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# BOUND STEM PROCESSING IN L1 AND L2 ITALIAN

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SABRINA PICCININ SERENA DAL MASO HÉLÈNE GIRAUDO

In this work, we investigate the processing of bound stems in L1 and L2 Italian in order to verify whether their lack of autonomy is a factor affecting processing mechanisms or whether, on the contrary, they are processed in the same way as free and autonomous stems. In paradigmatic approaches, morphological connections among words are established on the basis of simultaneous semantic and formal similarities; consequently, morphologically complex words should be considered as members of the same family even if they do not share a proper segmentable and autonomous stem. In order to answer our research question, we conducted a masked-priming experiment where derived target words (*giornalismo*, *terrore*) were primed by derived words comprising free (*giornalista*) and bound stems (*terribile*). Results indicate similar effects yielded by free and bound stems on the recognition of morphologically related words relative to both an unrelated and an orthographic condition with native speakers. With non-native speakers, however, the facilitation observed in the morphological condition was significant relative to both the unrelated and orthographic conditions only in the free set. With bound stems we did observe an effect, which was however significant only relative to the unrelated baseline. We conclude that the lack of a transparent, segmentable and autonomous status does not affect L1 processing mechanisms as predicted by paradigmatic approaches, while for L2 speakers the establishing of truly morphological relationships might be impaired by formal opacity. Our interpretation is in line with models of L2 processing which acknowledge the role of morphology, while admitting a possible interference of formal aspects.

KEYWORDS: bound stems, morphological processing, second language acquisition

## 1. INTRODUCTION

Psycholinguistic research on morphological processing conducted on different languages has been able to provide evidence for the role of morphological paradigms in the organization of the mental lexicon, at least as far as native speakers are concerned (for a review, see Diependaele, Grainger & Sandra 2012; Feldman & Weber 2012). For learners of a second language, the debate is still open as to whether morphology structures their lexical organization to the same extent. Moreover, research on less prototypical cases (i.e., opaque

derivations where either form or meaning are not straightforwardly related to the base of derivation) in both L1 and L2 domains is still in progress, as focus on such cases is supposed to provide a better insight on the way morphology actually drives lexical organization and access. In other words, research has convincingly proved that most transparent derivations (where no semantic and formal disruption of the base intervenes) such as *darkness* are perceived by speakers as being related to their base (*dark*), while less transparent cases are still at the centre of debate.

In this work, we concentrate precisely on one of such cases, bound stems, i.e., stems made up of a lexical root that cannot occur in isolation, but needs to have a derivational affix (either a prefix or a suffix) attached to it (e.g., *deceive* – *receive*). We propose to focus precisely on the processing of such words in order to clarify the type of lexical connections establishing in paradigms involving bound stems compared to those existing in paradigms involving free isolable stems. Our aim is thus to provide psycholinguistic evidence to the claim that morphologically complex words could be considered as members of the same family even when they do not share a proper segmentable stem.

Bound stems, by definition, pose a problem for morphological theories that are strictly morpheme-based and that consider the morpheme as the smallest meaningful unit, given the lack of an identifiable meaning inherently entailed by stems which have no lexical existence on their own. Since no overt morpheme segmentation can be assumed, morpheme-based approaches have traditionally considered words containing bound stems (e.g., *survive*) as mono-morphemic (e.g., Marchand 1969). Aronoff (1976) criticized this traditional view in favour of a theory based on words in which it is sufficient that speakers are able to isolate and recognize an element to perceive it as a morphemic unit.

