

Article

Mixed Compounds: Where Morphology Interfaces with Syntax

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Abstract: In this work, we investigate a special type of CS below word level, which is observed in mixed compound words. In particular, we discuss mixed Italian–German compounds; this combination is particularly interesting since, in the two languages, the process of compounding follows different rules for what concerns the position of the head, as well as gender and number inflection. An Acceptability Judgment Task was administered to some bilingual speakers, who assessed the acceptability of mixed compounds inserted in both German and Italian clauses. Our conclusion is that it is possible to have mixed compounds, though this option is severely constrained, especially because of the different word order parameters exhibited by the two languages.

Keywords: compounding; code-switching; mixed compounds; integration; gender

1. Introduction

Poplack's (1980) seminal work on code-switching (CS) assumes, among other things, the Free Morpheme constraint, which states that CS cannot take place below word level, e.g., between two morphemes such as root and inflection, a fact which is clearly demonstrated by the unacceptability of mixed formations such as Spanish–English *eat-iendo ('eating'; *ibidem*). The basic idea beyond Poplack's Free Morpheme constraint also characterizes more recent generative approaches to CS (MacSwan (1999) and subsequent work), where such a restriction is rephrased into the PF Disjunction Theorem, which bans mixing between two phonological systems within a word.

In this pilot work¹, we investigate a special type of CS below word level, which is observed in mixed compounds. Indeed, compounds are peculiar elements, which are regarded by morphology as words, though complex, rather than phrases. Therefore, mixed compounds can rightfully be treated as cases of CS below word level. At the same time, however, compounds represent an environment where morphology crucially interfaces with syntax, as shown by the fact that the head-complement parameter, which is typically implemented in syntax, also determines the form that compounds take in different languages.

In particular, in this work, we analyze Italian–German mixed compounds. This combination is particularly interesting, in that (a) the two languages exhibit a different noun-modifier parameter, and (b) in both languages, nouns are inflected for number and gender. Indeed, inflection is the principal environment where morphology interfaces with syntax, and this makes the analysis of Italian–German mixed compounds particularly promising.

This work proceeds as follows. In Section 2, the structure of compound words is discussed, and we highlight the different behavior exhibited by compounds in Italian and German. In Section 3, we discuss cases of CS below word level, including mixed compounds, reported in the literature. In Section 4, we present the main focus of this work, i.e., the problems raised by Italian–German mixed compounds in CS contexts, and open our research questions. Section 5 is devoted to the presentation of our Acceptability Judgment Task (AJT) and the participants to the survey, while, in Section 6, we present the results obtained. Finally, in Section 7, we discuss the theoretical implications of the results.



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2. Compound Words

2.1. General Issues

Compounding is one of the most common and productive processes of word formation in many languages. A compound is obtained when two (or more) free morphemes are linked together to form a new word with a different meaning.

However, the field of compounds is vast and variegated, and their classification is often not easy, also because several inter-language variations can be observed, as we see in the following sub-sections.

There are indeed various types of compounds, and they can be classified according to different properties (Adams 1987):

- The categories of the combined words, as well as the category of the outcome;
- How they are written; and
- The presence and position of the semantic head, namely the most important of the two words.

As for the former issue, though nouns have the lion's share, since most compounds are nouns formed out of an N+N combination (*ashtray*, *swordfish*), words pertaining to all major lexical categories can be combined into a compound noun: A+N (*blackboard*), V+N (*breakwater*), etc. In some cases, anyway, the compound may be of a different category, i.e., an adjective (*blue-green*) or a verb (*highlight*).

Shifting to the second issue, the way a compound is written reflects the degree of union of the two combined words. Compounds are generally classified into closed compounds, open compounds and hyphenated compounds (Trach n.d.). Closed compounds consist of the union of (generally short) words which are written as one word, without spacing or hyphens, as can be observed in most of the examples given above. Open compounds, where the two words are separated by a space, represent more recent formations, and often feature the combination of longer words (*horse race*, *police station*). Hyphenated compounds represent an intermediate degree of union between open and closed compounds (*oil-free*, *dry-clean*).

Lastly, most compounds are assumed to have a grammatical head, which is considered as its most important part, from both a semantic and a syntactic point of view. Accordingly, compounds are divided into endocentric, exocentric and copulative compounds. The semantic head of an endocentric compound is inside the compound, gives it category specification and determines all the semantic and syntactic features of the compound (Plag 2003); e.g., an *ashtray* is a *tray*, hence *tray* qualifies as the head of the compound, and so is *fish* for *swordfish*. Compounds whose semantic heads cannot be identified as either of the two members are referred to as exocentric compounds (*outlaw*, *pickpocket*). Finally, we may observe a small group of compounds with two semantic heads (*sofa bed*); they are called copulative compounds.

2.2. German Compounds

German is a language which massively offers the possibility of combining words, especially nouns. The basic German compound word consists of two vocabulary items, although longer chains are often observed. Such chains, which in many languages often feature spaces or hyphens between the words, in German normally appear as one word, even when composed by more than two elements².

Furthermore, most German compounds are endocentric: in a word such as *Sprachschule* ('language school'), the second element, *Schule*, represents the head or primary word, and designates the larger set of which the compound noun is a part. It also establishes the gender of the compound noun, and may be inflected in the plural. The first item, *Sprach*, is the determinative element. It designates the subset of the category that the primary word defines.

The majority of German compounds are nouns which are formed out of the combination of two nouns (*Kugelfisch* 'puffer fish' [lit. sphere+fish]³, *Apfeltorte* 'apple pie'). But the

determinative element can also be a verb, which is represented by the stem, as in *Esszimmer* ([eat+room] ‘dining room’), *Lehrbuch* ([teach+book] ‘textbook’) or *Schreibtisch* ([write+table] ‘desk’), or an adjective/adverb: *Hochkultur* (‘high culture’), *Schwarzmarkt* (‘black market’), *Spätschicht* (‘late shift’).

