not interested in the prelinguistic stage of L1 acquisition.

The next advancement in phonological theory is the introduction of Generative Phonology. The standard theory of generative phonology was borne out of Chomsky’s (1965) work when he linked linguistic theory and language learning. Chomsky’s main claim is that the child is innately provided with “tacit knowledge” of universal principles of language structure. The same claim was also highlighted in *The Sound Pattern of English* (Chomsky & Halle, 1968, henceforth SPE). The SPE theory is segmental, rule-based, and derivational. SPE is a segmental theory since the principal element of phonological representation is the individual speech sound, a segment. Segments are bundles of values for distinctive features (e.g. [t] is [+coronal, -continuant, -voice…]) but the features only have a classificatory role. Phonological processes in SPE are expressed by rules and these rules apply in sequential derivation. In other words, the rules are ordered in a language-particular list.

One of the main shortcomings of the SPE is the fact that it does not provide the means of expressing natural processes. One such counter example, given by Kenstowicz and Kisseberth (1979), is the process where in some languages consonants are converted to ? and h in preconsonantal
and final position. The neutralization to a glottal stop in these positions is not assimilatory in nature and is instead a natural rule.

The next advancement in phonological theory was the introduction of Natural Phonology (NP), which was developed by Stampe (1973). This emerged as a way of addressing the shortcomings of the SPE. The central idea of the NP is that learners begin with a set of innate natural processes (i.e. Universal Grammar; UG), such as simplification of clusters and stopping of fricatives. At the onset of learning, all of the innate processes are active, and therefore children’s early productions tend to be highly variable (since their L1 parameter settings are not yet set) and unmarked. NP views the phonological system of any language as “the residue of a universal set of processes reflecting all the language-innocent phonetic limitations of the infant” (Donegan & Stampe, 1979:127). In the acquisition of a primary language, these processes are variously applied, some remaining productive while others are suppressed or remain latent after exposure to positive evidence in the ambient language. For example, learners of English will, upon encountering words like ‘bad’ or ‘bag’, eventually suppress the natural process of final devoicing, but learners of Turkish will not, since they never hear word final voiced stops due to the final devoicing rule.

From the early 1970s to the present, linguists have been concerned with creating models of perception and production that could account for L1 acquisition data. The interest in models of phonological acquisition has mostly grown out of Smith’s (1973) study of his son Amahl from age 2 to 4. In his work, Smith devises a set of “realization rules” to express the regularities in his son’s phonological development. In addition, he provides two sets of analyses: (1) the child’s underlying representation (UR) is identical to the adult surface forms; and (2) the child’s system is self-contained and has no relation to the adult grammar. Despite this dual representation, Smith rejects the validity of the second analysis and concludes that the child’s URs are generally equivalent to the adult surface forms that the child takes in as his input. Evidence for this assumption comes from the fact that Amahl was able to recognise and discriminate certain lexical items of the adult language, which he himself could not or did not produce in his production, and therefore indicates that Amahl must have stored the adult forms. For instance, Amahl was able to point correctly to pictures of a mouse and a mouth even though he was unable to produce the contrast between [s] and [θ].

Unlike Smith (1973), Stampe’s (1973, 1979) dissertation on Natural Phonology abandoned the prevailing belief in rule ordering and relied alternatively on a set of “universal” rules that were all part of the grammar.
Within the NP framework, Stampe (1979: 46) pointed out the fundamental distinction between “innate phonological processes” and language specific “acquired phonological rules”. According to Stampe, the innate constraints represented a restriction on the phonological component of a language, while the acquired rules governed how a language implements the phonological possibilities that are not prohibited by the constraints. In terms of first language acquisition, Stampe remarked that “(t)he evidence of child language shows clearly that phonological constraints are innate, and do, from the outset of speech, govern phonetic behaviour. It would be surprising if these constraints did not persist in adult speech” (1979: 45). In many respects, NP incorporated the tenets of OT, which will be discussed in Chapter 3.

