Internal and external interfaces in bilingual language development: Beyond structural overlap

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Abstract

This article deals with the interface between syntax and discourse-pragmatics/semantics in bilingual speakers. Linguistic phenomena at the interface have been shown to be especially vulnerable in both child and adult bilinguals; here we explore four variables that contribute to this vulnerability to different extents depending on the nature of the interface: underspecification, cross-linguistic influence, quantity and quality of the input, and processing limitations.

We investigate the role played by the aforementioned variables in two recently completed studies. One compares the performance of English–Italian and Spanish–Italian bilingual children, monolingual English- and Italian-speaking children and adults on forced-choice grammaticality tasks on the distribution of overt and null subject pronouns in Italian and in English. The second explores bilingual and monolingual speakers' sensitivity to the presence of definite articles in specific and generic plural noun phrases in Italian and in English.

We show that over and above structural overlap, other factors must be included to account for differences in the behavioural data in the two tasks and in different populations of bilinguals and monolinguals. We argue that processing factors play a non-trivial role in the difficulty encountered by bilinguals in coordinating syntax with contextual discourse-pragmatic information, regardless of the absence or presence of partial structural overlap. In the case of the internal coordination between syntax and semantics, processing factors may be less likely to affect bilinguals' performance, while the extent of structural overlap and the associated internal formal features seem to play a more important role.

Key words

bilingual

cross-linguistic influence

interfaces

plurals

subjects

1 Instability of interfaces in bilingual speakers

Over the last 10 years researchers working in the field of bilingual acquisition have been gathering substantial evidence for the vulnerability of morphosyntax in domains in which it is regulated by pragmatic or semantic factors (Hulk & Müller, 2000; Müller & Hulk, 2001; Paradis & Navarro, 2003; Serratrice, 2007; Serratrice, Sorace & Paoli,

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2004). Bilingual speakers of all ages and backgrounds have repeatedly been shown to exhibit linguistic behaviors that are significantly different from monolinguals in a selected number of contexts, which have been attributed to cross-linguistic influence. For example, bilinguals speaking a range of different null-subject languages have been shown to accept overt subject pronouns in their null-subject language significantly more frequently than monolinguals when their other language is not a null-subject language (Montrul, 2004; Sorace, Serratrice, Filiaci, & Baldo, 2009; Tsimpli, Sorace, Heycock, & Filiaci, 2004). For example English-dominant English–Greek bilingual children accept pragmatically inappropriate pre-verbal subjects in wide-focus contexts in Greek significantly more frequently than monolingual children (Argyri & Sorace, 2007). Adult Spanish heritage speakers also behave differently compared to monolinguals in the semantically constrained use of the preposition *a* with animate direct objects and they have a tendency to omit dative clitic doubling in inalienable possession constructions (Montrul, 2004).

The attention of researchers has been predominantly focused on linguistic phenomena that have different realizations in the two languages of bilingual speakers. More specifically, in bilingual first language acquisition much attention has been paid to cases in which there is partial structural overlap across the two languages where language A uses construction X in context X and construction Y in context Y, while language B uses construction X in both context X and context Y. The result of cross-linguistic influence in such cases is the overextension of the overlapping construction X in language B to the inappropriate context Y in language A. The idea that structural overlap plays a decisive role in driving cross-linguistic influence in bilingual acquisition was originally proposed by Döpke (1998) and was later refined by Hulk and Müller (2000) and Müller and Hulk (2001) with the additional stipulation that, for cross-linguistic influence to take place, the distribution of the morphosyntactic construction of interest must be regulated by the interface with discourse pragmatics.

In the wake of Hulk and Müller's work, the effects of cross-linguistic influence at the interface have been reported for a number of domains including the overextension of overt subject pronouns in a range of null-subject languages acquired alongside English (see Paradis & Navarro, 2003 for Spanish; Serratrice, 2007, and Serratrice et al., 2004 for Italian; Hacohen & Schaeffer, 2007 for Hebrew; Argyri & Sorace, 2007 for Greek), and for the acceptability of pragmatically inappropriate preverbal subjects in wide focus contexts (Argyri & Sorace, 2007). Inconsistent patterns of accuracy at the interface have likewise been observed in cases of L1 attrition (Tsimpli et al., 2004), second language learners (Belletti, Bennati, & Sorace, 2007; Iverson, Kempchinsky, & Rothman, 2008; Rothman, 2007a; Sorace & Filiaci, 2006) and heritage speakers (Montrul, 2002, 2004; Rothman, 2007b) for the use of pronominal subjects, the acquisition of aspectual distinctions, the use of the subjunctive and of inflected infinitives.[1] Despite differences with

