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### **Unacceptable but comprehensible: the facilitation effect of resumptive pronouns**

5 **Abstract:** It is often assumed in the theoretical syntax literature that intrusive resumptive  
6 pronouns can rescue island violations. However, recent experimental investigations did  
7 not provide strong evidence for such a rescuing effect. The current study examines  
8 intrusive resumption in Italian and English. In four experiments, we show that resumption  
9 indeed improves island violation to some degree, but such an effect is sensitive to task  
10 and contextual manipulations. In particular, the rescuing effect only surfaces with a  
11 comprehensibility but not a traditional acceptability task, and the effect is strongest when  
12 the antecedent of the resumptive pronoun is made salient through additional context. At  
13 the same time, however, the effect of resumption in longer embedded clauses (compared  
14 to shorter ones) is more subtle. We discuss these findings in terms of how resumptive  
15 pronouns, although ungrammatical in English, can facilitate parsing in particular yet  
16 principled ways.

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18

### **1 Introduction**

20 Resumptive pronouns (henceforth, RPs) have drawn considerable attention in theoretical  
21 and experimental syntax. Informally defined as pronouns which are found in a position  
22 “in which, under other circumstances, a gap would appear” (McCloskey, 2006, p. 26),  
23 RPs are subject to well-documented patterns of cross-linguistic variation (McCloskey  
24 2006). A distinction has been made between *grammatical* resumptives as found in  
25 Hebrew, Swedish, Irish, certain varieties of Arabic, etc. (Chao and Sells, 1983;

26 McCloskey, 2006; Shlonsky, 1992) and *intrusive* resumptives found in English. In  
27 languages with grammatical resumption, RPs have been reported to be perfectly  
28 acceptable, both when they are obligatory (e.g. in direct object relatives in Palestinian  
29 Arabic, see Shlonsky 1992), or when they occur in free variation with gaps (e.g. in direct  
30 object relatives in Hebrew, see Shlonsky 1992). Intrusive resumption, instead, is reported  
31 to be ungrammatical and generally unacceptable, as the following contrast shows  
32 (example from Erteschik-Shir 1992, p. 89).

33

34 (1) a. \*This is the girl that John likes **her**. (RP)

35 b. This is the girl that John likes \_\_\_. (Gap)

36

37 This paper focuses on RPs of the intrusive kind. Two interesting and seemingly  
38 contrasting observations have emerged from previous studies on intrusive RPs. On the  
39 one hand, linguists have commonly assumed, based on introspective judgments, that  
40 resumptives aid processing of long distance dependencies in situations where the  
41 processing demand is high, such as syntactic islands and dependencies with multiple  
42 embeddings. On the other hand, controlled experiments have not been able to consistently  
43 find amelioration effects in the acceptability of RPs over gaps in such environments (see  
44 Section 2.2), challenging the claims in the theoretical literature.

45 This paper aims to reconcile these seemingly paradoxical observations. Based on  
46 evidence from four experiments, we argue that intrusive RPs, while less consequential for  
47 *acceptability judgment*, do make the sentence more *comprehensible* in the presence of  
48 island violations. In particular, Experiments 1 and 2 provide evidence that RPs improve

49 comprehensibility in both Italian and English. Experiments 3 and 4 suggest that the effect  
50 of RPs does not emerge with an acceptability task (Experiment 3) or without a  
51 sufficiently rich preceding context (Experiment 4). In all of these experiments, we also  
52 tested the effect of resumption with increased level of embedding. Consistent with  
53 previous findings, the effect of resumption in deeply embedded clauses is relatively  
54 subtle. We discuss these findings in terms of how resumptive pronouns, although  
55 ungrammatical in English, nevertheless could facilitate parsing in particular yet  
56 principled ways. Methodologically, our findings also raise questions about the role of  
57 task in eliciting linguistic judgments.

