The Acquisition of Voice and Transitivity Alternations in Greek as Native and Second Language

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Abstract

This paper investigates the acquisition of Greek voice morphology in relation to transitivity alternations. 'Non-active' voice morphology is found in reflexive, anti-causative and passive structures. The role of the non-active morpheme is to 'check' a thematic feature of the verb, internal or external. Developmentally, the study addresses hypotheses proposed for the acquisition of transitivity alternations (Borer & Wexler 1987, Borer 2004), based on comprehension and production data from Greek L1, as well as L1 Turkish speakers with Greek L2. Results show that L1 and L2 learners can 'read' non-active morphology as passive or reflexive, indicating that it is syntactically computed. The differences between learners and native controls concern use of non-syntactic constraints on an otherwise target-like grammatical system (Borer 2004).

1. Introduction

The question of how children acquire argument structure and transitivity alternations has been central in first language acquisition research. Two hypotheses have been proposed: the first argues for the priority of lexical semantics over syntax and is referred to as the Semantic Bootstrapping hypothesis (Grimshaw 1981, Pinker 1984, Randall et al 2004), and the Syntactic Bootstrapping Hypothesis (Gleitman 1990, Borer 2004), prioritizes syntax over lexical semantics. The two hypotheses are based on alternative syntactic analyses of argument structure representations. Earlier accounts proposed that information on argument structure is included in the lexical entry. Lexical information dictates the way syntax will project (Jackendoff 1990, Levin and Rappaport Hovav 1995, Reinhart and Siloni 2004, a.o.). The alternative proposal suggests that syntax determines argument structure (Hale & Keyser 1993, Borer 1994, 1998, a.o.).

The transitivity alternations in Greek discussed in the present paper include the passive, the reflexive and the anti-causative, which are morphologically marked in terms of active / non-active Voice distinctions. More specifically, the passive, the reflexive and some anti-causatives are morphologically non-active, while other verbs in the anti-causative class are morphologically active. This is reminiscent of the morphological identity found in reflexive clitics, anti-causatives, middles and impersonal passives in Romance languages (Kayne 1975, Manzini 1986, Wehrli 1986, Reinhart

2001).[1] As will be shown in the following section, the productivity in the use of voice distinctions in Greek to mark changes in verb transitivity can be accounted for by the underspecification of voice morphology and the possibility of external or internal argument 'reduction' in the syntax (cf. Reinhart and Siloni 2004, Manzini & Roussou 2000).

Turning to previous research on transitivity alternations in child L1 acquisition, studies presented in the remaining part of this section will provide a brief sketch. Starting with the acquisition of passives, it has been argued that syntactic passives develop relatively late in English L1 acquisition, roughly around the age of 5 (Bever 1970, Strohner & Nelson 1974, Wasow 1977, de Villiers 1985). Maratsos et al (1985), however, showed that 4-year–old English children can interpret 'actional' passives accurately but have problems with 'non-actional' passives. Moreover, 'short' or 'truncated' passives (i.e. without the 'by-phrase'), as opposed to 'long' passives, are produced earlier and interpreted more accurately by English children. On the basis of such facts, Borer & Wexler (1987; henceforth B&W) propose a Maturation account for A-Chains. This notion refers to the dependency formed between the thematic position of the moved element and its landing site in SpecIP, i.e. the subject position. The formation of A-chains is also involved in unaccusative and raising structures. On this account, these structures are also predicted to be unavailable prior to the maturation of A-Chains.

A-chain formation in the English passive and unaccusative is presented in (1a) and (1b) below:

(1) a. $[_{IP}$ the doll$_i$ $[_{VP}$ was combed $t_i]]$

b. $[_{IP}$ the girl$_i$ $[_{VP}$ arrived $t_i]]$

Given that early passives are actional truncated ones and assuming that A-chain formation is unavailable as yet, B&W (1987) analyze early passives in English L1 data as adjectival. The crucial difference between adjectival and verbal passives, B&W argue, is the locus of their derivation: the lexicon for adjectival and the syntax for verbal passives. Assuming that no A-movement is involved in the adjectival passive formation, the child grammar can generate adjectival passives at a stage earlier than the one predicted for verbal passives. In addition, the lexical derivation of adjectival passives leads to the absorption of the external argument pre-syntactically. The absence of an implicit argument in the syntax further implies that adjectival passives disallow an optional 'by-phrase' to which the external theta-role would be transmitted (cf. Baker et al 1987, Jaeggli 1986, Roeper 1987). Viewed more generally, the problem that child grammars have, according to B&W (1987), is the non-canonical theta-role assignment involved in verbal passives and unaccusatives: the argument is thematically interpreted in a position other than the position where it is spelled-out.

B&W's (1987) account is further developed in B&W (1992) with the aim of accounting for Italian child data (up to 2;0-2;6) showing participle agreement in transitive constructions with clitic and DP objects alike. In order to account for the overuse of participle agreement in Italian child data, B&W (1992) suggest the *Unique External Argument Proto-Principle* (UEAPP), which reads as follows:

(2) **Unique External Argument Proto-Principle (UEAPP)**

Every predicate is associated with a unique external argument.

Every external argument is associated with a unique predicate.

In the *passato prossimo* structure consisting of the auxiliary *avere* ('have') and the participle, B&W suggest that the Italian child analyzes each verbal element as taking an external argument. Thus the syntactic subject is the external argument of 'avere' and the remaining argument (i.e. the object) is the external argument of the participial form, agreeing with its predicate.[2] Maturation leads to the 'relaxation' of UEAPP, perhaps transforming it into a more syntactic notion like the EPP associated with INFL only. Crucially, the adult derivation of participial agreement, which involves A-movement, is missing in early grammars due to maturational constraints (see also Babyonyshev et al (2001) for Russian L1 acquisition of unaccusatives). Overall, the combination of UEAPP with the lack of A-chains predicts that transitives and unergatives should be acquired earlier than passives and

unaccusatives. Crucially for our discussion, this prediction holds *independently* of the morphological properties that may distinguish passives from unaccusatives in a given language.

The maturational account has been criticized on theoretical and empirical grounds. Theoretically, attempts have been made to account for the L1 English data based on properties of the passive other than A-movement. For example, Fox & Grodzinsky (1998) argue that the problem with non-actional passives is associated with the 'by-phrase' itself and not with A-movement. In particular, the syntactic process of *θ-transmission* which establishes the link between the by-phrase and the suppressed external argument (Baker et al 1989, Grimshaw 1990, Lasnik 1988), is missing in child grammars. Thus, nonactional non-truncated passives are problematic as the by-phrase cannot be interpreted in any way other than the agentive (Fox, Grodzinsky & Crain 1995).

Furthermore, crosslinguistic data from early acquisition of verbal passives has also been presented as counterevidence to B&W's maturation account. Demuth (1989) shows that Sesotho-speaking children as young as 2;8 use nontruncated actional passives productively. Verrips (2000) presents Dutch L1 acquisition data from passive and anti-causative (ergative) structures (e.g. *het glas werd gebroken* 'the glass was broken' vs. *het glas brak* 'the glass broke'). The data (Dutch children at age 2;6-6;6) show that the implicit argument is present in both the passive and the anti-causative structure, providing support for the claim that child passives have an

implicit argument represented even if not expressed in a by-phrase (contra B&W 1987). Note that the morphological difference between the (periphrastic) passive and the active morphology in Dutch passives and anti-causatives respectively, does not appear to help the child distinguish between the two structures in the representation of the implicit argument even as old as age 6;6. This claim is relevant to languages like Greek, which can use non-active morphology in passives and some anti-causative structures (see section 2 below). In other words, the 'passive' reading for passives and anti-causatives alike should be attested across languages, regardless of morphological properties of each class of predicates within a language.

Universal claims regarding L1 development are made by the maturation account (B&W 1987, 1992) as well as the θ-transmission deficit account (Fox & Grodzinsky 1998). Demuth's (1989) analysis, on the other hand, acknowledges the possible role of crosslinguistic differences in the development of passives, which depend on the productivity of the structure in the language and its frequency in the input. Thus, Demuth attributes the contrast between the early use of passives in Sesotho and their late development in Hebrew (Berman 1985) or German (Mills 1985), to language specific properties of the passive in each language.

Considering the variation in the emergence and acquisition of passives crosslinguistically, the data argue against a maturation account. It is possible, however, that maturation and language-specific properties can

jointly account for the acquisition of transitivity alternations in a language. In other words, it is possible that a maturation account can place the lower limit of acquisition before which the derivation is not available, whereas language-specific properties will determine the relative timing of development.[3] Languages with a limited productivity of the passive due to restrictions on information structure or a relatively free word-order form a very different input for the language learner compared to languages like English with a productive passive. Moreover, language-specific differences in morphological marking of transitivity, unaccusativity, reflexivity and passives could also be critical for the nature of the input and the timing of acquisition of the structures in question.

An alternative account in Borer (2004) argues for very early syntactic knowledge of argument representation and (aspectual) event structure. This knowledge constrains the use but also the overgeneralisations attested in the L1 acquisition of Hebrew transitivity alternations. Two stages in L1 development are identified; the first, a mopho-phonological stage where syntactic event structure is in place but morphological production is constrained by morpho-phonology alone. The second stage is the morpho-syntactic stage in which morphology maps onto syntax but the limitations in item selection are not limited by vocabulary knowledge available to the adult. Borer's analysis of child language crucially involves the suggestion that verb forms produced by children roughly up to the age of 6;0 are computed 'on-line' on the basis of syntactic rules, rather than retrieved from

the lexicon. This claim will be shown to receive support from the results of the present study from child L1 and child L2 Greek.

2. Voice distinctions and transitivity alternations in Greek

Voice morphology in Greek is expressed on the verb and can be distinguished between active (ACT) and non-active (NACT).[4] Some typical transitive, action verbs show a one-to-one correlation between ACT/NACT morphology and the active/passive reading, as illustrated in (3a) and (3b):

(3) a. *I ergates gremis-an to spiti.*
the-nom workers demolished-ACT.3p the house
'The workers demolished the house.'

b. *To spiti gremis-ti-ke apo tus ergates / apo to sismo.*
the-nom house demolish-NACT-3s by the workers / by the earthquake
'The house was demolished by the workers / by the earthquake.'