The underlying principle of NP is that in L1 acquisition the UR of the child is identical or nearly identical to that of the adult and the child’s mispronunciations are due to processes causing deviations from the adult target rather than to perceptual inabilities. Thus, a child who says [gak] for ‘dog’ is trying to say [dag], but due to consonant harmony and terminal obstruent devoicing, the word is pronounced as [gak]. In L1 acquisition, the child knows the adult target, whereas the L2 learner may or may not know the UR. For the L2 learner, in this respect, there seem to be three possibilities with respect to the UR. The underlying lexical representations may be the same as the L2 learner’s L1 or same as the L2 or something intermediate. Furthermore, just as the URs can vary in these three ways, so too can the processes that act on URs to produce surface forms.

Thus these processes may be the same as the L1 (transfer processes), different from the L1 and L2 (universal developmental processes) or the same as the L2. The goal of the L2 learner is to suppress the L1 processes that cause interference, while applying other processes that are present in L2 but absent from L1. If learners cannot master the processes required by L2 “naturally”, they will be forced to learn them as rules- which they consequently would not apply in all and only suitable contexts (Zborowska, 1997). In L1 acquisition the situation is much simpler since it is only the universal developmental processes that have a role.

There are two crucial problems with the L1 acquisition literature we have reviewed thus far. Firstly, there is no consensus as to whether a child’s UR is adult-like or non-adult-like. Some linguists argue that the child’s UR is non-adult-like (e.g. Macken, 1980); whereas others argue it is adult-like (e.g. Stampe, 1979). Secondly, it is a welcoming fact that NP departs from rule-based phonology and identifies the innate processes in L1 phonology. Nonetheless, NP is unable to account for variable output and variable difficulty, since it assumes uniformity across children and
assumes that children will find similar things difficult. For instance, the word-final voiced obstruent in [pɪg] ‘pig’ is not always devoiced as it is expected, since it is also epenthesized [pɪɡə], deleted [pɪg] or reduplicated [pɪpɪ]. NP cannot account as to why different strategies are used by different children. Similarly, the innate processes can not account for children who have no difficulties with what is statistically difficult- e.g. the claim that CV is the basic syllable is falsified as soon as there is a child whose first syllable is not CV, as is the case of Eleni in Edwards (1970) who substituted ‘look’ with [ʊk] and then later with [jʊk].

Strictly speaking, the first problem has no direct relevance to the scope of this current research since the primary goal of this dissertation is to examine production rather than perception. In this case, for the purpose of this study we need a theory which 1) makes no direct reference to the UR (i.e. output-oriented) and 2) accounts for variability. The next learning theory I will introduce, that is Optimality Theory (OT) (Prince & Smolensky 2004; see Chapter 3 for a full description of OT), can account for both of these requirements.

Firstly, OT is output-oriented and assumes that the child’s UR parallels with the adult surface form (e.g. Demuth, 1995; Gnanadesikan, 2004, although these authors only examine examples where the surface form and underlying form are the same in the adult grammar). In principle, OT can account for both “competence” and “production” (Smolensky, 1996a). Secondly, OT views phonological systems as a result of rankings of universal constraints. OT is closer to NP than to SPE since it replaces the concept of rules with constraints. As NP postulates a universal set of natural processes, OT claims there is a set of constraints shared by all speakers-hearers. These constraints are not all inviolable; some, which are violable, can serve to capture patterns that do not occur throughout the language, however widespread they may be. The rankings of constraints hypothetically differ among individual child acquirers and from one primary language- hence also interlanguage -to another. With these differing rankings we can also account for as to why not all children find similar things difficult.

### 2.2 Acquisition of L2 Phonology

#### 2.2.1. Previous Theories of L2 Phonology

Historically, it has been assumed that L2 phonology had no relevance to phonological theory in the same way as L1 phonology. The reason for this is two-fold. Firstly, the reluctance of L1 researchers and theorists to look
at L2 phonology has been partly due to the assumption that research on L2 phonology was conducted for pedagogical reasons only. Secondly, it was assumed that L2 phonology is directly related to the learners’ native language grammar, yet recent research has shown that L2 learner errors cannot be explained only by reference to the learner’s native language. In fact, several studies in L2 phonology have revealed universal tendencies which also correlate with L1 phonology (e.g. Benson, 1988; Broselow & Finer, 1991). The aim of this section therefore is to illustrate how SLA theory can inform linguistic theory and vice versa. In SLA, the learner must identify a new set of constraints imposed upon universal processes. In research on L2 speech, NP provides a basis for predictions on how learners will attempt to overcome their difficulties with certain sounds in the L2, but it cannot predict which process a learner will choose on a particular occasion. Nonetheless, research in the NP framework has pointed up the fundamental distinction between rules and processes. In other words, Stampe assumes that children do not learn a set of processes often expressed as rules and instead assumes that the processes are universal and innately available. It is therefore these automatic phonological rules, which he terms “phonological processes”. The goal of the L2 learner, therefore, is to suppress the L1 processes that cause interference, while applying other processes that are present in L2 but absent from L1.

