The Interpretability Hypothesis: evidence from *wh*-interrogatives in second language acquisition

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The second language acquisition (SLA) literature reports numerous studies of proficient second language (L2) speakers who diverge significantly from native speakers despite the evidence offered by the L2 input. Recent SLA theories have attempted to account for native speaker/non-native speaker (NS/NNS) divergence by arguing for the dissociation between syntactic knowledge and morpho(pho)nology. In particular, Lardiere (1998), Prévost and White (2000), and Goad and White (2004) claim that highly proficient learners have knowledge of the abstract syntactic properties of the language but occasionally fail to associate them with the correct morphological or phonological forms. On the other hand, theories that support partial availability of Universal Grammar (UG) (Tsimpli and Roussou 1991; Hawkins and Chan, 1997) argue for a problem in the syntax: while UG principles and operations are available in SLA, the formal features of the target language that are not instantiated in the L1 or have a different setting, cause learnability problems. This article discusses acquisitional data in the light of the Interpretability Hypothesis (Tsimpli and Mastropavlou, 2007), which is a reformulation of the SLA theory suggested by Tsimpli and Roussou (1991) in minimalist terms. It is argued that a minimalist approach to SLA can be implemented to specify the status of the features that are least accessible to re-setting in the SLA process, given (1) constraints on their learnability and (2), their setting in the L1 grammar. The phenomenon discussed concerns the use of the resumptive strategy in *wh*- subject and object extraction by intermediate and

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advanced Greek learners of English. It is proposed that the accept-ability rate of pronouns in the extraction site is conditioned by the Logical Form (LF) interpretability of the features involved in the derivation. Hence, the interpretable features of animacy and dis-course-linking are hypothesized to be involved in the analysis of English pronouns by Greek L2 learners, while the first language (L1) specification of resumptive pronouns as clusters of uninter-pretable Case and Agreement features resists resetting.

I Introduction

This article addresses the issue of variability in second language (L2) learner judgments, attested even at advanced stages of second language acquisition (SLA). Variability (Tsimpli, 2005) or 'optionality' (Sorace, 1993; 2000; 2005) refers to the (in)consistent behaviour of the language learner in the target second language (L2), which is contrasted with the performance of the native speaker. In the present study, variability con-cerns the acceptability of both the target L2 form and its non-target (first language, L1) equivalent.

　　In earlier generative literature, studies focused primarily on the issue of Universal Grammar (UG) availability in SLA (compare 'Full Access' approaches: White, 1986; Schwartz and Sprouse, 1994; 1996; Epstein *et al.*, 1996; Flynn, 1996; vs. 'No Access' approaches: Clahsen and Muysken, 1986; Schachter, 1988; Bley-Vroman, 1989; Meisel, 1997). However, optionality in learner data and divergence in near-native grammars gave rise to models of SLA that argued for partial accessibility of UG (e.g. Tsimpli and Roussou, 1991; Smith and Tsimpli, 1995; Hawkins and Chan, 1997), hypothesizing that while UG constrains L2 development as well as mature L2 grammars, in the domain of parametric options, L1 properties directly or indirectly affect L2 representations even at the advanced state of development. More specifically, Tsimpli and Roussou's (1991) account of SLA distinguish-es between UG principles and parameters, the latter being responsible for cross-linguistic variation (Chomsky 1986; 1995; Pollock, 1989; Ouhalla, 1991). Although invariant principles of UG constrain adult L2 grammars, L1 parametric options resist resetting due to maturational

effects (Tsimpli and Roussou, 1991; Smith and Tsimpli, 1995). In this theory, the domain of the functional lexicon in the Language Faculty ceases to be accessible once first language acquisition is complete (see also Hawkins *et al.*, 1993; Hawkins and Chan, 1997).[1]

More recently, based on minimalist assumptions with respect to the architecture of the language system (see Section III below), the role of narrow syntax and the two interfaces, Phonetic Form (PF) and Logical Form (LF), have given rise to alternative accounts of L2 variability. Specifically, L2 variability can be regarded as the result of problems at the narrow syntax, the interface between syntax and discourse (Sorace, 2005) or syntax and morpho-phonology (Haznedar and Schwartz, 1997; Lardiere, 1998; Prévost and White, 2000). The Missing Surface Inflection hypothesis (Haznedar and Schwartz, 1997) suggests that the underlying feature specification in L2 is target-like whereas variability/optionality is due to a failure to map abstract syntactic features onto the target realization. Sorace (2005) and Belletti *et al.* (2005) maintain that features relevant to the syntax–discourse interface are problematic for L2 learners, in contrast with uninterpretable features, which are acquired in end-state L2 grammars. The phenomena discussed involve the overuse of subject pronouns in English near-native speakers of Italian but also inappropriate use of postverbal subjects in narrow focus contexts. The shared property is the discourse-relevant status of these forms, which places them at the syntax–discourse interface.

Tsimpli (2003) and Tsimpli and Mastropavlou (2007), on the other hand, claim that operations, such as Merge or Agree, in the narrow syntax are available in L2 grammars, but capitalize on the distinction between features which are visible at the LF-interface because of their semantic import, i.e. LF-interpretable features, and those whose role is restricted to syntactic derivations and possibly have PF-realization but no role at LF, i.e. the uninterpretable features. Specifically, the claim is that interpretable features are accessible to the L2 learner whereas uninterpretable features are difficult to identify and analyse in the L2 input due to persistent, maturationally-based, L1 effects on adult L2 grammars.

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[1]Beck (1998) argues for the 'Local Impairment Hypothesis', which suggests that even at advanced stages of development, functional features are inaccessible to parameter-resetting. This theory can also be viewed as a version of the partial access hypothesis.