Similarly with English passives, the by-phrase may express cause or agent theta-roles depending on the semantics of the predicate.

There are cases, however, where voice distinctions do not match the corresponding interpretive differences. Starting with active morphology, the well-known ergative class of verbs, which undergo the causative/anti-causative (ergative) alternation (e.g. (4)-(5)), appear in the active form in both structures (see Theophanopoulou-Kontou 2000, Alexiadou & Anagnostopoulou 2004):[5]

(4) a. *O aeras eklis-e tin porta.*
the-nom wind closed-ACT.3s the-acc door
'The wind closed the door.'

b. *I porta eklis-e apo ton aera.*
the-nom door closed-ACT.3s by the wind
'The door closed (*by the wind).'

(5) a. *O ilios elios-e to pagoto.*
the sun melted-ACT.3s the ice-cream
'The sun melted the ice-cream.'

b. *To pagoto elios-e apo ton ilio.*
the-nom ice-cream melted-ACT.3s by the sun.
'The ice-cream melted (*by the sun).'

Note that the PP (*apo* ... 'by …') expressing cause can be present in the anti-causative structures (4b) and (5b). The preposition used is identical

with the one used in the passive (3b).[6] The anti-causative version involves the suppression of the external argument present in the causative.[7] This process has been analysed in a large number of previous studies as involving some lexical or feature-based operation which reduces the number of expressed arguments by one (referred to as 'decausativization', 'detransitivisation' or 'reduction', e.g. Chierchia 1989, Levin & Rappaport 1995, Reinhart 2002). Other accounts of unaccusativity suggest that the unaccusative structure derived from or associated with the transitive/causative version correlates with the absence of a light v or Voice/v category responsible for introducing the external argument (Hale & Keyser 1993, 1998, Chomsky 1995, Kratzer 1996, von Stechow 1995, Alexiadou & Anagnostopoulou 2004).

In Greek, the class of anti-causative verbs also includes verbs which can appear either with active or non-active morphology (Theophanopoulou-Kontou 2000, Alexiadou & Anagnostopoulou 2004):

(6) *To pukamiso leros-e / lero-thi-ke*
The-nom shirt got-dirty-ACT.3s / got-dirty-NACT-3s
(apo to krasi).
(by the wine)
'The shirt got dirty (by the wine).'

Verbs like *tsalakono* (‘crinkle’), *katharizo* (‘clean’), *dhiplono* (‘fold’), *isiono* (‘straigthen’) belong to this class. This apparent optionality in the choice of active or non-active voice morphology disappears when the subject DP is animate (see also references above):

(7) *Ta pedhia lero-thi-kan / *leros-an*
The-NOM children got-dirty-NACT-3p /* got-dirty-ACT.3p
(apo ti laspi).
(by the mud)
‘The children got dirty (from mud).’

Furthermore, there is an interpretive difference between *lerose* and *lerothike* in (6). The active form is used when no indication of a cause or agent argument is intended, whereas the non-active form involves an additional argument, albeit implicit. In other words, the active form of the verb implies that the speaker is unaware or wants to avoid reference to some cause (animate or inanimate) or agent and opts to refer to the result of the event. Non-active morphology, on the other hand, makes the syntactic argument active, but unexpressed in the typical (DP) sense. In addition, Alexiadou & Anagnostopoulou (2004) argue that the active form of (6) denotes a partial change whereas the non-active form a complete change-of-state (possibly, an aspectual distinction between achievement and accomplisment). In any

case, the two options in (6) are different in interpretation and point to a distinct syntactic derivation presented below.

With respect to (7), it could then be argued that animacy forces the predicate to denote a syntactically implicit external cause or agent, hence the non-active voice marking. (7) is, thus, ambiguous between an anti-causative and a reflexive reading, as shown by the continuation of (8) in the form of a purpose clause:

(8) *Ta pedhia lerothikan ja na eknenvrisun*
the-NOM children dirtied-NACT for SUB. anger
tus gonis tus.
the-ACC parents their
'The children dirtied themselves in order to make their parents angry.'

The subject *ta pedhia* is an agent argument which controls reference of the embedded subject in the purpose clause (Tsimpli 1989). Thus, the difference between (7) and (8), both involving animate subjects, is a difference between the DP 'ta pedhia' being an internal and an external argument respectively (cf. Reinhart & Reuland 1993, Reinhart & Siloni 2004, Alexiadou & Anagnostopoulou 2004).[8] The anti-causative interpretation is similar to the passive, the difference being the cause reading of the suppressed external argument.

The ambiguity between a reflexive and a non-reflexive (passive or anti-causative) reading is also found with actional verbs generally, even those usually referred to as inherently reflexive:

(9) a. *To moro pli-thi-ke (mono tu*
the-nom baby wash-NACT-3s (own his
/ apo tin mitera tu).
/ by the mother his)
'The child washed itself.' / 'The child is being washed.'

b. O papus ksiris-ti-ke (monos tu
The old-man shaved-NACT-3s (own his
/ apo ton kurea).
/ by the barber)
'The old man is shaving himself' / 'The old man is being shaved.'

It should be pointed out that use of an overt agent 'by-phrase' is considered marked in Greek (Laskaratou & Philippaki-Warburton 1984, Joseph & Philippaki-Warburton 1987, a.o.). Recall also from the discussion of (4b) and (5b) that the *apo*-phrase in Greek has a variety of readings depending on the morphological and semantic properties of the predicate (see also fn.6). In many cases, the agent *apo*-phrase appears to be marginally acceptable,

even where the passive reading is independently available. The markedness of an agent by-phrase is reduced when properties of the information structure, pragmatic salience of the agent and register differences are controlled for.[9]

It is thus possible to claim that non-active voice morphology has transitivity effects, although NACT is underspecified with regard to the passive, anti-causative or reflexive readings it gives rise to (cf. Embick 2004). Clearly, the adult native speaker shows preferences for the anti-causative, passive or reflexive reading depending on semantic or pragmatic properties of the verb as well as extralinguistic factors that regulate vocabulary choices. The grammar, however, does not distinguish between derivations in any way other than the reflexive/non-reflexive distinction in sentences with non-active voice morphology.

In the following section the representation of non-active voice morphology and the derivation in the reflexive and non-reflexive structures is presented.

2.1 The Syntax of Voice

As shown in the previous section, non-active voice marks reflexives, middles, passives and anti-causatives in Greek. In addition, the ambiguity in the interpretation of the non-active verb is constrained by (i) animacy of the syntactic subject, (ii) semantic features of the predicate which interact with

the animacy of the subject (e.g. animate subjects with anti-causative verbs are ambiguous between the reflexive and the anti-causative reading, whereas reflexive verbs are ambiguous between the reflexive and the passive reading) and (iii) lexical preferences of the adult speaker depending on the prototypicality of the subject in relation to the predicate used (cf. (4) and fn. 5).

I will assume that Voice projects as a feature of light v only in the non-active (cf. Alexiadou & Anagnostopoulou 2004). This is partly due to the fact that active voice is not morphologically marked independently from tense, agreement or aspect, and partly due to the fact that it appears in both transitive and unaccusative structures; in unaccusatives no external argument is present. Thus, the transitivity alternation found when no voice change is involved, as well as unaccusative verbs like *arrive* and *come*, can be argued to represent differences in a transitivity or agentive feature borne by light v, independently of Voice (cf. Hale & Keyser 1993, 1998, Chomsky 2001). On this account, the anti-causative structure with active morphology is unaccusative and the single internal argument in (10a) is moved to the specTP position, i.e. the structure in (10b) (Hale & Keyser 1993, 1998, Chomsky 2001, Alexiadou & Anagnostopoulou 2004).[10] Alternatively, it could be assumed that the subject is merged in its spell-out position and attracts the θ-feature on the V head, i.e. the structure in (10c) (Manzini & Roussou 2000).[11] The basic assumption in this case is that theta-roles are

features attracted by DPs, subject to locality (see also Hornstein 1999 for treating theta-roles as features):

(10) a. *To pukamiso lerose.*
the-nom shirt dirtied-ACT-3s

b. [$_{TP}$ to pukamiso [$_{vP}$ lerose [$_{VP}$ [$_{DP}$ ~~to pukamiso~~]]]]

c. [$_{TP}$ <u>to pukamiso</u> [$_{vP}$ lerose [$_{VP}$ [$_{\underline{V<\theta>}}$]]]]

The vP in the anti-causative (and unaccusative) structure in (10a) lacks a transitivity or agentive feature.

Consider the representation of non-active morphology. Following Kratzer 1996 and Alexiadou & Anagnostopoulou (2004), I will assume that a v/Voice head is included in the structure. On the basis of the data discussed in the previous section, we can conclude that the presence of non-active Voice has effects on the predicate's expression of transitivity. In structural terms, Voice has a single effect on the derivation: the local attraction of a theta-feature. Recall that in Manzini & Roussou's (2000) analysis, theta-attraction is possible by DPs as well as by inflectional features. Voice can then be a local theta-attractor with one crucial difference from DP arguments: the theta-feature attracted by Voice is not available for lexicalisation as an independent DP argument (see also Zevgoli 2000). A by-product of this restriction, is that Voice leaves the attracted feature underspecified with regard to interpretation at LF. This can be viewed as a

consequence of Voice lacking nominal features (case or person) which would enable the interpretive component to assign referential or thematic properties of the traditional type (cause, agent, experiencer etc).

