1. Introduction

Languages demonstrating “conflicting directionality” as concerns ‘stress’ provide phonologists with intriguing opportunities to investigate the options made available by Universal Grammar (UG), and have informed all major theories of stress (see e.g., Halle & Vergnaud, 1987; Hayes, 1981, 1995; Idsardi, 1992; Kenstowicz, 1995; Prince, 1983; Zoll, 1997, among others). Also called Default-to-Opposite Edge stress systems, stress in these languages falls on a property closest to one edge of a word (say, the leftmost syllable demonstrating a certain property), but if no such property is present within the word, the opposite edge of the word (e.g., the rightmost syllable) attracts stress. Highly researched in formal theoretical phonology, this pattern has so far not been investigated in second language (L2) acquisition research despite the unique insight it would offer to the generative study of L2 acquisition. One reason for this is the fact that very few people are second language speakers of this handful of languages, which are solely composed of almost never taught languages, such as Buriat, Chuvash, Huasteco, Mari, Khalkha Mongolian and Selkup.

In this paper, I investigate the L2 acquisition of one such language, Khalkha Mongolian, a language rarely taught in the US, with only one institution of higher education offering a formal Mongolian language program in the American continent, but is perhaps still the most commonly taught language among those demonstrating Default-to-Opposite Edge stress, as others are never taught, excluding occasional instruction on their structures, usually by a visiting scholar.¹

In Khalkha Mongolian, the standard variety of Mongolian, the location of primary stress is determined by the following rule, provided in (1), which is itself composed by three parts, each of which is exemplified below in (2) to (4) with Light (L) and Heavy (H) syllable combinations:

(1) Primary stress in Khalkha Mongolian falls on:
   (a) the rightmost nonfinal heavy syllable (see [2]),
   (b) the final heavy syllable if it is the only heavy syllable (see [3]), or
   (c) if there are no heavy syllables, on the leftmost light syllable (see [4])
   (Bosson, 1964; Poppe, 1970; Walker, 1997)

¹ Indiana University is the only university in the American continent offering a Mongolian language program and Mongolian language instruction at three levels, introductory, intermediate and advanced. To my knowledge, none of the other languages demonstrating Default-to-Opposite Edge stress is regularly taught in the Americas.

These three tenets of stress assignment in Khalkha are illustrated in (2) through (4) below, where Heavy (H) stands for a syllable that contains a long vowel, with Light (L) standing for a syllable with a short vowel, with or without a coda consonant (i.e., codas are not moraic in Mongolian and its various dialects).

(2)  
a. Ť Ť  
b. Ť L Ť  
c. H L H Ť  
d. Ť Ť Ť Ť  
e. Ť Ť Ť Ť Ť  
f. L L H H H

(3)  
a. Ľ L Ľ  
b. Ľ Ž  
c. Ž  
d. L L L Ž

(4)  
a. Ľ Ľ  
b. Ľ Ľ Ľ  
c. Ľ Ľ Ľ Ľ

Given the additional Nonfinality effect, illustrated in (2) (see also [1a]), which most Default-to-Opposite Edge (DOE) stress languages do not entertain (see e.g., Gordon, 2000), this is a system even more complicated than other languages displaying DOE stress, making Khalkha perhaps the most complex regularly stressed language in the world.

Therefore, on the surface, it looks like Mongolian is a Trochaic and Weight-Sensitive language, but a strange one in that End-Rule appears to be sometimes set to Left (2a, b), sometimes to Right (3a, b, d), and sometimes even to Middle (2c, d, f), and sometimes replaced by Leftmost-Wins (4c), a system that is linguistically impossible (more on this in [7] and [8] below), and crucially one that is, thus, ruled out by UG.

To make things even more complicated, even linguists do not concur regarding the exact location of stress in Mongolian. Svantesson, Tsendina, Karlsson, & Franzen (2005), in their book, The Phonology of Mongolian, point this out in the most explicit ways possible, stating “there are widely differing opinions on the place and nature of word stress in Mongolian” (p. 96), exemplifying at least six different opinions in the literature on the place of stress in Mongolian, and concluding as a result that word stress is not as “relevant” in Mongolian as it is in languages like English. Nevertheless, Walker’s (1997) description has gained popularity in recent theoretical research, with her convincing arguments that much of the disagreement on the location of stress in Mongolian originates from a lack of understanding of Nonfinality effects, which, in fact, are not possible to observe in Khalkha unless a word contains more than two heavy syllables (e.g., as in [2d-2f]). Looking into most other word types, one will thus get the (incorrect) impression that Mongolian stresses the leftmost heavy syllable (as in [2a-2b] and [3]) and otherwise the leftmost light syllable (as in [4]), i.e., a system that would put Khalkha among Default-to-Same Edge languages (as opposed to Default-to-Opposite Edge), unless, of course, one looks into forms that contain more than two heavy syllables (as in [2c-f]), combinations that naturally form a small minority of words in Mongolian. It is perhaps for this reason, as Walker (1997) emphasizes, that many of the earlier descriptions of Mongolian stress have later been found to be incorrect, with the same authors updating their own analyses in their later research in certain cases. For example Poppe (1951) presented Mongolian as a Default-to-Same Edge system, updating it later in Poppe (1970) into an argument more in line with a Default-to-Opposite Edge system.

