L1 transfer in L2 word formation

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1 Introduction

Compounding is a word formation processes together with inflection and derivation. The product of compounding is a word structure consisted of two major constituents each of which belong to the category of either a **N**(oun), an **A**(djective), a **V**(erb) or a **P**(reposition). Cross-linguistic studies have revealed that the majority of compounds are right-headed, i.e. the rightmost compound constituent carries the important grammatical characteristics of the newly formed word (Selkirk 1982).[1] In other words, the rightmost constituent determines the phonological, morphological, syntactic and semantic features of the compound. Compounding has been extensively dealt with theoretically for Greek and other languages (Becker 1992, for German, Booij 1992, 2002a, 2002b for Dutch, Kiefer 1992, for Hungarian, Anastassiadis-Simeonidis 1983, 1996 Αναστασιάδη-Συμεωνίδη 1986, 1996, Ράλλη 1996, 2005, Ralli 1992, 2002, Ralli 2003a, b, 2005, Revithiadou 1995, for Greek). However, only recent studies focus on topics concerning the learning and teaching of compounding (cf. Agathopoulou 2003) as well issues concerning compound perceptibility and performance in language disorders (cf. Jarema *et al*. 1999).

   In this study, we cross-examine the capacity of Greek native speakers and German L2 learners of Greek to form compound words placing emphasis on, first, the internal structure of compounds, second, issues regarding headedness, third, the relation holding between the compound elements and, fourth, the status of the linking vowel in compound formation. The remainder of the present study is organized as follows: section 2 describes the research methodology adopted for the carry-out of our experimental task, while sections 3 and 4 present the main characteristics of Greek compounding and the results of the experimental task with Greek native speakers. Respectively, sections 5 and 6 discuss compounding in German and the results of the experimental task with the German L2 learners of Greek. Section 7 concludes the paper.

2 Research methodology

The data used for this study were collected through an off-line experimental task which took the shape of two questionnaires filled in by the subjects. T(est) 1 investigates the formation of existing Greek compounds while T(est) 2 assesses the formation of novel, i.e. non-existing, compounds. Novel compounds are morphologically possible but semantically vague or ambiguous forms. To give an example, the data in (1a) comprises an acceptable Greek compound at the morphological and semantic level. (1b),

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[1] On the relation between headedness and inflection see also Booij 1997, 2005.

however, is well-formed only at the morphological level; the two compound constituents are joined with the linking vowel **-o-** which receives stress resulting in the unmarked [[stem + stem] + deriv. suffix] compound type.[2] However, such a compound is a semantically non-acceptable word, because 'pies made of pencils' do not exist. Participants were asked to form compounds on the basis of questions like "how is a pie made of spinach called" or "what is the name of a set of a fork and a knife".[3]

(1) a. spanak-**ó**-pita   'spinach pie – FEM.SG.NOM.' (T1)
      b. *moliv-**ó**-pita   'pencil pie – FEM.SG.NOM.' (T2)[4]

Both T1 and T2 consist of 138 questions taking all major compound types, nominal and verbal, into consideration. Compounds whose first member is a preposition or a prefix or an element of archaic origin are not considered because we have indications that such forms are ambiguously perceived as either compounds or derived words. With respect to headedness, both endocentric and exocentric compounds are tested. The questionnaires were distributed to two groups, one consisting of 40 native speakers of Greek (age range: 18–58 years) and 3 German L2 learners of Greek (age range 24–41 years).[5] The group of Greek speakers consists of undergraduate and graduate students of the Department of Preschool Education/ University of Crete and other participants with higher or University education (cf. Tzakosta 2009, for detailed discussion). The group of German learners of Greek consists of three adults with higher or University education who moved to Greece as adults and live and work there. It is worth mentioning that all participants in the experiment, native speakers and L2 learners, felt awkwardly when they had to form non-existing compounds because of the semantic ambiguity of the latter. Additionally, participants took at least double time to fill in T2 compared to T1. The mean time of completion for T1 was a quarter of an hour and 45 minutes for T2 (cf. also Tzakosta 2008, 2010 for comparable results on Turkish and Dutch data, respectively).

     Our basic working hypotheses regarding the four variables of our study referred to in section 1 are the following:

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[2] [[stem + stem] deriv. suffix] forms carry the unmarked untepenultimate stress (cf. Revithiadou 1995, 1999).

