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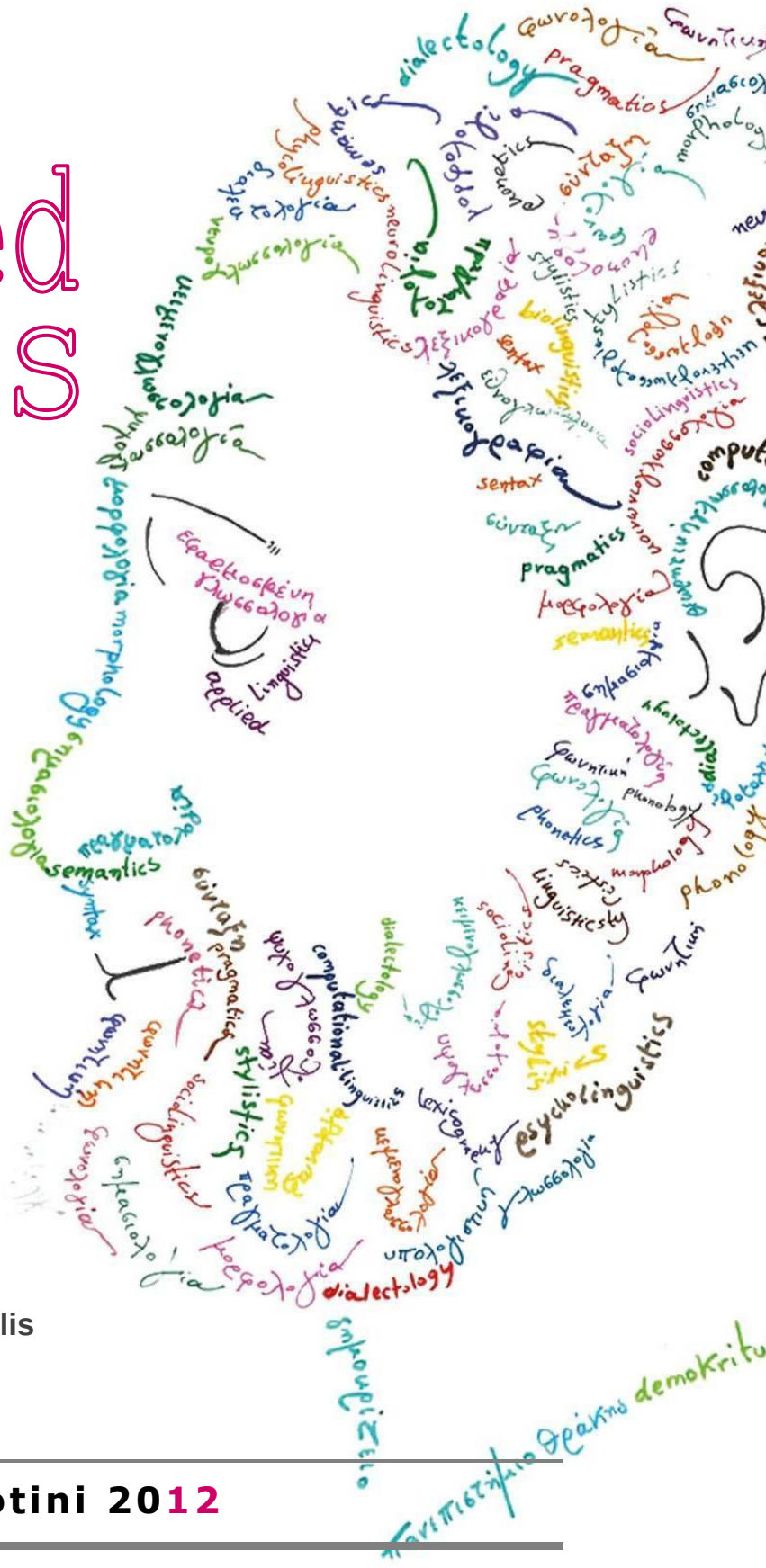

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COMPREHENSION IN GREEK-SPEAKING AGRAMMATISM: A CASE STUDY

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ABSTRACT

This study reports data of a Greek-speaking agrammatic patient on four constrained tasks tapping comprehension of semantically reversible active and passive sentences, subject-verb Agreement, Tense, Aspect, and CP. The results, discussed in light of recent hypotheses, indicate that in agrammatic comprehension—and at least for some patients— canonical and non-canonical sentences may not dissociate and, further, functional categories associated with the verb morphology may be compromised in the face of well-preserved categories located higher in the syntactic hierarchy.