Thus, LF requirements related to the predicate-argument(s) interpretation, force the attracted feature to be 'read off' according to the following two possibilities:

(11) $[_{v/VoiceP}\ \underline{DP}\ [_{v/Voice}\ \underline{<\theta 1>}\ v/\ \underline{Voice}\ [_{VP}\ V_{\underline{<\theta 2>}}\ ]]]$ Reflexive

In (11), v has an agentive feature which is attracted by the DP subject in the specifier of vP. This is the true external argument. The remaining theta-feature is attracted by Voice. Given the ban on lexicalisation by a DP, the LF interface has two theta-features to interpret in the verbal domain. The reflexive interpretation is the result of the DP attractor interpreting both features in this domain.

(12) $[_{TP}\ \underline{DP}\ [_{v/VoiceP}\ v/\underline{Voice}\ \underline{<\theta 1>}\ [_{VP}\ V_{\underline{<\theta 2>}}\ ]]]$ Passive / Anti-causative / Middle

In (12), Voice attracts the agentive feature, i.e. the external argument (cf. Embick 2004)[12]. As a result, the external theta-feature cannot be lexicalised by a DP, hence the absence of specvP. The remaining theta-feature requires an attractor to be interpreted at LF. The DP merged in the subject position

can attract the internal theta-feature, hence the 'derived' interpretation of the subject available in passive, anti-causatives and middles. Given that Voice can only attract a feature but fails to interpret it, the preferred anti-causative, middle or passive reading is the result of the semantics of the predicate (e.g. change-of-state, situation type), temporal/modal properties of the clause (e.g. for the distinction between the middle and the passive), and pragmatic information (i.e. the naturalness, frequency and transparency of the relation between the subject and the event described by the verb; e.g. *to pedhi plenete / vrexete* 'the child is washing himself (preferred reading: reflexive) / is getting wet (preferred reading: anti-causative'). In other words, the interaction of various clausal but also extra-clausal properties can be invoked in arriving at a final 'unambiguous' reading, whereas the syntactic derivation itself can only distinguish between what is LF-interpreted as reflexive or non-reflexive (cf. Reinhart & Siloni 2004).[13]

On the basis of the above, a three-way distinction is required to account for the difference between an argument being (i) not syntactically realized (but possibly present at the level of conceptual structure, e.g. in active anti-causatives), (ii) syntactically realized as a theta-feature but not as a DP (i.e. in non-active voice morphology), and (iii) lexicalised as a DP (i.e. in active transitive and reflexive structures). Options (i)-(ii) involve the transitivity alternations examined in Greek L1 and L2 acquisition data in the present study.[14]

Before we move to the L1 and L2 data, it is important to describe some morpho-syntactic properties of Turkish reflexive, anti-causative and passive verbs, in order to consider the possibility of Turkish L1 interference in the production and interpretation of L2 Greek verbs of the corresponding class.

3. Voice morphology and transitivity alternations in Turkish.

Turkish marks reflexivity morphologically with the morpheme –(I)n (Kornfilt 1997):

(13)	giy- (= wear)	/	giy-in- (=dress-REFL)
	tara- (=comb)	/	tara-n- (=comb-REFL)
	yika- (=wash)	/	yika-n- (=wash-REFL)

Kornfilt points out that the reflexive morpheme has low productivity in that only a restricted number of verbs undergo the transitive / reflexive alternation illustrated in (13) above. In some cases, the reflexive is marked identically with the passive (see below). When ambiguity between the two readings arises, a second passive morpheme can be added to distinguish between the passive and the reflexive reading:

(14) *Ayşe yika* ***-n*** *–di*

Ayşe wash-REFL/PASS-PAST

'Ayşe washed herself.'

(15) *Ayşe yika* ***-n*** *–****il*** *–di*

Ayşe wash –REFL/PASS-PASS-PAST

'Ayşe was washed.'

Passivisation is productive in Turkish, mostly with direct objects of transitive verbs, as in Greek. However, Turkish also has impersonal passives, where the subject retains its dative case marking but verb morphology is non-active:

(16) a. *Hasan ders –ler – e başla –di*

Hasan lesson-PL-DAT begins-PAST

'Hasan began the lessons.'

b. *ders –ler –e başla –****n*** *–di*

lesson-PL-DAT began-PASS-PAST

'The lessons began.'

As far as the causative/anti-causative alternation is concerned, there is partial overlap in the use of the morpheme found in reflexives and passives, but, again, only with a few verbs:

(17) a. *Hasan kapi –yi kapa-di*

Hasan door-ACC close-PAST

'Hasan closed the door.'

b. *Kapi kapa –**n** –di*

door closes-ERG.-PAST

'The door closed.'

(18) a. *Hasan kapi –yi aç -ti*

Hasan door-ACC opens-PAST

'Hasan opened the door.'

b. *Kapi aç –**il** –di*

door opens-ERG-PAST

'The door opened.'

Kornfilt (1997) argues that the morpheme in the above examples is neither passive nor reflexive, despite the similarities it bears with both of these morphemes, in certain cases. She concludes that it is a 'middle' morpheme with an anti-causative reading.

Overall, the properties of voice morphology in Greek and Turkish are similar in terms of the syncretism, or underspecification, of the non-active morpheme. As in Greek, the Turkish non-active morpheme can occur in passive, anti-causative and reflexive structures. However, reduplication of

the morpheme for disambiguation is only possible in Turkish. In addition, in Turkish use of this morpheme in anti-causatives and reflexives is lexically restricted whereas the passive is productive. This is evidenced by the availability of impersonal passives and the possibility of passivizing an indirect object. As mentioned in the previous section, the Greek passive is constrained by lexical, pragmatic and discourse factors. However, 'short' passives with a modal or temporal reading are productively used and the ambiguity between the anti-causative and the passive with inanimate subjects, and between the anti-causative, the passive and the reflexive with animate subjects, shows that the process is productive and syntactically derived.

4. The Study

The empirical part of this research is a pilot study investigating the interpretation of voice morphology and its interaction with transitivity alternations in Greek as native and second language. The first task used was a sentence-picture matching task (SPM). The second was an elicited production test which was used only with the more advanced groups of L2 learners of Greek and adult controls. Both tasks aimed at testing structures with active and non-active morphology verbs in relation to two conditions: (a) animacy of the syntactic subject and (b) verb class, i.e. verbs

participating in the causative/anti-causative alternation and verbs which favour the reflexive reading. Recall that the grammar does not appear to restrict its derivational options depending on verb class. Thus, the term 'verb class' will be used to refer to the *preferred* reading that an adult native speaker of Greek has for each of the verbs used in the tests. The production task aimed at eliciting passives as well as active anti-causatives and reflexives.

4.1 Subjects

The SPM task included 104 subjects in total. These were distributed as shown in Table 1.

@@@insert Table 1 here @@@

In the non-native speaker NNS groups, children in the T-Prim group were born in Northern Greece and live in the town of Iasmos in the Komotini area, while the T-Sec and T-UpperSec subjects were born in different parts of Northern Greece and at the time of the study, they all attended a secondary school close to the Greek/Turkish border. The native language of all of the NNS is Turkish, their home language. They are systematically exposed to Greek only at school. The T-Prim children go to a minority Greek/Turkish school where both languages are used in education, whereas

the language used at school for the secondary school groups (T-Sec and T-UpperSec) is Greek only. All groups of NS live in Northern Greece, in the area of Thessaloniki.

The production test included 54 subjects in total, who were distributed as shown in Table 2.

@@@insert Table 2 here @@@

The production part did not include primary school or pre-school children with Greek as L1 or L2 because there was considerable difficulty in eliciting the right verbs, not at the level of morphology but at the vocabulary level. In some cases, the same problem was found in the groups tested (see below).

4.2 Description of the tasks

4.2.1 The Sentence-Picture Matching task (SPM)

The SPM task tests the preference for the anti-causative or the reflexive reading as compared to the passive. It aims to examine whether the preference depends on the animacy of the subject, voice morphology and verb class. In all test sentences, schematised in Table 3, the passive reading was non-target due to verb class. Specifically, the verbs were chosen to be either 'inherently' reflexive or verbs of the anti-causative class. The test

included 11 sentences (see Appendix for details). For each sentence orally produced by the researcher, three pictures were presented simultaneously. The position of the target picture was random and the order of presentation of the sentences was the same for all subjects but randomized with respect to the type of structure tested. All verbs were in the 3rd person singular. No 'by-phrase' was included in any of the sentences.

@@@insert Table 3 here @@@

Eight of the sentences included an animate subject and three an inanimate. Recall that animate subjects with verbs in non-active morphology usually give rise to ambiguity between the anti-causative, the passive and the reflexive reading. Inanimate subjects, on the other hand, can only be ambiguous between the anti-causative and the passive interpretation, when the verb is in the non-active form.

The 'target' picture was the one depicting the event as anti-causative or reflexive depending on verb class and subject animacy. Of the other two pictures, one presented the same activity with an additional participant being the agent of the activity. The third picture either showed a different activity (a true distractor) or the activity described by the verb but with 'active' reading, i.e. where the subject of the sentence is the agent. Specifically, the sentences with inherent reflexives were presented with two non-target pictures, one of which depicted the activity affecting the subject of the

sentence but with another person as agent (i.e. the 'passive' reading), and the other where the subject of the sentence is the agent but the activity affects someone else (the 'active' reading). The possibility of the active reading was included since it is possible that verb meaning is known but voice distinctions are not fully acquired. For example, for S8 (*To agori plenete* 'The boy wash-NACT'), the target picture is the one where the boy washes himself, the second picture shows the boy being washed by someone else (the 'passive' reading) and the third shows the boy washing someone else (the 'active' reading) (see example of picture-set in Appendix).

Sentences with animate subjects, non-active morphology and anti-causative verbs, were given the following choices: the target picture where only the syntactic subject appears, a picture where someone else is the agent of the action (the 'passive' reading) and the third picture where the syntactic subject of the sentence performs the activity described on something else (the 'active' reading) or a true distractor.[15] For example, for S1 *I kopela tripithike* 'The girl pricked-NACT-3s', the target picture shows the girl sewing and pricking her finger, the second picture shows a nurse pricking the girl with a needle, and the third picture shows the girl reading.