[3] Given the form questions take in the tests, it is inevitable that answers may be biased in the sense that subjects may order compound constituents on the basis of the order of the constituents given in the questions. Such a bias is hard to avoid unless the off-line task takes the shape of a picture naming task. Deviation from the expected order of the compounds constituents is attested in the 'variable forms' category. Our assumption is that certain compound categories allow such deviations while others do not. This issue is amenable to future research.

[4] Ungrammatical compounds are signalled by a preceding asterisk.

[5] The number of L2 learners of Greek participating in the experiment is much smaller compared to the number of the native participants. This is due to the fact that the pool of L2 data is in the process of still being enriched. Here, we want to provide the reader with some first results from the German L2 data.

a. Native speakers are expected to prefer producing [[stem + stem] + deriv. suffix] compounds because of the unmarked prosodic pattern of the latter.

b. Linking vowels/elements comprise compound perceptual cues. In other words, linking vowels/ elements are supposed to drive accurate compound perception and production.

c. L2 learners' production is highly influenced by L1 compound formation.

d. Heads almost always emerge at the right edge of the word for both native speakers and L2 learners.

e. Both native speakers' and L2 learners' compound perception is influenced by language frequency and language use. Words of high frequency are not recognized as compounds; therefore, they are produced based on mnemonic knowledge. On the contrary, words of low frequency are produced through the activation of word formation mechanisms.

f. Both native speakers and L2 learners more frequently use forms which are determined by common word formation parameters, such as right-headedness or the use of linking vowel.

g. Both native speakers and L2 learners draw from the same pool of word formation mechanisms governed by Universal Grammar (hereafter UG).

3 Compounding in Greek

Drachman and Malikouti-Drachman (1994), Malikouti-Drachman (1997), and Nespor and Ralli (1994, 1996) have established two major compound categories for Greek; lexical and morphosyntactic. Lexical compounds are forms made of two stems and a derivational suffix, i.e. [[stem+stem] + deriv. suffix] compounds, or a stem and a word, i.e. [stem + word] compounds. The major difference between the two types of lexical compounds is that in [[stem+stem] + deriv. suffix] forms the compound head does not retain its stress; on the contrary, stress is shifted and assigned to the linking vowel on the untepenultimate syllable. In other words, ([[stem+stem] + deriv. suffix] Greek compounds are prone to the unmarked stress pattern. This is illustrated in (2a).[6] In [stem + word] compounds the rightmost constituent preserves its morphophonological characteristics, i.e. its stress and its inflectional ending. This is shown in (2b). Morphosyntactic compounds, on the other hand, are words consisting of two distinct words which preserve their morphophonological and syntactic characteristics (example in (2c)).

(2) a. pali-**ó**-filos   'old friend-MASC.NOM.SG.'
    b. pali-o-f**í**los   'old friend-MASC.NOM.SG.'
    c. ped**í**-th**á**vma   'miracle child-NEUT.NOM.SG.'

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[6] In the data discussion sections we will see that in neutral gender [[stem + stem] + deriv. suffix] compounds the inflectional ending also changes.

The linking vowel –o– is a relic from ancient Greek according to Anastassiadis-Simeonidis (1983), Ralli and Raftopoulou (1999), Ralli (2005) and Ράλλη (2007). The linking vowel appears when the second compound constituent starts with a consonant, as shown in (3a). However, it is missing when the second constituent starts with a vowel (3b).

(3) a. pefk-**ó**-dasos/ pefk-**o**-dásos   'pine forest-NEUT.NOM.SG.'
    b. xion + **á**nthropos   'snowman-MASC.NOM.SG.'

As already mentioned in section 1, like in most languages, compound heads emerge at the right edge of the word in Greek. Put differently, the rightmost constituent is the one that carries the main load of phonological, morphological and semantic characteristics of the compound form.

3 Results

Regarding the four fundamental variables which rule the present study, namely, compound type preference, the relation holding between compound elements, the status of the linking vowel, and compound headedness, the results stemming from the native speakers' experimental task have shown the following: In the existing compounds' test (T1) native speakers displayed a 95% preference for [stem + stem] + deriv. suffix] compounds (leftmost example in (4)) than 5% for [stem + word] forms (rightmost example in (4)). We assume that this preference is attributed to the fact that [stem + stem] + deriv. suffix] forms have an unmarked prosodic shape. Such forms receive stress on the antepenultimate syllable which is considered to be the unmarked landing position for Greek (cf. Revithiadou, 1995, 1999).