L2 acquisition research has shown that both language-specific transfer factors and nonlanguage-specific universal developmental factors govern the formation of interlanguage phonology. Interlanguage syllabic structure, in particular, has attracted a great deal of attention, since it shows a variety of phenomena related to both L1 and universal factors (e.g., Hancin-Bhatt & Bhatt, 1997). Many studies of second language phonology are based on the idea that native language (L1) transfer plays a significant role in determining the errors that an L2 learner will make (e.g., Lado, 1957; Major, 1986; Eckman, 1977, 1987). Transfer not only includes replacement at a segmental level, but can also refer to processes such as erroneous stress placement or to missyllabification. In looking at language transfer and phonotactic constraints, it has been shown that second language learners will employ various strategies in developing an interlanguage.

Therefore, if L1 is the only influence present in the interlanguage of L2 learners, we should be able to predict the difficulties that learners will encounter in acquiring a second language. For instance, Lado’s (1957) Contrastive Analysis Hypothesis (CAH) suggested that L2 difficulty stemmed from the difference between the learners' L1 and the target
language. Thus, the statement “difference equals difficulty” had become the accepted axiom. However, quite soon, the CAH proved to be a poor explanation for L2 acquisition problems in fields such as morphology or syntax. Firstly because difference between L1 and L2 does not always lead to difficulty. Secondly, something that the CAH does not claim, but which is crucial to the study of L2 phonology, is what an individual learner will do when faced with a surface form that is not possible in their L1. Because transfer from the L1 does not account for all of the differences between interlanguage and the target language, the CAH has limited predictive power when determining the types of error L2 learners will make. In spite of this, L1 influence is still a matter of discussion in phonology, which seems to be an exceptional area.

Within the field of L2 prosodic development, it has been suggested that L2 syllabic structure is quite susceptible to L1 influence, to the extent of being regarded as the major influence in errors (Broselow, 1984, 1987; Tarone, 1976, 1980). Some researchers have attempted to reach a compromise between L1-dependent processes and universal forces shaping the syllables of the learner’s interlanguage because it was shown that most errors could be explained as the result of developmental processes similar to those found in L1 acquisition (Dulay & Burt, 1974). For instance, for L2 phonology in general, Tarone (1980) proposed that “a preference for the open (CV) syllable seemed to operate as a process independent of language transfer in influencing the syllable structure of the interlanguage phonology” (1980:151). This suggests that understanding L2 phonology requires looking further than the structure of the native language alone.

The most crucial advancement in L2 phonology which accounts for non-L1 transfer processes was introduced by Eckman’s (1977, 1987, 1981) Markedness Differential Hypothesis (MDH), which claims that universal factors influence L2 acquisition. Eckman’s theory has been extremely influential and it is the source of much research in syllable structure acquisition carried out from the late 1970s onwards and has also been supported by empirical studies (Anderson, 1987; Eckman, 1987; Weinberger, 1987). Although the MDH, like the CAH, predicts that those phonological processes different from L1 will constitute a potential area of difficulty for the learner, it claims that this will only be true if these areas of difference in the target language are more marked than what exists in the L1. Markedness is defined as the following:

A phenomenon $A$ in some language is more marked than $B$ if the presence of $A$ in a language implies the presence of $B$, but the presence of $B$ does not imply the presence of $A$. (Eckman, 1987:60).
Based on this theory, an English speaker learning Japanese will encounter no difficulty within the prosodic level since Japanese does not exhibit complex consonant clusters. Japanese speakers, in contrast, encounter the more marked situation since English exhibits both onset and coda clusters, thus they should exhibit difficulties in acquiring English consonant clusters.