Note that the different predictions made by Sorace's account and the Interpretability Hypothesis, advocated here (see also Tsimpli, 2003; Tsimpli and Mastropavlou, 2007), could be reconciled if we provide a principled distinction between LF and the syntax–discourse interface (see Tsimpli and Sorace, 2005). Assuming that LF is a semantic level where notions such as predication, quantification, anaphora and reflexivity, for instance, are relevant, it is not at all clear that reference-assignment to pronouns is indeed part of LF. Theories such as Relevance (Sperber and Wilson, 1995), for example, assume that pronouns find their referent at a post-LF level, which is the first step of pragmatic processing. If this is correct, then the problem that the near-native speakers of Italian in Sorace's study have in using null subjects in appropriate contexts may not be due to the problem that they have with interpretable features, but due to a 'vague' pragmatic representation where overt and null pronouns may share the same set of discourse antecedents. This is, after all, a possibility in native grammars too, albeit pragmatically conditioned by contextual factors. Moreover, it is possible that the inappropriate use of subject pronouns by near-native speakers stems from a non-target setting of the null subject parameter.[2]

The present study challenges the claim that uninterpretable features are unproblematic in advanced L2 grammars and evaluates the 'compensatory' role of interpretable features in the analysis of L2 properties that involve uninterpretable feature clusters. Specifically, the study investigates the use of subject and object resumptive pronouns in L2 *wh*-interrogatives. The resumptive strategy in L1 Greek instantiates a cluster of uninterpretable formal features such as agreement and case (Tsimpli, 1997; 1999; Tsimpli and Stavrakaki, 1999; see also Section II). Given that English disallows the use of resumptive pronouns in the position of the gap in subject or object *wh*-questions, resumptive use of pronouns in L2 English by L1 Greek speakers would offer evidence relevant to the role of uninterpretable features in L2 grammars. In addition, the study addresses the question of variability in the use of resumptive pronouns by examining the role of the interpretable features

[2]Belletti *et al.*'s (2005) data from the inappropriate use of preverbal subjects in narrow focus contexts in Italian could be addressed along similar lines. If new information focus is not an operator-variable structure as 'exhaustive' focus is in Kiss's (1998) terms, then the phenomenon is also part of syntax–discourse rather than LF-related.

of animacy and d-linking in the distribution of resumptive pronouns in L2 *wh*-interrogatives. The motivation for this further distinction between resumptive uses is twofold: first, Greek and English differ with regard to the grammaticalization of the [animacy] feature on the pronominal system of clitics and *wh*-pronouns, in that the [+/–animate] distinction is grammaticalized in the pronominal paradigm of personal pronouns in English, but not in Greek. The lack of animacy distinctions in Greek pronouns is due to grammatical gender distinctions that override the [+/–animate] specification. D(iscourse)-linking, on the other hand, is a possibility available in both English and Greek *wh*-phrases. According to Pesetsky (1987), *which*-phrases are d-linked in that the set of possible discourse referents is restricted by the noun. Thus, the interpretation of the variable in a d-linked chain is derived from the referential properties of its antecedent on a par with the interpretation of pronouns (Pesetsky, 1987: 120). In contrast, the interpretation of the variable associated with a non-d-linked (quantificational) *wh*-phrase does not pre-suppose a limited set of referents but is brought about through syntactic LF movement.

The article is organized as follows: in Section II the differences between Greek and English interrogatives are presented, together with an analysis of the resumptive strategy in Greek within the minimalist framework. An outline of the Interpretability theory of SLA is then presented in Section III, with the aim of formulating predictions of learnability and parameter-resetting. In Section IV, the present study and its results are discussed; finally, in section V, the results of the study are viewed from the minimalist perspective on SLA suggested in Section III.

II *Wh*-interrogatives in Greek and English

1 Subject and object extraction

Modern Greek, a null subject language, allows subject extraction out of a complement clause in the presence of the lexical complementizer *oti* ('that'), as shown in (1). In this respect, it differs from English, which exhibits *that*-t effects in the same context, as shown by the gloss (Rizzi, 1986; 1990).

1) a. Pji   ipe   oti efighan?

     who$_{NOM-PL}$ said$_{3SG}$ that left$_{3PL}$

     '*Who did he say that left?' (cf. Who did he say left?)

    b. Pjion   ipes   oti idhes?

     who$_{ACC-SG}$ said$_{2SG}$ that saw$_{2SG}$

     'Who did you say (that) you saw?'

By contrast, object-extraction out of embedded clauses is a licit option in English with or without a complementizer (see 1b).

An additional difference between the two languages with respect to the properties of *wh*-interrogatives concerns the use of resumptive pronouns[3] (see also Alexopoulou and Keller, 2003). In Greek, structures like (2) optionally allow for a resumptive clitic pronoun co-indexed with the extracted *wh*-phrase. According to Anagnostopoulou (1994) and Iatridou (1995), d-linked *wh*-phrases of the type in (2b) also increase the acceptability of resumptive clitics in A′ chains:

2) a. Pjon ipes   oti (ton) prosevalan xoris   logho?

     whom said$_{2SG}$ that him-insulted$_{3PL}$ without reason

     'Who did you say that they insulted (*him) without a reason?'

    b. Pjon fititi   ipes   oti (ton) aperipsan sti   sinedefksi?

     which student said$_{2SG}$ that him-rejected$_{3PL}$ at-the interview

     'Which student did you say that they rejected at the interview?'

Use of a resumptive clitic is disallowed only in object *what*-interrogatives exemplified in (3):

3) Ti   nomizis oti tha (*to) dhiavasun?

     what think$_{2SG}$ that will   it-read$_{3PL}$

     'What do you think that they will read?'

The difference between (2) and (3) is attributed to the properties of *ti* ('what') as opposed to those of *pjos/pja/pjo* ('who'-masc/fem/neuter). In particular, *ti* is the only *wh*-word unspecified for *phi*-, gender features

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[3]The notion of resumption discussed here is purely syntactic, i.e. it excludes the use of pronouns in languages like English, which can also appear in the place of an empty category. The distinction is based on the fact that the English-type resumptive use of pronouns is restricted to spoken discourse mostly, and is directly related to the degree of embedding involved in the sentence. We assume that such cases are conditioned by processing constraints and are not a question addressed by a parametric approach.

or case in contradistinction with *pjos/pja/pjo*, which are specified for all of these features.[4]

On the assumption that the resumptive strategy involves the spell-out of uninterpretable agreement features on non-nominal functional heads (i.e. agreement on *v* or Infl; see Chomsky, 1995), the ungrammaticality of (3) is to be expected: the resumptive clitic and *ti* ('what') do not agree in feature specification.