Keywords: agrammatism, comprehension, grammaticality judgment, Agreement, Tense, Aspect, Complementizer Phrase.

1. Introduction

It is well established that agrammatic patients have often difficulties comprehending semantically reversible sentences involving movement of a Determiner Phrase (DP) from its θ-position to a higher one, such as passive sentences, object relative sentences, and object cleft sentences (e.g., Caramazza & Zurif, 1976). Comprehension of reversible sentences requires successful processing of syntactic information, which is assumed to be impaired in agrammatism (e.g., Avrutin, 2006). In contrast, agrammatics are able to successfully comprehend irreversible sentences based on semantic cues. Several accounts have been proposed to capture the syntactic problems agrammatic patients face in the comprehension of reversible sentences. According to the influential Trace Deletion Hypothesis (TDH) (Grodzinsky, 1995), traces that DP movement leaves behind are deleted from the sentence representations of agrammatics, a process which results in their inability to use syntax in order to assign θ-roles to the moved arguments. In such cases, they resort to a cognitive strategy assigning the agent role to the linearly first argument of the sentence. Consequently, in passive sentences with an overt by-phrase, representations with two agents are built up, leading agrammatics to perform at chance on this sentence type.

In line with Caramazza and Zurif's (1976) findings, several researchers report that, unlike movement-derived reversible sentences, "simple" canonical active sentences do not cause comprehension difficulties to agrammatics (for a review, see Grodzinsky, Piñango, Zurif, & Drai, 1999). Recent studies, however, indicate that comprehension of simple active sentences can also be impaired in agrammatism. For instance, structures used to test functional categories such as subject-verb Agreement, Tense, or CP can be affected (e.g., Dickey, Milman, & Thompson, 2008; Stavrakaki & Kouvava, 2003).

A number of accounts have been argued to capture agrammatic comprehension data related to functional categories, although some of them were originally proposed to account for production data. Here I will focus on four of them: (a) Tree Pruning Hypothesis (TPH) (e.g., Friedmann, 2006), (b) Tense Underspecification Hypothesis (TUH) (Wenzlaff & Clahsen, 2004, 2005), (c) Interpretable Features' Impairment Hypothesis (IFIH) (Fyndanis, Varlokosta, & Tsapkini, 2010, 2012; Nanousi, Masterson, Druks, & Atkinson, 2006; Varlokosta, Valeonti, Kakavoulia, Lazaridou, Economou, & Protopapas, 2006), and (d) Distributed Morphology Account (DMA) (Dickey, Milman, & Thompson, 2008; Thompson, Fix, & Gitelman, 2002).

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According to the TPH (e.g., Friedmann, 2006), agrammatism arises from a "pruning" of the syntactic tree, usually at the Tense node; categories hosted above the pruning point (e.g., CP) are inaccessible, whereas those located below (e.g., subject-verb Agreement, at least in Hebrew) are intact.

Within the minimalist spirit (e.g., Chomsky, 1995), the TUH (Wenzlaff & Clahsen, 2004, 2005) posits that the selective difficulties of agrammatic speakers with Tense are due to the underspecification of this category within the T/INFL node, in the face of the other well-preserved features hosted within the same node (e.g., Agreement, Mood, in German). This hypothesis, therefore, attributes the Tense deficits in agrammatic comprehension (and production) not to the impaired projection of the syntactic hierarchy, but to morphological/morphosyntactic processes.

Exploiting the minimalist notion of Logical Form (LF)-Interpretability (e.g., Chomsky, 1995, 2001), the IFIH (Fyndanis et al., 2010, 2012; Nanousi et al., 2006; Varlokosta et al., 2006) suggests that, in agrammatism, categories with LF-interpretable features (e.g., Tense, Aspect) are expected to be significantly more impaired than categories with LF-uninterpretable features (e.g., Agreement). Fyndanis et al. (2010, 2012) argue that, given the processing limitations of agrammatics, the dissociation between "interpretable" and "uninterpretable categories" is due to their differential processing demands. "Interpretable categories" are more demanding in terms of processing resources compared to "uninterpretable categories", since the former require processing and integration of grammatical and extralinguistic/conceptual information; in contrast, "uninterpretable categories" involve processing of grammatical information only.

