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**A-Chains and S-Homophones in Children's Grammar:
Evidence from Greek Passives***

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1. Introduction

The difficulties and successes that children often have with particular linguistic constructions tell us much about how linguistic processes develop. It is however not an easy task to determine what children actually know, as in many instances they hide their lack of knowledge by adopting strategies which allow them to respond to sentences appropriately even when they cannot give a full grammatical analysis of them. Put in other words, even during the stages that a certain construction seems to have been acquired, it is often the case that it is not fully mastered, but children act as if they know how to analyze it by adopting alternative strategies.

Perhaps the most famous example of such misleading behavior is children's performance on the Passive, a construction that develops notoriously late in many languages. The most well-known linguistic hypothesis about why this is so is that held by Borer and Wexler (1987). They argue for the A-Chain Deficit Hypothesis, which can be stated as follows (see Borer and Wexler 1992, fn. 13, for the sketch of a theory as to why only object to subject A-chains are affected, and not subject raising out of VP):

- (1) *A-Chain Deficit Hypothesis* (ACDH)
Object-to-Subject A-Chains are ungrammatical for a child until a certain age of maturation.

As Borer and Wexler (1987) argue, ACDH predicts that:

* We would like to thank E. Christodoulou for carrying out the experiment for us. See her report Christodoulou (2001). Also, thanks to S. Iatridou for comments on this work and discussion on the Greek passive.

- (1) a. Children until a certain age will not be able to correctly analyze verbal passives with a *by*-phrase (*Long Passives*).
 b. The same children will do well on adjectival passives, since they do not contain an A-chain.

Borer and Wexler assume that child native speakers of English will sometimes treat a verbal passive as an adjectival passive so that the following are predicted:

- c. Children will perform well on full verbal passives of 'actional' verbs, since these make good adjectival passives.
 d. Children will do poorly on full verbal passives of 'non-actional' verbs since these do not make good adjectival passives.
 e. Children will do well on passives without a *by*-phrase (*Short Passives*) since these can be treated as adjectival.

All the above predictions have turned out to be true. In particular, Maratsos, Fox, Becher and Chalkley (1985) have shown that, in English, children do quite well on passives of actional verbs (basically ones with Agent subjects) compared to passives of non-actional verbs (essentially those with Experiencer subjects).

Fox and Grodzinsky (1998) confirmed the above results, except that they showed that children did well on Short Passives of non-actional verbs while they did poorly on Long Passives of non-actional verbs. That is, they found that:

- (2) Non-actional verbal passives: Short=OK, Long=Poor

Babyonyshev, Ganger, Pesetsky and Wexler (2001) (henceforth BGPW 2001) confirmed the ACDH by showing that children before the maturation of A-chains cannot analyze unaccusatives correctly. With regard to the distinction between Short and Long non-actional verbal passives, they showed that an idea in the spirit of Borer and Wexler (1987, 1989), more explicitly developed by Fox and Grodzinsky (1998), could be used to predict this result. Namely, the child could take *by* to assign an agent theta-role to its object, (3), even when the child could not assign the correct theta-role via theta-transmission. Even though the child did not have the structure of a verbal passive and thus no theta-transmission (Borer and Wexler), an agent could still be assigned via this direct mechanism:

- (3) *By* assigns agent theta-role to its object DP/NP

Thus, BGPW assumed that during the 'pre-maturation' stage children will treat non-actional as well as actional passives as adjectival and, therefore, do well on Short Passives even of non-actional verbs. Likewise, children will do well on Long verbal passives of actional verbs since, although *by* will not 'transmit' a theta role (since the structure is not that of verbal passive), it will directly assign an agent theta-role to its object. But since the agent theta-role is not the right theta-role for the object of *by* when the verb is non-actional, children will do poorly on Long verbal passives of non-actional verbs. Thus, the predicted (and obtained) pattern of results for English is:

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- (4)
- | | | |
|----|--|----|
| a. | Short verbal passive of actional verbs | OK |
| b. | Short verbal passive of non-actional verbs | OK |
| c. | Long verbal passives of actional verbs | OK |
| d. | Long verbal passives of non-actional verbs | * |

BGPW (2001) further suggested that the crucial factor in making an adjectival passive in English a structure that a child could use to obtain an interpretation of the verbal passive is that the adjectival passive have the same phonetic form as the verbal passive, namely that it be a *syntactic homophone* of the verbal passive.

- (5) A structure X is a 'syntactic homophone', or else, 'S-Homophone' of a structure Y if X has the same surface form as Y.

The Greek Passive has a number of properties that allow us to test in a direct manner the assumptions of ACDH:

First, the verbal passive is not homophonous to the adjectival passive. Thus, we have the opportunity to see whether and how well Greek children can use the adjectival passive to substitute for the verbal passive.

Second, unlike English, the Greek adjectival passive can appear in full form, that is, with a *by*-phrase. Thus, we can test the essential idea of ACDH according to which the crucial difference in development between Short and Long Passives is not being 'Short' or 'without a *by*-phrase', but rather the distinction between adjectival and verbal passives, the latter involving an A-chain. The goals of our paper, therefore, are to test:

- (6)
- Whether the predicted difficulties with verbal passives exist in the Greek child grammar.
 - Whether the adjectival vs. verbal distinction is crucial, as ACDH predicts.
 - Whether the difficulty with verbal passive can only be overcome if verbal passives have an s-homophone adjectival passive.