However, also the head of the compound (hence the category of the whole compound) may be other than a noun: a verb, as in *teilnehmen* ([part+take] ‘participate’) or an adjective or adverb, as in *arbeitsbereit* ([work+ready] ‘ready to work’) or *vollbesetzt* ([full+occupied] ‘completely occupied’).

In German, there are also copulative compounds, where both elements can be regarded as head, especially when two adjectives are involved: *nasskalt* (‘wet and cold’), *süßsauer* (‘sweet-and-sour’).

As for exocentric compounds, according to Gast (2008), German (almost) completely lacks this category: it is not productive and there is only a handful of exceptions, such as *Habenichts* ([have+nothing] ‘an X that does not have anything’) or *Störenfried* (‘trouble-maker’)⁴.

2.3. Italian Compounds

Most of the general properties of compounds discussed above are also found in Italian, though, in this language, we may observe some important differences as well.

First of all, concerning category combinations, though N+N is overall the most common type also in this language (*pescecane*[fish+dog] ‘shark’, *ferrovia*[iron+way] ‘railway’), in Italian we observe several different patterns and, crucially, a very high number of compound nouns formed out of the V+N combination. In these compounds, the verbal part is always the left member,⁵ and the verb stem is employed. Some examples: *lava stoviglie*[wash+dishes] ‘dishwasher’, *portacenere*[carry+ash] ‘ashtray’, *cacciavite*[stick+screw] ‘screwdriver’, etc.

Regarding how compounds are written, in Italian, hyphens are hardly ever employed to separate the two members, if not (optionally) in loanwords from English, such as *baby-sitter*, or sometimes in A+A combinations (*grigio-verde*[gray+green] ‘green-gray’). Nonetheless, not all compounds written in one word without spacing or hyphens show the same degree of internal cohesion. Indeed, among what we have previously called ‘closed’ compounds, Italian scholars distinguish between ‘lexicalized’ compounds and ‘tight’ compounds.⁶ The former include compounds that have existed for a long time and are very frequently used, to the extent that speakers hardly realize they are compounds any longer and treat them as if they were simple words;⁷ examples of lexicalized compounds include *pomodoro* ([pommel+of+gold] ‘tomato’) and *ferrovia* (‘railway’). Conversely, in other compounds the internal degree of cohesion is less strong, and speakers are aware of their morphological complexity, though they are still written in one word without spacing; this is why they are called ‘tight’ compounds (e.g., *cassaforte*[chest+strong] ‘safe(N)’, *pescecane* ‘shark’), in order to distinguish them from the so-called ‘large’ compounds, which—like the above-mentioned ‘open’ compounds—are compounds of more recent formation, still written in two words with spacing in-between: *pesce martello* ([fish hammer] ‘hammerhead fish’), *divano letto* (‘sofa bed’).

If a large compound becomes more frequent in use, the link between the two words grows stronger, to the extent that it may be written in one word as well; around some of these compounds, indeed, different speakers have different intuitions, and sometimes, both forms with or without spacing occur (e.g., *pescespada* or *pesce spada* [fish+sword] ‘swordfish’).

However, the fact that a compound is defined as a word, though complex, implies that no modifier or other material can be inserted between the two parts of the compound, not even in large compounds where the two members are written separately; this is easily observed in the following examples:

- (1) a un grosso pesce martello
 b un pesce martello grosso
 c *un pesce grosso martello
 'a big hammerhead fish'.

Indeed, in (1), the adjective *grosso* 'big' may either precede or follow the whole compound, but it cannot be placed between the two members, i.e., after the semantic head, as in (1c).

Crucially, the greatest difference between Italian and German⁸ is observed in the presence and position of the grammatical/semantic head, as can be inferred from (1). Indeed, in Italian endocentric compounds, the head is not necessarily the rightmost element; on the contrary, it is generally the leftmost one: *pescecan* ('shark')—such as *pesce martello*—is a *pesce* ('fish'), *camposanto* ([field+holy] 'cemetery') is a *campo* ('field'), *pomodoro* ('tomato') is a *pomo* ('pommel'), and so on.

Furthermore, another important difference concerns exocentric compounds. Indeed, they are very numerous and productive in Italian, unlike in German,⁹ especially for what concerns nouns composed by V-stem+N, like those quoted above (e.g., *portacenere* 'ashtray', which is an X that carries ash). This is, however, not the sole possible pattern of exocentric compounds: see, for instance, A+A *pianoforte* ([low+loud] 'piano'), which is interpreted as 'an X that plays loud and low', or N+N *pellerossa* ([skin+red] 'red Indian'), which is 'an X that has a red skin'.

Finally, Italian also presents a few copulative compounds, such as N+N *cassapanca* ([chest+bench] 'chest') or A+A combinations such as *agrodolce* ([sour+sweet] 'sweet-and-sour').

2.4. Plural Inflection in Compounds

Another important environment where Italian crucially differs from German (or English) is the plural inflection of compounds.

To begin with, German endocentric compounds are always right-headed, as seen above; this implies that when the head is inflected in the plural, the whole compound is automatically inflected. Here follow some examples; cf. also the English translations, which pattern with German:

- (2) a Sprachschule -> Sprachschulen ('language school/s')
 b Grundwort -> Grundwörter ([basis + word] 'basic word/s')

This situation is reflected only in Italian endocentric right-headed compounds, such as (3a), but not by left-headed ones, such as (3b,c), which are by far the most numerous and productive:

- (3) a ferrovia -> ferrovie ('railway/s')
 b pesc spada -> pesc spada ('swordfish')
 c pesce martello -> pesci martello ('hammerhead fish')

As for exocentric compounds, most of them do not vary from singular to plural (but see the discussion that follows). Indeed, the majority of them is formed out of V-stem+plural noun; thus, the compound looks like a plural noun, even when it denotes a singular object:

- (4) un cavatappi, due cavatappi [take out+corks]
 'a corkscrew, two corkscrews'