The DMA (Dickey et al., 2008; Thompson et al., 2002) was based on the patterns of performance Dickey et al.'s (2008) and Thompson et al.'s (2002) patients exhibited, which were consistent with the assumption of Distributed Morphology (Halle & Marantz, 1993; Harley & Noyer, 1999) that the syntactic component operates separately from the morphological component, but that the latter takes the outputs of the former (phrase structures and feature bundles) as input for its computations. In particular, in a study focusing on comprehension, Dickey et al. (2008) reported significantly better performance of English-speaking agrammatic individuals on judgments of CP-related structures, rather than of IP-related ones. According to the authors, the selective comprehension deficit affecting verbal morphology categories in the face of well-preserved higher projections is in line with the above-mentioned assumption of Distributed Morphology. It is suggested, thus, that probably what is genuinely affected in agrammatic individuals is not syntax, but morphological insertion processes (Dickey et al., 2008; see also Thompson et al., 2002).

Only a few published studies have investigated the comprehension of functional categories in Greek-speaking agrammatic aphasia, while only Stavrakaki and Kouvava (2003) and Alexiadou and Stavrakaki (2006) have examined a wide range of functional categories. I will only focus on the comprehension data of these studies, which are of interest here.

Stavrakaki and Kouvava (2003) tested the abilities of two Greek-speaking agrammatic patients to comprehend subject-verb Agreement, Tense, Negation, Mood, and CP using a grammaticality judgment task and a preference test between grammatical and ungrammatical sentences. Regarding CP, they examined both the specifier and head positions. Furthermore, regarding Negation, they tested the comprehension of both negative particles in Greek, *δén* and *mín*, which are used in the indicative and subjunctive Mood, respectively. In the grammaticality judgment task, Stavrakaki and Kouvava's first patient, SC, performed above chance[1] on Agreement, Tense, Negation in indicative Mood, and Spec, CP[2], and at chance on Mood, Negation in subjunctive Mood and C°. VF, their second patient, performed above chance on all the conditions of the grammaticality judgment task.[3] According to the

[1] The characterizations of the performance of Stavrakaki and Kouvava's (2003) patients in terms of chance performance were not provided by the authors, but they are based on statistical comparisons (by Binomial test) made in the present study.

[2] Spec, CP was assessed through items testing operator movement in embedded questions and through wh-NP constructions. SC performed above chance on the former and at chance on the latter. Wh-NP constructions, however, also involve a "discourse component" (they are *Discourse-linked*, in terms of Avrutin (2000)), which has been argued to place an extra burden on speakers' processing system (op. cit.); therefore, the testing of Spec, CP through wh-NP constructions is confounded with this component. In fact, based on these items, SC performed at chance on Spec, CP. Hence, Stavrakaki and Kouvava's patients' abilities to handle the Spec, CP position in comprehension can be best assessed based on their performance on the condition testing operator movement in embedded questions.

[3] In the grammaticality judgment task, each condition included 20-24 items. On the other hand, the preference test included only 10-12 items per condition, which, in some cases, does not allow to draw firm conclusions about the ability of Stavrakaki and Kouvava's participants to comprehend the functional categories under consideration. For example, SC performed 8/10 correct on three conditions, namely Neg-*δén*, Neg-*mín*, and Mood, which, by a Binomial test, corresponds to chance performance (two sided $p = .109$). It is doubtful, however, if indeed this patient's ability to comprehend these categories is impaired. In fact, his performance on the Neg-*δén* condition of

authors, these results indicate that, despite the individual variation observed, both patients show a high degree of grammaticality sensitivity. Strong evidence for this is provided by their high performance on structures involving functional categories located high in the syntactic tree (i.e., embedded object wh-questions).

Alexiadou and Stavrakaki (2006) tested the ability of a Greek-English bilingual individual with Broca's aphasia and mild agrammatism, KS, to judge adverb placement in sentences through a contrastive grammaticality judgment task.[4] This task included adverbs associated with different functional (and lexical) projections: CP, MoodP, AspectP, NegP, and VP. In Greek, KS's performance was quite high on all types of adverbs. Although the higher the functional projection with which a given adverb was associated, the lower KS's performance was, no significant dissociations were observed between the different adverb types/functional projections. KS's results, therefore, indicate increased grammaticality sensitivity for all the functional projections tested.

Against this background, the goal of this study is two-fold: (a) to contribute new comprehension data aiming at the better understanding of the way Greek-speaking agrammatic aphasia manifests itself in this modality; (b) to relate the data reported here to the comprehension data provided by Stavrakaki and Kouvava (2003), and Alexiadou and Stavrakaki (2006), and discuss them all in light of the above-mentioned theories of agrammatic comprehension. In particular, this study investigates the ability of a Greek-speaking agrammatic patient to comprehend a wide array of syntactic structures and functional categories: reversible canonical and non-canonical sentences, wh-questions/CP, Tense, Aspect, and subject-verb Agreement.