In another study, Eckman (1991) looked at the status of interlanguages as languages in and of themselves. Instead of trying to examine or predict what errors would occur in a learner’s interlanguage, Eckman proposed that interlanguages should simply be examined as “secondary” languages that “conform to universal generalizations formulated about primary languages”. This is reflected in what is known as the Interlanguage Structural Conformity Hypothesis (ISCH), which holds that “the universal generalizations that hold for the primary languages also hold for the interlanguages” (1991:24). There are many ways in which universals can affect interlanguage grammars, such as more marked form would be the last to be acquired.

Eckman has argued that the ISCH is more valid than the MDH, since the MDH makes predictions on the basis of universals and the differences between the L1 and L2, whereas the ISCH makes predictions only on the basis of universals. Thus, if there are no differences for a given phenomenon, the MDH makes no predictions and therefore not as such useful L2 theory in the same way as the ISCH. For example, Altenberg and Vago (1983) found that Hungarian learners of English devoiced word final obstruents, even though Hungarian has a voiceless/voiced contrast in this position. However, the Hungarian learners maintained the contrast in English in word-initial and medial-positions, which is a universal pattern of voicing. If, however, the speakers had devoiced obstruents in initial but not in final position, this would have falsified the ISCH because no primary language has such voicing constraints.

A further adult L2 model known as the Ontogeny Model (Major, 1986, 1987) also recognizes the strong influence of both transfer and developmental factors. The advantage of the Ontogeny Model is that it also predicts developmental paths in L2 phonology. For instance, Major claims that “interference processes will decrease over time, while developmental processes will first increase and then decrease” (1987: 104). Thus, at the beginning transfer errors will predominate, eventually however, transfer errors are eliminated, and the latter errors are attributable to developmental/universal processes that begin to emerge in a speaker’s interlanguage. Eventually, both developmental and transfer processes should disappear. The only drawback of the Ontogeny Model is
the fact that it is based on adult L2 learners. This model may not be applicable to child L2 learners, especially if their L1 phonology is not yet fully established and L1 transfer may therefore not be an influential factor in the initial stage of acquisition as in the way as it is with adult L2 learners. Based on this observation, this current study will test the Ontogeny Model in order to examine whether the degree of developmental and L1 transfer processes are different in two points of development between both age groups.

OT works very well in this sense since it has provided an answer to the combination of universal and language-specific factors (Broselow, et. al., 1998; Hancin-Bhatt & Bhatt, 1997; Hancin-Bhatt, 2000). Hancin-Bhatt and Bhatt (1997) point out that OT is remarkably similar to Major’s Ontogeny Model in its results: the high number of interference errors at the beginning is caused by the original constraint hierarchy of the learner’s L1. The eventual decrease of these and their replacement for developmental ones can be explained in terms of OT learnability theory. Constraint demotion forces the learner’s grammar to depart from their L1. Subsequently, the minimal demotion of markedness constraints displays a whole range of developmental phenomena, which are similar to the ones found in L1 acquisition. Therefore, with OT it can be shown that by re-ranking the constraints, which already exist in a speaker’s grammar, a new grammar can be attained. This can also account for the various factors which affect the speaker’s interlanguage. In addition, OT makes no predictions about the order of transfer and developmental processes since it assumes that all languages begin with the universal constraint ranking and the way in which they differ is how the language-specific constraints are ranked. This assumption accounts for both adult and child L2 learners’ phonological grammars and eliminates the shortcomings of the Ontogeny Model.

In addition, OT eliminates the controversial issue of whether children and adults have the same URs. In OT, the perspective on URs is different: the base (i.e. input) is universal, and it is the grammar- a ranking of universal constraints- that filter this rich base to yield the surface inventory. Based on this observation, both children and adults are assumed to have the same URs and any restriction on inputs is dependent on the ranking of markedness and faithfulness constraints. A more detailed discussion of OT will follow in Chapter 3.
2.3. The Availability of UG and Age Effects in L2 Acquisition

The enriched relationship between linguistic theory and L2 acquisition theory can largely be attributed to the introduction of the Principles (i.e. unvarying linguistic properties available from birth) and Parameters (i.e. varying linguistic properties which are fixed on a language-particular basis given linguistic experience in that language) Theory (PPT) (Chomsky, 1981, 1986). The emphasis on parameters allowed L2 researchers to look at variation between languages and the role of language transfer and enabled L2 researchers to investigate whether parameters of Universal Grammar (UG) can be reset in L2 acquisition (e.g., Flynn, 1987; White, 1985). To date almost all of the research on the availability of UG in SLA focuses on syntax; as such, all of the following evidence is from syntax.