On the other hand, in paradigmatic approaches (e.g., Bybee 1985; Booij 2010), where morphological connections among words are established on the basis of simultaneous semantic and formal similarities, bound stems are recognized a status since, «even though they have no corresponding base word, the meaning of one member of a pair can be defined in terms of that of the other member» (Booij 2010: 29). Indeed, a word-based approach seems to be more adequate to give an account of how such stems may be represented in the mental lexicon. More specifically, the mental lexicon posited by such models is structured not only by the relationship between a derived word and its base but, crucially, also by the relationships establishing between derived words exhibiting the same degree of internal complexity. In Booij's Construction Morphology (Booij 2010), the issue of 'baseless' derivations is extensively discussed (see also Booij & Audring 2018) and fully developed within

a theory of constructional schemas. In such derivatives, word complexity can be accounted for on the basis of (potential) multiple schemas. On the one hand, across ‘baseless’ words such as *altruism*, *autism*, *baptism*, a generalization can be formulated on the basis of the shared semantic categories that they express via the suffix *-ism*. In other terms, we can relate words ending with the suffix *-ism* and identify a common semantics even if the first part is still semantically opaque: «the meaning of complex words can better be defined over the entire word than over their individual morphemes» (Booij & Audring 2018). On the other hand, relationships between two or more sets of words derived from the same base are also established. In the example of nouns in *-ism*, a relationship also emerges with the derivatives ending with the suffix *-ist* and sharing the same stem. This suffix is often utilized to denote a person involved in some kind of disposition or ability Y (a variable associated with the specific nature of the phenomenon under consideration) and alternates frequently with the same bases with which *-ism* occurs (as in *altruism* – *altruist*, *autism* – *autist*, *baptism* – *baptist*, see Booij 2010: 30-33). Therefore, a paradigmatic relationship between the schema for words in *-ism* and those in *-ist* can be established by way of what is called a second-order schema, i.e. a schema which can express the parallelism between words with the same degree of internal complexity (in this case, between two derived words). Ultimately, word internal complexity emerges as a consequence of such systematic paradigmatic relationships between sets of words.

In the present work, we aim at verifying the validity of such a theoretical framework by focusing on whether bound and free stems are processed differently in Italian, a morphologically rich language in which the phenomenon is largely found. To this aim, we compare the priming effects induced by both free and bound stem derivatives.

As far as L2 processing is concerned, the present study proposes to investigate the issue of bound stem processing for the first time. The research sets into the more general question relating to the existence of potential differences between the mechanisms underlying L1 and L2 processing (see Giraudo & Dal Maso 2018 for a review of the debate). So far, the effects of morphology emerged quite systematically in masked-priming experiments which focused on formally and semantically transparent base-derivative relationships in a certain number of L2s (mainly English: Silva & Clahsen 2008; Diependaele et al. 2011; but also German, Turkish and Italian: Jacob et al. 2017; Kirkici & Clahsen 2013; Dal Maso & Giraudo 2014). Nonetheless, the interpretation of such effects is far from being univocal. According to one line of research, the mechanisms underlying native and non-native processing would be substantially different because of age-related effects (Silva & Clahsen 2008; Neubauer & Clahsen 2009; Clahsen & Neubauer 2010; Jacob, Fleischhauer & Clahsen 2013). Opposite views claim that no such differences exist between

L1 and L2 processing mechanisms and propose that any observed difference in native and non-native performances might be a consequence of processing mechanisms being less automatized, possibly because of lower levels of proficiency, limited exposure to the L2 input and cross-linguistic influence (Feldman & al. 2010; Diependaele & al. 2011; Voga et al. 2014).

Given the relatively small number of studies on the issue, our first goal is to contribute to the existing body of L2 research with data from the processing of Italian derivational morphology. In particular, according to recent claims (e.g., Heyer & Clahsen 2015), previous findings on morphological priming effects might be due to the formal similarity among morphological relatives rather than the perception of morphological relationships *per se*. In other words, what has been considered to be a morphological effect might be formal in nature.

In the light of such claims, bound stems seem particularly interesting to provide insights about the relative contribution of form to morphological processing in non-native speakers. Since they can never appear in isolation as autonomous words, it is legitimate to ask whether such stems are still perceived as such by L2 speakers, i.e. whether morphological paradigms are still established when forms are indirectly related.

Before introducing the experimental part of this work, we will briefly summarize the main outcomes of the psycholinguistic research previously conducted on bound stem processing. Since, to our knowledge, no prior study on second language processing has been conducted with regard to this issue, we will necessarily concentrate only on evidence found in native processing.