The sentences with anti-causative verbs in active morphology and inanimate subjects included, apart from the target picture, a picture where someone performs the activity on the syntactic subject according to the verb meaning (the 'passive' reading) and a distractor where a different event takes place. This irrelevant distractor was used because the active reading

was unavailable for the inanimate subject. For example, for S5 *To lastixo tripise* 'the hose pricked-ACT-3s', the target picture shows a hose with water coming out from a hole, the second picture has a hose without a hole, and the third has someone opening a hole with a pair of scissors (the 'passive' reading).

4.2.2 The Production Task

The main aim of the task was to look for areas of difficulty in the production of voice morphology. Overgeneralisation of active or non-active voice morphology on different verb classes would indicate the priority of derivational differences (reflexive vs non-reflexive) and verb morphology over the verb's semantics in developing L1 and L2 grammars.

The task consists of fifteen isolated colored pictures which were presented to the subject one-by-one, followed by a question asked by the researcher, such as 'What happened to x?' or 'What is x doing?' (cf. Jakubowicz et al 1996, 1997).[16] The pictures aimed at eliciting verbs which belonged to three classes (5 per class): reflexives (non-active morphology), anti-causatives with active morphology and passives:

(19) a. **Reflexives**: *skepazete* (cover-NACT), *vrehete* (spray-water-NACT), *ksirizete* (shave-NACT), *skupizete* (wipe-NACT), *tendonete* (stretch-NACT)

b. **Anti-causatives**: *lighise* (bend-ACT), *raghise* (crack-ACT), *espase* (break-ACT), *evrase* (boil-ACT), *anikse* (open-ACT)

c. **Passives**: *vaftike* (paint-NACT), *mutzurothike* (smudged-NACT), *ksilothike* (ripped-NACT), *skistike* (tore-NACT), *gremistike* (demolish-NACT).

For the elicitation of reflexives the activity always involved an animate subject, whereas the remaining pictures included an inanimate entity. It is common in such production tests to elicit verbs close in meaning to the target but not the target itself. For example, in cases where the target verb was *espase* 'broke' and the subject produced *rajise* 'cracked', the response was considered appropriate. Overall, responses were classified as correct when the target verb or a verb semantically close to the target, was produced and the morphology was appropriate (active or non-active). Responses in which an appropriate verb was used but voice morphology was wrong were considered non-targetlike and coded accordingly. For example, if instead of *espase* 'broke-ACT' the participant produced *spastike* 'broke-NACT', the response involves overuse of non-active morphology, and hence, is considered non-targetlike. Lexical errors including irrelevant and inappropriate responses as well as zero responses were coded differently and will be presented as a separate class.

4.3 Research questions

The main research questions of the study are the following:

(20) a. Does the grammar (i.e. voice morphology and the +/- reflexive difference) constrain the possible readings of a verb in NS and NNS even in the youngest groups of learners? In other words, is there more ambiguity in the interpretation of non-active verb forms in L1 and L2 learners, compared to native controls?

b. Is there evidence for the absence of a syntactic passive in the youngest group of L1 Greek children (cf. B&W 1987, 1992)?

c. Is there a preference for an implicit agent in passives and anti-causatives alike regardless of voice morphology in the latter group? (cf. Verrips 2000)

5. Results: Sentence-Picture matching task

5.1 'Inherent' Reflexives

For the reader's convenience, the presentation of the results will be according to reading type. First, consider verbs which are arguably inherent reflexives: *plenome* 'wash', *dinome* 'dress', *xtenizome* 'comb', *vafome* 'make-up'. Voice morphology is non-active and the subject of the sentence

is animate. The term 'target reading' refers to the reflexive whereas 'non-target' includes the dispreferred by natives, but grammatical nevertheless, reading (i.e. the 'passive' in Table 5), or an ungrammatical choice (i.e. the 'active' in Table 5). The relevant sentences are S6, S7, S8 and S10.

@@@insert Table 4@@@

In the NNS data, there is a developmental trend towards the target but the difference with the adult controls is found even in the advanced group (T-UpperSec). The two groups of Greek preschool children differ from the remaining Greek groups and their performance is on average similar to the youngest non-native group (T-Prim). However, on individual sentences the T-Prim group shows diverse performance, whereas this variation is not found in the Greek children. It is possible that the variation in the T-Prim group is due to lexical rather than morphological problems.

@@@insert Table 5@@@

As shown in Table 5, the most frequent non-target reading in the NNS groups is the passive. In the T-Sec and T-UpperSec groups, the passive is the only 'non-target' reading type, whereas in the younger Turkish-speaking group (T-Prim), the active reading is also attested. This indicates that T-Prim occasionally faces problems with identifying voice distinctions.

In the NS groups, the youngest group (G-PreS1) show similar rates of passive and active readings with reflexive verbs, whereas G-PreS2 follow the trend found in the NNS, i.e. the passive reading is more frequent than the active. Overall, it is clear from the performance of both native and non-native groups that reflexive verbs are not exclusively interpreted as such in the early stages of L1 and L2 acquisition. Non-active morphology is also 'read' as passive in reflexive verbs whereas the 'active' reading attested only in the youngest groups indicates a different kind of problem, namely the identification of voice morphology. Thus, with respect to the research questions in (20a) and (20b), the data indicates that learner groups show ambiguous interpretations for non-active morphology on reflexive verbs. The implication is that non-active morphology is already part of the developing grammar but is not as yet constrained by the lexical or pragmatic factors which lead to the attested unambiguous interpretation of the native controls.

5.2 Anti-causative verbs with Non-active morphology and Animate subjects

Sentences including the verbs *tripithike* 'pricked', *kriftike* 'hid' and *kopike* 'cut', belong to this category (S1, S2 and S3).

@@@insert Table 6@@@

In the NNS groups, performance is similar to that found with reflexive verbs. In addition, the variable performance of the T-Prim group between sentences is similar to that found with reflexives. In the NS groups, there is gradual improvement but the difference between the two preschool groups is rather small.

Table 7 presents the preference for the passive and the active reading, i.e. the 'non-target' dispreferred and ungrammatical readings of anti-causatives, respectively.

@@@insert Table 7@@@

The most common 'non-target' response with non-active anti-causative verbs and animate subjects is the passive. This is particularly obvious in the G-PreS1 and G-PreS2 groups but also in the T-Prim group. If we compare the preference for the passive reading in the anti-causative and the reflexive verbs presented in the previous section, the NNS groups show similar rates, whereas for the Greek preschool children the passive reading is more frequent with anti-causatives. This provides further support that non-active morphology is part of the developing L1 and L2 grammars, while the increased acceptability of the 'passive' reading is an indication of the minimal effects of vocabulary and pragmatic choices in early stages of acquisition (cf. (20a)).

As far as the active reading is concerned, only S3 is problematic in this respect, possibly due to the fact that the passive morpheme in this verb is not as salient phonologically as in the other two verbs tested (i.e. *kop-**i**-ke* vs *trip-**ithi**-ke* and *krif-**ti**-ke*). Nevertheless, the active reading is only found in the three groups for which there is additional evidence from reflexives that voice morphology may occasionally be ignored, i.e. G-PreS1, G-PreS2 and T-Prim.

5.3 Anticausative verbs with Active morphology and Inanimate subject

S4 (*I varka vuliazi* 'the boat is sinking') and S5 (*to lastixo tripise* 'the hose got-pricked') are included in this category. Recall that one of the other two pictures presented to the participant included an agent performing the action described by the verb. This will be referred to as the 'passive' reading. The third picture is a distractor picture (for S4 the boat is floating; for S5 the hose doesn't have a hole). Thus, there is no 'active reading' error involved.

@@@insert Table 8@@@

The only groups showing low preference for the target reading are the G-PreS1 and the T-Prim. It is noteworthy, however, that G-PreS1 show similar performance in both sentences whereas T-Prim show lower performance in S5. This difference is also found, albeit to a much lesser degree, in all NS

groups except for the adult controls. It is possible that the difference between S4 and S5 has to do with the difference between external and internal causation in each case. Thus, the verb *sink* could be more easily construed as internally-caused change-of-state compared to 'the hose got-pricked'. Finally, if we compare the performance of G-PreS1 in the two classes of anti-causative verbs, i.e. the non-active (Table 6) and the active (Table 8), the latter seem more problematic for this group.[17]

@@@insert Table 9@@@

With the exception of G-PreS1, all other groups show best performance overall in this group of anti-causatives with active morphology. The low performance of the G-PreS1 group could be argued to stem from the non-prototypical use of active morphology with a theme argument in subject position (cf. Verrips 2000). The contrast between the preference for the passive reading in the G-PreS1 group (i.e. 3-4 year olds) in anti-causatives with non-active vs. active morphology (24% vs. 64% respectively), points to the sensitivity of this group to voice morphology being linked to non-canonical thematic interpretation of the syntactic subject. This is indirectly supported by the performance of G-PreS2 who disallow a 'passive' reading in the active anti-causatives but not in the non-active ones (7% vs. 30% respectively).

Two of the test sentences, S9 and S11, involved the same anti-causative verb *leronete* 'dirties-NACT' with an animate and an inanimate subject respectively. In the case of the animate subject the choices depicted by the three pictures show reflexivity (the boy making himself dirty on purpose), the anti-causative reading (the boy making himself dirty when catching a ball) and finally the passive reading (someone throwing mud to the boy). For the inanimate subject, a white shirt, the choices are the passive reading, the anti-causative (no agent is present), and a distractor picture, pragmatically odd (i.e. a blue shirt getting dirty).

@@@insert Table 10@@@

The contrast in the interpretation of the same verb depending on the subject being animate or inanimate is clearly shown in the GC group. In particular, the animate subject gives rise to the ambiguity between the agent and the cause reading (reflexive vs anti-causative). The choice of the passive reading is found in the Greek preschool children and in T-Prim. The inanimate subject, on the other hand, also shows ambiguity between the passive and the anti-causative reading. Although the animate/inanimate distinction is based on one verb only, the results are indicative of the (multiply) ambiguous readings of non-active voice morphology in Greek, even though the semantic classification of the verb would predict an exclusively anti-causative reading.

