Irregular Accent Patterns in Correspondence Theory

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1. INTRODUCTION

In Modern Greek (henceforth MG), the position of word stress is unpredictable: a language learner cannot decide by default which syllable in a word should be stressed. In other languages, main stress can always be assigned to the same position in a word. In Icelandic, for instance, main stress is always on the first syllable of the word, and in French, words have main stress on the last syllable. In MG, any of the last three syllables may be stressed. This kind of irregular stress assignment may be attributed to specifications in the lexicon, where morphemes are marked for stress (stafiða 'raisin-Nom.sg.'). Conflicts arise, when more than one morpheme in a word is specified for stress, since MG allows only one main stress per word (spírto + kuti = spírtoúti, *spírtoúti 'matchbox-Nom.sg.').

Previous analyses of MG (e.g. Revithiadou 1998) show that the stress patterns in MG can be explained in terms of Optimality Theory (OT) and its successor Correspondence Theory (McCarthy & Prince 1995). Faithfulness constraints referring to specifications in the lexicon as well as prosodic markedness constraints interact with each other and account for stress placement. My aim is to show that (in contrast to what Revithiadou 1998 assumes) no reference to the morphological class of a word is necessary to explain the facts. Rather, the grammar of MG is only sensitive to certain kinds of metrical information in the lexicon.

The following properties of MG are relevant for my analysis. First, syllable weight does not play a role in stress assignment. In other words, MG is a quantity insensitive language. Second, main stress is always limited to one of the last three syllables in a word (this is also known as 'the trisyllabic window'), and only one main stress peak per word is permitted (see for example Joseph & Warburton 1987; Malikouti-Drachman & Drachman 1980). Syllables are parsed (or grouped together) into feet and each foot has one prominent syllable at its left edge (trochaic foot) or its right edge (iambic foot). MG has binary trochaic feet; i.e., each foot has two syllables and the left syllable in a foot is prominent. Finally, MG has fusional morphology: a word minimally consists of a root and an inflectional ending (it should be

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1 I do not assume secondary or rhythmic stress in MG, based upon phonetic analysis from e.g. Arvaniti (1992). So all syllables which are not contained in the stressed foot are unfooted.
noted, however, that there are a few exceptions, e.g. monomorphemic nouns like *fós 'light-NOM.sg.*, and function words).

After the presentation of the data in section 2, the optimality theoretical analysis will follow in section 3, and I present concluding remarks in section 4.

2. MODERN GREEK STRESS DATA
The discussion on MG stress is limited here to one productive class of nouns, since they display all patterns of stress assignment attested in this language. The data in (1) and (2) reveal some interesting properties. First of all, any of the last three syllables in a word may bear stress. Moreover, stress may either be fixed on a certain syllable, (as in *klívanos - klívanu* and *stafiða - stafiðon* in 1b-d and 2b-d), or stress may alter its position from antepenultimate to penultimate or ultimate syllable (as in *ánthropos - anθrópu* and *θálasa - θalasón* in 1a and 2a).

(1) masculine nouns in *-os* (NOM.sg.) and *-u* (GEN.sg.):

<table>
<thead>
<tr>
<th></th>
<th>Masculine Nouns</th>
<th></th>
<th>Gender</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td><em>ánθrop-os</em> → <em>ánθróp-u</em></td>
<td>'man'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>but:</td>
<td>b. <em>klívan-os</em> → <em>klívan-u</em></td>
<td>'kiln'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. <em>fantár-os</em> → <em>fantár-u</em></td>
<td>'soldier'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. <em>uran-ós</em> → <em>uran-ú</em></td>
<td>'sky'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(2) feminine nouns in *-a* (NOM.sg.), *-on* (GEN.pl.):

<table>
<thead>
<tr>
<th></th>
<th>Feminine Nouns</th>
<th></th>
<th>Gender</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td><em>θálas-a</em> → <em>θalas-ón</em></td>
<td>'sea'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>but:</td>
<td>b. <em>γόνδol-a</em> → <em>γόndol-on</em></td>
<td>'gondola'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. <em>stafið-a</em> → <em>stafið-on</em></td>
<td>'raisin'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. <em>for-á</em> → <em>for-ón</em></td>
<td>'turn'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Some preliminary conclusions can be drawn: a fixed stress pattern arises, when the root contains an inherent specification for accent, so stress remains on the same position regardless of the inflection (e.g. *klívanos - klívámi*), indicating that the root bears a mark for stress on a special position within a morpheme. In contrast, stress becomes mobile, when the root itself is unmarked, so that the specification of an inflectional suffix may appear on the surface (e.g. *θálas-a - θalas-ón*).