Regarding animacy, English *wh-* and personal pronouns distinguish between [+/–animate] as in *who* vs. *what* and *he*, *she* vs. *it*, respectively. Greek, on the other hand, marks gender contrasts only (but not animacy) on both *wh-* and personal pronouns (clitic and strong forms).

As far as D(iscourse)-linked *wh*-phrases are concerned (see (2b) and its English translation), the differences between Greek and English are the following: English uses a distinct *wh*-word for the *wh*-specifier, namely 'which', whereas Greek uses the same *wh*-word as in non-d-linked *wh*-interrogatives. As a result, Greek d-linked *wh*-phrases show agreement between the *wh*-word and the noun (restrictor) whereas no such agreement is found in English. Furthermore, in English the animacy distinction found in the 'who/what' pair is missing from '*which*-N' in d-linked *wh*-phrases.

2 A minimalist account of subject–verb agreement in null subject languages

Alexiadou and Anagnostopoulou (1998) put forward a parametric account of the distinction between null and non-null subject languages, whereby the EPP (Extended Projection Principle) can be lexicalized either via verb-raising to T in null subject languages or by merging a DP in the specifier of TP. One implication of this suggestion concerns the status of subject agreement morphology in languages like Greek, i.e. typical null subject languages. Alexiadou and Anagnostopoulou (1998) suggest that subject agreement affixes could be analysed as subject clitics based on the pronominal features that the two categories share.

[4]It should be noted here that Greek has a tripartite gender distinction (masculine, feminine, neuter), which is not regulated by the (in)animacy of the referent.

We will restrict our discussion to 3rd person agreement, for two reasons: first, because 3rd person agreement on verbal inflection and 3rd person object clitics are relevant to *wh*-interrogatives, and secondly, because there are independent reasons to claim that 1st and 2nd person are interpretable in verb inflection of null subject languages and in the clitic paradigm (Tsimpli and Stavrakaki, 1999; Manzini and Savoia, 2004).

We thus assume that 3rd person subject agreement affixes are the spell-out of uninterpretable *phi-* features on T(ense). Similarly, 3rd person object clitics spell out *phi-* and case features on light *v*. Clitic interpretation is indirectly derived through coindexation with an available antecedent (DP) with which the clitic agrees in person, number and gender; see Cardinaletti and Starke's (1999) claim that 'severely deficient' pronominals, i.e. clitics, lack the ability to refer.

The parallelism between 3rd person clitics and subject–verb agreement can then be extended to the resumptive use of these elements in Greek *wh*-interrogatives. Thus, in subject *wh*-interrogatives, verbal agreement is resumptively used in that it 'doubles' the features of the variable in the subject gap. Similarly, in object *wh*-interrogatives, the resumptive clitic 'doubles' the features of the extracted object. The uninterpretable status of resumptive elements implies that these elements are not visible at LF.[5]

There is, however, an important difference between resumptive object clitics and subject agreement in that use of the former is optional whereas subject agreement is obligatory. Greek verb forms are affixal in nature and subject agreement morphology is required to satisfy the verb's morphological well-formedness condition.

The lack of *that*-t effects in null subject languages stems from the possibility of locally identifying the subject gap through subject-verb agreement (for an account of this phenomenon based on the notion of *locality* as a primitive notion in syntax, see Roussou, 2002).

In sum, according to the above analysis, the difference between Greek and English w*h*-interrogatives is attributed to the null subject parameter, on the one hand, and the availability of a resumptive strategy in Greek, but not in English. The resumptive strategy is viewed as

[5]See also Aoun and Li (2003) for a differentiation between last resort resumptive pronouns and ones that are the result of movement and turned into variables at LF.

the overt manifestation of agreement features on T and light *v*. Resumptive subject-verb agreement and object clitics are uninterpretable at LF, and interpretable at PF.

III A minimalist theory of SLA: the interpretability hypothesis

We maintain what we consider to be the default hypothesis, namely that all grammar-building processes make use of the same cognitive mechanism, the language module. Thus, adult SLA involves natural language principles and constraints from the onset of L2 development. Principles like Merge/Agree, and whatever economy constraints are operative in the selection of derivations, are available to the language learner at all stages of development. LF representations should then converge, in that feature matching and the Principle of Full Interpretation at LF would provide an output interpretable at the C–I systems. Briefly, this is what "UG is available" could be understood as, in minimalist terms.

Consider parameters. Parameterization is expressed as language differences at the level of lexical feature specification; in particular, whether a specific feature is spelled out or not in a language ('lexicalized' in the terms of Roberts and Roussou, 2003) and how this spell-out takes place (i.e. via Merge or Agree).[6] Further cross-linguistic differences may involve the option of phonological material which spells out uninterpretable features; resumptive elements are taken to be examples of this parametric type.

We then have four possible combinations of features in terms of their interpretability at each interface, LF and PF:

4) a. LF-interpretable/PF-uninterpretable features (e.g. animacy distinctions on Greek nouns and pronouns are not grammaticalized due to grammatical gender differences);

   b. LF-interpretable/PF-interpretable (e.g. animacy distinctions on English *wh*- and personal pronouns);

   c. LF-uninterpretable/PF-interpretable (e.g. resumptive uses of subject–verb agreement and object clitics in Greek);

   d. LF-uninterpretable/PF-uninterpretable (e.g. Case and subject–verb agreement in English)

[6]So, for example, the Q feature in yes–no questions can be realized either as a question particle (e.g. in Chinese), as an inflectional element (e.g. in English) or has no PF-realization (e.g. in colloquial French) (compare Cheng, 1991; Roberts and Roussou, 2003).