2. The Greek Passive

2.1. Verbal Passives

Greek verbal passives are synthetic, in the sense that they do not employ auxiliaries but are formed with N(on)Act(ive) inflection on the verb, the underlined part in (8) below:¹

- (7) I fitites diavasan to vivlio. Active
 the students read-3p-Act the book
 'The students read the book.'

¹ The same morphology on the verb is also present with reflexives, a subclass of middles, a subclass of inchoatives, a subclass of unaccusatives and with deponent verbs. According to Anagnostopoulou (to appear) and Theophanopoulou-Kontou (2000) passivization is distinct from the above processes and a safe criterion to distinguish it is the presence of a PP introduced by the Preposition *apo*, the counterpart of the English *by*-phrase.

- (8) To vivlio diavastike (apo tous fitites). Verbal Passive
 the book read-3s-past-NAct (by the students)
 'The book was read (by the students).'

2.2. Adjectival Passives

In addition to the verbal passives, Greek has forms which traditional grammar has called (medio)passive participles (Triandafyllidis 1941/1978). They are introduced by the copula followed by a form that is very much like an adjective but with passive morphology. In particular, the *-men-* part of the adjectival form below signifies that the accompanying noun is a patient rather than an agent/affector.²

- (9) To vivlio ine diavasmeno (apo olous tous neous fitites). Adjectival Passive
 the book is read (by all the new students)

2.2.1 Differences between the two Passives

The above two Passive forms differ in various ways. The properties of the adjectival passives (or else, of the (medio)passive participles of the previous section) that are reported immediately below are some core properties, which are not shared by verbal passives.

Nominal Inflection of the adjectival passive

The adjectival passive is inflected for gender, number and Case and agrees with the modified noun and its determiner, (10)-(11). Verbal passives, on the other hand, are inflected for number, person and Tense, (8).

- (10) To diavasmeno vivlio ...
 the-nom-neutr-sing. read-nom-neutr-sing. book-nom.-neutr-sing
 'The read book ...'
- (11) I diavasmeni efimerida ...
 the-nom-fem-sing read-nom-fem-sing. newspaper-nom-fem-sing
 'The read newspaper ...'

Adjectival passives can be coordinated with true adjectives

The adjectival passive can be coordinated with pure instances of adjectives, (12)-(13). Coordination of these adjectives with verbal passives is absolutely impossible.

- (12) O Andreas ine arostos ke eknevrismenos.
 the Andreas is sick and upset
 'Andreas is sick and upset.'

² Theophanopoulou-Kontou (1983/1984) disassociates the mediopassive participles from the corresponding verbs, and considers the inflection part of the participle as the 'marker for the patient oriented construction'.

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- (13) I efimerida ine diavasmeni ke vromiki.
the newspaper is read and dirty
'The newspaper is read and dirty.'

Adjectival passives can appear as complements of raising verbs, (14), on a par with true adjectives, (15).

Construal of the raising verb with a verbal passive is impossible as well.

- (14) I efimerida miazi diavasmeni.
the newspaper seems read

- (15) O Mixalis fenete evgenikos.
the Mixalis seems polite

An additional relevant difference between the two types of passives is that there seem to be restrictions as to what type of verbs can be associated with adjectival passives, (16a), (17a).³ The same restrictions do not seem to hold for the verbal passives of the same predicates, (16b), (17b).

- | | | | |
|------|----|---|--------------------|
| (16) | a. | *O Petros ine akousmenos (apo ti Maria).
the Peter is heard (by Mary) | Adjectival Passive |
| | b. | O Petros akougete (apo ti Maria).
the Peter hear-NAct (by Mary)
'Peter is heard (by Mary).' | Verbal Passive |
| (17) | a. | *O Petros ine idomenos (apo ti Maria).
the Peter is seen (by Mary) | Adjectival Passive |
| | b. | O Petros vlepete (apo ti Maria).
the Peter see-NAct (by Mary)
'Peter is seen by Mary.' | Verbal Passive |

Finally, unlike English adjectival passives (Wasow 1977), and like English verbal passives, Greek adjectival passives are compatible with a *by*-phrase. Examples of both types of passives follow immediately below:

- (18) a. To fagito itan magiremeno apo ti mama.
the food was cooked by the mom
b. To fagito magireftike apo ti mama.
the food cooked-NAct by the mom
'The food was cooked by mom.'

³ The predicates in (16) and (17) are of immediate relevance for the present study, as their English counterparts have been tested in the literature on the acquisition of the English passive. As a first observation, the 'non-actional' verbs do not seem to make good adjectival passives in Greek (similarly to English, see footnote 4). For a thorough classification and an account of which 'mediopassive (m/p) past participles' are possible in Greek see Tzeveleku (2000). In short, while she considers m/p formation to depend on Tense, aspect, and transitivity, her basic insight is that m/p participles are related to telic verbs because the NP argument of a telic verb undergoes a definite change of state which is captured by the m/p participle since the latter denotes a result state subsequent to the accomplishment of the event.

- (19) a. O dolofonos itan pliromenos apo ti Mafia.
 the killer was paid by the Mafia
 b. O dolofonos plirothike apo ti Mafia
 the killer paid-NAct by the Mafia
 'The killer was paid by the Mafia.'