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[1] Some of the studies cited here have in fact found that advanced L2 speakers have managed to master subtle aspects of grammar that are dependent on the successful interface with a module that is not purely syntactic. Iverson et al. (2008), for example, have shown that advanced L2 learners of Spanish can master the use of the subjunctive mood both with volitional predicates and with negated epistemic verbs. According to Iverson, et al., there is a fundamental distinction between these two contexts inasmuch as the choice of the subjunctive is a purely syntactic consequence of the lexical selectional restriction of the matrix verb, while in the case of negated epistemic verbs the choice is conditioned by discourse considerations.

respect to their ages and language backgrounds, these bilingual populations all exhibit optionality in their judgments on—and use of—morpho-syntactic constructions whose distribution is governed by a discourse-pragmatic interface.[2]

The present article has three main aims. First, it explores the nature of the syntax–pragmatics interface, pursuing the hypothesis that this interface differs from other interfaces and in particular from the syntax–semantics interface. Second, it sketches a hypothesis of how extra-grammatical factors—processing and input exposure—might differentially affect these interfaces. Third, it offers a review of some of our recent research on older bilingual children in the light of the distinction between interface types.

2 The nature of interfaces: Grammatical representations and processing

The term *interface* has been used to denote a component that links either (a) sub-modules of language, or (b) language and non-linguistic cognitive systems (Chomsky, 1995; Jackendoff, 2002; among others). Accordingly, one can distinguish between different types of interfaces at the developmental level. Tsimpli and Sorace (2006), for example, propose a principled distinction between the syntax–semantics interface and the syntax–discourse interface in Greek. The distinction between the two interfaces is determined by the nature of the interaction between levels of structure: the syntax–semantics interface involves formal features and operations within syntax and Logical Form, whereas the syntax–discourse interface involves pragmatic conditions that determine appropriateness in context. While violation at the syntax–pragmatics interface typically lie on a gradient of acceptability (e.g. the 'redundant' use of an overt rather than a null pronoun to maintain reference in Italian), some violations of syntax–semantics interface conditions give rise to clear ungrammaticality (e.g. Focusing in Greek). One might hypothesize that adult native speakers tend to have more categorical intuitions in tasks that tap the interface

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2 To date, the data on which researchers have based their investigation of cross-linguistic influence at the interface have been either naturalistic corpora or off-line grammaticality/acceptability judgments. These types of behavioral data provide revealing information on the linguistic choices made by bilinguals. Nevertheless, especially in the case of grammaticality judgments, these results give an indication of a speaker's metalinguistic abilities but they do not offer any insight into the implicit and unconscious activation of the speaker's knowledge from the other language. This point is made very forcefully by a recent study by Thierry and Wu (2007) on the effects of unconscious translation during foreign language comprehension. In their two experiments they failed to find any significant differences between Chinese–English bilinguals and English monolingual speakers in a task in which the participants had to decide the semantic similarity between two English words (e.g. post–mail; train–ham). Crucially, for half of the English word pairs that were not obviously related in meaning (e.g. train–ham) the Chinese translation included words which had one character in common (e.g. *Huo Che* and *Huo Tui*). In both the reading and the listening experiments there were no significant differences between the Chinese–English bilinguals and the English monolinguals in the speed with which they responded to semantically related and semantically unrelated pairs. In both groups semantically related pairs were responded to faster. More importantly, there was no significant effect of Chinese character repetition in the reaction times (RT) task, which was instead found in the Event Related Potentials (ERP) data. The electrophysiological data thus showed a significant effect of automatic translation in fluent bilinguals that was not detected by traditional behavioral data, and points to the need for the adoption of multiple measures to investigate differences in the time course of language processing in bilinguals and monolinguals. Although no differences might be detected in the final choice made by these different groups of speakers, the process by which they reach their decisions might be significantly different. The distinction between representation and processing difficulties should therefore be addressed with a combination of off-line and on-line methods.

with semantics, but may be more likely to make pragmatically inappropriate choices in a task that requires the integration of syntactic and discourse-pragmatics.