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59

## 60 **2. Background: The puzzle of intrusive resumptives**

### 61 **2.1 Resumptives as processing facilitators**

62 Our discussion starts from two previous observations. First, intrusive RPs, though  
63 ungrammatical, are systematically found in spontaneous speech and laboratory-based  
64 speech production studies (Prince 1990, Cresswell 2002, Ferreira and Swets 2005,  
65 Bennett 2008; also see Francis et al. 2015 on Cantonese Chinese). Second, linguists'  
66 introspective judgments suggest that RPs “sound better” in at least two environments:  
67 Island violations and long distance dependencies with multiple embeddings (Ross 1967,  
68 Kroch 1981, Sells 1984, Prince 1990, Erteschik-Shir 1992, Asudeh 2004, Asudeh 2011).  
69 For instance, in example (2), which contains a syntactic island, a resumptive pronoun is  
70 reported to improve the status of the sentence compared to a gap (2a vs. 2b). It is  
71 important to note, however, that there is no consensus on what the best measure is to

72 operationalize the amelioration effect. For the time being, we use the sign “>>” to notate  
73 the yet-to-be specified meaning of “sounds better.”

74

75 (2) a. I’d like to meet the linguist that Peter knows a psychologist that works for **her**.

76 (island with RP) >>

77 b. I’d like to meet the linguist that Peter knows a psychologist that works for \_\_.

78 (island with gap) (from Asudeh 2004: 320)

79

80 Sentences with multiple embeddings represent another environment in which resumption  
81 has been reported to make the sentence “sound better.” Two separate contrasts are  
82 relevant here. RPs in sentences with multiple embeddings are reported to be better than  
83 RPs in simpler dependencies (3a vs. 3b); they are also reported to be better than gaps  
84 with the same number of embeddings (3c vs. 3d).

85

86 (3) a. This is the girl that Peter said that John thinks that yesterday his mother had

87 given some cakes to **her**. (complex dependency with RP) >>

88 b. This is the girl that Peter gave some cakes to **her** (simple dependency with RP)

89

90 c. This is the girl that Peter said that John thinks that yesterday his mother had

91 given some cakes to **her**. (complex dependency with RP) >>

92 d. This is the girl that Peter said that John thinks that yesterday his mother had

93 given some cakes to \_\_ (complex dependency with gap)

94

(from Erteschik-Shir 1992: 89)

95

96 To explain the reported improvement of sentences like (2a), (3a) and (3c), and to account  
97 for the fact that RPs are relatively frequent in spontaneous speech, it has been suggested  
98 that intrusive resumptives can facilitate production and/or comprehension in unfavorable  
99 processing conditions (Kroch 1981, Prince 1990, Erteschik-Shir 1992, Asudeh 2004,  
100 2011, 2012 among others). More specifically, both islands and multiple embeddings  
101 might overload the parser due to their structural complexity. In both of these cases, the  
102 presence of a resumptive pronoun could facilitate performance by alleviating the  
103 processing burden. As for the exact mechanism whereby they do this, various hypotheses  
104 have been put forward.

105 Kroch (1981) argues that resumption can be used to fix errors due to poor  
106 planning in production. If speakers begin to articulate an utterance before having a  
107 complete planning of the syntactic structure for the whole sentence, they might find  
108 themselves in trouble midway through the utterance. This happens, for example, when an  
109 island boundary is encountered during the production of a long-distance dependency. In  
110 this situation, the only way to deliver a coherent message without disrupting fluency is to  
111 insert an RP. According to Kroch, the end result of this process is a sentence that is  
112 ungrammatical, but, contrary to an island with a gap, such a sentence is at least somewhat  
113 *interpretable*. Prince (1990) proposes a similar account, arguing that RPs in English are  
114 “officially ungrammatical” (Prince 1990, p. 480), but are not uncommon in speech.  
115 Observing that nearly 70% of spontaneously produced RPs occur in islands, she proposed  
116 a processing account, suggesting that in these environments resumption serves the  
117 purpose of “making the best out of a bad job” (p. 483). For the appearance of RPs in

118 dependencies with multiple embeddings, similar processing-based explanations have  
119 been proposed. In particular, Erteschik-Shir (1992) suggests that RPs such as those in (2)  
120 – (3) are cognitively advantageous: they help the hearer to make sense of the extracted  
121 NP, which has been pushed out of short-term memory due to the relatively long temporal  
122 interval that has elapsed since the initial encounter with this NP. Finally, Asudeh (2004,  
123 2011, 2012) provides a unified theory of intrusive resumption in islands and in complex  
124 dependencies with multiple embeddings. He argues that RPs, while ungrammatical, can  
125 nevertheless help the formation of a *locally well-formed* structure (see section 2.3 for  
126 more details).