However, the degree of union of the two parts of the compound strongly interferes with head position in determining plural inflection. Indeed, in lexicalized compounds, which are regarded by speakers as if they were simple words, as said above, plural inflection regularly changes the final vowel, independently of the head position:

- (5) a pomodoro -> pomodori ('tomato/es') left-headed endocentric
 b portacenere -> portaceneri ('ashtray/s') V+N exocentric
 c pianoforte -> pianoforti ('piano/s') A+A exocentric

Crucially, in (5a), unlike (3a), *pomo* is the head, but inflection regularly changes the last vowel as if it were a simple word, and internal inflection is no more visible.¹⁰ Conversely, (5b) is a compound formed out of a V stem + the mass noun *cenere* ('ash'), which has no plural; however, as the object denoted by the compound is countable, plural may regularly apply—irrespective of the exocentric nature of the compound—and the final vowel changes.¹¹ The same applies to (5c), which is an exocentric compound which merges two adjectives/adverbs into a noun.

As for Italian large compounds, they are mostly left-headed endocentric; hence, inflection regularly applies to the head noun, as in (3c) above, while the non-head noun remains unaltered.

To sum up, while most speakers agree on plural inflection of lexicalized compounds—treated as if they were simple words, hence changing their final vowel—and large compounds, where only the head is pluralized, there is a high degree of disagreement on pluralization of tight compounds, and more options are often allowed, as in the following example:

- (6) *pescecane* -> a *pescecane*
 b *pescecane*
 c ?**pescecane*

In this case, both (6a) and (6b) frequently occur:¹² the first option implies that the speaker judges this word as a tight compound—pluralizing it at the end but acknowledging that also its head, *pesce*, must be pluralized—while the preference for (6b) entails that the compound is considered as lexicalized (Scalise 1987, 1994). Interestingly, hardly any speaker accepts (6c), though this option is the sole possibility for most other types of (large) compounds with the head *fish*, as in (3c) above; cf. also *pesce/i palla* [fish ball] 'puffer fish', *pesce/i luna* ([fish moon] 'sunfish'), etc. Not accidentally, only *pescecane*, and optionally *pescespada*, are written in one word, while all the other compounds with *fish* are written separately, as if to underline the lower degree of union of the two words, which crucially depends on fortune and frequency in use.¹³

Finally, the few copulative compounds present different situations: in tight compounds, both heads are usually pluralized (*cassapanca* -> *cassepanche* 'chest/s')¹⁴, though in A+A compounds, plural inflection generally applies at the end (*grigioverde* -> *grigioverdi* 'green-gray'); in large compounds, plural inflection mostly applies at the leftmost member (*divano letto* -> *divani letto* 'sofa bed/s'). However, also in this case, speakers may have different preferences, depending on how strong the link between the two parts is perceived.

3. Code-Switching below Word Level and Mixed Compounds

Though the well-known constraints (mentioned in the Introduction)¹⁵ which ban mixing below word level overall apply, much research on CS has shown that there are, nonetheless, several exceptions to the rule. Indeed, across languages, it is not unusual to find mixed inflected words; see, e.g., Swahili–English *a-me-repeat* ('he has repeated/failed', in Myers-Scotton 1993), or Greek–English *i market-a* ('the market-feminine', in Alexiadou 2020).

According to Alexiadou and Lohndal (2018), the possibility of combining a root in one language, and the inflectional morpheme in another language,¹⁶ may be allowed when morpho-phonological constraints are not violated, in line with MacSwan (1999). Crucially, the language in which the functional morphology is expressed generally acts as the matrix language, in the sense of Myers-Scotton (1993, 2002), and determines the internal structure of the mixed word.

Furthermore, the availability of word-internal mixing also depends on the degree of morphological integration of the loanword (Poplack and Meechan 1995). See in this regard the Italian verb *formattare*, originated from the English verb *format*, to which the regular Italian inflections have been added.¹⁷ This is indeed allowed because *format* represents an adapted and stable loanword, which is perfectly integrated into Italian; if this were not the

case, the combination of an English stem and an Italian inflection would give rise to strong ungrammaticality (**walkare/eatare* ‘to walk/eat’), in line with Poplack’s (1980) assumptions.

Indeed, a lot of cases of CS below word level involve integrated loanwords: either words which are taken from a foreign language because they indicate a new object or concept which cannot be expressed with an indigenous word—as is the case for *formattare*, which has no exact Italian equivalent—or words which are borrowed because they bring along an extra meaning, modeled on the foreign word; this can account, e.g., for the Swahili verb *a-me-repeat* mentioned above, since the Swahili literal equivalent of *repeat*, *kurudia*, would not imply the meaning of *fail*, i.e., *repeat a class*.

A similar situation is witnessed for derivation: it is generally possible to have a foreign stem + an indigenous derivational affix only in the case of integrated loanwords, as observed in the Italian derived noun *formattazione* ‘formatting’.

The case of compounding is somehow different, as this phenomenon is not cross-linguistically homogeneous. In particular, languages differ in whether they combine stems, words or even phrases (with or without a linking element). Moreover, languages parametrize on the position of the semantic head within the compound, as seen in Section 2 above.

According to Muysken (2000), it is generally possible to have mixed compounds in languages which exhibit the same parametric choices,¹⁸ as mixed compounds are the result of a shared wordgrammar. In this regard, Alexiadou (2020) reports cases of German–English compounds such as *beachhäuser* (‘beach houses’) or *kettenstore* (chain store), which are allowed since both languages feature endocentric, right-headed compounds.

Turning to languages with different parametric choices, Treffers-Daller (2005) discusses some Dutch–French compounds such as *velo-winkel* (‘bicycle shop’) or *winter-paletot* (‘winter coat’); the author assumes that, in these cases, there is one language (Dutch) that acts as the matrix language and dictates the structure of the compound (right-headed). Alexiadou (2020) reinforces this assumption and reports many cases of mixed compounds involving Greek and different languages, in which the basic structure always conforms to the Greek language.