Nonetheless, studies on L2 syntax have suggested five possible positions on the L2 initial state, as summarised in (1). Both five situations can be distinguished by the degree of L1 grammar (full/partial/no “transfer”) and UG (full/partial/no “access”) involvement.

(1) Differing perspectives on the L2 initial state
   c. Full Transfer/Full Access (Schwartz, 1998)
   d. Partial Transfer/Full Access (Vainikka & Young-Scholten, 1994)
   e. Partial Transfer/Partial Access (Eubank, et al., 1997)

Although the studies in (1) dealt with syntax, the findings can also be extended to L2 phonology. Studies using the PPT provide evidence that adult L2 learners have access to both phonological principles and parameters of UG. Table 1 and Table 2 summarize the various studies which provide evidence for this claim.
Table 1. Evidence for access to phonological principles

<table>
<thead>
<tr>
<th>Principle</th>
<th>Studies showing evidence of access</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sonority Hierarchy</strong></td>
<td>(Selkirk, 1984) onsets and codas conform to the following sequence: stop &lt; fricative &lt; nasal &lt; liquid &lt; glide &lt; vowel. At the outermost edges of the syllable the least sonorous obstruent appears, giving way to a more sonorous element to the peak.</td>
</tr>
<tr>
<td></td>
<td>a. Tropf (1987) Acquisition of codas by Spanish L1/German L2 learners. Spanish does not fully instantiate the sonority hierarchy. Learners simplify consonant clusters by deleting one of the segments— a straightforward case of transfer of the canonical syllable structure of Spanish, which disallows obstruent clusters. When two adjacent obstruents in a final cluster did not violate the sonority hierarchy the second consonant was deleted. When the cluster violated the sonority hierarchy with a less sonorous segment preceding a more sonorous one the speaker deleted the first less sonorous consonant. Learners therefore have Full Access to this principle in UG.</td>
</tr>
<tr>
<td></td>
<td>b. Broselow (1987) Arabic L1/English L2. SSP complying [s] clusters are repaired by epenthesis (e.g., ‘slide’ becomes ‘silide’), while SSP violating [s] clusters are repaired by prothesis (e.g., ‘street’ becomes ‘istreet’).</td>
</tr>
</tbody>
</table>

Similarly, there also seems to be evidence that adult L2 learners can also reset parameters, either at the target language value or at some intermediate value, as presented in Table 2.
Table 2. Evidence for parameter resetting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Studies showing evidence of resetting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimal Sonority Distance Parameter (MSD)</strong></td>
<td>Broselow and Finer (1991). Japanese/Korean L1/English L2. Intermediate learners acquired a minimal sonority distance which is smaller than what is allowed in their native language. The learners have less difficulty with [pj] clusters since it complies with their L1 MSD requirement and shows Full L1 transfer. Nonetheless, at the same time their performance for the [pr] cluster is better than [br], since the sonority distance between the former clusters is larger and therefore less marked and this shows that L2 learners have Full Access to this parameter in UG.</td>
</tr>
<tr>
<td><strong>Coda</strong></td>
<td>Young-Scholten (1993) Korean, Spanish and Turkish L1/Germain L2. Advanced learners acquired coda clusters in L2 German which are not allowed in the native language.</td>
</tr>
</tbody>
</table>

In OT, UG is an integral aspect of the theory since there are no language-particular restrictions on the input and every language has the same set of universal constraints. Languages differ only in constraint rankings. The assumption that no grammatical restrictions are stated at the level of lexical representations is also referred to as Richness of the Base (Prince & Smolensky, 2004; Smolensky, 1996a). In essence, Prince and Smolensky (2004) describe the role of UG as follows:

Optimality Theory abandons the widely held view that constraints are language-particular statements of phonotactic truth. In its place is the assertion that constraints are essentially universal and of very general formulation, with great potential for disagreement over the well-formedness of analyses; and individual grammar consists of a ranking of these constraints, which resolves any conflict in favour of the higher-ranked constraint. Interlinguistic differences arise from the permutations of constraint-ranking (P&S: 5)

Prince and Smolensky (2004) nor Tesar and Smolensky (1996), however, address the issue of the availability of the constraints after the L1 constraint hierarchy has been fully established. Nonetheless, considering that the constraints are the instantiation of UG in OT, it must follow that UG will be available in SLA. It is inherent in the theory that if a second
language learner has achieved his/her L2 grammar, s/he will have re-ranked the constraints in his/her L2 grammar such that the constraint ranking resembles his/her L2 more than his/her L1.