The Interpretability Hypothesis adopts assumptions regarding the critical period hypothesis for language acquisition (Johnson and Newport, 1989; Smith and Tsimpli, 1995; Meisel, 1997). In particular, it maintains that uninterpretable features are subject to critical period constraints and, as such, they are inaccessible to L2 learners. In other words, L1 parametric values associated with these features resist re-setting in L2 acquisition. On the other hand, LF-interpretable features are accessible to the L2 learner, even if L2 differs from the native language, i.e. the animacy contrast in (4a) and (4b). This difference between the two sets of features is primarily based on the idea that interpretable features are represented both in the language system and in the LF-interface, implying that they have a dual status in the mental lexicon: a linguistic and a conceptual one. This double representation is emphasized by the role of interpretable features at the LF-interface, i.e. the level which links linguistic to conceptual representations. Thus, interpretability at LF implies that these features will be accessible either top-down (i.e. from the mental lexicon to the LF-interface) or bottom-up (i.e. from language to cognition). Thus, interpretable features are not subject to critical period constraints and can be acquired by L2 learners (see Sorace, 2005).

In light of this, options (4c) and (4d), which involve LF-uninterpretable features, are predicted to be problematic in L2 acquisition. In these cases, an LF-uninterpretable feature is grammaticalized in L1 but not in L2 (L1 has option (4c) and L2 option (4d) for the same feature).[7] In the case of resumptive pronouns available in the (Greek) L1 but not in the (English) L2, the prediction is that the learner will have problems in abandoning the resumptive strategy in L2 *wh*-interrogatives. A further prediction made by the Interpretability Hypothesis concerns the developmental process. Although L1 transfer effects are expected at all stages of L2 acquisition, development is expected even in syntactic phenomena that involve uninterpretable features, e.g. resumptive pronouns.

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[7]The other parametric difference where an LF-interpretable feature is PF-interpretable in L1 and PF-uninterpretable in L2 i.e. options (4a) and (4b) respectively has been discussed more often in the literature of SLA. Studies on the acquisition of the *wh*-movement strategy in Chinese and Korean learners of English (White, 1985; Schachter, 1989; Johnson and Newport, 1991) is a case in point. The relevant feature, Q, is interpretable and thus available in both languages. The morphological properties of the *wh*-feature, on the other hand, determine whether raising to check the (universally) strong Q feature, will involve pied-piping of the whole *wh*-phrase or not.

In particular, the theory predicts that the developing grammar will make use of interpretable features, which are independently available. The role of these features will be to constrain acceptability of resumptive pronouns, hence eliminating real optionality (Tsimpli and Mastropavlou, 2007).

In order to test this prediction, the interpretable features of animacy and d-linking were included as additional variables in the subject and object *wh*-interrogatives tested. Animacy was tested on the grounds that it is a semantic feature specified on English *wh*-phrases and pronouns but not in Greek. Since it is an interpretable feature, it is predicted to be accessible to L2 learners and to constrain the resumptive strategy in L2 *wh*-questions. D-linking was tested on the same grounds. As has already been discussed (see Section II), d-linked *wh*-phrases are typically *which*-XP phrases, whose quantificational range is specified by the restrictor (XP). This feature has been argued to affect syntactic and/or interpretive options in L1 (Greek) and L2 (English) *wh*-interrogatives (for the licensing of clitics in L1 Greek d-linked *wh*-chains, see Anagnostopoulou, 1994; Iatridou, 1995).

Based on Interpretability, we can now present the research hypotheses of the present study:

> 5) a. Given that 3rd person subject agreement and object clitics in L1 Greek are clusters of uninterpretable features, we predict that even advanced Greek learners of English will incorrectly accept subject and object pronouns in the gap position of *wh*-interrogatives.
>
> b. The LF-interpretable features of animacy and d-linking will affect acceptability of resumptive pronouns in *wh*-interrogatives. The effect is expected to be stronger in the advanced group of L2 learners, due to their higher sensitivity to L2 input.
>
> c. Given the optionality of resumptive object clitics and the obligatory status of subject–verb agreement in L1, we predict that Greek L2 learners of English will show differences in the acceptability of the resumptive pronoun depending on the extraction site. Specifically, L2 learners will be more tolerant with resumptive pronouns in subject than in object position. For similar reasons, object *wh*-interrogatives are expected to show a clearer developmental trend compared to subject *wh*-interrogatives.

IV The study

1 Methodology

Two groups of learners ($n = 48$) took part in the study together with a control group of adult native speakers of English ($n = 26$) who were, at the time, students at the University of Cambridge. The learners were assigned to two proficiency levels, according to their results in the Oxford Placement Test (Allan, 1992): the intermediate (INT) group ($n = 21$) and the advanced (ADV) group ($n = 27$). They were recruited from local language schools and the Aristotle University of Thessaloniki.

The study tested the degree of acceptability of resumptive pronouns in embedded interrogatives through a bi-modal paced acceptability task, consisting of 51 sentences (30 test items and 21 distractors). The participants saw each sentence on the screen for 5 seconds while at the same time they heard it on tape. Then they had to indicate their judgement according to a 5-point scale ranging from –2 (certainly ungrammatical) to + 2 (certainly grammatical), while 0 encoded the 'not sure' option (White *et al.*, 1998). Non-target performance was measured on the basis of all choices made on the 'wrong' side of the scale (0 choices excluded). Thus, for a sentence judged as grammatical (+1 or +2) by the control group, learners' responses of –1 and –2 were considered to be 'non-target'.[8]

In addition to the resumptive pronoun vs. gap strategy in L2 English subject and object interrogatives, the study also investigated possible effects of animacy and d-linking on the acceptability of pronouns. Furthermore, 6 ungrammatical sentences testing subject interrogatives without a complementizer were included. This was done to test possi-

Table 1   Variables tested in the paced acceptability task

	Complementizer (overt/null)		Animacy		D-linking	
Subject interrogative	+that	–that	+animate	–animate	*wh*-NP	*wh*-word
Object interrogative	+that		+animate	–animate	*wh*-NP	*wh*-word

[8]According to an anonymous reviewer, the 5-point scale loses its importance if results are conflated. Methodologically speaking, the 5-point scale was used in order to cater for those informants who avoid categorical judgements (see Sorace, 1996). In the statistical analysis, we felt it was necessary to conflate the judgements since we were examining the patterns of (non)-acceptability of resumption.

ble effects of a null complementizer on the acceptability of subject pro-
nouns. The variables examined in the test are presented in Table 1 while
example sentences are given in (6)–(7). The battery of the sentences
examined is also presented in Appendix 1:

Grammatical and ungrammatical object extraction
6) a. *Which student / Who* do you think that Jane likes *ec /*him*?
    b. *Which book / What* do you remember that Peter read *ec /* it* carefully?