Given all these issues, it should come as no surprise that the L2 acquisition task should be extremely difficult and confusing for learners of Mongolian (see below). In fact, target-like representations may not ever be reached. Nevertheless, as input is not very helpful in that it does not
give unambiguous evidence as to the parameters of stress assignment in Khalkha, the acquisition task here presents us with intriguing opportunities to examine the various constructions learners come up with, as well as various others they do not.

In fact, I will demonstrate that this unique acquisition task presents strong evidence that L2 prosodic grammars are constrained by the options made available by UG, thereby offering support for UG-based approaches to L2 acquisition (Schwartz & Sprouse, 1996; White, 1989, 2003). As will be made clear later, in restructuring their grammar, learners of Mongolian consider only UG-constrained options and do not entertain options that are not permitted by UG. Further, in doing so, a stage-like behavior emerges as learners continue to reset various prosodic parameters, a stage-like behavior that ultimately makes the grammar more target-like (at least on the surface). Before such target-like behavior emerges, however, various intermediary stages arise which are neither like the first language (L1) nor like the L2, and are, sometimes, more unlike the L2 than the initial stage (the L1), even with respect to the location of stressed syllables on the surface, a fact that finds no explanation based on input alone or L1 transfer alone.

In addition, this paper also sheds light on variability in interlanguage grammars, a topic that has recently generated much fruitful discussion in syntax and morphology, particularly with respect to variable omissions of functional morphology (see e.g., Ionin & Wexler, 2003; Ionin, Ko, & Wexler, 2004; Lardiere, 1998a, b; White, 2003 for different accounts of variability), but has received almost no attention in phonology, even though successful phonological explanations have been offered to explain variability in morphology and syntax (see e.g., Goad & White, 2004, 2006; Goad, White, & Steele, 2003). Explaining variability in phonology itself is crucial, because along with variability in suppliance of functional morphology, phonological variability in interlanguage grammars is perhaps the leading indication of non-native-like performance, as it is persistent even in end-state grammars, leading to what is perceived as ‘foreign accent’.

The remainder of the paper is organized in the following way: In Section 2, we review a range of facts about stress and prominence in both Mongolian and English. This section also outlines our hypotheses. Section 3 then describes the design of the experiment we employed to test these hypotheses and the participants who took part in the experiment. The results are then presented in Section 4 along with a discussion of their implications for UG and variability in L2 phonology. Finally, Section 5 concludes the paper.

2. Representation of Stress: the L1-L2 Language Background

2.1. Mongolian Stress

The stress pattern of Khalkha Mongolian has already been described above in (1). As mentioned there, this pattern is potentially very challenging for any learner, irrespective of the L1, making Mongolian perhaps the most challenging regularly stressed language of the world. Unless one has a means of analyzing and comparing (almost) all Mongolian words, reaching the correct generalizations, presented in (1) above, on the basis of primary linguistic data alone are extremely challenging, a task that may never be accomplished by L2 learners. In fact, as has already been mentioned above, this stress pattern has been challenging even for linguists to correctly describe the rules of stress assignment in Mongolian.

To exacerbate this already arduous task of simply ‘describing’ the Mongolian stress pattern in layman words, accounting for it or even simply defining it with the parameters of stress assignment (see e.g., Dresher & Kaye, 1990; Hayes, 1995) usually leads to difficulties that appear to predict a UG-unconstrained language, as will be explained below. Still, with respect to certain parameters at least, things look straightforward: Regarding the parameter Foot-Type, for example, Khalkha looks, on the surface, like a Trochaic (head-initial) language, given initial stress in forms like (4). In addition, given the fact that heavy syllables attract stress when available, as with the forms in (2) and especially (3) (where all Hs bear primary stress), it looks clear that the Weight-Sensitivity parameter is set to Yes. Further glance at the data reveals some complications however; for example, the End-Rule parameter, which determines the location of primary stress, appears to be sometimes set to Left (1a,b), sometimes to Right (2a,b,d), and sometimes even to Middle (1c,d,f), as evidenced by the fact that when there are multiple stresses available in a given word, it is sometimes the leftmost, sometimes the rightmost and sometimes the middle one that bears primary stress, indicated here with an acute accent.
sometimes, it looks like End-Rule is replaced by Leftmost-Wins (i.e., out of multiple possible stresses, only the leftmost one arises, instead of making one the most prominent but still keeping the others). In other words, on the surface, this looks like a system that is linguistically impossible and crucially one that is ruled out by the options made available by UG.

These problems, however, go away if initial (leftmost) stress in DOE stress languages like Khalkha is assumed to be intonational prominence (Gordon, 2000, 2014; Özçelik, 2014, in press-b), one that does not involve foot structure. This would mean that End-Rule is consistently set to Right in Mongolian (with final foot extrametricality), and End-Rule-Right is vacuously satisfied for cases with initial stress, as there is no foot available. This is an analysis that is supported by both acoustic data (Gordon, 2000; Svanstedt et al., 2005) and typological considerations regarding stress systems (Özçelik, 2014, in press-b), but is still one that is perhaps impossible to reach (see Section 2.3. below).