2. Verbal morphology and clause structure in Greek

Greek is a null subject language with rich morphology and relatively free word order (Holton, Mackridge, & Philippaki-Warburton, 1997). The canonical order in Greek is VSO (e.g., Roussou & Tsimpli, 2006). A number of grammatical (functional) categories are instantiated in the Greek verb morphology, such as Agreement, Tense, Aspect, Voice, and Mood (Holton et al., 1997). Greek does not have infinitives and the only non-finite forms are the gerund and the non-finite form that is used to compose the perfect tenses.

The distinction between imperfective and perfective Aspect shows up in the past tense, in the future tense, and in the *na*-constructions (subjunctive). No aspectual distinction is made in the present tense, as it always uses the imperfective stem.

According to Tsimpli (1990), the likely clause structure for Greek with respect to CP, Agreement Phrase (AgrP), Tense Phrase (TP), and Aspect Phrase (AspectP) is (1) (but see Philippaki-Warburton, 1998, for a different analysis[5]):

(1) **CP** > (MoodP) > NegP **> TP > AgrP > AspectP** > VP

Given the syntactic hierarchy above, the predictions of the five theories discussed in the Introduction for Greek-speaking agrammatic aphasia are summarized in Table 1.

3. Methods

3.1 Participants

A Greek-speaking agrammatic patient, GL, and an age-, gender-, and education-matched control participant, SA, were tested. Details about the diagnosis of agrammatism, demographic and lesion information, and language testing data are given in Fyndanis et al. (2010, 2012).

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the grammaticality judgment task, which elicited a % rate similar to that elicited by the preference test (17/20, 85% correct vs. 8/10, 80% correct, respectively), is above chance (by Binomial test, two sided p = .003). For this reason, in the present study, only the results of the grammaticality judgment task are reported.

[4] Alexiadou and Stavrakaki (2006) also examined the production modality (with a constituent ordering task), which, however, is not relevant to the present study.

[5] For the different predictions the TPH (Friedmann, 2006) would make depending on which of the two alternative analyses is adopted, see Fyndanis (2009: 63-67). Crucially, irrespective of which analysis is adopted, the results of this study lead to the same conclusions with respect to the adequacy of the TPH to capture the agrammatic participant's pattern of performance.

3.2 Experimental investigations

Four tasks were developed overall: a sentence-picture matching task to test comprehension of canonical active and (non-canonical) passive sentences, a sentence-picture matching task to test comprehension of Tense, a sentence grammaticality judgment task to test judgment/comprehension of subject-verb Agreement, Tense, and Aspect, and a picture-pointing task to test comprehension of wh-questions, which involve the CP.

3.2.1 Sentence-picture matching task I: Aim/Design/Procedure

A sentence-picture matching task was developed to investigate whether GL has greater difficulty comprehending sentences with non-canonical argument order (object-subject), compared to sentences with canonical argument order (subject-object). The task included 18 reversible passive sentences and 18 reversible active sentences. The same, two-

TDH	reversible passives < reversible actives
TPH	CP, Tense < Agreement, Aspect
TUH	Tense < Agreement, Aspect
IFIH	Tense, Aspect, CP[6] < Agreement
DMA[7]	Tense, Aspect, Agreement < CP

Table 1 Predictions of the five hypotheses discussed in Section 1 for comprehension in Greek agrammatism.

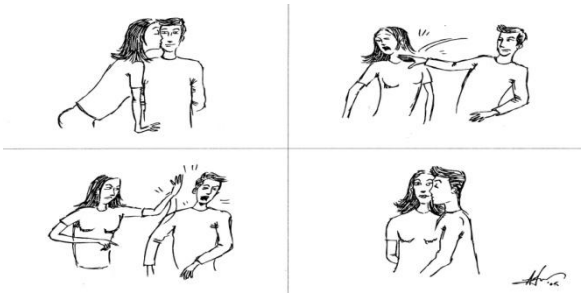

Figure 1 This set of pictures was accompanied by the sentences *To korítsi xastucízi to agóri* 'The girl is smacking the boy' and *To korítsi xastucízete apó to agóri* 'The girl is being smacked by the boy'

place verbs were used in both sentence types. Each sentence was accompanied by four pictures including the target picture, a picture with role reversal, and participant and action foils. An example is given in Fig. 1. Participants were auditorily presented with the sentences and required to point to the picture that matched the sentence they heard. The task was administered in two sessions, with at least a five-day interval in between. The block with the actives was administered first (session 1), followed by the block with the passives (session 2). Training to the participants was provided at the beginning of each session. The control participant had ceiling performance on both actives and passives and, thus, his performance will be further ignored.