127         We now turn to discuss a set of controlled acceptability studies that appear to pose  
128 some challenges to the reported introspective judgments on RPs.

129

## 130 **2.2 The empirical challenge from the acceptability judgment studies**

131         As mentioned earlier, the two representative environments that have been reported  
132 to host intrusive RPs are syntactic islands, and sentences with multiple levels of  
133 embedding. To operationalize this intuition, a number of researchers have made the  
134 following two predictions, both of which hypothesized that RPs lead to improved  
135 acceptability. First, RPs in islands are hypothesized to be more acceptable than their  
136 gapped counterparts; second, RPs in dependencies with multiple embeddings should be  
137 more acceptable than both their gapped counterparts and RPs in simpler dependencies.  
138 Surprisingly, however, these predictions were not completely borne out in previous  
139 experimental investigations: RPs were not more acceptable than gaps in many of the

140 previous experiments; neither was RPs' acceptability consistently ameliorated by  
141 increased levels of embedding. We review some of the experimental studies below.

142 In Ferreira and Swets (2005), participants were cued to produce target sentences  
143 containing a resumptive pronoun inside a wh-island, such as "*This is a donkey that I*  
144 *don't know where it lives*". Then the same participants were asked to rate the  
145 acceptability of the sentences they produced earlier. Regardless of whether the stimuli  
146 were presented in auditory or written format, sentences containing RPs turned out to be  
147 significantly less acceptable than the control sentences (e.g. "*This is a donkey that*  
148 *doesn't know where it lives*"), showing that RPs in islands were not accepted even by the  
149 same speakers who produced them. A caveat of this result is that the study did not  
150 directly compare the acceptability of RPs with their gapped counterparts, and therefore is  
151 inconclusive as to whether intrusive RPs within islands are more acceptable than gaps. At  
152 the very least, however, the results strongly suggest that production of RPs does not  
153 automatically entail their full acceptability (also see Zukowski and Larsen 2004, for  
154 similar design and results).

155 A later set of acceptability studies directly compared RPs with gaps and found  
156 either no facilitation effect or very limited improvement associated with RPs.  
157 Alexopoulou and Keller (2007) compared gaps and RPs in islands by testing wh-  
158 questions containing complement clauses in English, German, and Greek. In a magnitude  
159 estimation task, they showed that in all tested environments, RPs did turned out to be  
160 more acceptable than gaps. Heestand, Xiang and Polinsky (2011) tested the acceptability  
161 of RPs in relative clause islands and adjunct islands. In a Likert scale acceptability  
162 judgment task, the participants were explicitly instructed to "judge (the acceptability)

163 based on their native-speaker intuition rather than any prescriptive rules, and to go with  
164 their first instinct rather than spending time pondering on their answers” (Heestand,  
165 Xiang and Polinsky 2011: 142). In addition to a regular offline acceptability task, a  
166 speeded presentation task was also employed to impose a certain amount of time pressure  
167 on the participants. In neither of these tasks were RPs rated more acceptable in islands  
168 than gaps, although there was a numerical trend that with the relative clause islands the  
169 acceptability judgment was made slightly faster on the RP conditions (Experiment 2).  
170 The acceptability rating results from Heestand et al. (2011) were later replicated on a set  
171 of auditorily-presented stimuli, generalizing the absence of the island-rescuing effect to a  
172 different modality (Clemens, Polinsky and Scontras, 2012; Polinsky et al., 2013).

173         It is worth noting that the studies reviewed above all compared RPs with gaps in  
174 islands that involve object extraction. A number of other studies examined islands with  
175 both object and subject extractions (McDaniel and Cowart, 1999; McKee and McDaniel,  
176 2001; Keffala and Goodall, 2011; and Keffala, 2011; Han et al., 2012). These studies  
177 replicated the findings that RPs were not rated more acceptable than gaps in object-  
178 extracted islands; but crucially they also found higher ratings for RPs than gaps in  
179 subject-extracted islands. Yet, it is unclear whether such an improvement should be  
180 entirely due to a rescuing effect of RPs. As Keffala (2011) suggested, subject relative  
181 clause islands with gaps record extremely low acceptability judgments in that they evoke  
182 two different kinds of syntactic violations: island constraints and ECP effects. Whereas  
183 the presence of a resumptive pronoun does not rescue the island violation *per se*, it  
184 salvages the ECP effect, preventing a further degrading in acceptability.<sup>1</sup>