2.3. The formal status of Greek Passives

The two types of passives that we presented have been argued to be associated with different syntactic structures. In the spirit of Wasow (1977), Lascaratou and Philippaki-Warbuton (1983/1984) claimed that:

- a) verbal passives involve movement of the internal argument to the subject position (hence, the creation of an A-chain).
 b) adjectival passives are formed in the lexicon (hence, no A-chain formation takes place).

The above claims regarding Greek passives, matched with the studies on the acquisition of passives, make an interesting testing ground for the theories laid out in section 1. Before proceeding to doing this however, some more detailed discussion of the findings in English is in order.

3. On the development of English Passives

Children show major difficulties with the full passive construction in English until at least age 4. This is especially true for the passives of non-actional verbs (mostly experiencer verbs such as *see* and *remember*) as compared to the passives of actional verbs (like *push* or *find*). The early developmental literature did not give a precise definition of *actional* and *non-actional*. Following Borer and Wexler (1987) and BGPW (2001), we take *actional* verbs to be those which select an affector external argument (e.g. an agent) and *non-actional* verbs those that select an external argument other than an affector (e.g. experiencer verbs like *see*).⁴

Maratsos, Fox and Chalkley (1985) conducted an experiment in which children had to select which of 2 pictures corresponded to a sentence depicting an event. Children did quite well on the active form of the sentence, whether the verb was actional or non-actional. Even 4-year-old children were correct most of the time on experiencer verbs in the active form. However, children performed extremely poorly on the passives of experiencer verbs as compared to actional verbs. Some actual data from Maratsos et al.'s Table 2 follow immediately below:

⁴ See Borer and Wexler (1987, 1989) for much discussion on the issue; they argue that the so-called non-actional verbs seem less able to form adjectival passives in English.

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	Actional verbs		Non-actional verbs	
	Active	Passive	Active	Passive
4 years	.97	.85	.92	.34
5 years	.99	.91	.96	.65
7 years	.99	.92	.97	.62
9 years	1.00	.96	.99	.87

The table also shows that in the relevant non-actional (experiencer) verbs, 4-year-old children chose the wrong picture more than the correct picture (significantly below chance) and although 5-year-olds chose the correct picture significantly above chance, their overall rate was only .65. The .62 rate at age 7 wasn't even significantly above chance. Comparing this chance rate for the 7 year olds to the .97 figure for the active experiencer verbs and to the .92 figure for the passive of the actional verbs, we see that the passive of experiencer verbs is really difficult for children even as old as age 7.

Borer and Wexler (1987) accounted for the above facts with their A-chain Deficit Hypothesis. Since in verbal passives objects move to subject position forming an A-chain and since children are subject to an A-chain Deficit, (which means that their grammars consider object to subject A-chains to be ungrammatical), it is expected that these children should perform poorly on experiencer verbal passives: children think that the structure of the verbal passive is ungrammatical, thus they show a poor response rate on it. Borer and Wexler proposed that children could understand the verbal passive well enough to respond correctly if they treated it as an adjectival passive, a structure that does not contain an A-chain, according to proposals going back to Wasow (1977). Hence, the .85 performance on actional verbs at 4 years (and the corresponding good performance in later years, before A-chains matured) was due to a misanalysis of the sentence by children. According to this proposal, children understand the verbal passive of actional verbs as an adjectival passive, a derivation of which does not contain an A-chain, hence perform relatively well on it.

BGPW (2001) stated this theory in the following way: the child believes that A-chains are ungrammatical, but can reanalyze the verbal passive as an adjectival passive because there is an adjectival passive with the same form in English:

- (20) a. [The door]_i was closed t_i by Mary
 b. The door was [ADJ closed] by Mary

In (20a) the verbal passive involves an A-chain. Since young children consider A-chains ungrammatical, they assign to (20a) the structure in (20b), that is, the structure of an adjectival passive. As for the object of the *by*-phrase in the verbal passive, (20a), it receives the thematic-role of the external argument of the predicate, via a process called *theta-transmission*.⁵ Since the subject thematic role of *close* is an agent, the *agent*

⁵ Following Jaeggli (1986) and Borer and Wexler (1987) (who followed Jaeggli (1981)), Fox and Grodzinsky (1998) use the term *theta-transmission* to refer to the mechanism that transfers the external (and compositional) theta-role of the predicate to the *by*-phrase of the passive. Fox and Grodzinsky refer to claims of Jaeggli (1986) and Grimshaw (1990) according to which this mechanism is not necessary in all

thematic-role is transmitted to the *by*-phrase. No comparable process of theta-transmission takes place in adjectival passives however. In fact, Wasow (1977) notes that adjectival passives do not normally allow *by*-phrases in English.

Thus, BGPW followed assumptions of Borer and Wexler (1987, 1989) that were more explicitly developed in Fox and Grodzinsky (1998) and assumed that young children understood the *by*-phrase in (20b) by assuming that *by* assigns its own thematic-role, the Affector role to its object noun. BGPW argued that the child understood the verbal passive as an adjectival passive but in order to understand the *by*-phrase, she could not use theta-transmission, since no verbal passive was there to induce it. Instead, the child assumed that *by* assigned the Affector role to its object. Thus, for a sentence involving an actional verb such as *push* the appropriate understanding arose since *Mary* receives the theta-role of Affector by *by*, an appropriate theta-role for a verb such as *push*.