## 2. PREVIOUS STUDIES ON BOUND STEM PROCESSING

The issue of the processing of bound stems has been previously investigated in the field of L1 processing, though mainly with reference to English (but see, e.g., the recent study by Giraud & Voga 2016), from different perspectives and using different methodologies.<sup>1</sup>

The seminal study by Taft & Forster (1975) specifically addressed this issue by means of a lexical decision task. In this study, decision times for bound stems presented in isolation (i.e., stimuli which should be rejected since they are not real words, e.g., *juvenate*) and for non-words which are not stems (e.g., *pertoire*) were compared. Interestingly, participants were faster in rejecting the *pertoire*-type. Moreover, their reaction times for bound stems were

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<sup>1</sup> See also the series of experiments presented in Burani (1990); Burani, Laudanna & Cermele (1992); Chialant & Burani (1992), which deal with the specific issue of prefixed verbs comprising bound stems in Italian by using production tasks. Given the different domains of investigation, we do not discuss such studies here.

longer also when these were presented combined with a prefix (e.g., non-words such as *dejuvenate* and *depertoire*). Such results were taken as evidence of the fact that bound stems are indeed represented independently in the lexicon (see also Taft 1979, 1994).<sup>2</sup>

Another body of research on the processing of bound stems is constituted by priming experiments, where the relationship between two words is investigated. The study by Stanner et al. (1979) first focused on this issue by means of a long-lag priming experiment. In their experiments, words such as *progress* were reliably primed both by relatives such as *regress* and by their bound stems presented in isolation (e.g., *-gress*). Moreover, comparable effects were obtained for words with free stems (e.g., *true – untrue*), suggesting similar processing mechanisms for bound and free stems.<sup>3</sup>

Contrasting evidence comes from the cross-modal priming study by Marslen-Wilson et al. (1994). Their data revealed no facilitation effect for pairs of prefixed words sharing a semantically empty bound stem (e.g., *submit – permit*), while prefixed free stems such as *unfasten – refasten* strongly primed each other. Given that the difference between the two types of pairs lied in their degree of semantic transparency, the authors conclude that semantically opaque bound stems have no representational status on their own and that words containing them would be perceived as monomorphemic. While the study provides interesting insights about bound stem processing, it is difficult to disentangle the effects of semantic transparency and stem autonomy, which, although related, do not necessarily need to co-exist.

More recently, the issue of the representation of bound stems has been investigated through the use of the masked priming paradigm (where the prime is not consciously perceived by participants). Forster & Azuma (2000), considering prefixed bound stems, found the same amount of facilitation triggered by free stem (*happy – unhappy*) and bound stem (*survive – revive*) primes. However, the RTs in these two conditions did not differ from the ones obtained in the orthographic control condition (*shallow – follow*) and reliable effects (i.e., different from the orthographic ones) were only obtained when increasing the SOA from 50 ms to 68 ms.

Two more studies conducted on English further revealed some aspects of

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<sup>2</sup> In this study, the author conceded that the stimuli used in the Taft & Forster's study might have been poorly controlled and proposes the same experiments with better controlled items. Results confirmed the findings of the previous study.

<sup>3</sup> Similar findings were found in a primed auditory lexical decision task by Emmorey (1989), in which facilitation effects for pairs such as *conceive – deceive* emerged. See, however, discussion in Marslen-Wilson et al. (1994), suggesting that these effects might have been partly due to phonological similarities.

the early stages of processing of bound stems by means of the same methodology. Pastizzo & Feldman (2004), in a study where free and bound stem processing was compared, found robust priming effects in the morphological condition for both free and bound stem items, when compared to the unrelated condition. However, when such effects were assessed relative to the orthographic condition, a significant tendency towards greater facilitation for free stem primes emerged (in line with the results by Forster & Azuma 2000). No effect of form was instead found by the study by Taft & Kougious (2004), who concentrated on bound stems retaining a constancy of meaning (e.g., *virus* – *viral*) and compared the priming effects for such pairs to those triggered by pairs which were only phonologically or orthographically related (*future* –  *futile*; *saliva* – *salad*) and by semantically related ones (*pursue* – *follow*). Given that priming was only observed for the bound stem condition, the authors claim that semantic transparency is a key determinant for facilitation to occur.<sup>4</sup>