3.2.2 Sentence-picture matching task II: Aim/Design/Procedure

Another sentence-picture matching task was developed to test comprehension of Tense. This task included 18 active sentences with canonical argument order. Each sentence was accompanied by three randomly ordered black and white line drawings depicting three temporal versions (*past*, *present*,

[6] Wh-questions, which are used to test CP here, are considered to carry uninterpretable features (Tsimpli & Stavrakaki, 1999: 51).

[7] The DMA (Dickey et al., 2008; Thompson et al., 2002) would be consistent with impairment in categories associated with the verbal morphology in the face of well-preserved higher projections, such as CP. Other patterns, however, would not necessarily undermine the validity of the DMA. For instance, similar impairments in verbal morphology and CP could be attributed to deficits in both the syntactic and morphological components.

future) of a given event. Participants were asked to point to the drawing that matched the sentence they heard. An example of the past tense condition is given in Fig. 2. Seven sentences were in the past Tense, six in the present, and five in the future. The control participant made no errors and, thus, his performance will be further ignored.

3.2.3 Sentence grammaticality judgment task: Aim/Design/Procedure

The sentence grammaticality judgment task aimed at exploring GL's ability to judge/comprehend subject-verb Agreement, Tense, and Aspect. This task comprised 168 active sentences with canonical argument order, 56 per functional category, of which –in each condition– half were well-formed and half ill-formed. The vast majority of the sentences (150 overall, 50 in each condition) were irreversible. The same 56 verbs (two-place transitive, stressed on the penultimate syllable) were used in all three conditions. Participants were auditorily presented with the sentences, and asked to judge whether they sounded correct or not. The pairs of sentences in (2), (3), and (4) are examples of well-formed and ill-formed sentences in the Agreement, Tense, and Aspect conditions, respectively.

(2) a. Esí akús musicí. *You$_{sg}$ hear$_{2nd.sg}$ music*. 'You listen to the music'
*b. Esí épina bíra. *You$_{sg}$ drank$_{1st.imperf}$ beer.* 'You was drinking beer'
(3) a. Χθés esí éplases kuluráca. *Yesterday you$_{sg}$ shaped$_{2nd.sg}$ scones.*
*b. Ávrio eγó épsisa brizóles. *Tomorrow I cooked$_{1st.sg}$ steaks.*
(4) a. Ávrio esí θa mirázis ta ðóra epí mía óra. *Tomorrow you$_{sg}$ will give out$_{2nd.sg.imperf}$ the gifts for an hour.*
*b. Χθés aftí kúrðisan ta rolója epí ðío leptá. *Yesterday they wound$_{3rd.pl.perf}$ the clocks for two minutes*.

In the Agreement condition, of the 28 ill-formed sentences, half violated number Agreement and half violated

person Agreement. All the Agreement values were included as targets (either realized or not) and were relatively evenly distributed between the well-formed and ill-formed sentences.

In the Tense condition, the well-formed sentences were crossed with all target Tense values, while the ill-formed

sentences were only crossed with past and future. The reason for the exclusion of the present Tense from the ill-formed sentences is that sentences with verbs in past or future and with adverbials prototypically associated with present (e.g., *tóra* 'now') can be considered acceptable. Therefore, in order to include the same number of well-formed and ill-formed sentences, as well as the same number of sentences for each target Tense, I used only well-formed sentences for the present Tense and counterbalanced through the ill-formed sentences, which all had past or future as their target Tense and, further, utilized the past *vs*. future contrast between adverbials and verbs.

Aspect was tested only within indicative (unmarked Mood). Of the 56 sentences in this condition, 28 had the perfective as their target Aspect and 28 the imperfective. The subsets above were crossed yielding a relatively even distribution of the relevant variables (±*well-formedness*, ±*perfectivity*) and presented an even distribution between past and future. The present was not included as it does not mark morphologically the distinction between the perfective

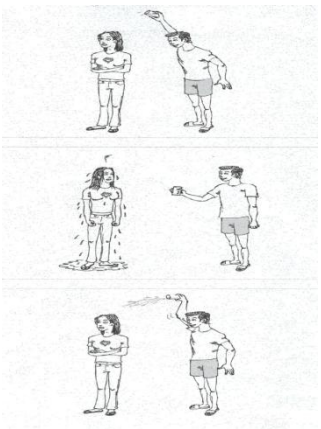

Figure 2 This set of pictures was accompanied by the sentence *To aγóri évrekse to korítsi*
'The boy dumped water on the girl'