2.2. English Stress

English, the first language of the learners tested in the current study, also has a very complex, but at the same time, a very well-defined stress system, one that differs significantly from that of Mongolian. In English, every (lexical) word is assumed to contain at least one foot (see e.g., Halle & Vergnaud, 1987; Hayes, 1981, 1995; Liberman & Prince, 1977), as evidenced by the fact that every prosodic word (PWd) has at least one stressed syllable in English, and that there are no words smaller than a binary foot; therefore, syllables that form a word on their own either contain a long vowel (e.g., /zu/ `zoo`) or end in a closed syllable (e.g., /æt/ `cat`), with no word types such as /zu/ and /æt/, meaning that words are composed of a minimum of a binary foot, one that is binary at the moraic level (and both long vowels and a nucleus vowel + a coda consonant sequences are bimoraic in English, as both vowels and codas are moraic in this language).

The complex stress system of English can easily be summarized referring to various parameter settings that all have to do with the way syllables are constructed into feet in English, as follows:

(5) Stress assignment in English:

English constructs binary iterative trochaic feet starting from the right edge of a PWd, with Extrametricality set to Yes and End-Rule set to Right.

(see e.g., Hayes, 1981, 1995; Nespor & Vogel, 1986).

What this means will be explained below, where we cover each relevant parameter one by one, i.e., Extrametricality, Directionality, Foot Binarity, Foot Type, Iterativity, End-Rule and Weight Sensitivity. This discussion will help the reader better understand the results of the study later, since, as will be demonstrated in the Results section, English speakers gradually move away from the English settings of these parameters in creating their interlanguage representations, the settings that are described in (6a) through (6g) below. In doing so, we focus on one example, the word originality, and illustrate how, given all the parameters of stress assignment, syllables are constructed into feet in English. First, examine (6a), where it is demonstrated that the parameter Extrametricality is set to Yes in English, which means that all word-final syllables are ‘ignored’ as far as stress assignment (or, rather, foot construction) is concerned.

---

Özçelik (2014) argues, within an Optimality Theoretical (OT) framework and focusing on Turkish, that within the same prosodic system, both End-Rule-Left and Leftmost-Wins could be available, and that this could capture certain cases of (otherwise random-looking) variability in the grammar. However, in this particular case, no such variability exists among speakers across words that have the same syllable structure profiles; words with similar syllable structure profiles are pronounced with the same stress pattern in Mongolian. Further, no languages have so far been identified to have a Middle setting for End-Rule, although End-Rule-Left and End-Rule-Right are equally possible, depending on the language (Hayes, 1995; Hyman, 1977). Similarly, although having both the Left and the Right settings of End-Rule within the same prosodic grammar is technically possible in an approach like OT, one of the two should always be more predominant than the other, and End-Rule-Middle should be incorrect outright, as prosodic parameters only refer to right- or left-most edges of prosodic constituents, whether the relevant constituent is the Foot, Prosodic Word or Phonological Phrase (see e.g., Nespor & Vogel, 1986; Selkirk, 1996; van der Hulst, 2014).
(6) (Some of the) Parameters of Stress for English nouns:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting 1</th>
<th>Setting 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extrametricality</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Direction</td>
<td>Right</td>
<td>Left</td>
</tr>
<tr>
<td>Ft-Bin</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Headedness</td>
<td>Left</td>
<td>Right</td>
</tr>
<tr>
<td>Iterativity</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>End-Rule</td>
<td>Right</td>
<td>Left</td>
</tr>
</tbody>
</table>

After the final (extrametrical) syllable is skipped (see [6a]), foot construction starts at the right edge of the word, as illustrated in (6b), since the Directionality parameter is set to Right-to-Left in English:

b. Directionality: Left-to-Right vs. Right-to-Left

Furthermore, as demonstrated in (6c), as the Binarity parameter is set to Yes, all feet are binary in English (as with the great majority of world’s languages, since this setting is usually viewed to be near-universal, see e.g., Hayes, 1995). This means that each foot must be composed of two syllables (or moras – see below) in English:

c. Foot Binarity: Yes vs. No

(6d) indicates, in addition, that the Foot-Type parameter is set to Left in English, meaning that feet are left-headed, and that is, trochaic (instead of iambic/right-headed), as the leftmost syllable within the foot is the one that bears the greatest prominence (and is, as such, called the head):

d. Foot-Type: Left- vs. Right-headed

Further, as illustrated in (6e), if a word is long enough to accommodate multiple binary feet, multiple feet can then be created in English, i.e., instead of leaving the remaining syllables unfooted, as some
languages would do. That is, footing in English is iterative, and in words that are long enough, multiple stresses emerge accordingly, suggesting that the Iterativity parameter is set to *Yes* in English:

**e. Iterativity: Yes vs. No**

<table>
<thead>
<tr>
<th>Parameters of Stress for English nouns:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Extrametricality: Yes vs. No</td>
</tr>
<tr>
<td>b. Direction: R-L vs. L-R</td>
</tr>
<tr>
<td>c. Ft-Bin: Yes vs. No</td>
</tr>
<tr>
<td>d. Headedness: Left vs. Right</td>
</tr>
<tr>
<td>e. Iterativity: Yes vs. No</td>
</tr>
<tr>
<td>f. End-Rule: Right vs. Left</td>
</tr>
</tbody>
</table>