We conclude this review with the recent study on French presented by Giraudo & Voga (2016), who contributed to the analysis of bound stem processing taking a step further into the issue of their representational status. Specifically, their interest was set on demonstrating that, although derived words sharing a bound stem can give rise to facilitation effects, this is not due to activation of an independently represented bound stem. The results from their series of experiments confirmed their hypothesis in that priming between bound stem derivatives was significantly larger compared to both orthographic controls and bound stems presented in isolation (e.g., *terr-* used as a prime for *terrible*, ‘terrible’). Such findings would therefore locate morphological effects at a more central level rather than positing access via a morphemic unit (e.g., *terr-* in their example).

While keeping in mind that most part of the findings described above comes from experiments conducted on English, a clear tendency emerging from these studies indicates that words containing bound stems are perceived as morphologically structured, at least when some sort of meaning continuity

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<sup>4</sup> However, it should be noted that their orthographic pairs, such as *future* –  *futile*, while superficially comparable to semantically empty bound stem pairs, are by no means similar to morphologically structured items such as *permit* – *submit*, in which a stem could be recognized by virtue of its appearance with other affixes. On the other hand, it is true that in this study the authors refer generically to *virus* – *viral* as sharing initial orthographic units rather than as bound stems. Elsewhere in the study (Taft & Kougious 2004: 11), these subunits are referred to as ‘bound morphemes’. It appears not entirely clear whether the aim was to investigate bound stems or only pairs with a shared semantics which have initial overlapping orthography. Confusion is added by the fact that the entire set of items used is not presented and in the examples provided by the authors some words could be more properly labelled as bound stems, given their occurrences with affixes, while for some others this would be more dubious.

can be found between them. In this study, we will further investigate the issue, by providing additional cross-linguistic evidence and, importantly, by verifying whether the same considerations hold for non-native speakers of a language.

### 3. THE PRESENT STUDY

The main aim of this study is to observe whether primes containing both bound and free stems trigger significant morphological facilitation on the recognition of targets sharing the same stems. To this purpose, we designed a masked priming experiment involving derived words sharing both bound and free stems as primes and targets. Even if no recognizable constituent can be isolated in words with bound stems, we can anticipate that, if words are indeed organized in terms of paradigmatic morphological series, we should be able to observe morphological priming. Such a result would also be consistent with what was previously found in other languages.

On the other hand, as far as L2 processing is concerned, our purpose is twofold: on the one hand, we aim at adding to the existing body of research on L2 processing by verifying whether facilitation can be found between derived words belonging to the same morphological family and displaying the same morphological complexity (so far, only the base-derivative relationship has been investigated). On the other hand, we seek to verify whether such a facilitation would still be present when those morphological relatives share a stem which is not autonomous.

#### 3.1 *Stimuli and design*

In the selection of materials, we concentrated on suffixed words containing bound stems which are semantically interpretable on the basis of other words they appear in. The design of the experiment features derived words for both primes and targets in the morphological condition (e.g., *terr.ore* – *terr.ibile* ‘terror – terrible’). For the sake of consistency, the same criteria were applied to the set of items sharing a free stem (*giornal.ismo* – *giornal.ista* ‘journalism – journalist’). Derived words in both sets exhibited a range of different suffixes:<sup>5</sup> while their characteristics (e.g., length and frequency) were not controlled in the experiment, we made sure that the same range and numbers of suffixes were present in the two sets of items. Overall, 72 suffixed words containing bound and free stems (36 + 36) were selected as targets. Four priming

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<sup>5</sup> The selection of suffixes was mainly determined by the availability of words with bound stems in Italian. Chosen suffixes were: *-(a/e)nza*, *-(a/e)nte*, *-ismo*, *-ista*, *-zione*, *-ivo*, *-oso*, *-tore*, *-ibile*, *-ore*, *-ido*, *-tura*.



conditions were included in the experiment: identity, morphological, orthographic, and unrelated.