(4) pefk-**ó**-dasos > pefk-**o**-dásos   'pine forest-NEUT.NOM.SG.'

In the novel compounds test (T2), native speakers displayed equivalent results; more specifically, [[stem + stem] + deriv. suffix] compounds appear in 90% of the asked cases, whereas [stem + word] forms appear in 10% of the data. Representative data are given in (5).

(5) **velon-ó**-dasos > velon-**o**-dásos   **'**needle forest-NEUT.NOM.SG.'

The linking vowel **always** appears in compounds whose second member starts with a consonant in both T1 (5a) and T2 (6a). Correspondingly, in both tests, the linking vowel is absent from words whose second constituent starts with a vowel, as shown in (5b) and (6b).

(5)   a.   xion-**ó**-nero/ xion-**ó**-vroxo   'sleet-NEUT.NOM.SG.'
       b.   xionØánthropos   'snowman-MASC.NOM.SG.'(T1)

(6)   a.   vrox-**o**-vrodí   'rain & thunder-FEM.NOM.SG.'
       b.   drakØánthropos   'dragonman-FEM.NOM.SG.' (T2)

However, **–o-** *always* emerges in [[stem + stem] + deriv. suffix] real and novel compounds when it is stressed. This is illustrated in (7a) and (7b). In addition, the linking vowel appears in environments where it is phonologically and morphologically prohibited, i.e. in **V**(owel) + **V**(owel) sequences (7c) and [stem + word] compounds (7d). In such data, the presence of the linking vowel causes no difference in meaning.

(7) a. kocin-**ó**-aspros   'red + white-ADJ.MASC.NOM.SG.'(T1)
    b. mis-**ó**-ilios   'half sun-MASC.NOM.SG.'(T2)
    c. vori-**o**-anatolikós   'north-east-ADJ.MASC.NOM.SG.'(T1)
    d. ner-**o**-éboros   'water seller-MASC.NOM.SG.'(T2)

The head of the word is accurately perceived and produced in T1 almost across-the-board. There is only one case for one subject who mistakes *'lemonódasos'* (=lemon forest) for *'dasolémono'* (forest lemon). However, the head is ambiguously perceived in T2. More specifically, the actual head appears either at the left or right edge of the word in ca. 5% of the attested cases. Some representative examples are provided in (8).

(8) a. riz-**ó**-kreas (instead of the correct kreat-**ó**-rizo)
      'rice meat-NEUT.NOM.SG.'
    b. drom-**ó**-zoos (instead of the correct zo-**ó**-dromos)
      'animal road-NEUT.NOM.SG.' (T2)

Subordinate compounds exhibit a high rate of variation, ca. 50%; however no morphological or semantic errors are attested given this word formation flexibility. This is displayed in the data in (9) below.

(9) a. xtip-**o**-kárdi vs. kardi-**ó**-xtipos/ kardi-**o**-xtípi
      'heart beat-NEUT./MASC.NOM.SG.'   (T1)
    b. xtip-**o**-kéfalo vs. kefal-**ó**-xtipos/ kefal-**o**-xtípi
      'head clack-NEUT./MASC.NOM.SG.'   (T2)

In general, native speakers seem to recognize the possibility for the formation of variable real and novel compound forms without any 'cost' in meaning. In variable forms the preferred compound type is also [[stem + stem] + deriv. suffix]].

    To sum up, the data from native speakers of Greek have shown that the preferred compound type is [[stem + stem] + deriv. suffix] because of its unmarked prosodic pattern. Heads are located at the right edge of the word and the linking vowel always appears in environments where its presence comprises an essential cue for accurate word formation. Heads land at the right edge of the word except for variable forms in which the leftmost or rightmost head location causes no semantic ambiguity (for detailed discussion cf. Tzakosta 2009).

5 Compounding in German

Compounding in German is not governed by specific word formation rules as in Greek or other languages. However, there are some properties which are characteristic of German compounding. More specifically, German compounds are made only of stems and not of words. Put differently, German prefers the [[stem + stem] + deriv. suffix] than the [stem + word] compound type. Like in most languages, nominal N+N compounds are the most productive forms and heads appear at the right edge of the word. Coordinate compounds appear rarely, while, in general, compounds may consist of four or five constituents. (10) is a representative examples of such *'long'* compounds (cf. Becker 1992).