We follow Jackendoff (2002) in considering the computation at the interfaces as the isomorphic correlation between one level of structure (e.g. syntactic) and another level of structure (e.g. semantic or pragmatic). In Jackendoff's terms, an interface module has high 'bi-domain specificity' in the sense that it only deals with those aspects of the two modules that can be directly correlated. The connection made by an interface is therefore a 'sort of partial homology' where similar information from different levels of structure is put in a bi-univocal correspondence. To take one of Jackendoff's examples (2002: 225), phonological structure is involved in a visual–phonological interface for the decoding of written language, and an auditory–phonological interface for spoken language comprehension. The two interfaces connect in different ways with phonological structure: the visual–phonological interface allows for the correlation of mostly reliable segmental information between the graphemic and phonemic level, while the auditory–phonological interface also provides supra-segmental information not available to the visual-phonological interface. Conceptualizing interfaces, moreover, involves both the structure and the mapping constraints that operate within interface components and the processing principles that apply in the real-time integration of information from different domains. Data from language development and language disorders have been especially useful in identifying particular processing demands that distinguish the syntax–pragmatics interface from the syntax–semantics interface. Avrutin (1999, 2004), for example, provides evidence from young (monolingual) children and aphasic patients that operations needing the coordination of syntax and discourse (e.g. pronominal dependencies and D-linked *wh*-questions) require additional processing resources compared to purely syntactic operations and are, therefore, particularly problematic for these two populations. Furthermore, the different nature of the syntax–semantics interface and the syntax–pragmatics interface has been shown to create different patterns of L2 attainment. Tsimpli and Sorace (2006) argue that L2 learners of Greek acquire syntax–semantics structures unproblematically (e.g. Focus, which involves an operator-variable dependency in this language) but have prolonged difficulty with syntax–pragmatics interface structures (e.g. the distribution of subject pronouns). On a similar vein, White (2008) distinguishes 'internal' interfaces, which are acquirable in L2, from 'external' interfaces, which are potentially problematic even at very advanced L2 developmental stages.

What makes some interface phenomena problematic for bilingual speakers, and why is the difficulty related to the internal vs. external distinction? Among the (non mutually exclusive) factors that can independently affect the learnability of interface structures one can mention:

(a) Underspecification of interpretable features affecting interface mappings between syntactic structures and interpretation at the level of mental representations of grammatical knowledge.
(b) Cross-linguistic influence in representations and/or in parsing strategies.
(c) Processing limitations, intended as inefficient (incremental) access to knowledge, inefficient coordination of information, and/or inefficient allocation of resources.
(d) The input received by bilingual speakers, both in terms of quantity and quality (for example, whether it is produced by native, non-native, or attrited speakers).

(e)   Bilingualism *per se*, including executive control limitations in handling two languages in real time.

In the remainder of this article we will deal with the first four of these five factors. While we believe that executive control has a role to play in accounting for bilinguals' behavior (see e.g. Treccani, Argyri, Sorace, & Della Sala, 2009), the focus here is more specifically on the psycholinguistic determinants of bilingual language development with respect to interface phenomena, rather than on general cognitive aspects of it.

3 Underspecification and cross-linguistic influence

Let us begin with several accounts based on underspecification of interface conditions which have been proposed both for persisting optionality found in advanced L2 speakers and for the residual optionality attested in L1 attrition. The focus of most studies has been the syntax–discourse interface. According to some of these accounts (Hopp, 2007; Lozano, 2006; Tsimpli, 2007; Tsimpli et al., 2004), residual optionality in L2 grammars involves discourse interface conditions linked to a parametric choice that differs between the L1 and the L2. An interface condition that is specified in L2 in a particular syntactic structure remains underspecified because of the absence of a similar condition in L1 English in the same syntactic context (for example, 'Topic Shift' in the case of overt subject pronouns and clitic pronouns in null-subject languages and languages with clitic pronouns; '+Focus' in the distribution of pre- and post-verbal subjects in null-subject languages or the licensing of scrambling in German). This underspecification gives rise to ambiguity and optionality in the L2 because it allows a wider range of possible mappings, for example in the case of 'Topic Shift' the overt pronoun option becomes applicable to contexts in which it is not in monolingual grammars. Furthermore, the same interface condition may become underspecified in native language attrition as a result of prolonged exposure to a second language (Tsimpli et al., 2004). However, the underspecification account applies to language combinations in which one of the languages instantiates a complex setting dependent on syntax–pragmatics interface conditions and the other does not. The validity of such an account is therefore put to a test by language combinations in which both languages instantiate the complex setting: no underspecification, and therefore no optionality, would be expected for these combinations.