This being the general situation, in this work, we investigate mixed Italian–German compounds.¹⁹ This combination looks particularly interesting, in that the two languages exhibit a different parametric choice; therefore, we sought to investigate if Italian–German mixed compounds are accepted by bilingual speakers, as well as if one of the two languages (perhaps the language in which the sentence is mainly expressed) acts as the matrix language and dictates the structure of the compounds. Other interesting issues characterize this language pair, such as the (almost) non-availability of exocentric compounds in German vis-à-vis the great productivity of this pattern in Italian, as well as the questions involving gender and number inflection.

4. Mixed Italian–German Compounds: Research Questions

4.1. Head-Complement Parameter

As hinted at above, compounds represent an environment where morphology crucially interfaces with syntax, as shown by the fact that the head-complement parameter, which is typically implemented in syntax, also determines the form which compounds take in different languages.

It is by no means accidental that German (or English) endocentric compounds are all head-final, while Italian ones are mainly head-initial, as this mirrors the parametric order that these languages exhibit with respect to nouns and their adjectival modifiers. Indeed, in German (7a), an adjective always precedes the noun it modifies, while in Italian, the adjective generally follows the noun (7b); analogously, in compounds, the modifier precedes the head in German, and follows it in Italian (7a’,b’):

- (7) a ein grüner Fisch a' ein Schwertfisch
 b un pesce verde b' un pescespada
 'a green fish' 'a swordfish'

However, while in German, adjectives always precede the nouns they modify, the N-A order is not so strict in Italian, where some specific adjectives may precede or follow nouns, as in (8a',b') below.²⁰ This may explain the fact that, in parallel, we can find examples of head-final endocentric compounds in this language (8a), though they represent an exception and are not productive with respect to head-initial ones (8b); anyway, no head-initial compound is observed in German (or English):

- (8) a una nobildonna a' una gran donna
 'a noble woman' 'a great woman'
 b una donna cannone b' una donna grande
 'a cannon woman' 'a big woman'

According to Poplack's (1980) Equivalence Constraint, code-switching should not be possible where the two languages do not share the same basic parametric order (e.g., Italian–English * *un prato green* 'a green lawn'). By virtue of this restriction, no Italian–German mixed compounds should in principle be allowed, as the head-modifier relative order is different or, at most, this option should be limited to the few cases of Italian head-final compounds.²¹

This issue represents our first research question (RQ1):

RQ1. *In code-switching contexts, will bilingual speakers accept mixed compounds which combine an Italian word and a German word?*

If so, is this option limited to compounds which are head-final in both languages?

4.2. Integration Issues

As underlined above, compounding differs from derivation in several morpho-phonological aspects. In particular, unlike derivation, the compounding process does not handle bound morphemes but free morphemes, which do not equally contribute to the agreement relations within the clause, a fact which makes mixing theoretically more acceptable. Indeed, as seen in Section 3, mixed compounds seem to be possible if the borrowed portion is morpho-phonologically integrated into the clause expressed in the other language.

When the process of mixing compounds involves the Italian–German language pair, several interesting issues emerge, which we briefly summarize.

Regarding number inflection, the plural inflection of the compound and the plural inflection of the head noun necessarily coincide in German endocentric compounds, which are all head-final, while this is not always the case in Italian ones, as seen in Section 2.4 above. Actually, in the majority of Italian endocentric compounds, we observe an internal inflection, i.e., plural inflection attaches to the first member of the compound—the head—and not at the end of the complex word; we may also find cases of a double inflection, with plural morpheme attaching to both words.

Concerning gender, instead, in both German and Italian endocentric compounds, the gender of the compound coincides with the gender of its head; however, the nouns which form a mixed Italian–German compound may have a different gender in the two languages. This fact bears important consequences in the determination of the gender of the mixed compound, as well as on the gender of the determiner and eventual other modifiers which go along with it.

Indeed, the mixed Italian–German compound (hence its determiner and modifiers too) might receive the selected gender of the head noun, or the analogical gender, namely the gender of the equivalent noun in the other language. The choice of gender may also depend on the dominant language of the sentence, as well as on the morpho-syntactic features encoded in the D-head in the two languages: see, among others, Licerias et al. (2008) on agreement within the mixed DP.

Our second research question (RQ2) thus focuses on a crucial topic in CS studies on integration issues:

RQ2. *In Italian–German CS contexts, will we observe any difference in the acceptance rate of a mixed compound relating to the language in which the clause is mainly expressed?*

Furthermore, will gender and number issues interfere with the acceptance rate?

5. Test Design and Participants

In order to provide an answer to the research questions opened above, we administered to some bilingual speakers an Acceptability Judgment Task (AJT) scored on a 6-points Likert scale,²² as well as a sociolinguistic survey, collecting crucial information about the participants, specifically the acquisition age of the two languages, the use of them in the daily life and their attitude towards code-switching.²³

Four participants filled out the AJT: two Italian/German bilingual speakers (S and B) who have acquired the two languages since birth, and two highly fluent speakers, who have acquired one of the two languages during adulthood—one Italian L2 learner (C) and one German L2 learner (M).²⁴

The AJT consists of 101 test sentences containing mixed Italian–German compounds of different categories and types, as described in Sections 2.2 and 2.3 above. Of these, 52 mixed compounds are inserted in a German clause and 49 appear in an Italian clause. The test was administered online using Limes Survey in three separate sessions of around 100 sentences. Each session consists of randomized code-switched sentences centered on different grammatical structures and switching points. In particular, 33% are sentences with mixed compounds (test sentences), 18% are sentences with mixed DPs, 32% are code-switched ergative clauses and finally, 16% are grammatical and ungrammatical monolingual sentences with plural bare nouns in the subject position.