(10) Donau + dampf + schiff + ahrtgesell + scaft
     'steam river boat-MASC.NOM.SG.'

Linking elements widely appear in modern forms. We prefer to refer to linking elements rather than vowels because such linking forms are not only made of vowels. The use of the linking elements is unpredictable and depends, first, on the inflectional group a compound belongs to, and, second, on the grammatical category of the word. In general, coordinate compounds lack linking vowels (cf. Becker 1992). The linking elements appearing in German are provided in (11) below with the addition of some representative examples.

(11) a. **-s- :** Wirt + Haus   →   Wirt**s**haus
          hotel owner + house   'inn-MASC.NOM.SG.'
    b. **-es- :** Jahr + Zeit   →   Jahr**es**zeit
          year + time   'season-MASC.NOM.SG.'
    c. **-(e)n- :** Affe + Haus   →   Affe**n**haus
          monkey+ house   'monkey's house-MASC.NOM.SG.'
    d. **-e- :**   Tag + Buch   →   Tag**e**buch
          day + book   'diary – NEUT.NOM.SG.'
    e. ¨ (umlaut): Mutter + Heim →   M**ü**tterheim
             mother + house   'mother's house-MASC.NOM.SG.'
    f. ¨ (umlaut) **+ er**: Haus + Bau →   Ha**ü**s**er**bau
               house + build   'house building-MASC.NOM.SG.'
    h. **Deletion of -e-** : Aug**e** + Apfel → Augapfel
                eye + apple   'eyeball-MASC.NOM.SG.'
    i. Deletion of –e-, anaptyxis of –s- :
               Geschict**e** + Buch → Geschict**s**buch
                       'history book-NEUT.OM.SG.'

Finally, German compounds do not seem to prefer a specific stress pattern (Becker 1992).

6 Results

The general picture we get from German learners of Greek display equivalent patterns of variation like native speakers of Greek do. We assume that this is

due to the fact that, to some extent, both native speakers and L2 learners draw from the same pool of universal constraints governing compounding. However, compounding in the speech of German L2 learners of Greek seems to be highly influenced by L1 word formation mechanisms. This L1 influence tends to be minimized in the speech of speakers who reach a high level of proficiency in Greek. Mnemonic knowledge is minimized in the formation of non-existing words both in L2 where word formation is productive.

Table 1 provides the rate of unsuccessful answers in both T1 and T2. Although the rates for nominal and verbal compounds are statistically significant, it is not as high as we would initially expect. This is an indication that our German subjects have a high proficiency level in their Greek L2. It is interesting to notice that although verbal compounds appear less frequently compared to nominal compounds both in German L1 and Greek L2, verbal compounds display a lower total rate of erroneous compounds compared to nominal ones. In addition, a zero rate of erroneous verbal compounds is attested in T2. This underlines the fact that word formation mechanisms are fully activated in T2 especially for verbal forms.

	Nominal	Verbal
Test 1	4,8 %	5,6 %
Test 2	8,8 %	0 %
Total	6,8 %	2,8 %

Table 1. Rate of unsuccessful answers

[[stem + stem] + deriv. suffix] forms are statistically prevalent compared to [stem + word] forms. However, the data exhibit a high rate of unstressed forms[7], as shown in table 2. It is unexpected that 'stressless' compounds appear more frequently in real compounds. Apparently, German subjects have difficulty to relate stress to a specific compound type. There is a 3% of cases which emerge variably, namely as [[stem + stem] + deriv. suffix] and [stem + word] forms at the same time. Representative examples are provided in (12) below.

Compound types	Stem + stem	Stem + word	'Stressless'
Test 1	30,1 %	55,9 %	13,9 %
Test 2	35, 3%	51,9 %	12,8 %
Total	32,7 %	53,9 %	13,35 %

Table 2. Compound types

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[7] These are forms with plain stress.