4 Processing factors

An alternative perspective on interface optionality in bilinguals relies on consideration of the processing resources involved in carrying out syntax-pragmatics mappings in real time. This view holds that structures requiring the integration of syntactic knowledge and knowledge from other domains require more processing resources than structures requiring only syntactic knowledge. Bilingual speakers may have fewer processing resources available and may therefore be less efficient at integrating multiple types of information efficiently in on-line comprehension and production of structures at the syntax–pragmatics interface. If this is the case, one would expect to find evidence of processing limitations in bilingual speakers of languages of any combination, regardless of whether one or both languages have a complex setting. From this perspective, the

overgeneralization of overt subject pronouns that has been found in both L1 attrition and advanced L2 acquisition may thus be regarded as the use of a 'default' unmarked form to relieve processing overload. Supporting evidence for this interpretation comes from studies of Spanish learners of Italian (Bini, 1993) and Greek learners of Spanish (Margaza & Bel, 2006) whose overproduction of overt subject pronouns cannot be easily ascribed to cross-linguistic influence. Similarly, studies by Sabourin (2003), Hopp (2007), and Roberts, Gullberg, and Indefrey (2008) support the view that L2 speakers—regardless of their L1—have similar processing disadvantages in computing syntax–discourse mappings in real time. Moreover, monolingual speakers may also occasionally experience processing limitations, albeit in more restricted circumstances, and may therefore employ similar strategies and default forms as bilingual speakers. Recent work on processing of subject pronouns in comprehension by native speakers of null subject languages may be interpreted in this light: native speakers' antecedent preferences for overt subject pronouns are more flexible than those for null subject pronouns, sometimes leading to inaccurate production and interpretation (Alonso-Ovalle, Clifton, Frazier & Férnandez-Solera, 2002; Carminati, 2002, 2005; see also Sorace, 2005; Sorace & Filiaci, 2006; for further discussion). However, the precise nature of processing limitations is still not well understood. As suggested by a study by Wilson, Sorace and Keller (2009) on anaphoric dependencies of pronouns and demonstratives in German, L2 speakers may have a problem in allocating processing resources efficiently (Levy, 2008), rather than in recruiting them in sufficient amounts.

In sum, processing limitations in bilingual speakers may be responsible at least for some of the difficulties attested at interfaces, especially the ones requiring the coordination of syntactic and contextual non-syntactic information. Internal interfaces, on the other hand, may be expected to be less sensitive to processing limitations because they involve mappings between formal properties of the language system alone.

5 Quantity vs. quality of input

There is another external factor to which structures at the interface between syntax and other cognitive domains may be expected to be sensitive, and that is the effect of experience, including both the quality and the quantity of the input received by bilingual speakers. We take the position that a theory of grammatical competence needs to have psychological reality; therefore whatever principles of competence we advocate must correlate with the principles that the language user actually adopts for the processing of language in comprehension and production (Jackendoff, 2002: 198). By this rationale an individual's language competence cannot be thought of as a static object; rather, it will inevitably be affected by the way in which it is actually used. Processing of language structures over time has consequences for how accessible and entrenched these structures will become both in comprehension and in production. The frequency with which a structure is encountered is bound to have an effect on the speed and on the accuracy with which it is processed. Because bilinguals deal with two languages, compared to monolinguals the amount of time that they are exposed to and/or use each of them is usually reduced. Reduced frequency of exposure and/or use is likely to be associated with slower and less efficient processing (see Sorace, 2005). In addition, there is robust evidence that complete deactivation of one of the two languages when hearing/speaking

the other is rarely possible: the two languages of a bilingual speaker are always simultaneously active and in competition with one another to some extent (Dijkstra & Van Heuven, 2002; Green, 1998). although their relative activation levels and the strength of competing structures will vary greatly according to the task, the proficiency level in each language, and the frequency with which each language is used, to name but a few of the factors involved.

A vast and expanding literature in monolingual adult language processing has shown that a significant predictor of the occurrence of a given construction is its prior occurrence (see Costa, Pickering, & Sorace, 2008; Ferreira & Bock, 2006; Pickering & Ferreira, 2008, for up-to-date reviews). Speakers are primed to repeat the underlying structure of what they have heard others use in the preceding discourse, and of what they have recently produced themselves. The robust effects of priming have been shown to hold within and across comprehension and production in monolingual adults for a variety of structures, even in the absence of lexical overlap. More recently, a number of studies have confirmed that priming also operates for bilingual adults across their two languages (Hartsuiker, Pickering, & Vertlkamp, 2004; Loebell and Bock, 2003; Meijer & Fox Tree, 2003; Schoonbaert, Hartsuiker & Pickering, 2007).