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<sup>1</sup> The experimental literature on resumption and islands in English has primarily focused on *wh*-islands and relative clause islands. It should be noted that McKee and McDaniel (2001) also found that RPs

185           Concerning RPs in dependencies with multiple levels of embedding, resumption  
186 appears to have an effect on acceptability, but only under some situations. First of all,  
187 across different studies it was shown that increased level of embedding did not yield RPs  
188 more acceptable than gaps (Alexopoulou and Keller, 2007; Hofmeister and Norcliffe,  
189 2013; Han et al., 2012; Keffala and Goodall, 2011; and Keffala, 2011). When RPs in  
190 sentences with longer embedding are compared with RPs in shorter embedding, the  
191 strongest effect was recorded when zero-embedding was compared to one or more levels  
192 of embeddings (Alexopoulou and Keller, 2007). The differences between higher numbers  
193 of embedding (e.g. two vs. three-levels) were very subtle—many of the studies above  
194 found that RPs in longer embedded clauses received the same, but not higher,  
195 acceptability ratings as those in shorter ones. However, since acceptability degradation  
196 associated with length was independently observed for sentences with gaps or declarative  
197 controls in these studies, one could also argue that the fact that RPs “neutralize” the  
198 negative length effect on acceptability is itself a demonstration of the amelioration effect  
199 of RPs.

200

### 201 **2.3 Looking for the source of the processing facilitation**

202           Although the experimental findings reviewed in the last section raise some  
203 questions on the facilitating effect of RPs, it would be too hasty to conclude that RPs’  
204 processing facilitation is illusory. In particular, we will suggest that the failure to find the  
205 facilitation effect of RPs is closely tied to the particular task employed in previous

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were significantly more preferred than gaps when the extracted element was a genitive object (e.g. “This is the pirate whose Minnie Mouse buried treasure”). Francis et al. (2015) more systematically tested resumption in possessive phrases in Cantonese and also found higher acceptability ratings on RPs than gaps.

206 studies, i.e., that acceptability judgment is not necessarily the best measure to capture or  
207 operationalize the facilitation effect of RPs.

208         Given that there is consensus that English resumption is of the “intrusive” type  
209 and is ungrammatical (e.g. Chao and Sells, 1983; Kroch, 1981; Prince, 1990), we already  
210 have some initial reasons to ask whether acceptability judgment is the most appropriate  
211 index to quantify the facilitation effect of RPs (see more discussion in 4.1)<sup>2</sup>. There are  
212 also proposals that explicitly argue that RPs impact the comprehension of a construction,  
213 as opposed to its acceptability. One of the most detailed accounts on how RPs can  
214 facilitate comprehension comes from Asudeh (2004, 2011, 2012). In his system, there are  
215 two distinct levels according to which the well-formedness of a sentence is evaluated: a  
216 *global* one, which concerns the sentence in its entirety, and a *local* one, which concerns  
217 the smaller segments that combine to form the sentence itself. Syntactic islands represent  
218 an example of *globally* ill-formed constructions—a filler (i.e., the extracted element)  
219 cannot be successfully interpreted as an argument of the verb, leading to  
220 ungrammaticality. The difference between the presence of a gap and the presence of a RP  
221 emerges at the local level. Sentences with a gap are locally ill-formed: given the  
222 impossibility of integrating the filler, the gap after the verb is perceived as an illicitly  
223 missing argument. By contrast, the presence of a RP ensures local well-formedness, as it  
224 supplies an argument to the verb. An example is given below (from Asudeh 2004, p.  
225 320), with the underlined part representing the relevant local segment where the gap/RP  
226 is found.

227

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<sup>2</sup> Grammatical resumption is not our main focus in this paper. But we note that not all studies on grammaticalized resumption have shown higher acceptability ratings of RPs than gaps in islands (e.g. Tucker, Idrissi, Sprouse and Almeida, 2016, on Modern Standard Arabic).

228 (4)

229 a. \*I'd like to meet the linguist that \*Peter knows a psychologist that works with\_\_\_\_\_

230 LOCALLY: \* GLOBALLY: \*

231 b. \*I'd like to meet the linguist that ✓Peter knows a psychologist that works with her.