Grammatical and ungrammatical subject extraction (+/-*that*)
7) a. *Which politician / Who* have you suggested *ec /*he /*that-he* should not resign?
    b. *Which party / What* does John think *ec /*it /*that-it* was very boring?

2 Results

a Grammatical and ungrammatical subject and object wh-interrogatives:
The results from the judgements of the intermediate group (INT), the
advanced group (ADV) and the native speakers (NS) on ungrammatical
sentences are presented in Table 2 and on grammatical sentences in
Table 3. The results are presented in terms of target and non-target
performance (percentages and frequencies), zero responses excluded.
As the dependent variable (resumptive pronoun or gap) became binomi-
al, we used non-parametric chi-square tests for the statistical analyses.

The overall results in Tables 2 and 3 show that the control group per-
formed as expected in rejecting the resumptive pronoun in ungrammati-
cal sentences and accepting the gap in the grammatical ones. On the other
hand, the two groups of learners differ significantly from the NS group in
most conditions. More specifically, the intermediate learners have a sig-
nificantly less successful performance than the NS group in all ungram-
matical sentences (subject [–that]: $\chi^2_{(1,260)}$ = 48.72, $p < .01$, subject
(+that): $\chi^2_{(1,264)}$ = 53.15, $p < .01$, object: $\chi^2_{(1,268)}$ = 58.70, $p < .01$) as
well as in grammatical subject interrogatives ($\chi^2_{(1,260)}$ = 43.40, $p < .01$).
Similarly, the advanced learners differ significantly from NS in all types
of sentences except for the grammatical object interrogatives
(ungrammatical: subject (–that): $\chi^2_{(1,304)}$ = 42.56, $p < .01$, subject
(+that): $\chi^2_{(1,307)}$ = 42.55, $p < .01$, object: $\chi^2_{(1,307)}$ = 23.12, $p < .01$;
grammatical: subject: $\chi^2_{(1,296)}$ = 33.97, $p < .01$). However, although
there is a difference in target performance between the L2 learners and

Table 2 Performance in ungrammatical subject–object interrogatives (percentages, with *n* in parentheses)

	Subject (–*that*)		Subject (+*that*)		Object	
	Target	Non-target	Target	Non-target	Target	Non-target
Intermediate	63.9 (69/108)	36.1 (39/108)	59.6 (65/109)	40.4 (44/109)	59.5 (69/116)	40.5 (47/116)
Advanced	68.4 (104/152)	31.6 (48/152)	66.5 (101/152)	33.5 (51/152)	78.6 (122/154)	21.4 (33/154)
Native speakers	96.7 (148/153)	3.3 (5/153)	95.5 (149/156)	4.5 (7/156)	96.7 (148/153)	3.3 (5/153)

Table 3 Performance in grammatical subject–object interrogatives (percentages, with *n* in parentheses)

	Subject		Object	
	Target	Non-target	Target	Non-target
Intermediate	67.9 (74/109)	32.1 (35/109)	85.1 (91/107)	14.9 (16/107)
Advanced	73.8 (107/145)	26.2 (38/145)	88.4 (129/146)	11.6 (17/146)
Native speakers	97.4 (148/152)	2.6 (4/152)	92.2 (130/141)	7.8 (11/141)

the native speakers of English, there is clear development in the two learner groups in the rejection rate of resumptive pronouns. The advanced group exhibits significantly higher target-like performance in ungrammatical object interrogatives ($\chi^2_{(1,269)} = 11.56$, $p < .01$).

Turning to within-group differences shown in Table 2, the intermediate learners do not appear to perform differently in the three types of clauses as almost half of the learners accepted resumptive pronouns across question types. The advanced learners differ in that respect, though, given that the acceptability rate of pronouns in their data is significantly lower in sentences involving object extraction than in subject interrogatives ($\chi^2_{(1,457)} = 6.18$, $p \leqslant .05$). Furthermore, the presence of the complementiser[9] does not seem to affect their judgements.

Turning to performance in grammatical sentences presented in Table 3, both learner groups fare significantly better in object than in subject *wh*-interrogatives (INT: $\chi^2_{(1,215)} = 8.81$, $p \leqslant .01$, ADV: $\chi^2_{(1,290)} = 10.06$, $p \leqslant .01$). Moreover, the comparison between performance on grammatical and ungrammatical object interrogatives reveals that both learner groups fare better in the grammatical set (INT: $\chi^2_{(1,222)} = 17.94$, $p \leqslant .01$; ADV: $\chi^2_{(1,300)} = 5.05$, $p \leqslant .05$). In contrast, comparison of performance in grammatical and ungrammatical subject interrogatives did not yield significant differences in either group.

This asymmetry in judgements has been documented in previous studies of (grammatical) subject–object extraction. More specifically, Schachter and Yip (1990) found a significant difference in the acceptability rate of object vs. subject *wh*-extraction by native and non-native

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[9]One could argue that the resumptive use of a subject pronoun in a (+that) clause is a way to override the 'that-t' effect. If this was the case, though, there should be a difference in the acceptability of resumptive subject pronouns depending on the presence vs absence of 'that', contrary to fact. Furthermore, Tsimpli and Roussou's study (1991) shows that Greek L1/English L2 learners are not sensitive to 'that-t effects' in English.

(Korean and Chinese) speakers of English alike, favouring object extraction. This finding was attributed to processing difficulties in the case of subject extraction and, more specifically, to possible garden-path effects (recall that in subject *wh*-extraction the complementizer is null). Similarly, in a study investigating subjacency violations by Chinese L1/ English L2 speakers, White and Juffs (1998) found a similar subject–object asymmetry both in the acceptability of grammatical *wh*-questions with a null complementizer and in the response times for grammatical sentences. Since learners had been able to reject sentences involving violations, White and Juffs (1998) argued that the asymmetry observed might be due to processing difficulties and not to a syntactic deficit.