Given these premises, a special place is occupied by those structures at the external interface with discourse pragmatics that partially overlap across languages and that need to be interpreted by an extra-syntactic module, such as pronominal anaphors. The morphosyntactic choice of a null or an overt subject pronoun in null-subject languages like Italian and Spanish, is governed by the discourse pragmatic requirement that null anaphors be used when there is no topic shift with its antecedent, and that overt pronouns be used when there is a shift of topic (Frascarelli, 2007). In contrast, in a non-null-subject language like English, overt pronouns are used regardless of whether there is a shift of topic. The partial overlap between the inventories of pronominal forms in Italian and English will favor the activation of overt pronouns in an English-dominant environment. This is not a problem for the processing of Italian pronominal anaphors in topic shift contexts. The difficulties arise in Italian when there is no shift of topic because there is competition between an Italian structure with a null anaphor and an English structure with an overt pronoun, on the assumption that the other language is always active to some extent even when it is not being used. When processing Italian, the language-specific Italian structure with a null pronoun should win the competition over the English structure with an overt pronoun because the activation level of the Italian structures will be higher when hearing/reading and speaking/writing in Italian, while the corresponding activation level for the English structure will be lower. This is what has been observed for a variety of bilinguals speaking English in combination with a null-subject language (Hacohen & Schaeffer, 2007; Paradis & Navarro, 2003; Serratrice et al., 2004). By and large these bilinguals accurately choose and produce structures including a null subject pronoun in no-topic shift contexts. However, in the same no-topic shift contexts they also choose and produce a significantly higher proportion of overt pronouns than monolingual null-subject language speakers. One of the reasons for this pragmatically inappropriate choice may be found in the routine processing of overt pronouns in English. This raises the accessibility of the structure with the overt anaphor,

which in turns makes it—at least occasionally—a stronger candidate in the competition with the Italian structure containing a null pronoun.

As the findings of priming studies have shown, competition between different forms also takes place during monolingual language processing. The accessibility of a given structure, through recent and frequent use, is a good predictor of its subsequent use. This entails that, even in monolingual null-subject language speakers, the availability of structures with null or overt subject pronouns will entail a degree of competition. The use of the appropriate anaphor will require the evaluation of the discourse pragmatic status of the antecedent and the suppression of the competing anaphor, a costly operation that might not always result in the optimal choice, especially when ambiguity is not at stake (Carminati, 2002, 2005). Work on the processing of null and overt pronouns in adult speakers of Italian and Spanish (Alonso-Ovalle et al., 2002; Carminati, 2002, 2005) has indeed shown that in cases of intra-sentential anaphora adult speakers opt for the pragmatically optimal anaphor approximately 80 per cent of the time. Even in the case of competent mature speakers there is a degree of residual optionality in the choice of the appropriate pronominal form. The fact that even mature speakers do not perform at ceiling on structures at the external interface with discourse pragmatics suggests that processing at this interface, understood in terms of activation, competition, and coordination between different modules, is a costly operation.

Finally, the quality of input may have a more visible effect on external interfaces than on internal interfaces. The bilingual groups tested in the aforementioned studies investigating the distribution of null and overt pronouns lived predominantly in an English-speaking environment, where they were likely to hear the null-subject language spoken by native speakers under attrition and second language speakers – two populations that have independently been found to produce a higher rate of redundant overt subjects. Although, with the exception of Paradis and Navarro (2003), none of the other studies give any information on the pattern of null and overt subjects in the non-native caregiver input, evidence from language attrition studies (Tsimpli et al., 2004) suggests that native speakers of a null-subject language living in an English-speaking country may actually produce more pragmatically inappropriate pronouns than native speakers in Italy. It is therefore reasonable to assume that children of parents who are themselves bilingual may experience input in the null-subject language that is not exactly comparable with the input received by monolingual peers in Italy.

To sum up, it is becoming apparent that cross-linguistic influence at the level of grammatical representations cannot be the only explanation for extended optionality in bilinguals. Less efficient processing, as well as continuous exposure to a language with a less complex setting, are likely to play a more crucial role than previously thought. In the remainder of this article we illustrate these arguments by reviewing and comparing the results of two studies we conducted with school-age bilingual children with different language combinations on the acceptability of specific and generic noun phrases, and of null and overt pronouns in Italian and in English. These studies together provide evidence for a qualitative difference between the way in which syntax interfaces with semantics and discourse-pragmatics, and for the different sensitivity of the two interfaces to cross-linguistic influence.