- (21) John is pushed by Mary

For sentences that involve non-actional verbs such as *see*, there is a problem, however:

- (22) John is seen by Mary

If the child reanalyzes *seen* above as adjectival, the (experiencer) theta-role of the subject of *see* cannot be transmitted to *Mary*, since there is no A-chain present to allow this transmission. Following the strategy used for (21), the child can attempt to allow *by* to assign the Affector theta-role to *Mary*, but because this is not one of the theta roles of *see* the result is that the child cannot get a coherent understanding of sentences such as (22). The consequence of this is that she guesses according to some strategy, a fact that explains the poor performance on full non-actional passives. The problem does not emerge with passives of non-actional verbs which do not contain a *by*-phrase.

- (23) John is seen/remembered

Just as in sentence (21), the child who thinks A-chains are ungrammatical, can analyze (23) as an adjectival passive as well. Since there is no *by*-phrase, however, she does not have to assign an additional theta-role to the structure. The meaning is simply that of an adjectival passive, without an external argument. Thus, good performance on passives without *by*-phrase is predicted, even with non-actional verbs⁶. Fox and Grodzinsky

languages for all nontruncated passives, in particular, for those whose (external) theta-role is that of an 'agent' or 'affecter' that can be assigned directly by the preposition *by*.

⁶ BGPW (2001) thus changed one assumption from Borer and Wexler (1987). Namely, BGPW assumed that the child would accept non-actional verbs as making acceptable adjectival passives, possibly in violation of the lexical restrictions on adjectival passive formation in adult English (see fn.4). Thus *John was seen* is predicted to be acceptable to the child - it is simply an adjectival passive. Borer and Wexler had assumed that the child would not accept non-actional verbs as adjectival passives (following the adult lexical restrictions, as mentioned in our fn. 4), and that this is why according to Borer and Wexler, children did poorly on (22), the full verbal-passive on non-actional verbs - the child couldn't make these adjectival at all. But, as Fox and Grodzinsky pointed out, this aspect of Borer and Wexler's analysis would predict that the child should do poorly on short non-actional passives like (23). BGPW's small change in Borer and Wexler's assumptions was to accommodate Fox and Grodzinsky's claim that children do well on short non-actional passives. There is very little research on short non-actional passives; if the claimed results in Fox

(1998) showed that this is indeed the case⁷.

Following Borer and Wexler (1987), BGPW (2001) suggest that what makes the analysis of the verbal passive as an adjectival passive possible is that the adjectival passive has the same form as the verbal passive in the language. In other words, a sentence such as (24) is ambiguous, since it can be analyzed either as an adjectival or as a verbal passive.

(24) The door was closed

BGPW (2001) defined the notion of a *syntactic-homophone (s-homophone)* of a sentence S as a structure which is different from the intended structure for S, but which is homophonous to it (see our (5)). It is in this sense that the adjectival passive is an *s-homophone* for the verbal passive. The assumption of BGPW is that the child will use an alternative structure for a sentence she cannot compute, when the alternative structure is an *s-homophone*. Children will substitute an adjectival passive for the verbal passive, since they consider the verbal passive ungrammatical (as it involves the ungrammatical, for their grammar, A-chain) and because the adjectival passive is an *s-homophone* of it, with no ungrammaticality involved. Although the meanings of the 2 structures are slightly different (for example, aspectually), they are close enough (at the level of understanding of the meaning of the predicate and its argument structure) that the child uses the *s-homophone* form to derive an understanding of the sentence that will allow her to respond appropriately.

The data above and the interpretations provided raise the following question: how do we know whether the existence of an *s-homophone* in the language is indeed necessary in order for the child to do reanalysis? In English, the alternative structure that the child uses, the adjectival passive, *is an s-homophone* for the structure that the child cannot correctly analyze. This seems to be the most conceptually natural interpretation of the English results. If this homophonous adjectival passive did not exist in the language, the children presumably could not interpret the structure at all. In other words, it seems natural to assume that children can only analyze sentences with structures that they already have, or for which there is direct evidence.⁸

and Grodzinsky are correct, and short non-actional passives are easy for a child, then BGPW's assumption will have to be maintained. But Fox and Grodzinsky's empirical result is equivocal – of the 11 non-adult-like children in their study, 8 of them (their 'group 2') did well on short non-actional passives. But the other 3 (their 'group 3') did poorly on short non-actional passives. Fox and Grodzinsky write that "the data from the 3 children ... are problematic for the hypothesis." If it turns out that children actually *do* have difficulty with short non-actional passives, then we can return to Borer and Wexler's assumption. It might even ultimately turn out that different children (or the same child at different stages) use alternative strategies, either accepting adjectival passives of non-actional verbs or not accepting them. In either case we have support for ACDH. Note that the two versions (Borer and Wexler and BGPW) are identical in spirit: children consider A-chains to be ungrammatical, and interpret the verbal passive as an adjectival passive.

⁷ Fox and Grodzinsky suggested that it was the process of theta-transmission that was immature in the child, rather than the A-chain construction. But, as BGPW pointed out, a theta-transmission deficit cannot explain why children at the same age have difficulty in giving the correct analysis to unaccusative structures, the structures studied by BGPW, which are not considered to involve a process of theta-transmission.