Before each session, we provided our speakers with the following hints to score the sentences of the test:

1. fully acceptable and natural
2. acceptable but not so natural
3. more or less acceptable
4. awkward, but not totally unacceptable
5. unacceptable
6. strongly unacceptable, horrible

The 101 test sentences were obtained from the manipulation of 13 Italian compounds and their German counterparts, which are also compounds: 5 compounds have a different gender in the two languages, 2 compounds are internally inflected for number in Italian and 3 compounds are head-final in both Italian and German. In (9–15) below, we report the category combinations of the 13 compounds, as well as the head distribution in the two languages:

	Italian	German	English translation
(9)	N+N (head-final)	N+N (head-final)	
	a. ferrovia	Eisenbahn	railway
	b. carta moneta	Papiergeld	paper money
(10)	N+N (head-initial)	N+N (head-final)	
	a. pesce palla	Kugelfisch	puffer fish
	b. pescespada	Schwertfisch	swordfish
(11)	N+A(head-initial)	A+N (head-final)	
	a. lavoro nero	Schwarzarbeit	undeclared work ²⁵
(12)	A+N	N+A	
	b. grigio topo	mausgrau	mouse gray

(13)	V+N (exocentric)	N+N (head-final)	
	a. portachiavi	Schlüsselanhänger	key holder
	b. tagliacarte	Brieföffner	paper knife ²⁶
(14)	P+N (head-final)	P+N (head-final)	
	sottopassaggio	Unterführung	subway
(15)	P+N (exocentric)	Prepositional Phrase	
	sottoscala	Raum unter der Treppe (approx.)	basement ²⁷
(16)	Prepositional Phrase	N+N (head-final)	
	b. torta di mele	Apfeltorte	apple pie
	c. camera da letto	Schlafzimmer	bedroom
	d. gamba del tavolo	Tischbein	table leg

With the exceptions of the compound pairs in (13), (15) and (16), where either the type of the compound or the translation differs in the two languages, the compounds listed in (9–12) are formed out of the combination of free morphemes that could be easily exchanged or mixed without modifying the meaning and the category of the output. For example, if in (9) we simply invert the Italian free morphemes *ferro* and *carta* with their German equivalents *eisen* and *papier*, we obtain the mixed compounds in (17).

(17)	N+N (head-final)	N+N (head-final)
	a. eisenvia	b. ferrobahn
	c. papiermoneta	d. cartageld

We also obtain two mixed compounds when we invert the Italian preposition *sotto* with the German preposition *unter* in the compound pair reported in (14):

(18)	P+N (head-final)	P+N (head-final)
	a. unterpassaggio	b. sottoführung

The complex nouns in (17) and in (18) are all mixed compounds sharing, in the two languages, the (final) position of head. However, when we manipulate an Italian–German compound pair displaying a different head position, as in (10–12), we obtain a different outcome. For example, in (10a,b), the substitution of the Italian (head) word *pesce* with its German equivalent *Fisch* and the Italian (modifier) words *palla* and *spada* with their German equivalents *Kugel* and *Schwert* leads to the following 8 mixed compounds:

(19)	N+N (head-initial)	N+N (head-final)
	a. pesce kugel	b. pallafisch
	c. fischpalla	d. kugel pesce
(20)	N+N (head-initial)	N+N (head-final)
	a. pesceschwert	b. spadafisch
	c. fischspada	d. schwertpesce

We tested the four patterns in (19) in both singular and plural forms in order to see which position of the plural inflection is preferred by the Italian–German bilingual speakers. In (21), we list the possible plural forms of the mixed compounds in (19):

(21)	N+N (head-initial)	N+N (head-final)
	a. pescikugel	b. Pescekugeln
	c. fischepalla	d. Fischpalle
	e. kugel pesci	f. Kugelpesci
	g. pallafische	h. Pallafische

As mentioned above, the monolingual compounds in (13) and in (15–16) sharply differ in Italian and German. If the nouns in (15–16) are compound nouns in only one of the two languages, those in (13) are exocentric compounds in Italian formed out of V+N and they correspond in German to N+N endocentric compounds. Moreover, in the case of the pair

tagliacarte and *Brieföffner* reported in (13b), even the meaning of the compounds is partly different in the two languages. In fact, the Italian feminine plural noun *carte* would have as an equivalent the German neuter plural noun *Papiere*, while the German masculine plural noun *Briefe* has as an equivalent the Italian feminine plural noun *lettere*. In short, in this case, we cannot simply invert the words because they do not overlap from either a semantic or a grammatical point of view; in particular, the Italian word *taglia* is a verb stem while the German word *öffner* is a noun.

Hence, in order to derive mixed compounds by manipulating (13) and (15–16), we replaced the words with their equivalents in the other language. This yields the following mixed compounds:

- | | | |
|------|----------------------|-------------------|
| (22) | V+N (exocentric) | N+N (head-final) |
| | a. portaschlüssel | b. chiavianhänger |
| | c. tagliapapere | d. carteöffner |
| | e. tagliabriefe | f. lettereöffner |
| (23) | P+N (exocentric) | |
| | sottotreppe | |
| (24) | Prepositional Phrase | N+N (head-final) |
| | a. apfeltorta | b. melatorte |
| | c. dormizimmer | d. schlafcamera |
| | e. tavolobein | f. tischgamba |

Given the strong differences exhibited by the Italian and German compounds in (13) and (15–16), the mixed compounds obtained in (22–24) might allow us to prove the role of the grammatical and semantic equivalence in the availability of switching below the word level.

6. Results

Though we are aware of the limits of this pilot work, and that a much higher number of participants would be necessary to draw more definitive conclusions, nonetheless the data collected until now exhibit an interesting inter-individual variation, which makes this field of investigation particularly promising.

Overall, the two L2 learners accept mixing below word level more frequently with respect to the bilingual speakers. However, in spite of the different degree of tolerance of mixed compounds, our AJT recorded an agreement among the participants with respect to the grammatical status of some mixed compounds. In other words, our participants agreed on the judgments attributed to some test sentences.