6 Comparing interfaces: Evidence from older bilingual children

The aim of the two studies (Serratrice, Sorace, Filiaci, & Baldo, 2009; Sorace et al., 2009) was to test the same groups of bilingual and monolingual children on the acceptability of two different constructions, one at the external syntax–discourse interface (null and overt subject pronouns; see Figure 1) and the other at the internal syntax–semantic interface (specific and generic noun phrases; see Figure 2). The same participants (N = 167) took part in the two studies. The children were divided into two groups of English–Italian bilingual children, one group living in the UK (N = 20) and one in Italy (N = 39), a group of Spanish–Italian bilingual children in Spain (N = 31), a group of monolingual English-speaking children in the UK (N = 39), and a group of monolingual Italian-speaking children in Italy (N = 38). The children were further divided into a younger (6;2–7;11) and an older group (8;0–10;10). We also tested 30 monolingual English-speaking adults and 30 monolingual Italian adults. Both studies employed acceptability judgment tasks in which children had to assess sentences heard in the context of particular pictures or animations.

We chose two different language combinations; one in which there is complete overlap with respect to the constructions of interest (Spanish–Italian), and one in which there is only partial overlap (English–Italian). Both Italian and Spanish are null-subject languages where the distribution of null and overt subject pronouns is governed by the same discourse pragmatic constraints associated with topic shift.[3] There is also complete overlap in the use of definite pronouns with specific and generic plural noun phrases. Unlike in English, where the definite article is only allowed in specific but not in generic contexts, both Italian and Spanish always require the use of a definite article for plural noun phrases in subject position. These differences are illustrated in Figures 1 and 2.

On the assumption that competition of partial overlapping structures from the other language also affects processing, we included language exposure as one of the variables in our studies. We investigated the role of amount of input by recruiting English–Italian bilingual children in the UK, with more exposure to English, and in Italy, with more exposure to Italian. These differences are quantitative, as opposed to the qualitative differences related to exposure to two typologically similar languages (in the Spanish–Italian group) and exposure to two typologically different languages (in the English–Italian group). The manipulation of the language of the community (English or Italian) keeps the language combination constant, but increases the quantity of exposure to one of the two languages (English in the UK, Italian in Italy); this allowed us to test the hypothesis that the frequency with which a given construction is encountered (e.g. overt pronouns) will determine the magnitude of the cross-linguistic influence. In contrast, the manipulation of the degree of typological difference between the two languages was instrumental to test the hypothesis that it is the specific language combination where the

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3   We are leaving aside the possibility that there may be microvariation among null subject languages traditionally regarded as belonging to the same type (see Ordóñez, 1998; among others). The implications of such variation for learnability predictions, however, are potentially important and should not be underestimated in future research.

Figure 1

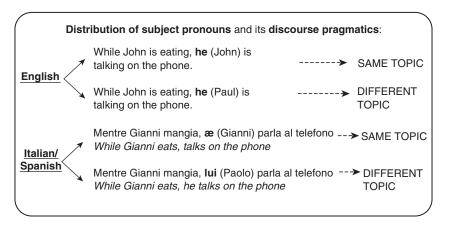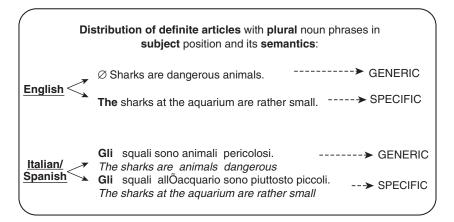Distribution of subject pronouns in English and Italian/Spanish

Distribution of subject pronouns and its **discourse pragmatics**:	

English

While John is eating, **he** (John) is talking on the phone. ------→ SAME TOPIC

While John is eating, **he** (Paul) is talking on the phone. ------→ DIFFERENT TOPIC

Italian/ Spanish

Mentre Gianni mangia, **æ** (Gianni) parla al telefono --→ SAME TOPIC
While Gianni eats, talks on the phone

Mentre Gianni mangia, **lui** (Paolo) parla al telefono --→ DIFFERENT TOPIC
While Gianni eats, he talks on the phone

Figure 2

Distribution of definite articles with plural noun phrases in English and Italian/Spanish

Distribution of definite articles with **plural** noun phrases in **subject** position and its **semantics**:	

English

∅ Sharks are dangerous animals. ---------→ GENERIC

The sharks at the aquarium are rather small. -----→ SPECIFIC

Italian/ Spanish

Gli squali sono animali pericolosi. -------→ GENERIC
The sharks are animals dangerous
Gli squali allÕacquario sono piuttosto piccoli. --→ SPECIFIC
The sharks at the aquarium are rather small

distribution of the construction differs that leads to discourse-pragmatically inappropriate behavior, as opposed to the number of languages spoken.