232 LOCALLY: ✓ GLOBALLY: \*

233

234 According to Asudeh, restoring local well-formedness in a globally ill-formed  
235 structure allows the speaker to produce a sentence that is consistent with the message  
236 plan. At the same time, it makes it possible for the listener to put together a coherent  
237 interpretation, extracting a meaningful message even if the structure is not grammatical.  
238 It follows from this account that resumption has little effect on the grammatical status of  
239 a sentence. Instead, the processing facilitation should be specifically related to the  
240 *comprehensibility* of a construction, which refers to how easily a speaker can construct a  
241 coherent interpretation out of an utterance. If this is true, the particular task adopted by  
242 previous experiments, i.e., the acceptability judgment task, may not be the most  
243 appropriate task to capture the facilitation effect of RPs.

244 This hypothesis gains some initial support from studies that did not measure the  
245 effect of RPs with an acceptability task. Hofmeister and Norcliffe (2013), besides  
246 collecting acceptability judgments, adopted a self-paced reading task paradigm to  
247 compare the processing difficulty of 2 and 3-embedding sentences with gaps and RPs in  
248 English. While, as discussed above, the authors did not find an improvement in  
249 acceptability, they did find an effect of resumption on reading times. Going from 2 to 3-  
250 embeddings, reading times on regions following the RP/gap increased significantly on the

251 sentences with gaps, and decreased for sentences with RPs. Based on this finding,  
252 Hofmeister and Norcliffe argued that resumptive pronouns make comprehension easier  
253 than gapped sentences do in situations where processing pressure is high (e.g.,  
254 dependencies with three embeddings). Similar results were also reported in Dickey  
255 (1996), in which RPs were found to speed up online reading times for sentences with  
256 multiple-embeddings. Experiments on other languages also obtained similar findings:  
257 Ning (2008) found that in Mandarin Chinese, RPs in more deeply embedded contexts  
258 (e.g., indirect object relative clauses) were read faster than those in simpler contexts (e.g.,  
259 subject and direct object relative clauses).

260 Besides reading time measures, the benefit of RPs has also been shown in forced  
261 choice tasks. Ackerman et al. (2014) tested the effect of RPs using two forced choice  
262 tasks. In one task, participants were asked to choose the more acceptable option between  
263 two given sentences, one with a RP and the other one with a gap. In the other task,  
264 participants were given an incomplete sentence and asked to complete it by selecting  
265 either a segment containing a gap or a segment containing a resumptive. A range of  
266 constructions was tested, including wh-islands, adjunct islands, relative clause islands  
267 and also their non-island counterparts. Across all types of islands, RPs were found to be  
268 more preferred than gaps.

269 As a whole, these results show that the facilitation effect of RPs surfaces in  
270 controlled experiments once standard acceptability judgment is removed from the task.  
271 Hofmeister and Norcliffe (2013) argued for a direct link between comprehension and the  
272 facilitation effect of RPs, and suggested that the failure to find a facilitation effect of RPs  
273 in previous acceptability judgment studies is due to “the lack of measurements of

274 comprehension difficulty.” The reading time results reviewed above are certainly  
275 consistent with this hypothesis. Even for the force-choice task employed in Ackerman et  
276 al. (2014), it could also be argued that when participants were forced to choose between  
277 two given options (i.e. they were not given the option that “neither is acceptable”), they  
278 could resort to all possible dimensions of comparison, including comprehensibility, in  
279 order to make a response.

280         To further pin down the relationship between resumption and comprehensibility,  
281 the current paper explores whether a minimal change on the original acceptability  
282 judgment task, i.e., a comprehensibility task, is sufficient to bring out the facilitation  
283 effect of RPs. If participants’ judgments can be modulated by whether they are asked to  
284 judge the “acceptability” or the “comprehensibility” of a sentence, it provides strong  
285 empirical support to the hypothesis that intrusive RPs, although ungrammatical, can  
286 indeed facilitate the comprehension process. We present a total of four experiments  
287 below, one in Italian (Experiment 1) and three in English (Experiments 2-4). Our  
288 investigation will focus on the two well-known “RP-friendly” environments: relative  
289 clause islands and sentences with multiple embeddings.