5.4 Summary of results from the SPM task

The results from the SPM task point to developmental patterns in L1 and L2 Greek with regard to voice morphology, its interaction with verb class and subject animacy. With respect to questions (20a&b), the answer is positive. Specifically, child L1 grammars allow the passive reading, i.e. an agentive reading, for reflexive and anti-causative verbs with non-active voice morphology. This also holds for the youngest group of child L2 learners (T-Prim) similarly with G-PreS1 and G-PreS2, as well as the older L2 learners although at a lower rate. Compare the following two graphs which show reading preferences for the youngest L1 and L2 groups of learners, with reflexive and anti-causative verbs with non-active morphology.

@@@insert Figures 1 and 2@@@

Note that the non-target 'passive' reading in anti-causatives and reflexives indicates that voice morphology and its syntactic effects are already part of the L1 and the L2 grammars (cf. (20b)).

As shown by the above Figures, these groups of L1 and L2 learners of Greek also show some problems with voice morphology as evidenced by the occasional preference for the active reading. Recall that this choice indicates appropriate interpretation of the verb but not of voice morphology.

In contrast to these results, adult Greek controls disprefer the passive reading for reflexives and anti-causatives, regardless of subject animacy.

Furthermore, animacy of the subject seems to play a role in L1 and L2 Greek for the younger groups, in that the incorrect 'active' reading is primarily found with animate subjects. Compare Figures 2 and 3.

@@@insert Figure 3@@@

With respect to question (20c), anti-causative verbs with active voice morphology are relatively unproblematic with the exception of G-PreS1 and T-Prim who allow for the passive reading as well (Fig.4). This result is consistent with the results in Verrips (2000) from Dutch children, although the pattern in her data is found in all groups of child learners, whereas only the youngest group of Greek and Turkish children shows this pattern. It is then possible to claim that the agent reading found in Greek active anti-causatives could be due to the language-specific property of non-active voice morphology, i.e. that it is productively used in most cases of transitivity alternations. Active anti-causative verbs are exceptions to this generalized pattern. Figures 3 and 4 illustrate this contrast between active and non-active morphology on anti-causatives.

@@@insert Figure 4@@@

In order to compare between-groups results per verb class with regard to subject animacy and voice morphology, the non-parametric Mann-Whitney test was used (see Appendix, Table I, for all significant results). The patterns that emerge from these comparisons are the following: the L2 groups do not differ significantly from G-PreS1 and G-PreS2 in their performance on reflexives. This is due to the similar preference for the 'passive' reading by these groups. The older Greek L1 groups, however, show significant differences from the three L2 groups. Anti-causative verbs with animate subjects show no significant differences between T-Prim and G-PreS1, whereas the T-Sec and T-UpperSec groups do not differ from G-PreS2. When compared to the L2 performance on reflexives, anti-causatives with animate subjects provide results closer to the target. Nevertheless, the T-Prim and T-Sec groups differ significantly from G-Prim, G-Sec and GC. The T-UpperSec group does not differ from G-Prim and G-Sec but differs significantly from GC.

Anti-causative verbs with active morphology appear to be the least problematic for L2 learners of Greek. The only exception is the T-Prim group. The comparison between GC and T-Sec is also significant. In the overall results, the NNS groups differ significantly from adult Greek controls and between them. The developmental pattern in both native and non-native groups is similar but the T-UpperSec group differs significantly from the Greek controls in all verb classes but the active anti-causative, where performance becomes target-like.

5.5 Results: Elicited Production task

To evaluate the results from this test, it was necessary to exclude irrelevant responses, i.e. verbs which incorrectly describe the picture or verbs which describe more generally the pragmatics of the activity. For example, the elicitation of reflexive verbs proved problematic even for the adult controls, who produced sentences such as 'he is thinking/relaxing/trying to fall asleep' instead of the reflexive 'covering himself with the blanket'. Of the 100 responses for reflexive verbs (5 pictures x 20 subjects), only 51 included reflexives, whereas the remaining were categorized as 'irrelevant' and were thus excluded from the analysis. Zero responses were also excluded.

Overall, the percentage of irrelevant responses produced by the two non-native groups was much lower than that of the Greek controls (due to the GC responses on reflexives). On the other hand, natives never gave zero responses whereas non-natives did, according to L2 level. This is expected due to vocabulary or lexical access problems faced by NNS in production. In addition, the higher percentages of zero responses in the T-Sec group compared to the T-UpperSec group is consistent with their respective performance in the sentence-picture matching test. Non-target responses include production of the right verb but with incorrect voice morphology. In

Table 11, elicited responses (target and non-target) as well as irrelevant/inappropriate and zero responses are presented.

@@@insert Table 11@@@

Irrelevant responses in the GC group are primarily found when the target was a reflexive verb. It is possible that this is due to the question asked 'what is x doing' which allowed subjects to infer activities and produce verbs related at a pragmatic level instead of those which describe the activity itself. In the other two groups, irrelevant/inappropriate responses were found in all categories with the lowest percentage in anti-causatives.

Concentrating on target and non-target responses only, the difference between them refers to the use of active and non-active voice morphology. For example, non-target responses in the reflexive set would be the production of *ksirizi* 'shave-ACT' or *kovi* 'cut-ACT' without an object, the target response being *ksirizete* 'shave-NACT'. In the class of anti-causatives, production of *majirevi / majirepse* 'cooks-ACT' / 'cooked-ACT' is non-targetlike, the target being *vrazi / evrase* 'boils-ACT'/ 'boiled-ACT'. Finally, in the class of passives, the production of *vafi* 'paints-ACT' instead of *vafete* 'paints-NACT' is considered non-targetlike. In the group of irrelevant / inappropriate responses, production of *xalase / espase* 'broke-down-ACT' / 'broke-ACT' instead of *gremistike* 'demolished-NACT' were

included. No ungrammatical forms were categorized as irrelevant or inappropriate. The results are presented in Table 12.

@@@insert Table 12@@@

In the reflexive class, errors involving the correct lexical item with active morphology were only produced by the T-Sec group. In the anti-causative class, only the L2 groups produced transitive verbs like *majirepse* 'cooked-ACT' as anti-causatives. Most erroneous responses were produced when the target was a passive, but only by the NNS. The difference between the two non-native groups, however, is clear. Errors included responses like *katestrepse* 'destroyed-ACT' to questions such as 'what happened to the house?' or *eskise* 'tore-ACT' to the question 'what happened to the book?'. Overall, the T-Sec group shows more problems with producing passives and reflexives compared to active anti-causatives, whereas the T-UpperSec group shows similar (low) error rates in anti-causatives and passives but not reflexives, which are target-like. This pattern indicates that the lower NNS group, T-Sec, has not yet mastered use of non-active morphology, whereas the T-UpperSec group seems to have identified the unambiguous use of non-active morphology with reflexives (i.e. when the subject is animate), but overuses or omits non-active voice morphology in the production of anti-causatives and passives.

Table 13 presents the statistical analysis of the between-group comparisons per verb class. The anti-causative class appears to be the easiest for both L2 groups, whereas reflexives and passives, both involving non-active morphology show a developmental difference between the L2 groups, whereas the advanced L2 group does not differ from the controls.

@@@insert Table 13@@@

Table 14 presents within-group results based on the comparison between verb classes.

@@@insert Table 14@@@

In the T-Sec group, significant differences between anti-causatives and the other two verb classes are due to the low number of non-target responses in the active anti-causative class. In the T-UpperSec group no significant difference between verb-classes is found.

Overall, the production task revealed a clear difference between the L2 groups which was not found in the SPM task (see Table I in Appendix). In particular, the T-Sec group finds production of non-active voice morphology considerably more problematic than its interpretation. Presumably, this difference has to do with the increased morpho-phonological *and* morpho-syntactic complexity of non-active morphology in

production. Interpreting non-active morphology on the other hand, is not as problematic given that it is a cue to some transitivity change.

6. Discussion

On the basis of the L1 and L2 data presented, we can now return to the research questions presented in (20). The question whether the grammar, and in particular, voice morphology and the related transitivity changes constrain the interpretive choices of all learners, even in the youngest L1 and L2 groups, receives a positive answer. The only type of 'error' that provides evidence to the contrary is the 'active' reading with reflexives and non-active anti-causatives. Although this reading is indeed found in the G-PreS1 and the T-Prim groups, it is the least preferred reading (around 18-20%). On the other hand, the reflexive and the passive reading are consistent with the predicted ambiguity caused by the grammar. The 'passive' reading found with reflexive verbs indicates that the child has acquired and successfully interprets language-specific properties of Voice which involve either a derived (the 'passive' reading) or an underived (the 'reflexive' reading) subject. Thus, the Greek data appear to be problematic for the maturation approach to A-chains (B&W 1987, 1992).

The preference for the 'non-target' passive reading decreases in the older groups of learners and the controls give unambiguous responses to

reflexives and anti-causatives with non-active morphology. As argued in section 2, however, this is due to the interaction between the grammar output, vocabulary choices and the verb's semantics: the grammar leaves interpretive choices open, and this is most evident in the learner's underdetermined interpretive choices for non-active voice morphology. In addition, the increased number of 'passive' readings in active anti-causatives present in the G-PreS1 group primarily, can be accounted for according to one of the following possibilities; either, the thematic properties of the syntactic subject take priority over syntax, or, lack of non-active voice morphology in a structure showing a transitivity change violates the child's grammar. Given that G-PreS1 are able to interpret non-active voice in transitivity alternations, it is plausible to conclude that the 'passive' reading provided in the case of active anti-causatives is due to the lack of a fully-fledged lexicon which would specify the set of verbs that undergo the causative/anti-causative alternation without any change in the verbal morphology. Given that the choice of verbs which allow or disallow voice alternations in the anti-causative class is, largely, arbitrary, we can conclude that even the G-PreS1 group has acquired Voice and its properties as a theta-attractor, whereas their lexicon is not as yet fully developed in order to evaluate the options provided by the grammar against lexical constraints, simultaneously. This conclusion is consistent with Borer's (2004) analysis of child data showing the grammar being in place and

constraining morpho-syntax on-line without yet being able to consult a fully-developed lexicon.