The working hypothesis behind these two studies was that the construction at the external interface would be more vulnerable to processing costs than the one at the internal interface because of the need to coordinate the syntactic module with the external discourse-pragmatic module. In the first study on the acceptability of null and overt subject pronouns in Italian (Sorace et al., 2009) we expected that even monolingual children, and to some extent adults, would have some difficulty in consistently choosing the pragmatically appropriate anaphor. As for the bilingual children, regardless of language combination and of the degree of structural overlap, we expected bilingual children to

perform significantly less accurately than their monolingual counterparts. At the same time we did not rule out the possibility that cross-linguistic influence and the amount of language exposure would play an additional role over and beyond the difficulties with language processing. In this respect we anticipated that the English–Italian children would find it more problematic to reject overt pronouns in no-topic shift contexts than Spanish–Italian children, and those raised in the UK should be significantly worse than children in Italy because of greater competition from English constructions containing an overt pronoun.

With respect to the internal syntax–semantics interface, the construction of interest here was the presence/absence of the definite articles in plural noun phrases presented in specific and in generic contexts. Languages of the world vary as to the distribution of the definite article according to the specificity or the genericity of the noun phrase.[4] According to Chierchia's (1998) influential proposal of the Nominal Mapping Parameter, natural languages can be classified into three types according to the different ways in which they refer to kinds. Nouns can either be predicates (e.g. the predicate 'mammals' in 'Elephants are mammals'), or arguments when they refer to kinds (e.g. the argument 'Elephants' in 'Elephants are mammals'). The mapping of the syntactic category Noun onto its semantic interpretation as predicate or argument is constrained cross-linguistically by the language-specific setting of the Nominal Mapping Parameter as either [± argument] and [± predicate]. In Italian and Spanish where the setting is [–argument; + predicate] all nouns originate as predicates and a determiner is therefore needed to turn them into arguments (e.g. '*Cani sono animali domestici' Dogs are domestic animals*). In English, where the setting is [+argument; + predicate], nouns can either denote kinds or predicates. In this class of languages a type-shifting operation is available that applies to plural nouns and turns them into kind arguments (e.g. *Dogs are friendly animals*).[5] English is thus more economical in resorting to type shifting than either Italian or Spanish, which instead require the projection of an additional Determiner to turn predicates into arguments.

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[4]   In our analysis we adopted Chierchia's (1998) Nominal Mapping Parameter. More recently Longobardi (2001, 2005) independently proposed another account of the cross-linguistic difference between English and Italian in the distribution of bare nouns (see also Longobardi, 1994). According to Longobardi, the strategy that the two languages use to assign object and kind reference to nominal structures is parameterized: in English, nominals get referential status with no overtly realized Determiner; in Italian, the Determiner position must be overtly occupied either by the noun itself (object reading in the case of proper names raised from N to D), or by a determiner placeholder (referential generic common nouns). Capitalizing on a distinction already made in Longobardi (1994), the observed cross-linguistic differences can be reduced to the parameterization of the strength of the referential properties of D: in English they are weak in the sense that they do not require 'visible systematic association of referential items with D' (Longobardi, 2001, p: 361). In contrast, strong referential properties of D in Italian demand N-to-D raising or the encoding of a determiner at PF. Aside from the differences that exist between Chierchia's and Longobardi's accounts, both proposals attempt to justify the cross-linguistic differences between English and Italian, and more generally between English and Romance languages, with the probable exception of some Portuguese varieties, by appealing to the parameterization of the referential properties of D. In both accounts English is the language with the most economical set-up inasmuch as it does not require an overt D at PF for kind reading with plural bare nouns, therefore both Chierchia's and Longobardi's account would make the same prediction with respect to the cross-linguistic influence effect we tested for in Serratrice et al. (2009).

[5]   The third type of language is represented by classifier languages such as Chinese where nouns originate as [+arg, –pred].

Our hypothesis for the study on plural noun phrases was that language combination would play a critical role. For this phenomenon, syntax interacts with formal semantic features internal to grammatical representations and does not require the integration of extra-syntactic pragmatic information. For this reason we did not expect that language processing in terms of coordination would play a significant role in this case. We also predicted that the direction of cross-linguistic influence would go from the more economical system (English) to the less economical system (Italian) and result in overacceptance of bare plurals in generic contexts, especially for those children with more exposure to English.