If the word does not have any inherent specification, stress is assigned by default to the antepenultimate syllable due to general prosodic

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2 The stress patterns of adjectives and verbs are more restricted.
principles (e.g. ánthropos, thálasa), which constitute the default mechanism in the language. In the next section, I will turn to my analysis.

3. ANALYSIS

Morphemes may be specified for stress in the shape of an already existing foot structure in the lexicon (I follow an idea from Inkelas 1998, who stipulated inherent feet for exceptional stress in Turkish). Since feet are trochaic in MG, the leftmost syllable constitutes the phonological head of a foot, dividing it into a prominent part (named foot head) and a weak part (foot tail): (s w) or (s)³.

MG stress assignment can be explained in considering only parts of feet as specifications in the lexicon, in such a way that a morpheme may be marked for either the head of a foot (s) or the tail (w) (cf. Revithiadou 1998). In (3–6) some examples are given.

In case that a word consists of unmarked morphemes (which constitutes the default pattern), only prosodic principles are responsible for stress assignment.

(3) Unmarked case (default pattern):

\[
\begin{array}{c}
\text{Foot} \\
\text{}/ \setminus \text{}/ \\
\text{s} \setminus \text{w} \\
\hline
\end{array}
\begin{array}{c}
\text{Foot} \\
\text{}/ \setminus \text{}/ \\
\text{s} \setminus \text{w} \\
\hline
\end{array}
\]

a. thalas + a \rightarrow (thá.la.)sa
b. anthrop + os \rightarrow (án.thro.)pos

The representation of marked morphemes is different. Let us have a look at words consisting of unmarked roots and marked suffixes. The examples in (4) indicate that the inflectional ending -on (GEN.pl., 4a) is specified for a strong part of a foot and attracts stress to itself. The GEN.sg. ending -u (4b) seems to carry a foot tail and surfaces as a prestressing element:

(4) Marked morphemes (stressed and prestressing suffixes):

\[
\begin{array}{c}
s \quad s \quad w \\
\hline
\end{array}
\begin{array}{c}
s \quad w \\
\hline
\end{array}
\]

a. thalas + on \rightarrow thá.la.(són)
b. anthrop + u \rightarrow an.(thró.pu)

Roots, on the other hand, seem to be specified only for foot heads, as the examples in (5) show. I claim that a root like uran- (5b) is marked on its last segment (in this case the consonant -n-) for part of a foot. The idea is that the morpheme causes the next syllable to be prominent. In this way, this phe-

³ 's' for 'strong' and 'w' for weak'.
nomenon can be explained with the same principles as those for other marked roots.\footnote{In contrast to Revithiadou (1998), who assumes a floating accent for such cases.}

(5) Marked morphemes (stressed and poststressing roots):

\[
\begin{array}{cccccc}
& s & s & w & s & s & s \\
a. \text{klivan}+os & \rightarrow (kli\text{va}.)nos & b. \text{fantar}+os & \rightarrow \text{fan.} (\text{t\'a}ros) & c. \text{uran}+os & \rightarrow \text{u} . \text{ra.} (n\'os)
\end{array}
\]

If marked roots combine with marked suffixes, a stress clash arises. Since MG allows only one stress peak per word, only one specification may survive in the surface representation. In those cases root stress surfaces (6).

(6) Marked morphemes (two specifications within a word):

\[
\begin{array}{cccccccc}
& s & s & s & w & s & w & s & s \\
a. \text{stati} \delta + \text{on} & \rightarrow \text{sta.} (\text{fi} . \delta \text{on}) & b. \text{uran} + \text{u} & \rightarrow \text{u} . \text{ra.} (n\'u), \text{*u} . (\text{t\'a} . \text{nu})
\end{array}
\]

3.1. Analysis of the default pattern

To explain phonological stress assignment (the default pattern), a mechanism is needed that assigns stress to the antepenultimate syllable. This can be achieved by treating the last syllable in a trisyllabic word as extrametrical (Drachman & Malikouti-Drachman 1996). How can this be done in terms of OT?