290

### 291 **3. Experiments**

#### 292 **3.1. Experiment 1**

293 Experiment 1 investigated RPs in Italian. From a typological perspective, Italian patterns  
294 with English with respect to resumption: while RPs are not grammatical in regular  
295 dependencies (as in (5a)), they have been reported to improve the status of sentences  
296 containing island violations (see the different status of (5b) and (5c); examples and

297 judgments are from Belletti, 2006). It has also been pointed out (Belletti 2006) that  
298 resumption in Italian, albeit ungrammatical, is particularly frequent in informal and  
299 colloquial registers.

300

301 (5) a. \*L'uomo che lo arresteranno se continua così

302 the.man that him(CL) they.will.arrest if he.goes.on like.that

303 'The man that they will arrest if he goes on like that' (RP outside of island)

304 b. \*L'uomo che temo il pericolo che arresteranno

305 the.man whom I.am.afraid.of the danger that they.will.arrest

306 'The man whom I'm afraid of the danger that they will arrest' (Gap in island)

307 c. (?) L'uomo che temo il pericolo che lo arresteranno

308 the.man who I.am.afraid.of the danger that him(CL) they.will.arrest

309 'The man whom I'm afraid of the danger that they will arrest' (RP in island)

310

311 Experiment 1 introduced two important design features of the current study. First, we  
312 explicitly asked subjects to focus on the *comprehensibility* of the target sentence, as  
313 opposed to its *acceptability*. If RPs can facilitate the construction of a more coherent  
314 semantic interpretation, we expect to see such a facilitation effect emerge in the  
315 comprehensibility rating. Second, whereas previous acceptability judgment studies often  
316 presented the target sentence in isolation, we embedded the target sentence in a short  
317 conversation between two partners, such that the target sentence was always preceded by  
318 a context sentence.

319

320 **Material**

321  
322 In a 2x2x2 factorial design we created 8 conditions, resulting from crossing the following  
323 three factors: a) Island, b) Resumption, and c) Embedding. For the *Island* factor, the  
324 experimental sentence was either a grammatical definite NP relative clause or an  
325 ungrammatical NP relative clause with an island violation. For the *Resumption* factor, the  
326 experimental sentence contained either a gap or a resumptive pronoun. For *Embedding*,  
327 the experimental sentence was presented either with two levels of embedding (2-level) or  
328 with three levels of embedding (3-level). Each item consisted of two sentences. The first  
329 one described a context and was the same across all of the conditions. The second  
330 sentence was framed as a natural continuation of the first one and was manipulated  
331 according to the factors above. The example in (6) demonstrates the full paradigm for an  
332 item.

333

334 **(6) Context sentence (same across conditions, spoken by a female voice):**

335 Ieri ci sono stati disordini per strada, e alcune persone sono rimaste ferite dalla  
336 polizia.  
337 “Yesterday there were riots in the street, and some people were wounded by the  
338 police.”

339

340 **Critical sentence (spoken by a male voice):**

341

342 a. Questo è il ragazzo che il poliziotto che guidava le operazioni ha  
343 picchiato \_\_\_.

344 This is the guy that the cop who led the operations has  
345 beaten \_\_\_.

346 “This is the guy that the cop who was leading the operation beat up.”

347 (Non-island, 2-level embedding, Gap)

348

349 b. Questo è il ragazzo che il poliziotto che guidava le operazioni l’ha picchiato.

350 This is the guy that the cop who led the operations has HIM beaten.

351 “This is the guy that the cop who was leading the operation beat him up.”

352 (Non-island, 2-level embedding, RP)