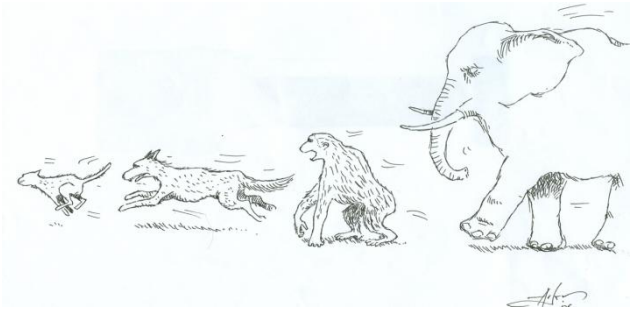

Figure 3 For this picture the following questions were asked (in Greek): *Who is the monkey chasing? Who is the dog chasing? Who is chasing the monkey? Who is the elephant chasing? Who is chasing the cat?*

and imperfective Aspect.

The grammaticality judgment task was divided into four blocks of 42 items. Each block included 14 items testing Agreement, 14 testing Tense, and 14 testing Aspect. In each block the same verb never appeared more than once. The three conditions were mixed and randomized, and the resultant order of items was kept constant for both participants.

More than three consecutive items of the same condition and more than four consecutive well-formed or ill-formed sentences never occurred. The task was administered within four sessions, with at least a five-day interval in between. No session lasted more than 45′.

3.2.4 Picture-pointing task: Aim/Design/Procedure

A picture-pointing task was developed to test comprehension of wh-questions, which involve the CP (at least for object questions). The design and results of this experiment are reported by Fyndanis et al. (2010). However, for the reader's convenience I briefly provide the relevant details. In this task, the participants were presented with four black and white line drawings. Each line drawing depicted a "reversible" action performed by four animate entities (people or animals) (see Fig. 3). Each of the animate entities constituted either one of the agents or one of the themes of the depicted proposition, or even both of them. For each line drawing, five (subject and object) argument questions were read aloud by the experimenter and the participants were asked to point to the person or animal representing the answer to each question. Ten subject and 10 object questions were included overall. This task was administered in two sessions, with a 15-day-interval in between. In each session the participants were presented with two drawings and 10 wh-questions. GL's control participant performed at ceiling, so his performance will be further ignored.

4. Results

4.1 Results from the sentence-picture matching task I

As shown in Table 2, GL performed high on both active and passive sentences (94% correct on both). Certainly, his performance was above chance on the two sentence types. (Given that each trial included four pictures, the chance level for this task is 25%.)

	actives	passives	Total	actives vs. passives	actives vs. chance level (25%)	passives vs. chance level (25%)
GL	17/18 (94%)	17/18 (94%)	34/36 (94%)	$p = 1$	$p = .000$ above chance	$p = .000$ above chance

Table 2 Raw and percent accuracy scores, and comparisons (by Fisher's exact test and Binomial test, using R) for GL in the picture-matching task I.

	Tense comprehension	raw data vs. chance level
GL	10/18 (56%)	$p = .086$ chance

Table 3 Raw and percent accuracy scores, and comparison (by Binomial test, using R) for GL in the sentence-picture matching task II

	T	Agr	Asp	Total	T-Agr	T-Asp	Agr-Asp	T vs. chance	Agr vs. chance	Asp vs. Chance
GL	44/56 (79%)	45/56 (80%)	26/56 (46%)	115/168 (68%)	$p = 1$	$p = .001$	$p = .000$	$p = .000$ ab.chance	$p = .000$ ab.chance	$p = 1.496$ chance
SA	54/56 (96%)	56/56 (100%)	55/56 (98%)	165/168 (98%)	$p = .496$	$p = 1$	$p = 1$	$p = .000$ ab.chance	$p = .000$ ab.chance	$p = .000$ ab.chance

Note:T=Tense, Agr=Agreement, Asp=Aspect

Table 4 Raw and percent accuracy scores, and comparisons (by Fisher's exact test and Binomial test, using R) for GL and his control participant in the sentence grammaticality judgment task

Subject questions	9/10 (90%)	ab. chance ($p = .000$)
Object questions	10/10 (100%)	ab. chance ($p = .000$)
Total	19/20 (95%)	ab. chance ($p = .000$)

Table 5 Raw and percent accuracy scores, and comparisons (by Binomial test, using R) for GL in the picture-pointing task

4.2 Results from the sentence-picture matching task II

GL's correct performance on the sentence-picture matching task II amounted to 56% (Table 3). The comparison (by Binomial test) between his raw data and the chance level for this task (33.3% given that each trial included three pictures) revealed that he had chance performance on the comprehension of Tense.