In our study, however, the subject–object asymmetry found is viewed from a syntactic rather than a processing perspective for two reasons. First, the difference between the obligatory presence of subject–verb agreement compared to the optional presence of resumptive object clitics in the L1 is consistent with the subject–object asymmetry found in the learners' performance. Second, if a processing difficulty was involved, we would not expect to find differences in the acceptability of subject and object resumptive pronouns depending on the animacy or d-linking status of the *wh*-antecedent. We next turn to the results from these two variables in our study.

b Effects of animacy and d-linking on the resumptive strategy: In order to investigate the effects of feature interpretability on the acceptability of resumptive pronouns, we compared the acceptability rate of pronouns in the ungrammatical sentences first in terms of their animacy (Table 4) and then in terms of their association with a d-linked (+DL) or non-d-linked (–DL) *wh*-phrase (Table 5). By further breaking down the results (see Figures 1 and 2 for the distribution of resumptive pronouns in the contexts of animacy and d-linking) we were able to

Table 4 Acceptability of resumptive pronouns grouped according to animacy (percentages, with *n* in parentheses)

	Intermediate		Advanced	
	+animate	–animate	+animate	–animate
Subject (–*that*)	48.7 (19/39)	51.3 (20/39)	68.7 (33/48)	31.3 (15/48)
Subject (+*that*)	31.8 (14/44)	68.2 (30/44)	33.3 (17/51)	66.7 (34/51)
Object	27.7 (13/47)	72.3 (34/47)	30.3 (10/33)	69.7 (23/33)

Table 5 Acceptability of resumptive pronouns grouped according to d-linking (percentages, with *n* in parentheses)

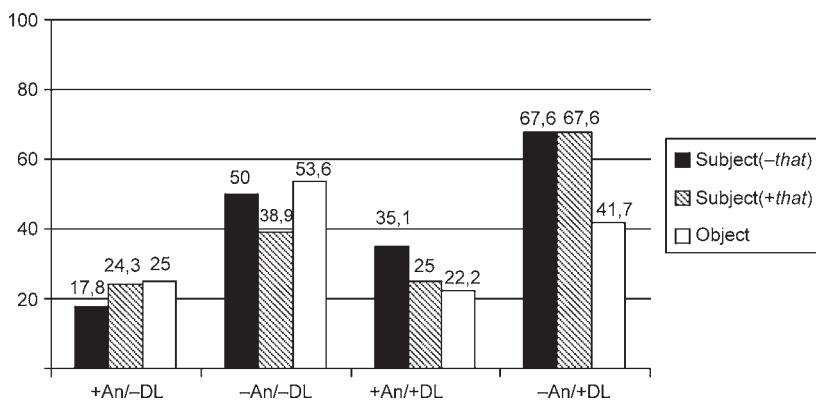|	Intermediate		Advanced	
	+DL	−DL	+DL	−DL
Subject (−*that*)	59 (23/39)	41 (16/39)	43.8 (21/48)	56.2 (27/48)
Subject (+*that*)	63.6 (28/44)	36.9 (16/44)	65 (33/51)	35 (18/51)
Object	42.5 (20/47)	57.5 (27/47)	60.5 (20/33)	39.5 (13/33)

Figure 1   Distribution of resumptive pronouns in the INT group
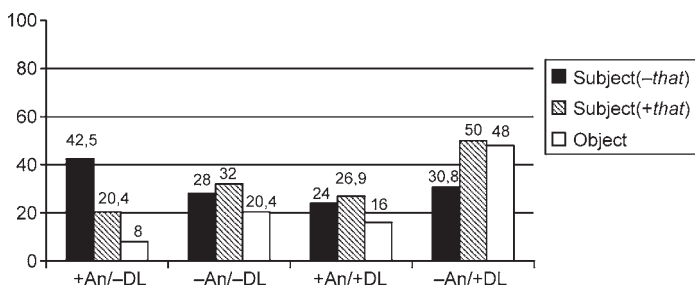

Figure 2   Distribution of resumptive pronouns in the ADV group

conduct logistic regression tests in order to investigate possible main effects and interactions of animacy and d-linking.

There is significantly higher acceptability of inanimate over animate pronouns by both learner groups in subject (+that) (INT: $\chi^2 = 5.82$, $p \leqslant .05$; ADV: $\chi^2 = 5.67$, $p \leqslant .05$) and object *wh*-interrogatives (INT: $\chi^2 = 5.86$, $p \leqslant .05$; ADV: $\chi^2 = 5.12$, $p \leqslant .05$). This distinction, however, is not found in subject (–that) interrogatives, in which both types of

pronouns are equally accepted by the intermediate group whereas the advanced learners accept inanimate pronouns significantly less than animate ones ($\chi^2 = 6.75$, $p \leqslant .01$).

As far as effects of d-linking are concerned, Table 5 presents the acceptability rate of pronouns when these were grouped according to the type of *wh*-phrase with which they were associated (i.e. d-linked vs. non-d-linked *wh*-phrases). D-linking does not seem to affect acceptability of resumptive pronouns by the intermediate learners, who did not show a significantly higher preference for resumptive pronouns in d-linked over non-d-linked *wh*-dependencies. In contrast, the advanced learners seem to prefer resumptive pronouns associated with a d-linked *wh*-phrase in the subject (+that) and object *wh*-interrogatives, although this preference reached significance only in the case of object *wh*-interrogatives ($\chi^2 = 4.41$, $p \leqslant .05$).

Lastly, a separate logistic regression analysis was conducted on the distribution of resumptive pronouns according to both animacy and d-linking (see Figures 1 and 2 for the INT and ADV group respectively). For the intermediate group, the analysis yielded significant main effects of animacy in subject (–that) (Wald test $= 9.24$, $p \leqslant .01$) and object interrogatives (Wald test $= 12.76$, $p \leqslant .01$) as well as a significant interaction of animacy and d-linking in subject (+that) interrogatives (Wald test $= 4.002$, $p = .000$).