In particular, a general consensus was recorded on the acceptability of the mixed compounds in (17a) and (18a,b), which are head-final in both languages, while judgments on (17b) were not homogeneous.²⁸

In (25–26), we report the sentences with mixed compounds that have been judged as fully acceptable (1) or acceptable (2) by most of our participants:

- | | |
|------|--|
| (25) | Costruiranno una eisenvia
'they will build a (f.sg) railway' |
| (26) | a. Einige Demonstranten überqueren den Unterpasaggio
'Some demonstrators cross the (m.sg) subway' |
| | b. Alcuni manifestanti attraversano la sottoführung
'Some demonstrators cross the (f.sg) subway' |

Notice that in all the sentences above, as in monolingual speech, the head of the mixed compound assigns gender to the complex noun; in (25), the Italian singular feminine D *una* agrees with the Italian feminine head *via*; in (26a) the German masculine accusative D *den* agrees with the Italian masculine N-head *passaggio*, even though the German compound

Unterführung would be feminine; conversely, in (26b), the Italian singular feminine *la* agrees with the German feminine N-head *führung*.

Interestingly, all participants also agree in rejecting the mixed combinations obtained from compound pairs in (10a), reported in (19), independently of the language of the clause and the gender of the determiner. It is worth underlining that the sentences in (19) are derived from compound pairs having a different head position in Italian and German.

However, as we discuss later, we cannot completely rule out this type of mixed compounds. One of the four patterns presented in (20), *spadafisch*, and one in (21), *fischepalla* (inflected in the plural), were indeed accepted by the L2 learners.

The acceptable test sentences in (25–26), and the unacceptable sentences containing the mixed compounds in (19) above, are indeed the only test sentences which recorded a general (positive or negative) consensus among our participants. Concerning the other test sentences, we recorded different acceptability judgments which are connected to the age of acquisition and the different language dominance.

Besides accepting (25–26), S. (early bilingual) judged the sentence in (27a) more or less acceptable, the sentence in (27b,c) awkward but not totally unacceptable, and strongly rejected all the other mixed compounds.

- (27) a. ? Alcuni manifestanti attraversano il sottoführung
 b. ?? Einige Demonstranten überqueren die Unterpassaggio
 c. ?? Alcuni manifestanti attraversano l'unterpassaggio
 'some protesters cross the subway'

Hence, with the exception of (25–26) and (27), S. (early bilingual) assigns the score 6 (strongly unacceptable, horrible) to all the other test sentences with a mixed compound. In line with S., also B. (early bilingual) hardly tolerates mixing below the word level. However, the two early bilinguals sometimes provide different judgments. B., in fact, did not assign positive marks (1–2) to any test sentences with a mixed compound. However, a few test sentences were not completely rejected: (26a) was judged more or less acceptable (3), while (26b) and (27c) were judged awkward but not totally unacceptable (4).

Unlike the two early bilingual speakers, the two L2 learners are more flexible in scoring the test sentences. Crucially, according to their judgment, at least two mixed patterns among those available from the compound pairs in (19), having a different head position in Italian and German, become acceptable if they are inflected for plural number and inserted into an Italian clause. More precisely, M. (German L2) accepts the sentence in (28a), while C. (Italian L2) judges the sentence in (28b) as more or less acceptable. Even B. (early bilingual) judges (28b) and (28c) as awkward but not totally unacceptable:

- (28) a. Ho visto due fische palla
 b. ? Ho visto due pesci kugel
 c. ?? Ho visto due pallafische
 'I saw two pufferfish'

Moreover, the L2 learners partially accept the mixed compound *spadafisch*, and even B. (early bilingual) did not reject it completely. It is worth underlining that, however, their judgments change according to the dominant language of the clause. B. (early bilingual) judges the sentences in (29a) as awkward but not totally unacceptable and strongly rejects (29b). M. (German L2) judges the mixed compound in (29) as more or less acceptable independently of the language of the clause, while C. (Italian L2) accepts (29a) and judges the mixed compound *spadafisch* as awkward if inserted into a German clause, as in (29b).

- (29) a. Mangio solo spadafisch
 b. ? Ich esse nur Spadafisch
 'I only eat swordfish'

The language of the clause also interferes with the judgment of the mixed compounds derived from the pair in (9b) *cartamoneta/Papiergeld*, a compound pair sharing the head final position in the two languages. The mixed word *cartageld* was judged by M. (German

L2) more or less grammatical when it is inserted into an Italian clause (30a) and was rejected when it is inserted into a German clause as in (30b).

- (30) a. ? Pago solo con cartageld
 b. *Ich zahle nur mit Cartageld
 'I only pay with paper money'

C. (Italian L2), on the contrary, judges (30a) as awkward, (30b) as more or less acceptable and accepts the German sentence in (31) containing the mixed compound *Papiermoneta*.

- (31) Ich zahle nur mit Papiermoneta
 'I only pay with paper money'

In line with these data, the mixed compound *sottotreppe* also receives a different judgment according to the language of the clause where it is inserted. M. (German L2) accepts (32a) and classifies (32b) as awkward.

- (32) a. I cassetti sono nel sottotreppe
 b. ??Die schubladen sind in der Sottotreppe
 'the drawers are in the space under the stairs'

A different judgment, which may clearly be ascribed to the language of the clause, is provided also for the mixed compounds in (24a,b). Interestingly enough, C. (Italian L2) accepts the mixed compounds *apfeltorta* and *melatorte* if the language of the head (the Italian N *torta* and the German N *Torte*) matches with the language of the clause; see (33a,b).

- (33) a. Mangio una apfeltorta
 b. Ich esse eine Melatorte
 c. ?Ich esse eine Apfeltorta
 d. ?Mangio una melatorte
 'I eat an apple pie'

We also observed a matching between the language of the head of the mixed compound and the language of the clause in (34) below, judged grammatical by M. (German L2).

- (34) Ich kaufe ein Lettereöffner
 'I buy a paper knife'

The mismatching between the language of the head of the compound and the language of the clause may explain the negative judgments provided for the other mixed compounds listed in (22). In (35a) and in (36a), there is no match between the language of the clause and the language of the head, while in (35b,c) and (36c,d), there is no head at all, given that these mixed compounds are exocentric.