The results of the two studies confirm our predictions and reveal a striking asymmetry in terms of bilinguals' intuitions on phenomena at external and internal interfaces. For the acceptability judgment task on overt and null pronouns (Sorace et al., 2009), as expected, we found that performance was not 100 per cent accurate in Italian, not even for monolingual adults. More importantly for our processing hypothesis, both the English–Italian and the Spanish–Italian bilinguals chose a significantly higher proportion of overt pronouns in no-topic shift contexts (38% and 33% overall compared to 20% for the monolingual children), although this effect was also mediated by the children's age and by the language of the community, with younger English–Italian bilingual children in the UK performing least accurately of all (57%). The crucial finding is that even the Spanish–Italian children had difficulties in consistently opting for the pragmatically appropriate null anaphor in no-topic shift contexts, confirming that dealing with two languages has associated processing costs regardless of the totality or partiality of cross-linguistic overlap.

By contrast, the results for the acceptability task with plural noun phrases showed ceiling performance in Italian for the monolingual children, the adults and the Spanish–Italian children. All these groups categorically rejected bare noun phrases in all contexts and accepted noun phrases with a definite article.[6] The English–Italian children, especially those in the UK, however, were significantly more likely to accept ungrammatical bare plural noun phrases in generic contexts in Italian (e.g. *In genere pomodori sono rossi* 'In general tomatoes are red'). We interpret these results as an indication that in the case of syntactic choices that are governed by grammar-internal semantic features the role played by the language-specific setting of the parameter played a determining role, while coordination with a non-syntactic interface was not problematic. This pattern of results provides evidence that there is a qualitative difference between the syntactic

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[6] In this task children were presented with a picture of animals or fruit (e.g. two red strawberries) and they listened to two sentences, one introducing a generic context prefaced by the adverbial phrase 'in general'/ 'in genere' (e.g. 'In genere (le) fragole sono rosse'/'In general (the) strawberries are red'), and one introducing a specific context which started with 'here'/'*qui*' ('*Qui (le) fragole sono rosse*'/'Here (the) strawberries are red). For each sentence they had to say whether it was ok in Italian/English, depending on the language used in the task. During the pre-test practice children's attention was drawn to judging sentence form with appropriate examples and feedback was provided when needed. As a reviewer correctly points, out the sentences in this task were shorter than those in the anaphoric test, nevertheless they still require a non-trivial effort in the interpretation of the sentence-initial phrase as setting up a generic or a specific context and mapping that on the presence/absence of an article, and on its grammaticality in the language by disregarding the possibilities of the other language. We therefore do not think that this task was substantially easier than the anaphoric task, with the proviso that 'measuring' difficulty is not a straightforward notion.

phenomena that interface internally with sub-modules of grammar, and those that interface externally with other cognitive systems.

7 Conclusions and implications for future research

The synthesis and comparison of the two studies presented in the previous section point to three main conclusions. First, the syntax–discourse interface and the syntax–semantics interface pose different challenges to bilingual children. The phenomena investigated in the two studies concern different interfaces: one involves formal semantic features internal to grammatical representations; the other requires the integration of contextual information external to the grammar. The results on subject pronouns are consistent with those obtained for other bilingual populations in showing an overacceptance of overt subject pronouns in no-topic shift contexts. This finding suggests that (a) less efficient processing may be an important cause of the overgeneralization of overt pronominal forms, and (b) exposure to English increases the magnitude of the effect.

Second, the syntax–discourse interface is not affected by language combination, whereas the syntax–semantics interface is: English–Italian bilingual children, who get qualitatively different (inconsistent) input, have more difficulty with the distribution of bare nouns in subject position in Italian. Third, both interfaces are sensitive to quantitatively reduced input: children who live in a predominantly Italian setting make fewer errors. The last two points indicate that quantitative aspects of the input to which bilinguals are exposed affect both interface types, although more research is needed to identify precisely how.

A word of caution, however, is in order. Since both studies employed off-line measurements, these conclusions are to be regarded as provisional. Future on-line studies of pronominal resolution in bilingual children and cross-linguistic priming studies of child and adult bilinguals—speaking different language combinations—are needed to corroborate the overall emerging picture. Nonetheless, we are now in a position to formulate more general, testable hypotheses about the nature of bilingual development that go beyond individual bilingual groups. For example, for L2 acquisition we predict potentially permanent optionality with respect to structures at the syntax–discourse interface, but not with respect to those at the syntax–semantics interface, regardless of language combination (see Slabakova, 2006). For L1 attrition in individual speakers in a situation of long-term use of a second language, we predict that attrition effects manifest themselves initially at the syntax–pragmatics interface and at a later stage at the syntax–semantics interface. Regardless of whether these predictions will be ultimately upheld, it is exciting that we are beginning to see the forest as well as the trees in bilingual language development.

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