353

- 354 c. Questo è il ragazzo che il giornale riporta che il poliziotto che guidava le  
355 operazioni ha picchiato \_\_.  
356 This is the guy that the paper reports that the cop who led the  
357 operations has beaten \_\_.  
358 “This is the guy that the paper reports that the cop who was leading the operation  
359 beat up.”  
360 (Non-island, 3-level embedding, Gap)  
361
- 362 d. Questo è il ragazzo che il giornale riporta che il poliziotto che guidava le  
363 operazioni l’ha picchiato.  
364 This is the guy that the paper reports that the cop who led the  
365 operations HIM has beaten.  
366 “This is the guy that the paper reports that the cop who was leading the operation  
367 beat him up.”  
368 (Non-island, 3-level embedding, RP)  
369
- 370 e. Questo è il ragazzo che il poliziotto che ha picchiato \_\_ deve essere sospeso.  
371 This is the guy who the cop who has beaten \_\_ must be suspended.  
372 “This is the guy that the cop who beat up must be suspended.”  
373 (Island, 2-level embedding, Gap)  
374
- 375 f. Questo è il ragazzo che il poliziotto che l’ha picchiato deve essere  
376 sospeso.  
377 This is the guy who the cop who HIM has beaten must be  
378 suspended.  
379 “This is the guy that the cop who beat him up must be suspended.”  
380 (Island, 2-level embedding, RP)  
381
- 382 g. Questo è il ragazzo che il giornale riporta che il poliziotto che ha picchiato \_\_  
383 deve essere sospeso.  
384 This is the guy who the paper reports that the cop who has beaten \_\_  
385 must be suspended.  
386 “This is the guy that the paper reports that the cop who beat up must be  
387 suspended.”  
388 (Island, 3-level embedding, Gap)  
389
- 390 h. Questo è il ragazzo che il giornale riporta che il poliziotto che l’ha  
391 picchiato deve essere sospeso.  
392 This is the guy who the paper reports that the cop who HIM has beaten  
393 must be suspended.  
394 “This is the guy that the paper reports that the cop who beat him up must be  
395 suspended.”  
396 (Island, 3-level embedding, RP)  
397  
398

399           Sixty-four sets of items were created. These items were distributed into eight lists  
400 with a Latin Square design, so that every subject was tested on only one condition for a  
401 given item. We also created 40 additional fillers, which consisted of two sentences: the  
402 first sentence provided a context, and the second one introduced a relative clause. All  
403 filler sentences were grammatical. Every subject was tested on 104 items total. In order to  
404 increase the naturalness of the task, we presented the stimuli auditorily, instead of in  
405 written form. All the items were first recorded by two native speakers of Italian (a man  
406 and a woman) from the same region as the subjects of the experiment.<sup>3</sup> In this way, the  
407 participants encountered an accent they were already fully familiar with, minimizing the  
408 disruption potentially generated by encountering accents associated with geographically  
409 distant areas of the country. In addition, to make the interaction as natural as possible, we  
410 explicitly asked our two speakers not to conceal their accents, and to read the sentences  
411 with a similar prosody to the one that they would use in an informal conversation with  
412 their peers. The context sentence was always read by the woman, while the target  
413 sentence was read by the man. In addition to the experimental items and the fillers, there  
414 were also six practice items.

415

#### 416 **Participants**

417 Forty-three participants participated in the study. To ensure that the subject pool was  
418 dialectally homogenous, all the subjects were recruited from the northern Italian region of

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<sup>3</sup> The speakers were from the town of Bergamo, while the participants were from the town of Sondrio. The two towns are located less than 50 miles apart from each other in the northern part of Lombardia, a region in northern Italy.



443 For statistical analysis, we first z-transformed all the raw scores of each individual  
444 subject, and then ran a mixed-effects model on the transformed data with the R statistical  
445 package lmerTest (Bates et al., 2014). Data analysis on all subsequent experiments also  
446 followed this procedure. The fixed effect predictors included Gap, Embedding, Island and  
447 their interactions, and the random effects included at least random intercepts for subjects  
448 and items. Random slopes were also included whenever the resulting model could  
449 converge. All predictors were sum coded before the data analysis, with island, three-  
450 embedding, and gap coded as 1, and non-island, two-embedding and RP coded as -1.

451

452

### 453 **Results**

454 Rating results from Experiment 1 (z-transformed) are presented in Figure 1. Mixed  
455 effects models show a significant main effect of Island ( $\beta=-0.36$ ,  $se=0.03$ ,  $p<0.0001$ ),  
456 reflecting the fact that all island conditions are rated significantly lower than their non-  
457 island counterparts (gaps: 2-level embedding,  $\beta=-1.45$ ,  $se=0.1$ ,  $p < 0.0001$ , 3-level  
458 embedding,  $\beta=-0.67$ ,  $se=0.1$ ,  $p < 0.0001$ ; RPs: 2-level embedding,  $\beta=-0.45$ ,  $se=0.09$ ,  
459  $p<0.0001$ , 3-level embedding,  $\beta=-0.34$ ,  $se=0.09$ ,  $p < 0.001$ ). Since we are most interested  
460 in whether RPs can rescue island violations, we report the results for islands and non-  
461 islands conditions separately below. The effect of embedding is also assessed below for  
462 islands and non-islands separately.