- (35) a. ? Compro un carteöffner
 b. ?/* Ich kaufe ein Tagliabriefe
 c. ?/* Ich kaufe ein Tagliapapiere
 'I buy a paper knife'
- (36) a. * Compro un chiavianhänger
 b. * Ich kaufe ein Chiavianhänger.
 c. ?/* Compro un portaschlüssel
 d. ?/* Ich kaufe ein Portaschlüssel
 'I buy a key holder'

However, the assumption that acceptability is favored by the matching between the language of the clause and the language of the head of the compound is only a tendency, which has been observed for the types of compounds listed in (22); that is, only for mixed compounds derived from the mixing of a V+N Italian exocentric compound and an N+N German endocentric compound.

In fact, this explanation does not account for the unacceptability of (36b), as well as the grammaticality of (26a,b), (28a), (29a) seen above and (37) below, judged as acceptable by C. (Italian L2):

- (37) a. Ich reserviere ein Schlafcamera
'I book a bedroom'

Other factors and restrictions come into play. For example, a mixed word such as *chiavianhänger* may be hard to process, given that the German noun *Anhänger*, the head of the mixed compound, is already a complex derived word (*an+hänger*). Moreover, the tendency may be related to the bilingual setting. For B. (early bilingual), *apfeltorta* in (33a,b) is judged as more or less acceptable independently of the language of the clause. More data are certainly needed to establish more precise tendencies.²⁹

7. Discussion

To sum up—and leaving aside, for the moment, the grammatical context (i.e., the dominant language of the clause, as well as gender and number of the determiner) and the external factors (i.e., the age of acquisition of the participants)—12 mixed compounds out of the 35 mixed combinations in (9–16), administered to our participants, were accepted.

In (38–41) below, we list them according to their category combinations, as well as to the head distribution of the monolingual equivalent compounds in the two languages:

- (38) Italian: N+N (head-final)/German: N+N (head-final)
a. eisenvia
b. unterpassaggio
c. sottomführung
d. papiermoneta
- (39) Italian: N+N (head-initial)/German: N+N (head-final)
a. spadafisch
b. fischepalla
- (40) Italian: V+N (exocentric)/German: N+N (head-final)
a. lettereöffner
- (41) Compound Noun available in only one language³⁰
a. sottotreppe
b. apfeltorta
c. melatorte
d. schlafcamera

The data in (38–41), as well as the general results described in Section 6, provide an answer to our RQ1. Indeed, some Italian–German mixed compounds are accepted by bilingual speakers. This possibility is not strictly limited to compounds which are head final in both languages, though this fact unquestionably contributes to a higher degree of acceptability. This tendency becomes even clearer if we take into consideration the ratio between the number of the accepted mixed compounds, grouped in (38–41), and the number of all possible mixed combinations available for each type of compound pairs. Crucially, four out of the six mixed compounds generated by manipulating the three compounds which are head-final in both Italian and German were accepted, as seen in (38), while only 1 out of the 12 mixed compounds with a different head position in the two languages was judged as acceptable (39a).³¹

We also have a low acceptance ratio of mixed compounds involving the two V+N exocentric Italian compounds and their German endocentric equivalents: only one out of six mixed compounds of this group was accepted (40); this may be due to the fact that exocentric compounds are unproductive in German, and hence they are regarded as something extraneous to this language. Interestingly enough, the acceptance ratio increases when an Italian or German compound, which does not have a literal equivalent in the other

language, but rather a N+PP constituent, is involved: in this subgroup, four out of the seven mixed compounds administered to our participants were judged as acceptable (41).

Therefore, on the basis of the 12 accepted mixed compounds in (38–41), we may tentatively formulate the following generalization:

- (42) a The acceptance rate of a mixed Italian–German compound increases if:
- (i) The two languages have two equivalent compounds with the same head position; or
 - (ii) A compound in one language corresponds to a N+PP in the other language.
- b The acceptance rate of a mixed Italian–German compound decreases if the two languages have two equivalent compounds with different head positions.

As stated above, the conditions reported in (42) are only a first attempt to draw a generalization, which answers our RQ1; more data are certainly needed in order to prove if they represent only a tendency or they may be translated into a general constraint.

Finally, concerning integration issues (RQ2), we must take into consideration the grammatical contexts in which we inserted the 12 mixed compounds in (38–41). As we have seen in the previous section, the acceptability rate of a compound seems to increase when the head of the compound is expressed either in the dominant language of the clause, or in the dominant language of the participant (in the case of L2 learners). Moreover, in the compound pairs having a different gender in Italian and German, it is always the selected head that assigns gender to the mixed compound; see again (25)–(26) above.

Significantly, in an Italian–German mixed compound inserted into an Italian clause, as in (28a), the German head, placed on the left, may be inflected for plural, a fact which is never observed in a German monolingual compound. This underlines how the matrix language (Italian) governs syntactic rules, in line with Myers-Scotton's (1993, 2002) assumptions: indeed, the mixed left-headed endocentric compound in (28a) shows internal inflection as if it were a monolingual Italian compound.³²

To sum up, our data seem to be in line with the null hypothesis of code-switching (Mahootian and Santorini 1996): indeed, no extra rules—apart from those which regulate the grammar of the two languages—are needed in order to explain the restrictions that we have recorded in our study of mixed compounds.

Crucially, the availability of mixing in the compounding process mirrors a CS constraint which is at work at sentence level: the Equivalence Constraint advanced by Poplack (1980). As a matter of fact, mixing is unquestionably favored when the two languages/constructions share the same word order parameter. This fact may contribute to the study of the nature of the compounding process itself, suggesting that it is definitely a syntactic phenomenon.

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Notes

¹ This work is the result of the collaboration of the two authors in all respects. Nevertheless, Gloria Cocchi takes responsibility for Sections 2, 3, 4.1 and 7, and Cristina Pierantozzi for Sections 1, 4.2, 5 and 6.