Finally, note that when there are multiple syllables that bear stress in a given word, it is the rightmost stressed syllable that is elevated to function as primary stress, and others are demoted to bear secondary stress status, as indicated in (6f) below. This means that End-Rule is set to *Right* in English, instead of *Left*:

**f. End-Rule: Left vs. Right**

<table>
<thead>
<tr>
<th>Parameters of Stress for English nouns:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Extrametricality: Yes vs. No</td>
</tr>
<tr>
<td>b. Direction: R-L vs. L-R</td>
</tr>
<tr>
<td>c. Ft-Bin: Yes vs. No</td>
</tr>
<tr>
<td>d. Headedness: Left vs. Right</td>
</tr>
<tr>
<td>e. Iterativity: Yes vs. No</td>
</tr>
<tr>
<td>f. End-Rule: Right vs. Left</td>
</tr>
</tbody>
</table>

One parameter that is not illustrated above with the word ‘originality’ but is important for the discussion in this paper is Weight-Sensitivity, which is set to *Yes* in English, and as such, heavy syllables, whether they are heavy because they contain a long vowel or a coda consonant, bear stress. Feet are, thus, binary at the moraic level in English. This is clarified with a comparison of two words in (6g); whereas the first syllable is stressed in the the first one, the second syllable is stressed in the second one. This is because the second syllable in the second word can create a binary foot of its own since it has two moras, one from the vowel and one from the coda consonant:

**g. Weight-Sensitivity: Yes vs. No**

<table>
<thead>
<tr>
<th>Parameters of Stress for English nouns:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Extrametricality: Yes vs. No</td>
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<tr>
<td>f. End-Rule: Right vs. Left</td>
</tr>
</tbody>
</table>

### 2.3. L2 Acquisition of Mongolian Stress: Challenges and Hypotheses

As has been established above, the word prosodic grammars of Mongolian and English differ significantly. In acquiring the target language and going through the process of restructuring their grammars, English-speaking learners of Mongolian need to make several significant changes in various parameter settings. First of all, if, as we have assumed above, the default initial prominence in Mongolian (the main focus of this paper) is footless intonal prominence rather than (footed)
stress, English-speaking learners will eventually need to produce footless utterances, at least for words that contain no heavy syllables (i.e., initial default stress). However, since producing footless utterances in an L2 is an extremely challenging task for learners with footed L1s (Özçelik, 2011, 2016, in press-a) and assuming thus that English-speaking learners of Khalkha will always produce footed outputs, in order to accommodate the L2 input with a footed grammar, Khalkha L2ers will likely be forced to make several UG-unconstrained assumptions about the language, where End-Rule is sometimes set to Right, sometimes to Left and, even more surprisingly, sometimes to Middle, as has already been mentioned in Section 1 and illustrated in (7) below. In fact, for words that are long enough and only contain a light syllable, Leftmost-Wins will replace End-Rule (see [8]):

(7) Variable ‘End-Rule’** (Head feet are bolded)
   i. End-Rule: Left:  
      (H)(H)  
      (from (2a))  
   ii. End-Rule-Right:  
      (LL)(H)  
      (from (3a))  
   iii. End-Rule-Middle*:  
      (H)L(H)(H)  
      (from (2c))

(8) Leftmost-Wins (i.e., instead of End-Rule)
   i. Step1: footing:  
      (LL)  
      (from (4c))
   ii. Step2: Leftmost-Wins:  
      (LL)LL

If interlanguage grammars are constrained by UG, however, as I hypothesize they are, learners would produce words that are consistent with either End-Rule-Left or End-Rule-Right only, despite the input and despite the fact that neither may capture the full array of primary linguistic data in Mongolian.

Even if we assumed initial default prominence in Khalkha to be trochaic (i.e., foot-based), English-speaking learners of the language will face similar challenges, except for having to expunge the Foot, of course. In other words, assuming that they may not ever be able to expunge the Foot (Özçelik, 2011, 2016, in press-a), whether one assumes initial prominence to be trochaic or footless intonational prominence, they will, in the end, have to make similar rearrangements (which all involve the Foot) in parameter settings in consistently stressing the initial syllables of words composed only of light syllables. More specifically, learners will need to create either a binary trochee that is constructed from the left edge (i.e., left-to-right) or an unbounded weight-insensitive trochee that encompasses the whole word, as illustrated respectively in (9a) and (9b) below. As (9a) is the more unmarked one of the two and almost all cases that refer to (9b) can be explained through (9a) (Hayes, 1995), I will, for the purpose of this paper, assume that this will be the structure that they will eventually come up with, the structure that will make their interlanguage grammar most similar, at least on the surface, to that of the target grammar:

(9) a.  
   Ft
   σ σ σ
   dzá casing
   b.  
   Ft
   σ σ σ
   dzá casing

Another challenge for English-speaking learners arises from the fact that codas are moraic in English, as illustrated in (6g) above; therefore, when a closed syllable is available, it is stressed, as with /e.líp.sis/ (compare with the initial stress in /gé.ne.sis/), just as syllables with long vowels are stressed, as with /á.ro.ma/, since the language is weight-sensitive. In Mongolian, however, only long vowels attract stress; closed syllables do not, as codas are not moraic. As such, English-speaking learners of Mongolian will have to learn that codas are not moraic in Mongolian; otherwise, in Mongolian words that are composed of all light syllables, such as /dzá casing/, they would stress the closed syllables, even though these are light in Mongolian, since they are heavy in English.
I hypothesize that whether Khalkha initial prominence, the focus of this paper, is formally footless or not, English-speaking learners of the language will always have footed utterances, as expunging the foot, I assume, is impossible. Further, given the Full Transfer/Full Access Hypothesis (FTFA) (Schwartz & Sprouse, 1996), in initial stages, they will construct feet as in English, that is, right-to-left iterative weight-sensitive trochees, with Extrametricality and Weight-Sensitivity both set to Yes and with moraic codas (see [5] and [6]), even though this will not, on the surface, consistently stress the correct syllables in the target language. I also hypothesize that they will gradually reset various parameters in the target language and in the end have left-to-right non-iterative trochees at advanced levels, as illustrated in (9a) above.

In resetting various parameters, I also hypothesize the learners to go through various stages that correspond to bundles of different parameter settings, and as such, create grammars that differ from both the target language and the native language but are constrained by the options made available by UG. Further, I predict them not to entertain options that are ruled out by UG, such as *End-Rule-Middle, even though input seems to lead them to such a direction.

In order to test these hypotheses, we have conducted an experiment involving words with various syllable structure profiles, which is the subject of the next section.

3. Experiment

In order to investigate the hypotheses laid out above, a semi-controlled production experiment was conducted with eight English-speaking learners of L2 Khalkha Mongolian, of various proficiency levels. Proficiency level was determined by means of two independent proficiency tests, the results of which closely matched self-report: (i) a cloze test to measure syntactic, morphological and proficiency, and (ii) a read-aloud task to assess participants’ global phonological proficiency (see Akita 2006, 2007, for a similar procedure and for more on the design and implementation of the read-aloud task). Level of proficiency was not used as a factor in recruiting participants, because the potential pool was limited to begin with, and as such, the experiment was open to any (near-)monolingual English-speaking learner of Mongolian. As was determined by the results of the two proficiency tests, however, there were 1 novice (low-beginner), 2 beginner, 4 intermediate and 1 advanced learners.

The participants ranged in age from 20 to 34 years old. They started learning Mongolian either in college or in graduate school, and in all cases, after age 20. All of the participants had college education (or higher) or were, at the time, attending college or graduate school.

The stimuli included a total of 180 polysyllabic nouns, of various lengths and syllable structure profiles. Further, for bisyllabic and trisyllabic stimuli, all possible Heavy (H) and Light (L) syllable combinations were represented. Although this was not always possible to do for longer words, various combinations of H and L were represented for these words, too. For words composed of only light syllables, the focus of this paper, coda profiles were controlled for all bisyllabic and trisyllabic stimuli, meaning that these represented all possible combinations of open (O) and closed (C) syllables, i.e., O.O, O.C, O.C, C.C for bisyllabic stimuli and O.O.O, O.O.C, O.C.O, C.O.O, C.O.C, C.C.O, C.C.C for trisyllabic words. There were 5 words within each subtype, amounting to 20 bisyllabic and 40 trisyllabic words with all light syllables.

As differing mechanisms of syllabification across the two languages could potentially confound the results, in preparing the stimuli, it was ensured that all coda + onset sequences were either sonorant + obstruent, sonorant + sonorant, or obstruent + obstruent. This guaranteed that codas in Mongolian would be syllabified as codas in English, instead of being syllabified as the first member of a following word-internal onset cluster, thereby avoiding the effects of a possible confounding variable, i.e., transfer of L1 syllabification strategies from English.

The task was a picture-naming task. Each stimulus was presented in a carrier sentence, exemplified below in (10):

(10) Энэ зураг дээр _______ байна.
/ena dzurag deer _______ baina/
this picture Loc _______ exist(ent)“There is ____X__ in this picture.”
Before uttering stimuli in carrier sentences, however, the participants first had to utter them in isolation; as demonstrated in (11), the first letter was provided in order to help them retrieve the item from memory:

(11) Example test item: <халбага> /halbaga/ “spoon” - Step 1

At the next stage, the item was provided in its full written form, where the participants’ task was to read it aloud, whether they guessed it correctly or not in the preceding step:

(12) Example test item: <халбага> /halbaga/ “spoon” - Step 2

Finally, at the next step, the participants’ task was to read aloud the stimulus by uttering it within the carrier sentence:

(13) Example test item: <халбага> /halbaga/ “spoon” - Step 3

Only the words produced in carrier sentences (as in [13]) were later transcribed and analyzed. Words uttered in isolation were not analyzed, because these are problematic as various confounding variables could be involved, such as utterance-final lengthening, which occurs frequently across languages when a word is pronounced in isolation. In addition, word stress and phrase-level prominence are confounded when a word is uttered in isolation (Gordon, 2014; Hyman, 2014).

Praat acoustic analysis software (Boersma & Weenink, 2011) was used to analyze and transcribe the stimuli produced within the carrier sentences. In determining the presence and location of stressed syllables in experimental words, impressionistic data were used, but with back-up from spectrogram and waveform analysis. In particular, the following acoustic correlates were noted for each syllable in
each stimulus: vowel and syllable duration (in ms), average and peak intensity (in dB), average fundamental frequency (F0, in Hz), and time of F0 peak. Further, as argued for by Peterson and Lehiste (1960), both spectrogram and waveform cues were employed for segmentation.