4.3 Results from the sentence grammaticality judgment task

The results from the grammaticality judgment task are presented in Table 4. Overall, GL performed 68% correct on this task. He performed significantly worse on all three categories than his control participant (by Fisher's exact test; Tense: $p = .008$, Agreement: $p = .001$, Aspect: $p = .000$). Agreement was found to be the best preserved category (80% correct), whereas Aspect was the most severely affected category (46% correct). GL performed significantly lower on Aspect, compared to Tense and Agreement (see Table 4). Likewise, the comparison (by Binomial test) between his raw data and the chance level for this task (50%) revealed that his performance was at chance on Aspect and above chance on Agreement and Tense.

4.4 Results from the picture-pointing task

GL performed at ceiling on the picture-pointing task (Table 5). Thus, no dissociation was observed between subject and object questions. Certainly, the comparison (by Binomial test) between his raw data and the chance level for this task (25% given that each picture depicted four entities) revealed above chance performance ($p = .000$).

5. Discussion

In this study, I investigated the ability of a Greek-speaking agrammatic patient, GL, to comprehend semantically reversible canonical active and non-canonical passive sentences, subject-verb Agreement, Tense, Aspect, and wh-questions/CP, by means of four constrained tasks. No significant dissociation was found between passive and active sentences; GL performed above chance on both conditions. In contrast, he performed at chance on comprehending Tense (Experiment I). Agreement, Tense, and Aspect were found more-or-less impaired in the grammaticality judgment task, as GL performed significantly worse on all three categories compared to his control participant. His deficit, however, with respect to these categories was selective as he performed significantly worse on Aspect (chance performance) compared to Agreement and Tense (above chance). Last, GL had above chance

performance on the comprehension of wh-questions. I will first relate GL's data to the comprehension data of the three Greek-speaking agrammatic patients reported by Stavrakaki and Kouvava (2003) and Alexiadou and Stavrakaki (2006). Subsequently, I will discuss these patients' results in light of the relevant theories mentioned in the Introduction.

GL's results do not differ from SC's, Stavrakaki and Kouvava's (2003) first patient, as they both performed above chance on judging Agreement, Tense, and Spec, CP. Unlike GL, however, SC was not tested on Aspect, so it is unknown whether he was unimpaired in this low functional projection. SC's performance is at odds with all the relevant hypotheses mentioned in the Introduction. It is contra the TPH (Friedmann, 2006), as his Spec, CP seems to be well-preserved. It is contra the IFIH (Fyndanis et al., 2010, 2012; Nanousi et al., 2006; Varlokosta et al., 2006) because his performance on Tense is not worse than that on Agreement and, further, his performance on Neg-*δén* and Spec, CP (which both bear interpretable features) is above chance. Last, the DMA (Dickey et al., 2008; Thompson et al., 2002) does not appear to be in a position to explain the selective impairment in lexical retrieval/insertion, revealed by the Neg-*mín* – Neg-*δén*, and Spec, CP – C° dissociations.

GL's results differ from VF's, the second patient of Stavrakaki and Kouvava (2003), as VF performed above chance on all conditions. This is consistent with the literature that reports that comprehension is not always affected in agrammatic aphasia. Certainly, VF's pattern of performance is contra the TPH, TUH, and IFIH, but in line with the DMA (Dickey et al., 2008; Thompson et al., 2002).

Last, GL's data could not be directly compared with the data of KS, Alexiadou and Stavrakaki's (2006) patient, as the contrastive grammaticality judgment task employed by the authors did not target verbal morphology, as was the case with the present study. An observation that could be made, however, is that, while GL exhibited dissociations between functional projections (e.g., Aspect < Tense, Agreement, in the grammaticality judgment task), no dissociations emerged in KS, who performed above chance on all the projections tested. Her pattern of performance is contra the TPH (Friedmann, 2006), since this hypothesis would expect poor performance on the higher projections in the Greek syntactic tree. KS's comprehension data cannot be discussed in the context of the three other theories the present study is focusing on. This is so because the TUH (Wenzlaff & Clahsen, 2004, 2005) can only make predictions about the aphasic patients' performance on categories directly associated with the verbal morphology, while the IFIH (Fyndanis et al., 2010, 2012; Nanousi et al., 2006; Varlokosta et al., 2006) is relevant only when both categories with interpretable features and categories with uninterpretable features are tested. (Note that this hypothesis predicts better performance on "uninterpretable categories", compared to "interpretable categories". This distinction is not exploited in Alexiadou and Stavrakaki's (2006) study.) Last, the DMA (Dickey et al., 2008; Thompson et al., 2002) is relevant especially for studies testing both syntactic structure building abilities and morphological retrieval/insertion abilities. Alexiadou and Stavrakaki's (2006) study did not focus on the latter.