With regard to L2 groups of learners, the T-Prim group shows similar performance with the L1 Greek preschool children. This similarity as well as the developmental trend found in both L1 and L2 learners indicates that the process of child L2 acquisition of Voice and transitivity effects is parallel to L1 acquisition. However, the fact that even the most advanced L2 group performs differently from the adult controls, with the exception of reflexives, indicates that L2 learners have acquired the morpho-syntactic properties of voice but their lexical knowledge is not rich or stable enough to constrain the grammatical options available. A contrast between production and comprehension is also attested in the L2 groups, favouring comprehension over production. Specifically, active anti-causatives are less problematic than non-active verbs in production, but not in comprehension. This contrast points to the increased complexity of the non-active voice morphology in production. This complexity is counter-balanced by the interpretive effects it has as a cue to transitivity alternations in comprehension tasks.

7. Conclusions

In this paper, an analysis of voice morphology and its relation to transitivity changes was presented. In contrast with active morphology, which can mark anti-causative verbs in a lexically-constrained fashion, non-active voice marks transitivity alternations productively but not in a deterministic way. In particular, non-active voice is a theta-attractor which bans one of the arguments of the predicate from being lexicalised as a DP. The attracted theta-feature, however, remains syntactically active. Active voice, on the other hand, can be found in unergatives, transitives and anti-causatives, which are represented as unaccusatives.

Two distinct syntactic representations are associated with non-active morphology in Greek: the reflexive and the non-reflexive, both of which are productive. Their difference is associated with the animacy of the subject, in that reflexives project a DP agent which attracts the external theta-feature of the verb. In non-reflexive structures, voice attracts the external theta-feature. Differences between anti-causative, passive and middles are derived at some interpretive level on the basis of an interaction between the semantics of the verb as well as pragmatic properties.

The pilot study aimed to test whether L1 and L2 learners of Greek show sensitivity to voice distinctions and the corresponding transitivity alternations at an early stage of development. Moreover, it aimed to test whether differences between learners and controls in interpretation and production of voice could indicate a dissociation between the development of the syntax of voice and the development of lexical and pragmatic

constraints which determine preferences in interpretation or production. On the basis of the results presented, it was argued that the morpho-syntax of Voice is part of the L1 and the L2 grammars of even the youngest groups of learners. The differences attested between adult controls and L1 or L2 learners were attributed to the grammar taking priority over lexical and pragmatic constraints on interpretation, in developing grammars.

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Appendix

A. Test sentences in the SPM task:

S5. To lastixo tripise.

the hose pricked-ACT-3s

S8. To agori plenete.

the boy wash-NACT-3s

S10. O papous dinete.

the old-man dress-NACT-3s

S3. To koritsi kopike.

the girl cut-NACT-3s

S4. I varka vuliazi.

the boat sink-ACT-3s

S6. To koritsi xtenizete.

the girl comb-NACT-3s

S1. I kopela tripithike.

the girl pricked-NACT-3s

S11. To pukamiso afto leronete amesos.

the shirt this dirty-NACT-3s instantly

S2. To agoraki kriftike.

the little-boy hid-NACT-3s

S7. O klooun vafete.

the clown make-up-NACT-3s

S9. To agori leronete.

the boy dirty-NACT-3s

B. Table I: Between-group differences per reading type (Results from Man-Whitney U (non-parametric) test that compares two groups on one variable. The first line in each cell shows the *p* value and the second line, the standardized *z* value. The choice of the test was made due to a) the sample size which in some cases was less than 20 subjects in a group and b) the responses which were codified as 1/0)

Subject Groups	**Anti-caus., Animate, Non-Act.**	**Anti-caus., Inanimate, Act.**	**Refl.**	**Total**
T-Prim /T-Sec	-	p=*.012* z= -2,522	p=*.044* z=-2,125	p=*.003* z=-2,935
T-Prim /T-USec	-	p=*.001* z=-3,217	p=*.009* z=-2,594	p=*.003* z=-2,986
T-Prim/ G-PreS1	-	p=*.048* -1,971	-	-
T-Prim/ G-PreS2	-	p=*.006* z=-2,755	-	-
T-Prim/ G-Prim	p=*.009* z=-2,605	p=*.015* z=-2,438	p=*.001* z=-3,272	p=*.000* z=-3,500
T-Prim/ G-Sec	p=*.009* z=-2,605	p=*.015* z=-2,438	p=*.000* z=-3,835	p=*.000* z=-3,787

T-Prim /GC	p=*.001* z=-3,197	p=*.000* z=-3,517	p=*.000* z=-4,105	p=*.000* z=-4,397
T-Sec/ T-USec	-	-	-	-
T-Sec /G-PreS1	p=*.002* z=-3,093	p=*.000* z=-4,198	-	p=*.000* z=-4,013
T-Sec /G-PreS2	-	-	-	-
T-Sec /G-Prim	p=*.037* z=-2,089	-	p=*.040* z=-2,293	p=*.042* z=-2,033
T-Sec /G-Sec	p=*.037* z=-2,089	-	p=*.002* z=-3,038	p=*.002* z=-3,030
T-Sec /GC	p=*.004* z=-2,860	p=*.049* z=-1,966	p=*.001* z=-3,276	p=*.000* z=-4,119
T-Usec /G-PreS1	p=*.001* z=-3,203	p=*.000* z=-4,341	-	p=*.000* z=-3,719
T-USec/ G-PreS2	-	-	-	p=*.024* z=-2,259
T-USec/ G-Prim	-	-	-	-
T-USec/ G-Sec	-	-	-	p=*.059* z=-1,886
T-USec/ GC	p=*.008* z=-2,645	-	p=*.041* z=-2,045	p=*.001* z=-3,310

C. SPM task: Example of picture-set for S10 *O papus dinete* '*The old man dresses-NACT*'

Insert picture-set here

Tables and Figures (Tsimpli)

Table 1. Distribution of Subjects in the Native and Non-Native Groups in the SPM task

Groups	L1	Subjects per Group	Age
NNS	Turkish	42	9-17
Primary (T-Prim)	Turkish	11	9-11
Secondary (T-Sec)	Turkish	18	12-14
Upper Secondary (T-UpperSec)	Turkish	13	15-17
NS	Greek	62	3-14, 19 >
Pre-school 1 (G-PreS1)	Greek	15	3-4
Pre-school 2 (G-PreS2)	Greek	15	5-6
Primary (G-Prim)	Greek	10	10-11
Secondary (G-Sec)	Greek	10	12-14
Adult Controls (GC)	Greek	12	19 >

Table 2. Distribution of Subjects in the Native and Non-Native groups in the Production task

Subjects	L1	Subjects per Group	Age
NNS	Turkish	34	12-17
T-Sec	Turkish	18	12-14
T-UpperSec	Turkish	16	15-17
GC	Greek	20	19 >

Table 3. Classification of test sentences according to +/-reflexivity, voice morphology and subject animacy

	Greek verb	active voice morphology	animate subject	'inherent' reflexive V	possible verb readings (preferred reading of Greek native speakers in bold)				English translation
					active	anti-causative	passive	reflexive	
S1	tripithike	-	+	-	-	+	+	+	'pricked'
S2	kriftike	-	+	-	-	+	+	+	'hid'
S3	kopike	-	+	-	-	+	+	+	'cut'
S4	vuliazi	+	-	-	-	+	-	-	'sink'
S5	tripise	+	-	-	-	+	-	-	'pricked'
S6	xtenizete	-	+	+	-	-	+	+	'comb'
S7	vafete	-	+	+	-	-	+	+	'make-up'
S8	plenete	-	+	+	-	-	+	+	'wash'
S9	leronete	-	+	-	-	+	+	+	'get-dirty'
S10	dinete	-	+	+	-	-	+	+	'dress'
S11	leronete	-	-	-	-	+	+	-	'get-dirty'

Table 4. Target reading with reflexive verbs (%)

Subjects	S6	S7	S8	S10	Total Mean
NNS					
Turkish-Primary (T-Prim)	82	36	73	36	57
Turkish-Secondary (T-Sec.)	72	72	89	83	85
Turkish-Upper Sec. (T-UpperSec)	92	77	77	92	85
NS					
Greek-Preschool 1 (G-PreS1)	60	60	67	73	62
Greek-Preschool 2 (G-PreS2)	80	60	53	80	68
Greek-Primary (G-Prim.)	90	90	100	100	95
Greek-Secondary (G-Sec)	100	100	100	100	100
Adult Controls (GC)	100	100	100	100	100

Table 5. Non-target readings of reflexive verbs (%): grammatical (passive) and ungrammatical (active)

Subjects	Passive reading					Active reading				
	S6	S7	S8	S10	Total Mean	S6	S7	S8	S10	Total Mean
NNS										
T-Prim	18	36	27	36	27	-	27	-	27	16
T-Sec	17	28	6	6	12	11	-	6	11	3
T-UpperSec	08	23	23	8	15	-	-	-	-	-
NS										
G-PreS1	27	7	13	20	18	13	40	20	7	20
G-PreS2	13	33	40	-	22	7	7	7	20	10
G-Prim	10	10	-	-	5	-	-	-	-	-
G-Sec	-	-	-	-	-	-	-	-	-	-
GC	-	-	-	-	-	-	-	-	-	-

Table 6. Target reading of anti-causative verbs with non-active morphology and animate subject (%)

Subjects	S1	S2	S3	Total Mean
NNS				
T-Prim	50	100	45	66
T-Sec	94	100	56	83
T-UpperSec	92	100	62	85
NS				
G-PreS1	42	64	67	59
G-PreS2	60	87	57	68
G-Prim	100	100	90	97
G-Sec	100	100	90	97
GC	100	100	100	100

Table 7. Non-target readings of anti-causatives (%)

Subjects	Passive reading				Active reading			
	S1	S2	S3	Total Mean	S1	S2	S3	Total Mean
NNS								
T-Prim	50	-	27	25	-	-	27	9
T-Sec	6	-	11	13	-	-	11	4
T-UpperSec	7	-	-	15	-	-	-	-
NS								
G-PreS1	42	36	-	24	17*	-	33	17
G-PreS2	40	13	36	30	-	-	07	2
G-Prim	-	-	10	3	-	-	-	-
G-Sec	-	-	10	3	-	-	-	-
GC	-	-	-	-	-	-	-	-

* the error in this case is in the choice of the distractor picture with an irrelevant verb.