² <https://www.dartmouth.edu/deutsch/Grammatik/Wortbildung/Komposita.html>, accessed on 5 January 2022.

³ In Sections 2.2 and 2.3, when German and Italian compounds are different from their English translations we provide literal glosses between square brackets the first time we mention them; the symbol + is used in the glosses to single out the two parts of the compound when it is written in one word in the original language.

- 4 Formed out of *stör-den-Fried[en]* [lit: disturb+the+peace] (Gast 2008, p. 279).
- 5 Indeed, if we combine N+V the result is a verb, as in *manomettere* ([hand+put] ‘tamper’).
- 6 See Scalise (1994), Grossman and Rainer (2004) and the references quoted therein.
- 7 See the discussion on plural inflection that follows.
- 8 English patterns with German in this regard, as can be easily detected from the translations of the Italian examples.
- 9 In English, exocentric compounds occur much more than in German, but they are not as numerous and productive as in Italian.
- 10 The plural form *pomodoro* (recommended in old grammar books, as reported by Scalise (1987, p. 227)), which pluralizes the head of the compound, is still attested in dialectal/substandard varieties, but it has now almost disappeared in standard Italian, especially among younger people. Interestingly, in many varieties the final *-o* of *pomodoro* has been reanalysed as a singular inflection, so that *pomodoro* is used also as a singular noun, with *pomodori* as its plural (map nr. 1374). (<https://navigais-web.pd.istc.cnr.it/> accessed on 23 June 2022).
- 11 For many speakers, this compound is judged invariable (*i portacenere*). The different judgment depends on the speakers’ attitude towards this word: those who prefer *i portacenere* judge it as a tight compound, while those who prefer *i portaceneri* judge it as lexicalized (Scalise 1987, 1994).
- 12 Several groups of students of Linguistics at the University of Urbino, in different years, have been asked to provide the plural form for *pescecane*; they almost equally divided into *pescecani* and *pescicani*, while hardly anybody chose *pescicane* (personally collected data).
- 13 Indeed, this is due to the fact that the word *pescecane* is widely known by everyone and frequently found also in books and cartoons for children (one in all, Pinocchio), and *pescespada* is often eaten in Italy; all the other words indicating fish are definitely rare in everyday speech.
- 14 *Cassapanca* is a special type of chest where one can sit on top; indeed, *panca* means *bench*.
- 15 Cf. again Poplack (1980), MacSwan (1999) and related work.
- 16 Alexiadou and Lohndal (2018), indeed, offer a detailed discussion of word-internal mixing, involving several different language pairs.
- 17 Indeed, this verb behaves like any regular Italian verb and combines with all tense/person inflections such as *io formatto* ‘I format’, *tu hai formattato* ‘you have formatted’, and so on.
- 18 Concerning the head-modifier parameter.
- 19 To the best of our knowledge, this topic has not been discussed thus far in the literature.
- 20 Crucially the different position of the adjective with respect to the noun correlates to a difference in meaning, as can be observed in the translations of the examples in (8a’, b’). Nevertheless, most classes of adjectives do not admit the pre-nominal position; cf. ?* *un verde pesce* ‘a green fish’ (marginally possible in the language of poetry), * *un italiano uomo* (‘an Italian man’).
- 21 It is indeed possible to find, in CS contexts, a few cases of mixed N-A combinations where the two languages do not exhibit the same parametric order. Following Cantone and MacSwan (2009), the language in which the adjective is expressed should determine the reciprocal order of N and A in these cases.
- 22 Unfortunately, we could find no evidence of actually produced mixed Italian–German compounds in spontaneous conversations in CS contexts, nor do we know whether such data have been reported in the literature.
- 23 An anonymous reviewer pointed out that the reliability of late bilinguals’ grammatical judgments has been called into question (Johnson and Newport 1989 among others). Naturalistic data and experimental data, such as acceptability judgment data, clearly present advantages and disadvantages. However, it is worth underlining, as highlighted by Gullberg et al. (2009, p. 22), that “different methods and techniques allow different questions to be answered”. Recent studies on methodological issues in CS have convincingly shown that judgment data represent a powerful methodological task in the study of the I-Language of bilingual speakers (see (González-Vilbazo et al. 2015; Badiola et al. 2017; Stadthagen-González et al. 2018) for a detailed discussion). The main aim of the present study is to uncover the interface between syntax and morphology by studying the grammatical restrictions observed in code-switching data. For future work, we plan to overcome the disadvantages presented by this methodology by integrating the results with data collected with different experimental techniques and methodologies.
- 24 For this pilot study, we were able to collect complete data from only four participants. However, we are planning to discuss a more consistent quantity of data in future work.
- 25 Lit. ‘black work’.
- 26 Lit. cut+papers (It.); letter+opener (Germ.).
- 27 Lit. under+stair (It.); place under the stair (Germ.).
- 28 Among our participants, different judgments were provided by B. (early bilingual) and C. (Italian L2). In particular, B. (early bilingual) judges (18a) as more or less acceptable, (17a) and (18b) as awkward, but not totally unacceptable. C. (the Italian L2) scores (17b) as more or less acceptable.

- 29 Indeed, a higher amount of data would allow us to run a statistical analysis, which is ineffective at this stage of the work. Hence, in the present paper, we simply offer a qualitative analysis of the collected data, and we postpone a quantitative analysis to future work.
- 30 As seen above, some compounds in one language may correspond to N+PP in the other language, as seen in, e.g., Germ. *Apfeltorte* vs. It. *torta di mele* ‘apple pie’.
- 31 In this calculation, we have not comprehended plural forms, such as (39b), since we have included only a few of them in the AJT. We postpone to future research a more detailed discussion of compounds inflected in the plural.
- 32 The interplay of mixed compounding and plural inflection will be discussed in detail in future research; here, we have only hinted at possible implications.

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