As for the advanced learners, the logistic regression analysis revealed a significant interaction of animacy and d-linking in both subject (+that) (Wald test $= 10.07$, $p \leqslant .01$) and object interrogatives (Wald test $= 12.32$, $p \leqslant .01$). In subject (–that) interrogatives, acceptability of animate and inanimate pronouns was similar in d-linked questions. On the other hand, animate pronouns were more acceptable in non-d-linked questions. Statistical analyses, therefore, did not reveal significant main effects or interactions of the variables we examined in this case.

It should be noted at this point that the logistic regression test performed on the NS group did not reveal any significant interaction or main effects of animacy or d-linking in any type of interrogative clauses.

c Effects of animacy and d-linking on gaps: Cases of non-target responses in grammatical *wh*-interrogatives (i.e. rejection of the gap in the *wh*-dependency) were grouped first according to animacy of the

wh-antecedent and then according to the type of *wh*-phrase (d-linked or non-d-linked). If animacy and d-linking affected responses on sentences involving gaps, we would expect to find animacy and, to a lesser extent, d-linking effects on performance. More specifically, given that resumptive pronouns in [–animate, +d-linked] contexts show higher acceptability, gaps in the same contexts should show higher rejection. The results in Tables 6 and 7, however, show that this was generally not the case. In particular, Table 6 reveals a dramatically high percentage of rejection of gaps with an [+animate] antecedent in subject interrogatives. Moreover, gaps are almost equally rejected in object interrogatives, regardless of animacy. What is more, both groups were distinctly similar in their responses.

Table 7 presents the rejection rate of gaps in relation to d-linking. Intermediate learners seem to dislike gaps associated with a non-d-linked *wh*-phrase in both subject and object questions alike. In contrast, the advanced learners are not sensitive to the type of *wh*-phrase in object interrogatives but seem to significantly disfavour gaps associated with a d-linked *wh*-phrase in subject interrogatives, as expected ($\chi^2 = 16.02$, $p \leqslant .01$).

d Summary of results: Overall then, the observed patterns emerging from the acceptability judgements on subject/object interrogatives are the following: at a less advanced stage of development a significant number of learners accept resumptive pronouns in *wh*-interrogatives

Table 6   Non-target responses in grammatical sentences with *wh*-phrases grouped according to animacy (percentages, with *n* in parentheses)

	Intermediate		Advanced	
	+animate	–animate	+animate	–animate
Subject	82.8 (29/35)	17.2 (6/35)	82 (32/39)	12 (7/39)
Object	56.2 (9/16)	43.8 (7/16)	47 (8/17)	53 (9/17)

Table 7   Non-target responses in grammatical sentences with *wh*-phrases grouped according to d-linking (percentages with *n* in parentheses)

	Intermediate		Advanced	
	+DL	–DL	+DL	–DL
Subject	31.4 (11/35)	68.6 (24/35)	46 (18/39)	54 (21/39)
Object	31.2 (5/16)	68.8 (11/16)	70.6 (12/17)	29.4%

irrespective of the site of extraction. Advanced learners, in their majority, disprefer resumptive object pronouns. However, resumptive subject pronouns are dispreferred by a significantly lower number of advanced learners. Both groups of learners are sensitive to the [+/–animate] distinction on pronouns. This affects the distribution of resumptive pronouns in that [+animate] pronouns are largely disallowed in *wh*-interrogatives. Moreover, the semantic feature of [d-linking] also interacts with animacy, as is shown by the higher acceptability of pronouns associated with inanimate d-linked antecedents.

The presence of a complementiser in subject *wh*-interrogatives does not seem to affect judgements overall, since the percentages of non-target responses are similar in both subject (–that) and subject (+that) interrogatives by both learner groups. However, when non-target responses were analysed in terms of animacy and d-linking, it was found that advanced learners showed an animacy effect only when there was an overt complementizer.[10]

In the next section, these patterns are discussed in relation to the theoretical background of the minimalist framework outlined in Sections II and III.

V Discussion

This study has addressed two main issues: the learnability problems posed by uninterpretable features in the form of resumptive pronouns, and the compensatory role of the interpretable features of animacy and d-linking in reducing and constraining L1 effects of the resumptive strategy.

The discussion of the results from this study is presented in relation to the variables tested. In particular, we discuss:

a) learners' performance in subject vs. object interrogatives;
b) animacy effects;
c) d-linking effects; and
d) the presence of a complementizer in subject interrogatives.

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[10]As the test did not include object questions with a null complementizer, we cannot make any definite claims as to the effect of the presence of *that* on object *wh*-questions.

Starting with (a), L1 effects are stronger in subject interrogatives even at advanced stages of L2 development, and present but not as strong in object interrogatives. This is supported by:

- the higher acceptability rate of resumptive pronouns in subject position;
- the higher percentage of incorrect judgements in grammatical subject interrogatives;
- the lack of a significant developmental change in both ungrammatical and grammatical subject extraction cases; and
- the significantly different performance of the advanced learners from the NS group in these test items.

Thus, this L2 data suggests that the abstract properties of subject–verb agreement in Greek are transferred to English L2. Accordingly, subject pronouns can function resumptively in the Greek/English interlanguage. Recall from our discussion in Section II that subject agreement is obligatory in all verb forms in Greek and functions resumptively in subject *wh*-dependencies. Given that subject agreement is absent from English verb forms, transfer of the L1 properties of subject agreement to L2 subject *wh*-extraction necessitates a misanalysis of English pronouns as 'weak' pronouns[11] (Cardinaletti and Starke, 1999). This misanalysis also extends to object *wh*-extraction although not as strongly compared to subject extraction cases. This is probably due to the optional use of resumptive object clitics in L1 interrogatives. The L1 optionality in this case is regulated by a number of factors, e.g. level of embedding, 'heaviness' of the part of the clause that follows the extraction site, and specificity of the antecedent (see Section II above).