Each participant was tested individually in a sound-attenuated booth and was audiorecorded onto a computer using the Audacity software, and with the help of an external microphone. The following order of testing was employed: (i) a language background questionnaire, (ii) production experiment, and (iii) proficiency tests (the cloze test and the read-aloud task). The whole procedure, including the stimuli not to be covered in this paper, took about 1.5 hours per participant.

4. Results and Discussion

Before we provide an in-depth analysis of some of the results of the study, let us summarize two general observations which were both immediately apparent from the data collected at a first glance. The first one involves variability in individual grammars and the second does not, both of which, I propose, can be captured in principled ways through L1 transfer and access to UG (more on this later).

The two general observations are provided in (14) below:

(14) a. Observation 1:
Although Mongolian words composed of all short syllables consistently have stress on the first/leftmost syllable (see [1c]), L2 learners of Mongolian stress them on the second, third or last syllables.

b. Observation 2:
Although Mongolian words with multiple long vowels should be stressed on the syllable with the rightmost nonfinal long vowel (see [1a]) (i.e., usually corresponding to the leftmost long vowel, as they are often taught, and as most words will contain only two or fewer long vowels), many L2 learners of Mongolian consistently place stress on the final long syllable.

Note that both of these general findings are also aligned with the observations of Mongolian language teachers, who, upon being asked about the problems of English-speaking learners of Mongolian, point out these two general facts that they have observed in their class.

Notice that one of these observations, i.e., Observation 1, involves variability within individual grammars in that a given learner could pronounce a target word like L L L either as L L L or L L L, or correctly as L L L. Such is not the case for Observation 2, which involves variation only across learners in that a given learner produces words with multiple Hs either with stress on the rightmost one or on the leftmost one, but not sometimes on the leftmost and sometimes on the rightmost one or the one in the middle (even though this last one would capture many cases with multiple Hs, such as when there are three Hs in a given word, as in [2c]).

Although this paper will focus on an analysis of words with all light syllables (i.e., words containing all short vowels in the case of Mongolian), and thus present an in-depth explanation of Observation 1 only, it should be noted that Observation 2 can easily be accounted for under the assumption that the options L2 learners entertain are constrained by the options made available by UG. As was mentioned in the introduction section, End-Rule can, after all, be set to either Right or Left, but never to Middle, nor can it be set variably such that the same grammar gives outputs that are in line with both the Right and the Left setting of End-Rule. Such options are ruled out by UG. Given this, then, it is understandable why the learners tested here do not seem to employ a variable setting for End-Rule, one that fluctuates between End-Rule-Right and End-Rule-Left, and even End-Rule-Middle at times, although this would have been perfectly compatible with the primary linguistic data that they receive.

Variability in the setting of this parameter was observed only across learners, with three learners (all beginners) consistently having the End-Rule-Right setting of this parameter (as with L1 English) and five learners (intermediate, n=4; advanced, n=1) consistently having the End-Rule-Left setting (with a few exceptions in a handful of words). Notice that neither setting alone gives target-like results 100% of the time, but the Left setting results in correct results for a greater number of cases than the Right setting, although, as explained in Section 1, formally speaking, the Right setting might be the
correct one (with Nonfinality taken into account). In a sense, then, formally speaking, beginners, who just employed the L1 setting of this parameter with no further change, were more correct with respect to the correct setting of this parameter, but less correct in capturing the correct location of stress on the surface (because of Nonfinality).

Turning back to Observation 1, for which we will provide a more detailed analysis, this, too, can be captured by having recourse to the options made available by UG, which, this time leads to variability on the surface in the outputs of the same learners, but in ways that are ultimately principled. Although a given English-speaking learner of Mongolian may stress the first, second or third syllable of, for example, a trisyllabic word in Mongolian that is composed of all short vowels, there is systematicity in choosing the syllable that is to be stressed, and the location of stress is, thus, predictable.

Regarding the systematicity, both parameters of UG and language transfer play a role, as with Observation 2 above, although the complex interaction between UG parameters and language transfer leads to variability on the surface in this case, variability that can be explained with recourse to prosodic parameters.

More specifically, the underlying reason for Observation 1 to emerge is, I argue, the fact that English-speaking learners of Mongolian (especially those at beginning levels) still analyze closed syllables as heavy (H), even though only syllables with long vowels can be H in Mongolian, as opposed to English where both long vowels and codas are moraic, meaning that closed syllables, as with syllables containing a long vowel, can be H.

With this in mind, and assuming that English-speaking subjects can still make a variety of changes to the settings of the other prosodic parameters exemplified in Section 2.2 above, both intra- and inter-learner variability in location of stress are naturally accounted for. In fact, a stage-like behavior emerges as learners of Mongolian make a variety of changes to the settings of prosodic parameters, while partially continuing to transfer from the L1 at the same time. This also results in a variety of grammars that are neither like the L1 nor like the L2, and can, thus, not be explained with input alone or transfer alone, i.e., without referring to principles of UG.