⁸ That is, we have to allow for what happens when children first analyze a form with respect to a structure, for example, when they first determine that *-ed* forms an adjectival participle that enters into an

We cannot test this natural assumption in English, since adjectival passives are homophonous to verbal passives. It would however be good to be able to test the natural assumption that a child will only interpret a verbal passive as adjectival if there is an adjectival passive in the language with the same phonetic output as the verbal passive. The alternative would be to claim that a child can analyze a verbal passive as an adjectival passive regardless of whether there is an *s-homophonous* adjectival passive in the language. This amounts to saying that when the child cannot analyze a structure for a piece of phonetic string, she may be able to interpret it as an alternative, even when the alternative is not directly attested as a possible analysis in the language⁹.

Our analysis predicts that when the adjectival passive is *not* an s-homophone of the A-chain passive, then performance on the A-chain passive will be poor. The children will do much worse on A-chain passives in a language where there is no appropriate s-homophone available than in English where such a homophone is available.

Greek is a language able to provide answers to such questions. As we have shown in Section 2, the Greek adjectival passive differs from the verbal passive in significant

adjectival passive structure. UG allows for such structures, of course, but children have to determine the morphological items and word order arrangements that give rise to them. Presumably, there is a strong form of evidence that leads a child to decide that *-ed* has particular grammatical properties.

⁹ The empirical and theoretical situation is slightly more complex. English is a language which has an adjectival s-homophone for the verbal passive while Greek is a language with an adjectival passive that is not homophonous with the verbal passive. Thus, we will test whether the homophonous adjectival passive is necessary for the adjectival interpretation of the verbal passive. There is conceivably a third possibility, namely a language L which has a verbal passive but no adjectival passive form. The theory as given predicts that children will perform poorly on verbal passives in this language because there is no homophonous adjectival passive. But on a more complex theory it may turn out that children can create an adjectival passive reading for a verbal passive when there is no adjectival passive at all in the language. Here is the situation, for the 3 possible types of language:

	adjectival passive	adjectival passive is homophonous with verbal passive
English	yes	yes
Greek	yes	no
Language L	no	

If it is necessary for a child to have direct evidence for the analysis of a particular form as a particular structure, then the Greek child will not have direct evidence for treating the verbal passive as adjectival and will not do it as such and will therefore have no analysis of the verbal passive and will do poorly on verbal passives. Similarly Language L children will not be able to treat the verbal passive as adjectival and will do poorly on verbal passives. But there is a potential alternative to the assumption that the reason that the Greek child doesn't treat the verbal passive as adjectival is that the child doesn't receive any kind of direct evidence to this effect. The alternative says that the existence of the adjectival passive form, known to the Greek child, *blocks* the child's creation of the analysis of the verbal passive as adjectival. This would follow from Wexler's (1987) *Uniqueness Principle*, which says that a child won't instantiate a grammatical structure in 2 different ways unless she receives direct evidence for it. Since the Greek child already has a way of formulating adjectival passives, she won't treat the verbal passive as adjectival. The child learning language L, on the other hand, on this view could treat the verbal passive as adjectival, since she has no other form for the adjectival passive. This alternative view would predict that learners of language L would do well on verbal passives, treating them as adjectival. These are rather subtle issues of theory. Since we don't know of developmental data for languages like L (assuming that such languages exist), we leave the matter here. On either interpretation, the prediction is that Greek children will do very poorly on verbal passives, the issue that we test in this paper.

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ways. Recall that the former contains a copula while the latter does not. Moreover, the passive participle has a different form in the verbal than in the adjectival passive. Thus, the Greek adjectival passive is clearly not an s-homophone of the verbal passive. Furthermore, the two forms have been given a different syntactic analysis. According to the theory we are pursuing then, the child who has not yet matured into a stage which accepts A-chains will not be able to use the adjectival passive as an alternative strategy to interpret verbal passives, hence will perform poorly on the latter.

In order to test this prediction, the experiment that we report in this paper studies full verbal passives in Greek and compares the results to those in the literature from English. The prediction is that Greek children at a comparable age (that is, before maturation of A-chains) will do much worse than English-speaking children on full verbal passives with actional verbs, since the (adjectival) s-homophone of the verbal passive that is available in English is not available in Greek. Performance on full verbal passives with actional verbs in Greek is expected to look more like performance on full verbal passives with non-actional verbs in English.

The study of the Greek adjectival passive is central to our concerns for an additional reason. As pointed out in Section 2, the Greek adjectival passive allows for a *by*-phrase, therefore allows us to study how well children do on the 'full' adjectival passive, a construction that is non-existent or is marginal at best in English. Adjectival passives do not contain A-chains, hence the A-Chain Deficit Hypothesis predicts that children will do well on them. We expect therefore, better performance on the full adjectival passive than on the full verbal passive, a pair that cannot be tested in a language such as English since full adjectival passives are not available.

Studying an adjectival passive with *by*-phrase is important for one more reason. One of the most prominent results in the empirical investigation of the development of passive in English is that young children do much better on short passives than on long ones. As part of their program of understanding child errors in terms of linguistic structures, Borer and Wexler interpreted this to mean that children interpreted short passives as adjectival passives. But the earlier literature suggested that the difficulty with long passives might involve more general, non-linguistic, problems. De Villiers and de Villiers (1985, p. 97), for example, suggest that "... with a specified agent, children might show more errors because of the processing load". It is difficult to know why processing load should be more relevant for passive structures than for active structures (children do fine on active transitive sentences) without a processing theory for children that makes explicit predictions (which, so far as we know, does not exist). Nevertheless we can test the 'processing' theory against the A-Chain Deficit Hypothesis. A processing theory predicts that adjectival passives with *by*-phrases will be difficult for children because they are passive structures with 2 arguments, the external argument is in the *by*-phrase, rather than in the subject position, and, moreover, the structure is 'longer' than its verbal counterpart since it consists of a copula and the predicate. The A-Chain Deficit Hypothesis, on the other hand, predicts that children will have no trouble with adjectival passives, even those with a *by*-phrase. Thus, the structure of Greek passives allows us to test linguistically-based theories of development (in particular the A-Chain Deficit Hypothesis) against processing theories, which assume that the non-canonical external argument in the *by*-phrase, or even the length of the structure, is what makes such

structures difficult.