All primes were matched for frequency and length, with frequency being given priority.<sup>6</sup> The experimental design, along with mean frequency and length values, is summarized in the table below:

Condition	Free stem set	Freq	Length	Bound stem set	Freq	Length
<b>Identity</b>	giornalismo/ GIORNALI- SMO 'journalism/ JOURNA- LISM'	3.95 (0.58)	9.7 (1.7)	terrore/ TERRORE 'terror/ TERROR'	3.78 (0.53)	8.5 (1.4)
<b>Morpho- logical</b>	giornalista/ GIORNALI- SMO 'journalist/ JOURNA- LISM'	3.73 (0.51)	9.4 (1.6)	terribile/ TERRORE 'terrible/ TERROR'	3.61 (0.55)	8.3 (1.4)
<b>Ortho- graphic</b>	giocare/ GIORNALI- SMO '(to) play/ JOURNALISM	3.68 (0.45)	8.3 (1.5)	terrazza/ TERRORE 'terrace/ TERROR'	3.57 (0.58)	7.4 (1.4)
<b>Unrela- ted</b>	edificio/ GIORNALI- SMO 'building/ JOURNA- LISM'	3.76 (0.42)	8.1 (1.5)	recita/ TERRORE 'performance/ TERROR'	3.60 (0.52)	7.4 (1.1)

TABLE 1- EXPERIMENTAL DESIGN.

Finally, 72 non-word prime-target pairs were created using a combination of non-existing stems + existing suffixes (*grofalico* – *grofalismo*). For each target, the correspondent identity, orthographic and unrelated primes were created, so to have overall four experimental lists with 144 targets (72 words + 72 non-words) each. Targets were rotated across the four priming conditions by means of a Latin square design, so that participants, who received only one

<sup>6</sup> T-tests between frequency values indicated no significant differences: bound stem set: morphological – orthographic:  $t(35) = 0.33$ ,  $p = .738$ ; morphological – unrelated:  $t(35) = .18$ ,  $p = .856$ ; free stem set: morphological – orthographic:  $t(35) = 0.89$ ,  $p = .375$ ; morphological – unrelated:  $t(35) = -0.58$ ,  $p = .562$ ). Frequency counts were extracted from the ItWac Corpus (Baroni et al. 2009).

list, could see each target only once, in one of the possible four conditions.

### *3.2 Participants*

47 native speakers of Italian, aged from 23 to 36 years (mean age: 26.6) and 35 learners of Italian<sup>7</sup>, aged from 24 to 37 (mean age: 27.6), who were living in Italy at the time of testing, participated in the experiment on a voluntary basis. They all had normal or corrected-to-normal vision and a high-school or university educational background. The proficiency level of non-native participants was self-assessed (proficiency levels ranging from B2 to C1 of the Common European Framework for Languages) with ratings given on: written production, oral production, listening and reading comprehension. None of the ratings on single abilities was below B2 (Vantage). Participants were recruited among students at the University of Verona (where non-native students need to have at least a B2 certificate to be enrolled) or in private schools of Italian in Italy (in upper-intermediate or advanced courses). None of the L2 participants reported considering themselves bilingual.

### *3.3 Procedure*

The experiment was run on a PC computer using the DMDX software (Forster & Forster 2003). Each trial consisted of three visual events: the first was a forward mask made up of a series of hash marks that appeared on the screen for 500ms. The mask was immediately followed by the prime, which appeared on the screen for 66 ms. The target word was then presented and remained on the screen until participants responded or timed-out (after 3000 ms). To minimize visual overlap, primes were presented in lowercase and targets in uppercase, both in Arial 16. Participants were instructed to decide as quickly and accurately as possible whether the target stimuli they saw were words or not, by pressing the appropriate buttons on the keyboard. They were not aware that a prime word was presented. After 20 practice trials, participants received the 144 items in two blocks.