We will illustrate this by examining individual learner grammars and by categorizing these grammars into various stages based on what kind of parameter settings participants have employed and what parameters and how many of them they reset. In doing so, we will focus on stimuli that are composed only of short syllables, which were created to accommodate all possible combinations of open and closed syllable types (see Section 3). As it is impossible to cover all of these words here within the space allotted, we will focus on three trisyllabic words, (i) /dzá.ɡás.ʧiŋ/ <загасчин> “fisher”, (ii) /úr.ɡa.mal/ <ургамал> “plant”, and (iii) /bá.ɡa.nəə/ <багана> “column.” These respectively represent LHH, HLH and LLL syllable structure types from the perspective of the English grammar, as codas, as stated above, are moraic in English, unlike in Mongolian.

When we look at the outputs of individual learners with respect to these word types, a stage-like performance emerges, with some learners behaving more on the L1 English side of the spectrum with respect to various parameter settings, and with some restructuring their grammars through resetting a number of parameters, and, in doing so, generating grammars that are neither like the L1 nor like the L2 (see Finer & Broselow, 1986 for the same argument from syntax; see also Archibald, 1992, 1993, 1995; Mairs, 1989; Özçelik 2016, in press-a for similar findings in various domains of prosody).

At the first stage, there was one learner, who was also the learner with the lowest level of proficiency, who used L1 settings of all prosodic parameters, as would be predicted on the FTFA. In other words, this learner uttered Mongolian words with English prosody, i.e., constructing right-to-left, weight-sensitive, iterative, moraic trochees where Extrametricality was set to Yes, and codas were moraic, as illustrated below in (15).
As seen, although this learner has initial stress in words that start with closed syllables, such as (15b), and cases where an open syllable is followed immediately by another open syllable, such as (15c), he fails to stress the initial syllable in all other cases, i.e., cases where the first syllable is open, and is immediately followed by a closed syllable, in which case the closed syllable is stressed, as in (15a), where this results in penultimate stress.

At the next stage were two learners (both beginners) who reset Extrametricality from Yes to No, possibly because of the input they received on many finally stressed words in Mongolian, i.e., those that contain a long syllable which is also the final syllable in the word, as in (3). Although, for this reason, they were more target-like when it comes to words ending in long vowels, this change made their grammar regarding words with all short syllables less target-like on the surface, at least with respect to certain forms. As illustrated in (16), for example, the learners at this stage not only fail to have initial stress in cases like (a), but also cases like (b) and (c), unlike the learners at the previous stage, for whom cases like (b) and (c) were still stressed on their first syllable:

Note that the learners at this stage employ not only prosodic representations that are neither like the L1 nor the L2, but also surface stress patterns that are very much unlike both languages. Neither English nor Mongolian stresses the second syllables in cases like (16c) for example. In fact, both English and Mongolian stress the first syllable in these cases, for words composed of three open/light syllables. The fact that the learners here stress the second syllable is, I argue, because they make changes to their grammar on a parameter-by-parameter basis, which implies that they have access to these options made available by UG. Otherwise, we would expect them to have somewhat of a random increase in stressing the first syllable for words that are composed only of open/light syllables, and expect no intermediate stages that are otherwise inexplicable. Note also that this intermediate stage corresponds to the settings employed in certain natural languages, such as Tol (Fleming & Dennis, 1977) and Bergüner-Romansh (Kamprath, 1987), both of which employ right-to-left iterative weight-sensitive trochees with Extrametricality set to No. (Gordon, 2014).

In addition to resetting Extrametricality from Yes to No, some learners reset End-Rule from Right to Left, as has already been mentioned earlier, a change that probably occurred in order to
accommodate stress in words that contain two syllables with long vowels (see above). There was only 1 learner (intermediate) who belonged to such a stage, i.e., one where only Extrametricality and End-Rule are reset, with no change in the values of any other parameters:

<table>
<thead>
<tr>
<th>(17):</th>
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<tbody>
<tr>
<td>a.</td>
<td>b.</td>
<td>c.</td>
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<tr>
<td>Ft Ft</td>
<td>Ft Ft</td>
<td>Ft</td>
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<tr>
<td>σ σ σ</td>
<td>σ σ σ</td>
<td>σ σ σ</td>
</tr>
<tr>
<td>dza.gás.fjìŋ</td>
<td>úr.ca.mål</td>
<td>ba.gá.nø</td>
</tr>
<tr>
<td>Extram: Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Head: Left</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight-Sens: Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End-R: Right</td>
<td>Left</td>
<td></td>
</tr>
<tr>
<td>Direc: R → L</td>
<td></td>
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<tr>
<td>Ft-Bin: Yes</td>
<td></td>
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<tr>
<td>Iterativity: Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Codas-moraic: Yes</td>
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</table>

As seen, with this additional change, the learner was able to place primary stress on the initial syllable in cases like (17b) (as well as, of course, being target-like in most cases that involve heavy syllables, although these are not covered here). Still, words with profiles like (17a) and (17c) did not bear initial stress. Notice, however, that this is once again a change that makes the grammar formally unlike both the L1 and L2, as End-Rule is set to Right in the L1 and, as the discussion in Section 1 and 2 demonstrated, this is most likely true for the L2, too.