Notice, finally, that we test the verbal passive of both actional and non-actional verbs. Since we predict that all verbal passives will be difficult for Greek children due to the A-Chain Deficit Hypothesis, plus the lack of a homophonous adjectival passive, the simplest theory will predict no difference between these two types in children's performance¹⁰. Since studies in English (see our earlier discussion of the Maratsos et al. data) show that a major variable in early full passive development is the actional/non-actional distinction, if we find that this distinction is of much smaller scale in Greek, it will support our theory and will argue against ideas that this type of verb has an inherent difficulty for children.

4. The Experiment

The experiment we report in this section tested the performance of 30 Greek speaking children on verbal and adjectival passives.

4.1. The verbs

The experiment tested children's performance on the passives of six actional and four non-actional verbs. They were all chosen so that they come as close as possible to the verbs tested in the study by Maratsos et al., hence, facilitate the comparison with the English results. The easiness of depicting the verbs for the purpose of using them in a picture task experiment was also a relevant factor.

The actional verbs on which children's performance was tested were:

<i>sproxno</i>	'push'
<i>xtipao</i>	'beat'
<i>akoubao</i>	'touch'
<i>kinigao</i>	'chase'
<i>vourtsizo</i>	'brush'
<i>filao</i>	'kiss'

The non-actional verbs tested were:

<i>agapao</i>	'love'
<i>mirizo</i>	'smell'
<i>vlepo</i>	'see'
<i>akouo</i>	'hear'

Each actional verb was used in two passive sentences, a verbal passive and an adjectival

¹⁰ There are however actually two possibilities that may still predict poorer performance on non-actional than on actional passives. First, non-actional verbal passives in Greek have a somehow odd status (see following section) and the child may be aware of this. Second, to the extent that the child attempts to use an adjectival passive reading for the verbal reading (which might be a small possibility despite the fact that the existing adjectival form is not homophonous with the verbal passive), the child will do better on full actional than on full non-actional verbal passives, because non-actional passives do not have an external argument that is compatible with the Affecter theta-role of *by*.

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passive identical in all other respects. For the verb *kinigao* (chase), for instance, the following two passives were formed and subsequently tested:

- (25) To skilaki kinigiete apo to arnaki. Verbal Passive
 the dog-dim chase-NAct by the lamb-dim
 'The little dog is chased by the little lamb.'
- (26) To skilaki ine kinigimeno apo to arnaki. Adjectival Passive
 the dog-dim is chased by the lamb-dim
 'The little dog is chased by the little lamb.'¹¹

As for non-actional verbs, and since no adjectival passives correspond to them, see (16a) and (17a) earlier, each verb was used in two verbal passives differing from each other with respect to the reversal of theta-roles only. That is, for a non-actional verb such as *akouo* 'hear' both sentences that follow were included in the questionnaire:

- (27) I Maria akougete apo ti mama. Verbal Passive
 the Mary hear-NAct by the mom
 'Mary is heard by mom.'
- (28) I mama akougete apo ti Maria. Verbal Passive
 the mom hear-NAct by the Mary
 'Mom is heard by Mary.'¹²

¹¹ S. Iatridou (p.c.) expresses scepticism as to the acceptability of most adjectival passives of the experiment, when these are construed with a *by*-phrase. Similar scepticism is also expressed by V. Tsakali (p.c.) but is waived with an appropriate agent in the *by*-phrase of some of them. Thus, she finds *I Maria ine filimeni apo olous tous fitites tou MIT* (Mary is kissed by all MIT students) acceptable, for instance, by contrast to *I Maria ine filimeni apo to Yianni* (Mary is kissed by John). To our knowledge, the interaction of the *by*-phrase with adjectival passives has not been discussed in the literature on Greek (but see footnote 1) nor have the semantics of the Preposition *by* been studied. Obviously, such studies are indispensable for an understanding of the above discrepancies with respect to grammaticality judgments and what they amount to, but are beyond the scope of the present work (see the discussion in Theophanopoulou-Kontou (200) with respect to the degree of affectedness expressed by the DP in the *by*-phrase in association with the result state status of the Greek *m/p* participles discussed in Tzevelekou (2000) and the crosslinguistic typology on Psych Passives in Landau (this volume) for potential answers). It is worth pointing in advance however (and see the results section later), that the children who participated in this experiment did far better on the adjectival passives than on the verbal passives, both of which were given to them in their full form, that is, with a *by*-phrase. The children did not have much trouble in understanding the adjectival passive with a *by*-phrase. The good performance of children on adjectival passives with *by*-phrases suggests that in fact the syntax of this structure is acceptable in Greek. It is quite possible that the somewhat varying judgments on adjectival passives with *by*-phrases is due to subtle lexical aspectual properties, the kinds of properties that children might either not know or might ignore so as to be able to obtain a usable response. It is becoming evident, we believe, that a follow-up experiment on the short forms (that is, the forms without the *by*-phrase) of both types of actional passives is of much value for both, a complete theory of passives and their interaction with the *by*-phrase, as well as their acquisition.