GL's results show that agrammatic patients can be impaired in the comprehension of canonical sentences –even irreversible–, such as "simple" active sentences that are used to test "demanding" functional categories like Aspect, which does not seem to be consistent with the TDH (Grodzinky, 1995). Moreover, his results are contra this hypothesis because he performed above chance on reversible passives. This is in line with findings of other studies (e.g., Caramazza, Capasso, Capitani, & Miceli, 2005, Luzzatti, Toraldo, Guasti, Ghirardi, Lorenzi, & Guarnaschelli, 2001), which reveal that only a subgroup of agrammatics exhibits the pattern predicted by the TDH. GL's results are in contrast to the TPH (e.g., Friedmann, 2006), since his comprehension of Aspect, a category located low in the syntactic hierarchy of Greek, was found significantly more impaired than his comprehension of categories that are higher in the syntactic tree, such as Agreement and CP. GL's data do not support the TUH (Wenzlaff & Clahsen, 2004, 2005) because this hypothesis does not predict verbal morphology deficits other than those concerning Tense. GL, however, was impaired also in Aspect. Last, his results only partially support the IFIH (Fyndanis et al., 2010, 2012; Nanousi et al., 2006; Varlokosta et al., 2006), since the predictions of this hypothesis are confirmed only as far as the verbal morphology categories are concerned (Agreement > Aspect/Tense). GL had above chance performance on CP, which is in contrast to the IFIH. Hence, his results indicate that the TPH, TUH, and IFIH cannot be extended to the comprehension modality, at least not for all agrammatics. In contrast, GL's pattern of performance is consistent with the DMA (Dickey et al., 2008; Thompson et al., 2002), since he exhibited a selective deficit in the comprehension of verbal morphology (which affected Aspect) in the face of his well-preserved CP. Thus, in line with Dickey et al. (2008), GL's results show that at least some agrammatics are able to have access to the syntactic tree up to the highest layer and –at the same time– they may have a selective difficulty comprehending morphemes instantiating certain categories. It is likely, therefore, that what is genuinely affected in agrammatics like GL is not syntax, but

morphological insertion processes (Dickey et al., 2008), which is consistent with the DMA's (Halle & Marantz, 1993; Harley & Noyer, 1999) assumptions. On this assumption, in my understanding, in judgment tasks agrammatic patients often fail to retrieve the morpheme or the verb form that corresponds to the target value (which is determined on the basis of an adverbial, e.g. "past tense" on the basis of the adverb *yesterday*). Therefore, they are not able to compare the correct verb form they should have retrieved themselves with the verb form appearing in the experimental sentence, in order to successfully judge the grammaticality of the sentence. It seems plausible, however, that low performance in judgment tasks does not stem only from impaired morphological insertion/verb selection processes, but also from concurrent impaired feature-checking operations, as intact checking operations would block incorrect judgments (see Arabatzi & Edwards, 2002). While this may be the case with grammaticality judgment, one could challenge the view that comprehension deficits as well should be attributed to impaired insertion/retrieval processes. In tasks such as the sentence-picture matching task II of the present study, for example, all the sentences and verb forms/inflections are grammatical/correct; no temporal adverbials are present, thus participants are not required to judge the compatibility between adverbials and verb forms. They only need to correctly interpret the verb form/inflection as to its Tense value. Therefore, no retrieval/insertion processes are involved in this task. It appears, rather, that the poor performance on this task could be attributed to impaired integration processes (e.g., Fyndanis et al., 2010, 2012), that is, integration of strictly linguistic information, namely the Tense value expressed by each verb form/inflection, and information concerning the "reflexes" of this Tense value in the extralinguistic world (as depicted in the pictures).

To summarize, the comprehension results from Greek agrammatism reported and discussed here indicate that not only agrammatic production but also agrammatic comprehension is characterized by variability (e.g., Kolk, 2007). Furthermore, GL's data show that, at least in some agrammatic patients, the ability to project the syntactic hierarchy up to the highest layer (CP) may be preserved at the face of (selective) deficits in handling morphemes instantiating verb related functional categories, which is in line with data from other studies (e.g., Dickey et al., 2008), and compatible with the assumptions of Distributed Morphology (Halle & Marantz, 1993; Harley & Noyer, 1999) that the syntactic component operates separately from the morphological one. Certainly, more agrammatic patients have to be tested, so that the picture regarding the predominant patterns in agrammatic comprehension becomes more complete.

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