### *3.4 L1 Results*

Data were cleaned considering accuracy rates for participants and items: given the high accuracy rate (higher than 85%), none of them were excluded. Incorrect responses and timeouts were removed (1.95%) and only correct responses to word trials were analysed. RTs that were two standard deviations

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<sup>7</sup> Participants had different L1 backgrounds: French (7), Spanish (5), English (3), German (6), Bulgarian (2), Romanian (6) and Russian (6).

above or below the mean were treated as outliers and consequently removed (4.40%). Remaining data were entered into by-subject and by-items ANOVAs, with Prime Type and Stem Type as within-participants factors in the subject analysis and Prime Type as within- and Stem Type as between-participant factors in the item analysis.

The analysis of reaction times showed a significant main effect of Prime Type ( $F(3,138) = 21.85, p < .0001, F(3,210) = 16.43, p < .0001$ ). Stem Type, on the other hand, had no significant main effect ( $F_s < 1$ ) and neither did the interaction of Prime by Stem Type ( $F_s < 1$ ). Morphological primes were found to facilitate target recognition in both sets, i.e., independent of stem type. Despite the absence of significant interaction between the two factors, exploratory planned comparisons were run to have a more fine-grained picture of such results. The effect of morphological primes was significantly different from that induced by unrelated (free stem set:  $F(1,46) = 12.07, p < .01; F(2,1,35) = 12.91, p < .01$ ; bound stem set:  $F(1,46) = 41.15, p < .0001; F(2,1,35) = 16.58, p < .01$ ) and orthographic primes (free stem set:  $F(1,46) = 6.14, p < .05; F(2,1,35) = 5.92, p < .05$ ; bound stem set:  $F(1,46) = 12.13, p < .01; F(2,1,35) = 10.43, p < .01$ ). Net priming effects and significant effects are shown in the table below:

	Prime type	RTs	SD	U-I	U-M	O-M
<b>Bound stem set</b> terribile – terrore 'terribile – terror'	Identity	612	111	51*	46*	26*
	Morphological	617	110			
	Orthographic	643	118			
	Unrelated	663	106			
<b>Free stem set</b> giornalista – giornalismo 'journalist – journalism'	Identity	611	114	39*	31*	25*
	Morphological	619	109			
	Orthographic	644	132			
	Unrelated	650	112			

TABLE 2 - MEAN REACTION TIMES, STANDARD DEVIATIONS, AND NET PRIMING EFFECTS (L1): \* =  $P < .05$ .

### 3.5 L2 results

In the L2 sample, not surprisingly, accuracy rates were overall lower compared to native speakers' performances, therefore the accuracy threshold

for non-native speakers was set at 70%. Such procedure led to the exclusion of five participants. Incorrect responses and timeouts (4.4%) were removed and only correct word responses were submitted to analysis. Data points which were two standard deviations above or below the mean reaction time were also excluded (4.68%).

The analysis of reaction times showed a significant main effect of Prime Type ( $F(3,87) = 6.79, p < .01, F(3,210) = 7.73, p < .0001$ ). Stem Type had no significant main effect ( $F_s < 1$ ) and neither did the interaction of Prime by Stem Type ( $F_s < 1$ ). In both sets, a significant effect of morphological primes relative to the unrelated baseline emerged (free stem set:  $F(1,29) = 9.45, p < .01; F(1,35) = 5.22, p < .05$ ; bound stem set:  $F(1,29) = 5.97, p < .05; F(1,35) = 9.85, p < .01$ ). The effect induced by morphological primes on the recognition of their targets was, however, significant compared to the orthographic baseline only in the free stem set and only by participants ( $F(1,29) = 4.79, p < .05; F(1,35) = 2.35, p > .10$ ). While the effects of the orthographic primes did not differ significantly from those registered after the presentation of unrelated primes ( $F_s < 1$ ), they were neither significantly different from those yielded by morphological primes in the bound stem set ( $F(1,29) = 2.75, p > .10; F(1,35) = 3.48; p > .05$ ), possibly suggesting that the latter were more likely due to shared form rather than truly perceived morphological relatedness. On the other hand, no significant difference was observed between reaction times in the identity and morphological conditions. Net priming effects and significant differences are indicated below:

	Prime type	RTs	SD	U-I	U-M	O-M
<b>Bound stem set</b> terribile – terrore 'terrible – terror'	Identity	752	146	63*	51*	35
	Morphological	764	168			
	Orthographic	799	179			
	Unrelated	815	180			
<b>Free stem set</b> giornalista – giornalismo 'journalist – journalism'	Identity	764	171	48*	53*	34*
	Morphological	759	169			
	Orthographic	793	169			
	Unrelated	812	198			

TABLE 3 - MEAN REACTION TIMES, STANDARD DEVIATIONS, AND NET PRIMING EFFECTS (L2): \* =  $P < .05$ .

## 4. GENERAL DISCUSSION

The present experiment was aimed at exploring how different stem types might influence the way morphologically complex words are processed. Specifically, according to our underlying hypothesis, if words are organized along the dimension of morphological schemas which are abstracted on the basis of connections among them, the fact that a stem is not isolable should not be perceived as problematic for processing. This is at least predicted to be the case when a common semantic core is identifiable on the basis of other words retaining the same stem with an associated meaning, as is the case with our bound stems. Crucially, such a common nucleus of meaning, in bound stems, can only emerge because of the holistic properties of words that share that same stem, given the non-lexicality of the stem in isolation. Basically, since the (lack of) base autonomy should not be relevant, equivalent facilitation effects were expected to occur between derivatives sharing free and bound stems.

Results are clear-cut for what concerns native speakers: similar facilitation effects were observed when derivatives containing either a free or a bound stem were presented as primes for derived targets sharing the same stem. Importantly, such effects were significantly different from those yielded by both unrelated and orthographically related primes, suggesting that facilitation did not stem from mere orthographic similarities. These findings appear to be in line with the majority of studies considered above, which found that complex words containing bound stems can facilitate each other in word recognition tasks. The data of this experiment, moreover, can fully meet the expectations of word-based models of lexical access, where facilitation effects arise from the morphological organization superimposed by an abstract higher level (such as in, e.g., the supralexical model proposed by Giraudo & Grainger 2000, 2001 and recently revised in Giraudo & Voga 2014).

Two main conclusions can be drawn from the observation of the above-presented data. Firstly, morphological facilitation effects appear to be quite robust also across paradigms. As was hinted before, even if expected, this result could not be taken for granted based on existing data on Italian. The fact that morphological effects arise between derived prime-target items could point towards an organization of the lexicon which does not necessarily entail only a derivational relationship between base and suffixed word. Secondly, derived words sharing bound stems also appear to be organized along the same lines, given that significant morphological effects were triggered for this set of prime-target items too.

The data for L2 speakers, on the other hand, are less clear and need a more cautious approach, at least for what concerns bound stem derivatives. On the

one hand, morphological priming in the most transparent set arose when words like *giornalista* ‘journalist’ were presented prior to stimuli such as *giornalismo* ‘journalism’. Reaction times in this condition significantly differed from those in the unrelated and orthographic conditions, suggesting the morphological nature of the observed facilitation. This result not only is consistent with the morphological effects found in previous studies on L2 processing, but could also indicate that such an effect is not limited to the base-derivative relationships so far considered in the literature, but encompasses second order schemas as well.