¹² The grammaticality of the verbal passives of the non-actional verbs of the experiment when used with a *by*-phrase, is also debated by the previous informants (as well as by A. Alexiadou and E. Anagnostopoulou). The Greek-speaking co-author of the current paper for the most part shares this judgment. Moreover, it has long been noted in traditional grammars (Tzartanos 1946) that verbs such as *akouo* (hear), *vlepo* (see), etc., are not used with a *by*-phrase in the verbal passive. Even when used without the *by*-phrase, their interpretation is closer to that of a middle, an intuition shared by all native speakers. We nevertheless included full verbal passives of non-actional verbs in our experiment because we were

Both of these sentences were included so that the child had about as many tokens of passives for non-actional verbs as for actional verbs and so that we had enough tokens of non-actional passive verbs that we could reliably test how well children did on them.

All passive sentences were semantically reversible and contained only animate arguments.

4.2. The questionnaires

The sentences that contained the verbs to be tested were given in two questionnaires, differing only with respect to reversing the theta-roles of the arguments involved. Each questionnaire contained two examples of each of the above verbs in passive form as described above (e.g. for the actional verbs, one verbal and one adjectival passive, and for the non-actional verbs two verbal passives). Given that a total of 10 verbs were tested, each of them forming two passive sentences, the total of passive sentences was 20 in each questionnaire. Of those, 6 were adjectival passives of actional verbs, 6 were verbal passives of actional verbs and 8 were verbal passives of non-actional verbs.

In addition to the above, each questionnaire also contained two control sentences for each verb. The first control sentence was a non-reversible active sentence, which, for a verb such as *sproxno* 'push', for instance, was:

- (29) O Yiannakis sproxni to baoulo.
 the John pushes the trunk
 'John pushes the trunk.'

The other type of control sentence was a semantically reversible active, for example, the sentence:

- (30) O Yiannakis sproxni ti Maria.
 the John pushes the Mary
 'John pushes Mary.'

The first type of control sentence was intended to test whether the children knew the verb in question. The second was intended to test whether children could recognize the participants in the event, that is, knew the active verb. Each questionnaire contained 40 sentences, namely, two passives and two control (active) sentences for each one of the ten verbs.

interested in comparing the Greek results with the corresponding results from English, for which a *by*-phrase seems to be much more readily acceptable. What we did through the picture task was to force the interpretation of a passive, according to which, for instance, a sentence such as *I Maria akougete apo ti mama* (Mary is heard by mom) depicted Mary playing loud music and mom listening to her from the next room. In this situation, the sentence sounded plausible to the Greek-speaking co-author as an adjectival passive with *by*-phrase. The disadvantage of such a situation is that we possibly tested verbs 'less' non-actional than what was intended. Again, a follow-up experiment on the short passives of the same verbs will shed light into which interpretations are there for children and what is the role of the *by*-phrase in the interpretation they eventually provide.

There were the same number (20) of active sentences as passive sentences. This meant that a child was not influenced to respond in one or the other way by the frequency of grammatical forms. Moreover, the equal number of passive and active sentences meant that a word order strategy, for example, 'make the first NP the agent' could do no better than chance overall.

4.3. Participants and method

The participants in the experiment were 30 monolingual Greek speaking children, of monolingual Greek speaking parents, ranging from 3;8 to 5;10 years old. They were tested in kindergarten and elementary schools of Patras and Athens. Each child was randomly chosen to receive one of the two questionnaires. There were no substantial differences in the results to the 2 questionnaires so we report the results for all children combined.

When each sentence was read to the child two pictures were presented to her simultaneously in order to choose the one that corresponded to the sentence just read. For control sentences such as (29) a picture describing the sentence and another one involving the same arguments but a different verb was shown as the wrong picture, for example for (29) it was the picture of the child holding on to the trunk. For control sentences such as (30), as well as for passives, the picture describing the sentence plus one with the same verb but reverse theta-roles for the same arguments was shown. For (30), for example, the wrong picture would be of Mary pushing John. All children completed all 40 sentences in one session. The questionnaires were first given to 5 adults who gave 100% correct responses. All but four children performed perfectly (100%) on all the control (active) sentences. If a child did not perform perfectly on the active sentences, we did not include his or her passive data, so the tables we present include only those children who got 100% on the active controls.

4.4. The results

The percentages of correct responses per type of passive and age group are given in Table I immediately below.

Table I: Percentages of correct responses for Greek Passives

Age groups	Verbal passives of Actional Verbs	Adjectival Passives of Actional Verbs	Verbal Passives of Non-actional verbs
3;8-3;10 (M=3;9) n=5	0.03	0.83	0.20
4;2-4;10 (M=4;7) n=14	0.33	0.77	0.13
5;3-5;10 (M=5;6) n=11	0.44	0.89	0.20

It is clear from the above table that children do very well on adjectival passives, even though these are not short passives. Even the youngest children (in their 3's) choose the correct picture 83% of the time. Thus:

(31) Performance is very good on full adjectival passives

The picture on verbal passives is very different, however. The 3 year-olds only produce 3% correct answers on the verbal passives of actional verbs. This means that not only don't they understand the syntax of verbal passives, but they are adopting a 'strategy' of selecting the first NP in the sentence as the Agent (since, if they were merely guessing, their responses would be closer to the 50% chance level). Or equivalently, the children might be treating each verbal passive participle as an active verb, since this too would predict a very low score for actional verbs.¹³ Similar strategies have been noted in English-speaking children, though probably at younger ages (Bever 1970). Even the oldest children, in their 5's, only perform at chance level on verbal passives of actional verbs:

(32) Performance is quite poor on full verbal passives, of actional as well as non-actional verbs

Performance on full passives of non-actional verbs is similar, but a bit worse than on actional verbs.