In addition to the learners mentioned above who made changes to the values of Extrametricality, and, in the case of one learner, Extrametricality + End-Rule, there were 3 learners (all intermediate) who, in addition to resetting Extrametricality and End-Rule, reset Directionality, from Right-to-Left to Left-to-Right, consequences of which are indicated in (18).

<table>
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<tr>
<th>(18):</th>
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<tbody>
<tr>
<td>a.</td>
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<tr>
<td>Ft Ft</td>
<td>Ft Ft</td>
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</tr>
<tr>
<td>σ σ σ</td>
<td>σ σ σ</td>
<td>σ σ σ</td>
</tr>
<tr>
<td>dza.gás.fjìŋ</td>
<td>úr.ca.mål</td>
<td>ba.gá.nø</td>
</tr>
<tr>
<td>Extram: Yes</td>
<td>No</td>
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<tr>
<td>Head: Left</td>
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</tr>
<tr>
<td>Weight-Sens: Yes</td>
<td></td>
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<tr>
<td>End-R: Right</td>
<td>Left</td>
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<tr>
<td>Direc: R → L</td>
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<tr>
<td>Ft-Bin: Yes</td>
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<tr>
<td>Iterativity: Yes</td>
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<tr>
<td>Codas-moraic: Yes</td>
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</table>

Although these learners employed completely different settings from the Stage 0 learner above who used L1 settings of all parameters (see [15]), on the surface (in terms of the location of stressed syllables), and with respect to these three word forms only, their productions looked similar, leading to the appearance of a bell-shaped learning curve in stages (15) through (18), where learners start with 2 target-like forms out of 3 (15), fall all the way down to 0/3 (16) and then up to 1/3 (17) and finally up again at 2/3 (18). If one looked only at surface forms, it would, thus, have appeared to be a case of getting worse with respect to stress patterns and getting back to the starting point again, when in fact, much is going on in individual grammars which are being restructured along with the options given by UG.

Finally, only one learner, the most advanced among all the learners tested, had non-moraic codas, thereby treating closed syllables as light, as in the target language. In addition to this change, this learner reset all the parameters that were reset by the learners in the previous stage:
That is, with this one additional change in the value of one parameter, in addition to all other changes described above, at least one learner is finally able to achieve target-like representations for all Mongolian words composed only of short vowels, consistently placing stress on the first syllable of all such words, irrespective of whether certain syllables within the word end in a coda or not.

5. Conclusion

To summarize, for speakers of weight-sensitive word prosodic systems such as English, it is very difficult to change from a grammar where both long vowels and codas contribute weight to a system where only vowels do (i.e., one where only vowels are moraic, as with Mongolian). One reason for this could be that learners in this condition move from a superset to a subset grammar, and thus have to constrict their grammar, which is argued to be more difficult than the converse (Schwartz & Sprouse 1996; White, 1989). More research will need to be done, however, to find if the converse is indeed easier, where one moves from a Mongolian-like system to an English-like system, and learns being sensitive to the weight contributed by codas, in addition that of vowel length.

The fact that codas are still moraic for (most of) these learners underlie part of the variability they demonstrate with respect to the location of stress in their utterances. Keeping this variable constant, yet changing the values of other prosodic parameters, these learners go through a number of stages, and in doing so, they generate a variety of interlanguage grammars, grammars that correspond to other natural languages.

This research also contributes to our understanding of variability in second language production. Although variability in syntax and especially morphology (and, more specifically, functional morphology) has been well-investigated (see e.g., Ionin & Wexler, 2003; Ionin, Ko, & Wexler, 2004; Lardiere, 1998a, b; White 2003 for various proposals), variability in phonology has received zero attention. Although well-justified prosodic approaches have been proposed in the literature, as with the Prosodic Transfer Hypothesis (see e.g., Goad & White, 2004, 2006; Goad, White, & Steele, 2003), the aim was, once again, to account for morphological or syntactic variability in interlanguage grammars, not variability in phonology itself. The current research sheds light on the underlying causes of variability in interlanguage phonologies, and demonstrates how this can be captured via transfer of L1 prosodic representations and through having recourse to the options made available by UG.

In addition, the present study provides several types of evidence for the involvement of UG in L2 acquisition. First, interlanguage grammars used by the English-speaking learners of Mongolian at each stage of their developmental path are possible grammars. Although they are neither like the L1 nor like the L2, these are grammars whose options are constrained by UG. Second, certain stages/interlanguage grammars, such as one that permits a variable End-Rule or End-Rule-Middle, did not emerge in the productions of the English-speaking subjects (despite being cognitively reasonable), again, a fact that is left inexplicable without recourse to UG, but finds a straightforward explanation on UG-based accounts, as these grammars are not permitted by the universal inventory of foot shapes (see e.g., Hayes, 1995; McCarthy & Prince, 1986). Instead, many learners reset End-Rule from Right to Left, in order to better accommodate the input, although this is not the value instantiated in the L1 and is different from the L2 setting, too.
In conclusion, the current study has demonstrated that both transfer from the L1 and access to UG-seem to be relevant factors in determining the stages that learners go through (and those that they do not) in acquiring the prosody of a second language. Although it is the L2 input that triggers grammar change and restructuring, clearly, the L2 input alone is not sufficient in explaining the constructions that define interlanguage grammars.

References