Table 8. Target reading of active, anti-causative verbs with inanimate subject (%)

Subjects	S4	S5	Total Mean
NNS			
T-Prim	90	33	63
T-Sec	93	100	97
T-UpperSec	100	92	96
NS			
G-PreS1	44	31	36
G-PreS2	100	86	93
G-Prim	100	80	90
G-Sec	100	80	90
GC	100	100	100

Table 9: Non-target readings of active anti-causatives with inanimate subject

Subjects	Passive reading			Irrelevant		
	S4	S5	Total Mean	S4	S5	Total Mean
NNS						
T-Prim	-	67	32	10	-	5
T-Sec	7	-	3	-	-	-
T-UpperSec	-	8	4	-	-	-
NS						
G-PreS1	56	69	64	-	-	-
G-PreS2	-	14	7	-	-	-
G-Prim	-	20	10	-	-	-
G-Sec	-	20	10	-	-	-
GC	-	-	-	-	-	-

Table 10: Passive, Reflexive and Anti-Causative readings with [+/- animate] subject

Subjects	S9 [+animate]			S11 [-animate]	
	Anti-causative	Reflexive	Passive	Anti-causative	Passive
NNS					
T-Prim	36	36	27	45	55
T-Sec	22	78	-	71	29
T-UpperSec	8	92		58	42
NS					
G-PreS1	40	7	53	67	33
G-PreS2	20	33	47	75	25
G-Prim	20	70	10	60	40
G-Sec	44	56	-	90	10
GC	63	36	-	100	-

Table 11: Distribution of responses per verb class and subject group

Subjects	Target/Non-target responses			Irrel./Inappr. responses			No Response		
	Refl.	Anti-caus.	Pass.	Refl.	Anti-caus.	Pass.	Refl.	Anti-caus.	Pass.
T-Sec (18)	33% 30/90	74% 67/90	50% 45/90	34% 31/90	3% 3/90	32% 29/90	32% 29/90	21% 19/90	18% 16/90
T-UpperSec (15)	75% 60/80	84% 67/80	77.5% 62/80	10/80 .12,5	14% 11/80	22% 15/80	12.5% 10/80	2% 2/80	4% 3/80
GC (20)	51% 51/100	87% 87/100	99% 99/100	49/100 .49	13% 13/100	1% 1/100	0% 0/100	0% 0/100	0% 0/100

Table 12: Target and Non-Target verb production with active and non-active morphology

Subjects	Reflexives		Anti-causatives (active morphology)		Passives	
	Target	Non-target	Target	Non-target	Target	Non-target
T-Sec (18)	73.3%	26.7%	98.5%	1.5%	69.8%	30.2%
	22/30	8/30	66/67	1/67	30/43	13/43
T-UpperSec (15)	100%	0%	97.6%	3.4%	96.7%	3.3%
	60/60	0/60	65/67	2/67	60/62	2/62
GC (20)	100%	0%	100%	0%	100%	0%
	51/51	0/51	87/87	0/87	99/99	0/99

Table 13: Between-group comparisons per verb class (χ^2)

Subjects	Reflexives	Anti-causatives (active morphology)	Passives
T-Sec /T-UpperSec	(90) p=.000	(134) p=.1,000 $\chi^2 = 1.307$	(105) p= .000 $\chi^2 = 15.124$
T-Sec / GC	(81) p=.000	(154) p=.188*	(142) p= .000
T-UpperSec / GC	-	(154) p= .435*	(161) p= .147*

* Fisher's Exact test due to the number of zero and irrelevant responses.

Table 14: Within-group comparison between verb classes (χ^2).

Verb Class	T-Sec	T-UpperSec
Reflexives/ Anti-causatives	(97) p=.000 χ^2 = 15.601	(127) p=.498
Reflexives/ passives	(73) p=.741 χ^2 = .110	(122) p=.496 χ^2 = 1.968
Anti-causatives/ Passives	(110) p= .000 χ^2 = 19.476	(129) p= 1.000

*Fisher's Exact test due to the number of zero and irrelevant responses

Figure 1: Target and Non-Target readings for Reflexive verbs

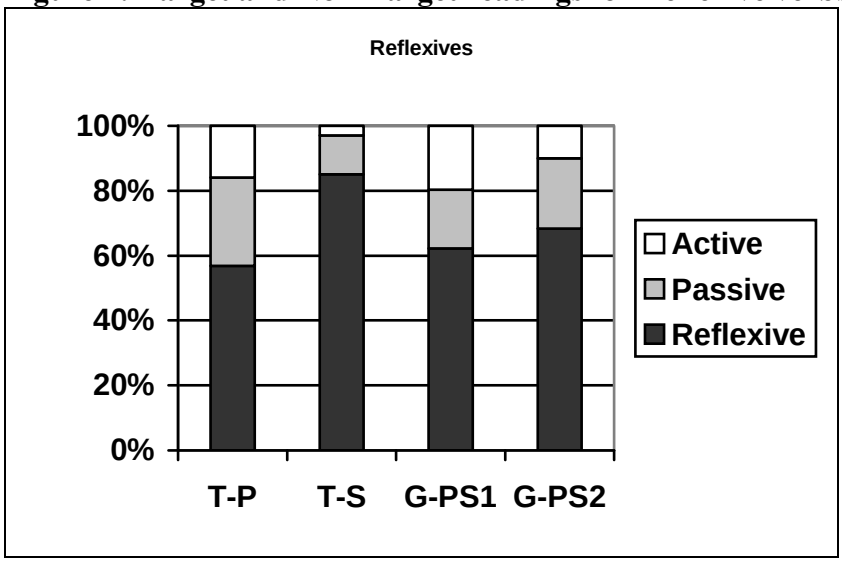


Figure 2: Target and Non-Target readings of Anti-causative verbs with Non-active morphology and Animate subjects.

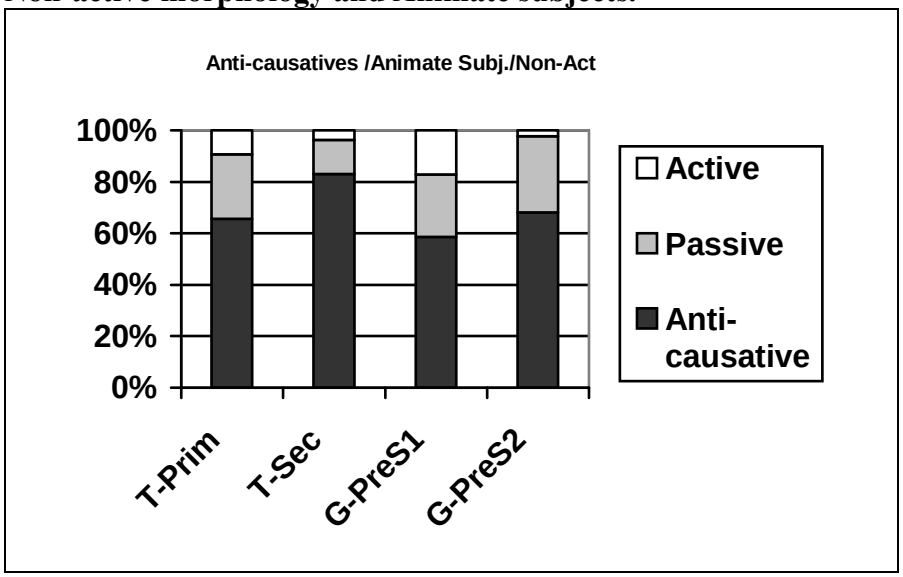


Figure 3: Target and Non-Target readings of non-active anti-causative verbs with inanimate subjects.

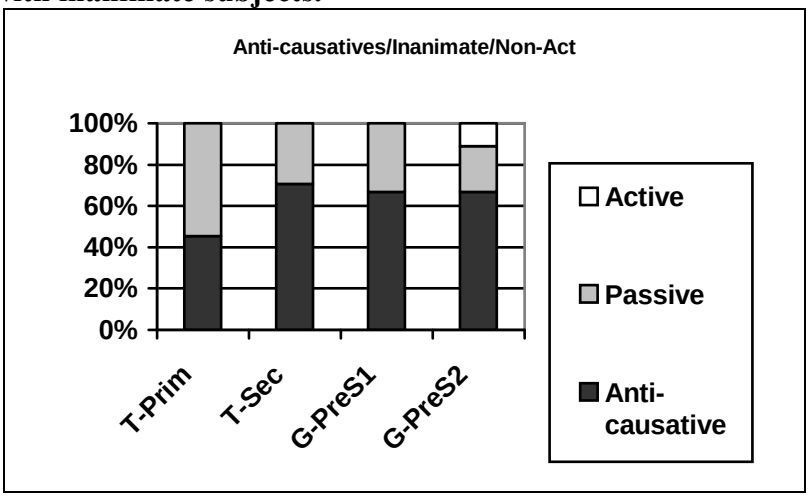
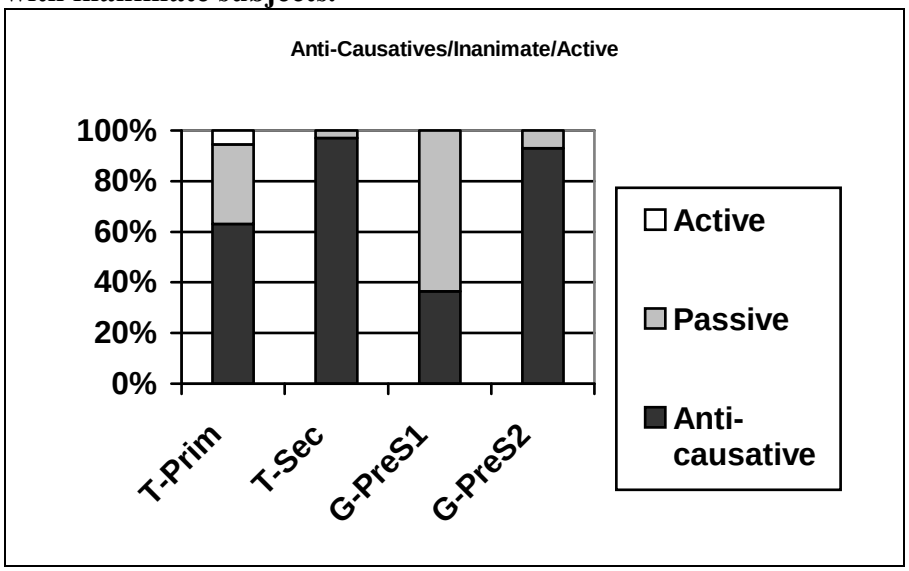