(33) Performance on verbal passives of non-actional verbs is slightly worse than on verbal passives of actional verbs, though both are quite poor.

An individual subject analysis of the 5 year-old data on verbal passives of actional verbs shows that they tend to be a collection of children who either use the Agent first (or better, *participle* = *active* strategy, see footnote 13) or get the answers right, that is, some of the children have matured and some have not. There is not a large set of children who are guessing at a chance level, though there are a few.

Thus we see that Greek children do very poorly on even verbal passives of actional verbs. To show how true this is with respect to English, we have listed in Table II below a comparison of our data with that of Maratsos et al. on English. Recall that the experiments were identical; both were two choice picture experiments with the same verbs.

¹³ Since the children also do very poorly on verbal passives of non-actional verbs (verbs whose subject is not an Agent), the latter hypothesis (that they are treating the verbal passive participles as active verbs) is more likely than that they are selecting the first NP as agents. The latter strategy wouldn't explain the less than chance performance on non-actional verbs, since these verbs don't specify agent roles. This conclusion has to be tempered by the possibility that our pictures for non-actional passive verbs inclined the child to reading them as 'more' actional than they normally are.

Table II: Percentages of correct responses on Full Verbal Passives for our Greek experiment and Maratsos et al.'s English experiment

	Actional verbs		Non-actional verbs	
	English	Greek	English	Greek
3 years		.03		.20
4 years	.85	.33	.34	.13
5 years	.91	.44	.65	.20
7 years	.92		.62	

A comparison of children at the same age shows that 4 year-old English-speaking children are 85% correct on actional passives, whereas Greek children are only 33% correct. A similar huge difference exists at 5 years (91% versus 44%). We can also see a difference on the non-actional verbs, with English-speaking children doing better than the Greek-speaking children.

5. Discussion

The data we have presented so far lead us to conclude that the theory presented in Section 1 is supported. This theory assumed the ACDH together with the hypothesis that in order for a child to use an adjectival passive structure to interpret the verbal passive, the adjectival passive must be an s-homophone for the verbal passive. Here is how exactly the facts support the theory:

- (34) a. The fine performance of children on the full adjectival passives shows that when there is no A-chain the child can easily analyze the sentence, even if there is a *by*-phrase. Thus, all accounts that put the difficulty with the passive in the *by*-phrase can't be right. We now know that the adjectival passive is easy for the child independently of whether it has a *by*-phrase or not.
- b. The extremely poor performance on the full verbal passive of actional verbs shows that Greek children do not use an adjectival structure in order to interpret the full verbal passive. This provides support for the hypothesis that the adjectival passive must be an s-homophone of the verbal passive in order for the adjectival passive to be used in this way.
- c. The much better performance of children on the adjectival passive, which is more complex than the verbal passive in terms of consisting of the copula and the predicate, argues against accounts that relate late acquisition to processing limitations.

A question that remains to be answered is why Greek children do somewhat better on the actional passive than the non-actional passive. It may be because passives of actional verbs are more felicitous than passives of non-actional verbs in Greek, in the manner sketched in footnote 12 or because even in Greek children to a very slight extent attempt to give the verbal passive an adjectival reading, as suggested in footnote 10.

There may also be a role for the *by*-phrase in accounting for the poor performance of Greek children on verbal passive. BGPW (2001) argue that in some languages *by* cannot assign an Agent theta-role (e.g. *a book by Mary* is not acceptable in some languages, Japanese being one of them). This will imply that in those languages children will do very poorly on actional full verbal passives even when the verbal and adjectival passives are homophones. As BGPW point out, Japanese children do very poorly on verbal passives of actional verbs. The equivalent of *a book by Mary* is also ungrammatical in Greek. It is possible that the reason that children do poorly on verbal passive in Greek is that they cannot allow *apo/by* to assign the Agent role directly to its object. A reason will then have to be found why Greek children do well on full adjectival passives. This will involve asking how the role of the object of *apo* is assigned in Greek adjectival passives. At the moment the s-homophone assumption seems the most able to capture all the facts.

To tease apart potential roles of the *by*-phrase and s-homophone assumption, it will be important to study properties of short verbal passives in Greek. It is clear that the s-homophone assumption predicts that children will do poorly even on short actional verbal passives. We are currently engaged in an experimental investigation of short passives.

In conclusion, the study of the development of Greek passive has provided remarkable evidence for the ACDH, further evidence that the ability to grammatically analyze an object to subject A-Chain matures at a relatively late age and that the adjectival vs. verbal distinction is crucial to the understanding of the development of passive. Once again, a structural condition, not a condition of sentence length or complexity, turns out to be at the bottom of developmental issues in language. To a linguist this should be satisfying indeed.

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