(12) a. asxim-ó-papo vs. asxim-ó-papi   'ugly duck'   (T1)
      b. makr-ó-steno vs. makr-o-sténo   'long & tight' (T1)
      c. xtip-o-kárdi vs. xtip-o-kardiá   'heart beat'   (T1)
      d. kal-ó-gria vs. kal-o-griá   'nun'   (T1)
      e. lemon-o-dásos/ lemon-ó-dasos vs. lemon-o-dasos
                                                      'lemon forest' (T1)
      f. mer-ó-nixto vs. méra-níxta   'day & night' (T1)

In general, German L2 learners of Greek do not seem to have any problems in the use of the linking vowel given that the Greek linking vowel is only part of the pool of the German linking elements; therefore, it is easy for German L2 learners to apply it in compound formation. Table 3 provides the rates of emergence of the linking vowel in T1 and T2.

Linking vowel	Existing	Non-existing
Test 1	88,5 %	0 %
Test 2	82,9 %	10,2 %
Total	85,7 %	5,1 %

Table 3. The linking vowel

Table 4 illustrates the high rates of accurate compound head production. The examples in (13) show that head misperception, and, consequently, wrong production takes the shape of phoneme/ segmental metathesis (13a), assignment of plain stress (13b) and the replacement of passive forms by active ones (13c).

Headedness	
Test 1	97%
Test 2	93%
Total	95%

Table 4. Right headedness

(13) a. fag-o-**p**óti vs. fag-o-**t**ópi   'eating & drinking' (T1)
      b. telefte-o-xoreftís vs. teleft**é**-o-xoreft**í**s   'last dancer'   (T2)
      c. provlimat-o-darm**é**nos vs. provlima+d**é**rnis 'problem beaten' (T2)

Another interesting result is that in ~3% of the emergent compound forms German subjects do not seem to respect the stress rules which are active in

Greek. More specifically, L2 learners form compounds with plain stress (14a) or stress assigned outside of the trisyllabic window (14b).[8]

(14) a. lemon-o-dásos/lemon-ó-dasos vs. **lemon-o-dasos**
         'lemon forest'   (T1)
      b. gant-o-fóros vs. **gánt-io-foros**
         'glover wearer'   (T2)

Table 5 provides the rates of emergence of variable forms. The table illustrates the rates in which the constituent presented first in the questionnaire emerges as the first compound constituent and the rates in which the constituent presented second in the questionnaire emerges as the first compound constituent. It is obvious that L2 learners are biased to use compound constituents in the same order the latter are provided to them.

Variable forms	1st constituent	2nd constituent
Test 1	84,9 %	15,1 %
Test 2	26,6 %	73,4 %
Total	55,75 %	44,25 %

Table 5. Variation

Finally, in ~3,7% of the attested compounds, German L2 learners fail to produce compound forms. In these cases, subjects prefer to substitute compounds for monomorphemic words which are fully or partly synonymous with the compounds. This is exemplified in (15).

(15) a. elaf-o-cinigós   vs.   **cinigós**   (T1)
         'deerhunter'   'hunter'
      b. organ-o-péktis   vs.   **musikós**   (T1)
         'instrument player'   'musician'
      c. sklir-ó-kardos   vs.   **ákardos**   (T1)
         'stonyhearted'   'heartless'
      d. iperdínamos   vs.   **dinamúxos**   (T1)
         'superpowered'   'powered'

7 Discussion and concluding remarks

The goal of this paper was to investigate the characteristics of compound formation in Greek L1 and L2 as well the mechanisms involved in word formation. The data displayed that German L2 learners of Greek broadly draw from the same pool of word formation rules like native speakers do. However, German speakers of Greek are also influenced by their L1. This is certified by

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[8] In these cases stress falls on the fourth or fifth syllable from right to left.

the fact that properties of German compounds appear in the formation of Greek compounds.

What is further evident in the data of both native speakers and L2 learners of Greek is that mnemonic knowledge is widely activated in Test 1. This is expected given that known and broadly used words are not prone to being produced on the basis of word formation rules; rather they are produced as single monomorphemic words.[9]

Within this research program we previously tested data from Greek native speakers (Tzakosta 2009), Turkish (Tzakosta 2008) and Dutch (Tzakosta 2010) L2 learners of Greek. We further wish to test the validity of our theoretical claims by comparing our findings with data collected from more languages. What is also left for future research is, first, to investigate whether L1 influence on L2 learning depends on proficiency level and/ or age, and, second, to explore the degree to which UG word formation principles govern L1 acquisition and L2 learning.

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[9] By monomorphemic we refer to non-derived non-compound inflected (nominal) or conjugated (verbal) forms.

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