In OT the grammar of any language consists of a set of universal constraints, which impose restrictions on a set of candidates. Constraints may be violated in favour of satisfying a higher ranked constraint. The differences between languages is due to different rankings of these constraints. In the successor of OT, Correspondence Theory, the constraints compare two strings which stand in a corresponding relation to each other. In the case of MG stress, input and output are the corresponding elements. Lexical specifications are marked in the input, and highly ranked constraints are responsible for their appearance in the output.

In this section I want to discuss the case when no specification for stress is available in the input. The following constraints have to be high ranking: FOOTBINARITY ensures that two syllables in a word group together as pairs, and thus build a binary foot (7). TROCHEE causes the left syllable in a foot to be prominent (8).

(7) FOOTBINARITY (FtBIN)

Feet are binary, i.e., consist of two syllables: (σσ).
(8) TROCHEE
Feet are left-headed: \((\sigma'\sigma), (\sigma'')\).

NONFINALITY guarantees that the last syllable in an at least trisyllabic word is counted as extrametrical (9). On the other hand, stress has to be hampered from moving further to the left than to the antepenultimate syllable. This is due to the constraint ALIGN-FOOT-RIGHT (10). These two constraints are responsible for the fact that the scope of stress is limited to the three-syllable-window.

(9) NONFINALITYFoot \((\text{NONFIN}_{\text{ft}})\)
A foot shall not stand in final position in a word.

(10) ALIGN-FOOT-RIGHT (ALIGN-FT-R)
The right edge of a foot is aligned with the right edge of the prosodic word.\(^5\)

In (11-13) it is shown how the correct output form can be selected from a possible candidate set. In a bisyllabic word without a lexical specification (11), there is no antepenultimate syllable, where the default pattern could apply. So there are two possibilities left: either stress could be placed on the first or the second syllable. The evaluation in (11) shows that stress is assigned to the first syllable. A candidate like (11c) realises an iambic foot and thus violates the constraint TROCHEE, which demands the left part of a foot to be prominent. Candidate (11b) leaves a syllable unparsed, so that it violates FtBIN. Even though all candidates violate NONFINFT in that they all parse the last syllable into a foot, candidate (11a) is the winner, since it doesn't violate any of the other relevant constraints.

(11) krátos 'state-NOM.sg.'

<table>
<thead>
<tr>
<th></th>
<th>TROCHEE</th>
<th>FtBIN</th>
<th>NONFINFT</th>
<th>ALIGN-FT-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (krátos)</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. kra(tós)</td>
<td></td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. (krátós)</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In a trisyllabic word consisting of unmarked morphemes (12), stress is assigned by default to the antepenultimate syllable. The winning candidate in (12a) builds a perfect binary trochee and leaves the last syllable unparsed. It only violates ALIGN-FT-R, but this is not crucial, since this constraint is lowly ranked. A candidate like (12b), which realises stress on the same posi-

\(^5\) Violations are counted by the number of syllables between the foot and the right word edge.
tion as the winning candidate in (11a), has to fail, since now there is a better candidate that fulfills NONFIN<sub>FT</sub>.

(12) ánthropos 'man-NOM.sg.'

<table>
<thead>
<tr>
<th>anθrop-, -os</th>
<th>TROCHEE</th>
<th>FtBIN</th>
<th>NONFIN&lt;sub&gt;FT&lt;/sub&gt;</th>
<th>ALIGN-Ft-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (ánθro)pos</td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. anθro(πos)</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. anθro(πós)</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

The low ranking of ALIGN-Ft-R becomes crucial in the case of words with four syllables (13). To prevent stress from moving to the pre-antepenultimate position, each violation of ALIGN-Ft-R counts (compare candidate 13a with candidate 13b). In this way, it is guaranteed that stress is kept within a certain scope.

(13) astráy̱̱los 'ankle-NOM.sg.'