When we consider bound stems, however, results are less straightforward: words such as *terrore* ‘terror’ were indeed primed efficiently by relatives containing the same stem (*terribile* ‘terrible’), but this effect appeared to be significant only relative to the unrelated baseline. One possible explanation for the weakness of such an effect might be found in the sample of non-native participants who took part in the experiment. Specifically, it is worth noticing that the number of tested subjects was smaller in the non-native sample and learners exhibited a heterogeneous first language background, which might have affected our pattern of results. Despite acknowledging such limitations, we will propose here a tentative interpretation which could be further tested in future research. Specifically, a more cautious explanation of such results could be proposed for what concerns the role of morphological paradigms in the non-native mental lexicon. From our data, it seems that when formal opacity intervenes the establishing of paradigms is more complex, i.e., the creation of morphological paradigms might be ‘impaired’ when forms are indirectly related. To elaborate, there is a possibility that words with bound stems are perceived by L2 learners as only orthographically similar words and not be viewed as having an internal morphological structure. Thus, a possible explanation for our data could view isolable stems as more salient elements in L2 than in L1 processing. In this light, the psychological reality of morphological organization for non-native speakers might be grounded primarily on elements which are freely occurring in the language. Notwithstanding our discussion about the psychological plausibility of second-order schemas for native speakers, free stems could more likely be perceived as more salient units, given their lexical autonomy.

Within the paradigm-based perspective adopted in this work, a unit may come to be perceived as salient for the speaker, besides merely by virtue of surface frequency, as a result of its participation in an open schema, i.e. a schema in which a high number of complex words participate. From this point of view, for native speakers priming effects may arise as a consequence of bound stems emerging as meaningful units by virtue of their occurrence in multiple complex words. Crucially, in such a model, there is in principle no

difference between bases that can occur in isolation *versus* those which cannot, given that common semantics, provided by both morphological family members and the semantics of a schema, contributes to their emergence.

Such claims should probably be mildly reconsidered for non-native speakers, or at least, cannot find full confirmation in our results. However, it is worth highlighting that there is in principle no need to reject the idea of a morphological organization of the lexicon for non-native speakers too, even if it could be modulated differently. Claims about substantial differences existing for native and non-native speakers could be reconsidered based on the fact that L2 speakers do indeed show morphological facilitation effects, at least in the most transparent conditions. Along these lines, we could see processing for second language speakers as relying on the same mechanisms operating in native speakers. The diverging results that have emerged might be deriving not from fundamental differences between these two groups, but simply from an underdevelopment of morphological schemas in non-native speakers. Indeed, an assumption made within the theoretical model posited by Construction Morphology is that the abstraction of schemas will likely differ among speakers: «it is not necessarily the case that all language users make the same subgeneralizations. Schemas are based on lexical knowledge, and this type of knowledge varies from speaker to speaker. Hence, speakers may also differ in the number and types of schemas that they deduce from their lexical knowledge» (Booij 2010: 89). From this point of view, we might expect that second language speakers have reduced development of schemas relative to native speakers, given that they prototypically have reduced lexical knowledge.

That reduced lexical knowledge affects patterns of morphological priming has been indeed previously demonstrated by a study by Andrews & Lo (2013). Interestingly, they found that speakers with reduced competence in spelling and vocabulary were more affected by the orthographic shape of primes and targets in a masked priming experiment: poor readers were found to be primed with both *worker* – *work* and *corner* – *corn* pairs, i.e., by morphological and pseudo-morphological primes. On the other hand, speakers with higher lexical skills were found to be strongly primed by the former and only little by the latter. Similarly, orthography was found to be a relevant factor for speakers with reduced lexical knowledge in the study by Andrews & Hersch (2010): specifically, while good spellers showed inhibition for words with high density neighbourhoods, poorer spellers appeared to be facilitated rather than inhibited in this condition.

In the specific field of L2 morphological processing, moreover, further support for the hypothesis that schemas might be less developed in L2 speakers comes from the study by Dal Maso & Giraudo (2014), who observed, in

native and non-native speakers, different degrees of sensitivity to the distributional characteristics of affixes in Italian, namely to their productivity. Accordingly, this highlights how more productive morphological schemas might be more salient for non-native speakers who «similarly to native speakers, [...] are sensitive to morphological information, but they integrate it progressively through L2 learning» (Dal Maso & Giraudo 2014: 333).

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