  With respect to (b), animacy effects on the acceptability of resumptive pronouns in L2 interrogatives are found in the data from the intermediate group of learners. The advanced group also shows animacy effects in both subject and object interrogatives with an overt complementizer (i.e. +that). The generalization is that inanimate

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[11]According to one reviewer, if learners did misanalyse pronouns, they should show placement errors. However, we use the term 'misanalysis' to refer to the abstract syntactic properties of these forms in the interlanguage and not their spell-out. Recall that we argue for a dissociation between overt morphophonology and abstract syntax. Weak pronouns have reduced semantic and syntactic structure but are free morphemes and are thus compatible both with the 'form' of a strong pronoun and the phi-features of a clitic/affix.

resumptive pronouns are favoured significantly more than animate ones. This data is consistent with our prediction that the interpretable feature of animacy, realized on L2 but not on L1 pronouns, will be acquired from early stages of development and, in addition, will constrain resumptive uses of L2 pronouns.

An implication of this suggestion is that the interpretable feature of animacy can improve L2 performance so that it approximates target output. The target grammar, English, disallows the resumptive strategy in interrogatives overall. On the other hand, the L2 learner accepts resumptive inanimate pronouns. Thus, learner performance is not constrained by a target L2 representation but by L1 properties filtered through the interpretable feature of animacy. This is the sense in which an apparently target-like PF output may obscure non-target syntactic representations.

Turning to (c), d-linking effects are found in the acceptability of inanimate pronouns by both groups of learners in subject extraction (+that). D-linking effects in object extraction are only found in the data from the advanced group. Recall that d-linked *wh*-phrases improve acceptability of resumptive clitics in L1 Greek. This is accounted for by the property of d-linked *wh*-antecedents, which receive their interpretation in discourse and not through LF-movement (Anagnostopoulou, 1994; Iatridou, 1995). As a result, the empty category is not a variable but a pronominal instead (Pesetsky, 1987). Given that d-linking is relevant at LF, the effects found are unsurprising in the light of the Interpretability Hypothesis.[12]

Finally, in terms of (d), the judgements of the advanced group show that an overt complementiser in subject interrogatives interacts with animacy and d-linking. Thus, resumptive pronouns are favoured in [–animate, +d-linked] contexts with an overt complementizer. When the complementizer is null, animate resumptive pronouns in subject position are favoured by the advanced group. This result contradicts the overall pattern of acceptability observed in the data, namely an increased preference for inanimate resumptive pronouns. Furthermore, in grammatical *wh*-interrogatives subject gaps associated with animate

[12]It could be argued that the d-linking effects found stem from L1 transfer directly. If that was the case, however, the contrast between animate and inanimate d-linked pronouns in English L2 should not be attested, contrary to fact.

antecedents are less preferred than inanimate ones by the advanced group. Thus, the reversed pattern of animacy effects shown in subject *wh*-interrogatives with a null complementiser, both grammatical and ungrammatical, points to the conclusion that the null complementiser strengthens the L1-based requirement for morpho(phono)logical material close to the extraction site, i.e. in the subject position as a resumptive pronoun or in the C position. Notice that this 'reversed' animacy effect is only found in the advanced group in both grammatical and ungrammatical sentences; the intermediate group exhibits this pattern in grammatical subject extraction cases but not in the ungrammatical subject [–that] interrogatives. It could be argued that this is due to the earlier stage of L2 development, which is characterized by an overall preference for resumptive pronouns in *wh*-interrogatives.

VI Conclusions

This study of *wh*-interrogatives in L2 grammars has allowed us to examine the role of LF-interpretable and uninterpretable features in SLA. Uninterpretable formal features, such as (subject, object) agreement, cause learnability problems even at advanced stages of acquisition. Resumptive uses of agreement on the verb or clitic pronouns in the L1 are, therefore, transferred as parametric options to the developing L2 grammar. In the absence of subject–verb agreement on L2 verb forms and clitic pronouns, the learner imposes the resumptive option on English L2 pronouns in questions, following a process of morphological misanalysis of these L2 items. L2 development involves compensatory use of interpretable features, like [animacy] or [d-linking], which appear to improve the non-target use of L2 pronouns. An account of SLA (such as the theory proposed by Prévost and White, 2000; Goad and White, 2004), which assumes target abstract specification of properties – at least in advanced L2 grammars – and views inaccurate performance as the result of processing difficulties or of the morphological component, cannot in the case of the acceptability of resumptive pronouns account for the systematicity characterizing non-target responses.

The alternative account (Sorace, 2005) that argues against vulnerability of syntax proper and for a crucial role of interpretable features at

the syntax–discourse interface would fail to adequately explain ungrammatical instances of resumption in A′ chains (which in native grammars are violations of the Full Interpretation Principle). The Interpretability Hypothesis discussed in the present article can account for the non-target use of L2 pronouns in interrogative contexts and, at the same time, for the selective improvement found in contexts where interpretable features are associated with the *wh*-dependency.

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Appendix I

Ungrammatical sentences

1. What did you say that Maria forgot it when she was leaving home?
3. Which book do you remember that Peter read it carefully?
5. Which student do you think that Jane likes him?
7. Which girl do you think that John would kiss her?
16. Who do you think that he met Katerina?
17. Who have you suggested that he should not resign?
19. Which car did you say that it was sold very cheap?
21. What do you think that it makes the book very interesting?
22. Which tiger did they say that it escaped from the Zoo?
24. Who did the students think he would be the best president?
25. Who do you think that Susan would marry him?
27. Which party does John think it was very popular?
28. What do people think it makes American cinema popular?
30. Who did Mary say he wanted to study abroad?
31. Which actress does Peter think she can play this role?
39. Which politician did Jane say he is very honest?
44. Which book do you remember that it was full of pictures?
47. What have you insisted that student should read it before the exam?

Grammatical sentences

9. Which animal do people believe that children love?
10. Which parcel did you say that Mary sent yesterday?
12. What do teachers insist that pupils should read before the exams?
13. Who does Peter think that Mary should meet?
14. What has John decided that he should buy for Christmas?
33. Which athlete does John think can win the Olympics?
35. Which politician has Mary said will support the communist party?
37. Who does Kathryn think is a good painter?
41. Who did John say kissed Susan?
42. Which president have the students decided that they will elect?
45. What did John suggest should be announced at the meeting ?
51. Which animal did the television announced ran away from the Zoo?