<table>
<thead>
<tr>
<th>Astráy̱̱l-, -os</th>
<th>TROCHEE</th>
<th>FtBIN</th>
<th>NONFIN&lt;sub&gt;FT&lt;/sub&gt;</th>
<th>ALIGN-Ft-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (ástra)y̱̱ḻ̱os</td>
<td></td>
<td></td>
<td></td>
<td>***</td>
</tr>
<tr>
<td>b. a(stráy̱̱ḻ̱os)</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>c. astrá(y̱̱ḻ̱os)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We thus arrive at the following ranking for the phonological default pattern in MG: TROCHEE, FtBIN, NONFIN<sub>FT</sub> >> ALIGN-Ft-R.

At this point of the analysis, only the ranking between ALIGN-Ft-R and the other constraints is established. In the next section it will be shown that other constraints come into play as soon as a word has a lexical specification.

3.2. Analysis of words with lexical specifications

As soon as morphemes with a specification for stress are part of a word, additional constraints become relevant that have no impact on words without such a specification. These constraints demand (i) that lexical specifications are realised in the output, (ii) that the specifications do not change their position, and (iii) that they retain the metric information of specification. Faithfulness constraints like MAX ensure that a lexical specification will surface in the output (14), while markedness constraints such as ANCHOR-POSITION ensure maintenance of position (15).

(14) MAX(HEAD/TAIL)

A specification for a foot head in the input surfaces as a foot head in the output.
A specification for a foot tail in the input surfaces as a foot tail in the output.

(15) ANCHOR-POSITION(Foot, Foot, Initial/Final) (ANCHOR, McCarthy 2000: 161)
An element that is initial/final in a foot in the input is initial/final in the corresponding foot in the output.

These constraints have to be ranked higher than the constraints which are relevant for the default pattern (FTBIN in 7, NONFINALFT in 9, and ALIGN-FT-R in 10), because otherwise the default pattern would always surface. Let us have a closer look at words with one marked morpheme. In (16), the word *fantáros* contains a marked root, i.e. the second syllable is specified for foot structure. A candidate like (16c) that does not realise a stress peak at all would be rejected, since words in MG have to have a prominence peak. It would also violate the MAX-constraint, since one of the morphemes of the word has a specification which is not realised in the output. Candidates like (16a) realise stress on a wrong position, since it moves one syllable to the left, and is thus ruled out by ANCHOR. The winning candidate (16b) parses the last syllable into a foot, violating NONFIN. However, this is not crucial, since it is a lowly ranked constraint. So, in the end, we have a word that is parsed into a binary trochaic foot which is anchored on a certain position (16b).

(16) *fantáros* 'Soldier-NOM.sg.'

<table>
<thead>
<tr>
<th>Fan(tar-, -os)</th>
<th>MAX(HEAD)</th>
<th>ANCHOR</th>
<th>FTTBIN</th>
<th>NONFINFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (fánta)ros</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. fan(táros)</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>c. fantaros</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The ranking established up until now is as follows: MAX(HEAD), ANCHOR >> FTTBIN, NONFINFT.

In words with an unstressable (or poststressing) root like in (17) the same principles are valid. The specification for stress is anchored to the last segment of the root, so that the trochaic foot starts with this segment, as in candidate (17c). The other possibilities, namely moving the specification to another position, would violate ANCHOR in both cases, which is worse than violating the lower ranked prosodic constraints FTTBIN and NONFIN.

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6 The constraint TROCHEE is considered to be undominated in MG, so it does not appear in the following tableaux.
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(17) *ura*noS 'sky-NOM.sg.'

<table>
<thead>
<tr>
<th></th>
<th>MAX(HEAD)</th>
<th>ANCHOR</th>
<th>FTBIN</th>
<th>NONFIN&lt;sub&gt;FT&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (ura)nos</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. urá(nos)</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. *ura(nós)</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

Tableau (18) shows a word containing a prestressing suffix. This suffix is specified as a weak part of a foot. The rest of the MG grammar (especially TROCHEE) seeks to build the rest of the foot, so the preceding syllable gets the strong or prominent part of the foot, and thus is stressed. Other candidates which have another prominent position fail since they shift the stress peak (18a) or change the lexical specification (18c).

(18) anthrópu 'man-GEN.sg.'

<table>
<thead>
<tr>
<th></th>
<th>MAX(HEAD)</th>
<th>MAX(TAIL)</th>
<th>ANCHOR</th>
<th>FTBIN</th>
<th>NONFIN&lt;sub&gt;FT&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (ánthró)pu</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b. anthrópu</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>c. anthró(pú)</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

Up to now, the ranking MAX(HEAD), MAX(TAIL), ANCHOR > FTBIN, NONFIN<sub>FT</sub> (i.e., between the constraints responsible for the default case and the constraints responsible for the marked case) is established.