Figure 4: Target and Non-Target readings of active anti-causative verbs with inanimate subjects.



[1] The Greek middle structure is also morphologically non-active (Tsimpli 1989, Sioupi 1998, Papastathi 1999, cf. Condoravdi 1989). However, the generic interpretation, the arbitrary agent by-phrase and the dynamic modal reading associated with the Greek middle make it more difficult to test with young children in ways similar to passives, reflexives and anti-causatives. Thus, they are not included in the present study.

[2] The authors assume that the auxiliary 'avere' selects an AP with its Spec to the right. This is the position in which the direct object is represented as the external argument of the participle (the adjectival head of the AP).

[3] With respect to maturation, we could shift the discussion from the lack of A-chains and the UEAPP (B&W 1987, 1992) to the development of morphological features which cause transitivity alternations in the syntax (e.g. Voice, Cause etc). This largely depends on the analysis of passives, anti-causatives and other transitivity alternations which one adopts. In a Hale & Keyser (1993) account, syntax determines argument structure without additional features or categories (Alexiadou & Anagnostopoulou 1999, see also Borer (1998)). Attempting to maintain a maturation account for transitivity alternations on this syntactic approach would imply that only one of the many syntactic options is initially available to the child (the 'canonical' syntax-θ mapping structure), for some reason. In other accounts, syntactic features and their projections are associated with distinct argument realizations (e.g. a defective and a non-defective vP (Chomsky 2001), v/Voice (Embick 2004, Alexiadou & Anagnostopoulou 2004, a.o.). It could be argued that the maturationally-constrained development of these features would account for late acquisition of passives and anti-causatives. Although this seems like an easier formulation of the maturation

hypothesis, it requires language-specific properties associated with the proposed features to account for the attested differences in the timing of acquisition .

[4] The terms active and medio-passive, or active and passive, have also been used in previous literature (Holton et al 1997, Joseph & Philippaki-Warburton 1987, Tsimpli 1989). I opt for the term active / non-active morphology used in Embick (2004) and Alexiadou & Anagnostopoulou (2004), as more accurate in that it is compatible with the various structures in which the non-active morphology occurs.

[5] Notice that the externally-caused change-of-state verbs such as *klino* 'close', *anigo* 'open', *vrazo* 'boil' also exist in the non-active form:

(i) a. To xrimatokivotio anixtike me efkolia.
the safe opened-NACT-3s with ease

b. Oles I eksodhi tu aerodhromiou klistikan ke asfalistikan.
all the gates the-gen airport closed-NACT-3p and secured-NACT-3p
'All airport gates were closed and secured.'

(iii) Afta ta ergalia prepi na vrazonde prin xrisimopiithun.
these the tools must sub. boil-NACT-3p before use-NACT-3p
'These tools must be boiled before being used.'

[6] The similarity could be only apparent, though. The preposition 'apo' is used in a number of different types of PPs, expressing source (*Agorasa to vivlio apo ton Jani* 'I bought the book from John'), location (*To rafi ine pano apo to trapezi* 'The shelf is above the shelf') and cause (*Kurastika apo tin poli dhulia* 'I got-tired from the hard work'). Thus, its use in passives introducing the agent and in ergatives introducing a cause PP is regarded as a result of its underspecified semantic features, which increase its compatibility with a larger number of interpretive contexts.

[7] The implication is that in the anti-causative structures in (4b) and (5b), the PP cause is represented as an adjunct, i.e. differently from the cause argument in the subject position of (4a) and (5a).

[8] Alexiadou & Anagnostopoulou (2004) also consider the structure in (8) reflexive, but, crucially, they argue for an unaccusative analysis of morphological reflexives (Marantz 1984, Pesetsky 1995, Embick 2004, a.o.).

[9] Non-active verbs used in the formal register can accept an agent by-phrase more easily than verbs in the colloquial register. For example, verbs such as *prootho* 'forward', *kataskevazo* 'construct', *sigendrono* 'collect' are easily construed with an agent by-phrase. On the other hand, frequently-used verbs in the colloquial register such as *sproxno* 'push', *klotsao* 'kick', *majirevo* 'cook' resist an agent by-phrase. In middles, the by-phrase is possible but, usually, with arbitrary or kind-referring expressions:

(i) a. Afto to film vlepete / Afti I musiki akujete
this the film watch-NACT-3s / this the music listen-to-NACT-3s
apo opjondhipote.
by anyone
'This film can be watched / This music can be listened to by anyone.'

b. To krasi telika pinete. / Afto to rafi ftanete
the wine after-all drink-NACT-3s / This the shelf reach-NACT-3s
akomi ke apo pedhia.
even and by children
'After all, this wine is drinkable / This shelf can be reached even by children.'

The same verbs do not occur in the non-active past (?**to film idhothike* 'the film was watched/seen',?* *to krasi piothike* 'the wine was drunk',?* *to rafi ftastike* 'the shelf was

reached'). Nevertheless, the occurrence of non-active voice morphology in middles together with the optional presence of an agent by-phrase implies that the derivation is similar to the passive, while the increased productivity of the middle as opposed to the passive is related to the non-temporal reading it conveys.

[10] Chomsky (2001) assumes a defective vP in unaccusatives and passives, which forces the internal argument to appear in the higher subject position. This account is adopted here for unaccusatives, but not for passives, for reasons discussed in the previous section.

[11] Manzini & Roussou (2000) argue that theta-features can be attracted by inflectional features such as subject-verb agreement in null subject languages. For present purposes, we would like to restrict the set of possible theta-attractors to DPs, 'reflexive' clitics and voice morphology, whereas *phi*-features do not interact with transitivity.

[12] Embick (2004) argues for a correlation between the absence of an external argument and non-active morphology. The present proposal differs in that it suggests that this underspecification correlates with the absorption of an argument, *either* external (in non-reflexives, i.e. (12)), *or* internal (in reflexives, i.e. (11)).

[13] This proposal bears certain similarities with Reinhart & Siloni's (2004) suggestion for Romance morphological reflexives whose productivity is also high. Their suggestion is that the process of 'reduction' is parameterized as to whether it applies in the lexicon or in the syntax. Syntactic reduction interpreted reflexively at LF implies that both theta-roles are present in the syntax but checked against a single DP, thus deriving the reflexive reading. The syntactic role of the clitic *se* is the absorption of accusative case, which blocks the presence of a (second) DP argument. In the proposal presented here, all transitivity changes due to the presence of non-active Voice can be reduced to the lack of accusative case. However, an additional effect which distinguishes between (11) and (12) has to do with the property of Voice being a theta-attractor. Thus, although the lack of accusative and theta-attraction are both properties relevant to non-active voice morphology in Greek, it seems that theta-attraction is the primitive one and case effects are a consequence of Voice being a

theta-attractor. If case absorption was the unique property of v/Voice, the difference between (11) and (12) would require auxiliary assumptions in order to derive the reflexive vs non-reflexive readings. Alternatively, it could be argued that the reflexive / non-reflexive distinction is pragmatically induced and properties such as animacy of the subject, which are crucial for the availability of the reflexive reading, are not visible to LF (Manzini & Savoia 2001, cf. Alexiadou & Anagnostopoulou 2004).

[14] As it stands, option (iii) is problematic because it excludes clitics, being heads, from the set of lexicalised arguments. In Romance languages, reflexive clitics would be theta-attractors similar to the Greek v/Voice category, whereas pronominal clitics would be relevant to option (iii) or its reformulation. One crucial difference between reflexive and pronominal clitics is the lack of case and person specification in the 'reflexive' clitic. This difference has been linked to its variable behaviour and its compatibility with passive, middle, anti-causatives and reflexive readings (Manzini 1986, Manzini & Savoia 2001). That pronominal and reflexive clitics differ in representational terms is also supported by L1 acquisition studies of monolingual and bilingual children speaking Italian and French (Jakubowicz et al 1996, 1997, Jakubowicz & Rigaut 2000, Schmitz & Müller 2003).

[15] The statistical analysis reported in the following sections excluded irrelevant responses, i.e. true distractors.

[16] Although the questions appear to bias the participant towards the 'active' ('What is x doing') as opposed to the 'passive' ('What happened to x?') reading, this does not correspond to ACT/NACT voice on the verb form. Thus, active and reflexive readings are possible responses to 'What is x doing?', whereas 'What happened to x?' may trigger anti-causatives in active or non-active form, as well as passives.

[17] This implies that for this group of learners an implicit agent is present at some level of interpretation. It is not possible, however, to conclude that the agent is also syntactically represented on the basis of this task (cf. Verrips 2000).