Tesar and Smolensky’s (1996) Constraint Demotion Algorithm (see §3.3.1.), which accounts for L1 constraint re-ranking and attainment of the native grammar, may also be applied to L2 acquisition if we assume that L2 learners have access to UG. It is questionable whether the constraints that are not “active” in the language actually remain in the constraint hierarchy after the L1 has been attained. In L2 acquisition, however, it is plausible that a learner “relearns” a constraint that had been “forgotten” since it did not directly pertain to the speaker’s L1 grammar. In fact, evidence will be given below that argues for the ability to re-rank L1 constraint hierarchies even after they have been established.

Based on this view, it is evident that L2 learners can and may have access to the phonological parameters of phonological UG. The extent and rate of constraint demotion may, however, differ between child and adult L2 learners. In fact, the common assumption that child L2 learners outperform adult L2 learners has led to the hypothesis that there is an optimal age (Asher & Garcia, 1969), a sensitive period (Oyama, 1976) or a critical period (Lenneberg, 1967; Scovel, 1988, hereafter CP) for L2 acquisition. The Critical Period Hypothesis (Lenneberg, 1967, hereafter CPH) holds that there is a biologically based period, usually ending around age of 12, and therefore mastery of a second language beyond the CP is no longer possible.

In addition, Scovel (1988) posits that there is no CP for the acquisition of any aspect of language, except pronunciation. Scovel claims that learning new words and acquiring morphological and syntactic structures are fundamentally different processes, because, unlike the acquisition of pronunciation, “none of these require neuromotor involvement; none of them have a “physical reality’” (1988:101). Scovel therefore claims the CP only holds for L2 phonology.

Some of the well-known long-term accent researches, which support the CPH include; Oyama (1976), Flege and Fletcher (1992), Asher and Garcia (1969), and Seliger, et al. (1975); all which were long-term naturalistic immigrant studies and attributed learners’ success to age of arrival in the new language environment. These studies were mainly interested in determining whether L2 learners can attain a native-like accent and therefore examined the end-state of acquisition.

Contrary to this, however, other L2 phonology studies by Bongaerts, et. al. (1995) and Ioup, et.al. (1994) have shown that adults can achieve native-like pronunciation after any putative CP. Similarly, the studies
outlined in Table 1 and 2 show that adult L2 learners can also reset the values of their L1 parameter settings. It may therefore be concluded that although there is compelling evidence that foreign accents become increasingly marked after puberty this does not necessarily indicate that adult learners cannot achieve native-like proficiency in phonology. Nonetheless, past research has shown that there is a clear correlation between “age of acquisition” and “degree of phonological attainment” and therefore age will be an important variable in this study.

Unlike previous studies, however, this study will not investigate the end-state of acquisition and instead identifies the developmental paths of both child and adult L2 learners. This alternative approach, I believe, will not only enable us to measure the extent of L1 transfer and universal processes in both age groups, but it will also enhance our understanding of other phonological issues such as markedness and structural representations of onset clusters.
3.1. Overview to Optimality Theory

Optimality Theory, as proposed by Prince and Smolensky (2004) and McCarthy and Prince (1995), discards the notion of rule altogether, since it operates within a nonderivational framework. Within derivational frameworks surface representations are derived from underlying representations through a series of rules that operate on different intermediate levels of representation, whereas in a nonderivational account the grammar selects the surface representation (or output) from a set of possible violable candidates. This selection is made through the incorporation of a set of ranked constraints on output structure that determine what possible output form is most “optimal” or “harmonic”. The basic architecture of OT can be represented in diagram (1) (adapted from Smolensky (1995)):

(1) Architecture of Optimality Theory

| G → Candidate1       | C               |
| → Candidate2         |                 |
| /Input/ E → Candidate3 | O H-eval → Optimal Candidate(Output) |
| Lexicon N → Candidate4 | N               |

The basic assumption about OT is that the grammar of a language is governed by a set of constraints on possible forms. There are two components of OT; the universal generator (GEN) and the language particular hierarchy (H) and the universal function of EVAL, which