In words where only one of the morphemes has a lexical specification for stress, this morpheme can realise its stress specification. But what happens, when more than one morpheme in a word is marked? Only one stress peak is permitted in MG, so where in the word does stress surface? In tableau (19) you see a word containing two specifications for a prominent part of a foot, namely in the root stafiδ- and in the inflectional suffix -on. All candidates in (19) violate MAX, since they realise only one specification, even though two specifications are available in the input. The actual output (19b) is the one which does not change the position of an underlying specification and builds a prosodically well-formed foot.

(19) stafiδon 'raisin-GEN.pl.'

<table>
<thead>
<tr>
<th></th>
<th>MAX(HEAD)</th>
<th>MAX(TAIL)</th>
<th>ANCHOR</th>
<th>FTBIN</th>
<th>NONFIN&lt;sub&gt;FT&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (stafi)δon</td>
<td>*</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. stafiδon</td>
<td>*</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. stafi(δón)</td>
<td>*</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>
Consider now tableau (20): it shows that it is more important to realise a specification for a strong part than to realise a weak part of a foot, and to keep the position of a specification. The candidates which change the position (20b and 20c) are prosodically more wellformed than the winning output, but that is less important.

(20) ura(n-) 'sky-GEN.sg.'

<table>
<thead>
<tr>
<th>ura(n-, -u)</th>
<th>MAX(HEAD)</th>
<th>ANCHOR</th>
<th>MAX(TAIL)</th>
<th>FTBIN</th>
<th>NONFINFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ura(nu)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b. u(ránu)</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. (úra)nu</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

So the ranking is MAX(HEAD), ANCHOR >> MAX(TAIL), FTBIN >> NONFINFT.

So far it is striking that prosodic wellformedness is subordinate to lexical specifications. When derivational suffixes with a lexical specification come into play, this is confirmed. According to Revithiadou (1998), derivational suffixes are dominant (since they constitute the morphological head of the word) and may assign stress by means of HEADFAITHFULNESS. I want to propose a different solution to show that it is not necessarily the morphological head of a word which assigns stress, but rather another kind of faithfulness, namely a constraint ensuring that a lexical mark in the input does not change its specification in the output:

(21) INPUTHEAD # OUTPUTTAIL

A foot head in the input may not become a tail in the output.

This constraint does not refer to a morphological class, but only to the specification that a morpheme may have. A specification for stress in the lexicon does not “know” whether it belongs to a root or a kind of affix, but rather to a syllable or a segment. So in the end there are only prosodic principles that are in competition with restrictions referring to lexical specifications. This is shown in tableau (22). The candidate in (22a) represents the same pattern as the output in (13), that is the default pattern. But in this case, another candidate is selected as the optimal output, namely the one which parses the last two syllables into a foot (22b).
The constraint ranking that I propose for MG is as follows: MAX(HEAD), I-HEAD#O-TAIL, ANCHOR &gt;= MAX(TAIL), PTBIN &gt;= NONFINFT.

The intuition behind this ranking is that in the unmarked case stress tends to be more leftwards in a word, while in the marked case it prefers the right edge.

4. CONCLUSION
Specifications in the lexicon account for the unpredictable stress pattern in MG, as already shown in previous analyses (e.g. Revithiadou 1998). These specifications are represented in the lexicon as parts of foot structure, i.e., morphemes may be marked for a strong or a weak part of a foot. This is in contrast to Inkelas' (1998) treatment of exceptional stress patterns in Turkish, where she assumes entire feet to be specified in the input of morphemes. Her account would not work for MG since too many conflicts would arise under this assumption, so a distinction between strong or weak parts of a foot has to be made.

To realise lexical stress, faithfulness constraints referring to corresponding specifications in the lexicon (markings for foot structure) in interaction with prosodic markedness constraints are needed, and there is no need to assume constraints referring to floating features nor to classes of morphemes (like in Revithiadou 1998). It is important to realise the metrical information (head or tail of a foot) of the input rather than to realise the properties of a dominant morpheme.

REFERENCES