463

464

465

466 *Without island*

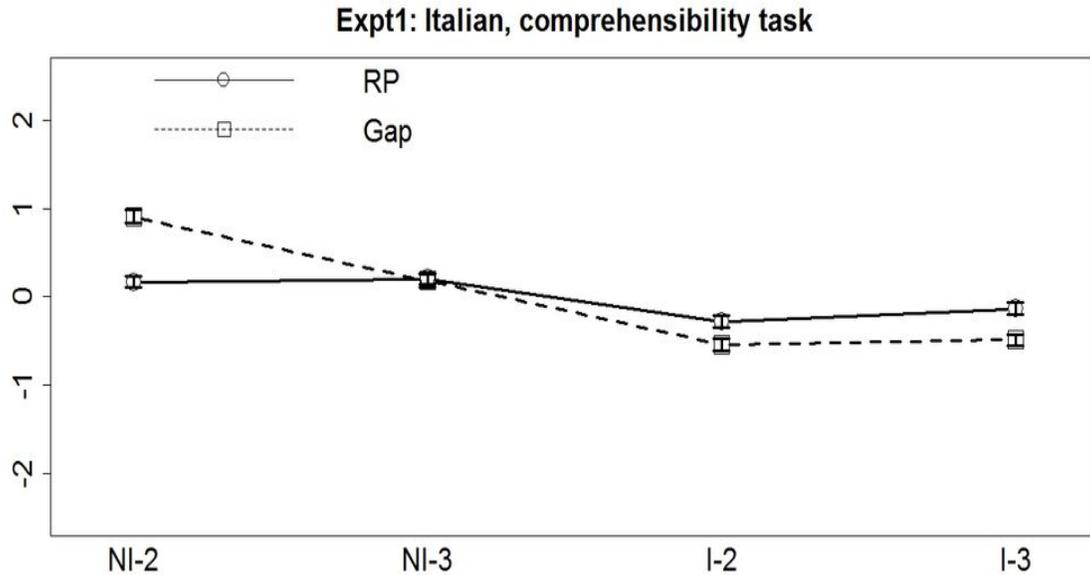
467 When there are no island violations, the effect of Gap and Embedding are both significant  
468 (Gap:  $\beta=0.18$ ,  $se=0.04$ ,  $p<0.001$ ; Embedding:  $\beta=-0.17$ ,  $se=0.03$ ,  $p<0.0001$ ). But crucially  
469 the interaction between the two is also highly significant ( $\beta=-0.19$ ,  $se=0.03$ ,  $p<0.0001$ ).  
470 The interaction is driven by the fact that although gaps are (unsurprisingly) more  
471 comprehensible than RPs with shorter embeddings ( $\beta=0.74$ ,  $se=0.1$ ,  $p<0.0001$ ). The  
472 difference disappears with 3-level embedding ( $\beta=-0.02$ ,  $se=0.09$ ,  $p>0.8$ ), due to the fact  
473 that more embedding reduces the comprehensibility of gapped conditions ( $\beta=-0.72$ ,  
474  $se=0.1$ ,  $p < 0.0001$ ), but RPs were not affected by more embeddings ( $\beta=0.04$ ,  $se=0.09$ ,  
475  $p>0.6$ ).

476

477 *With island*

478 For conditions with islands, the most striking effect is a significant main effect of Gap  
479 ( $\beta=-0.15$ ,  $se=0.04$ ,  $p<0.01$ ), reflecting that RPs are rated significantly higher than gaps  
480 across both 2 and 3-level embeddings (2-embedding,  $\beta=0.26$ ,  $se=0.1$ ,  $p<0.01$ ; 3-  
481 embedding,  $\beta=0.35$ ,  $se=0.1$ ,  $p < 0.001$ ). We also observe that, the depth of embedding  
482 does not have any effect ( $\beta=0.05$ ,  $se=0.04$ ,  $p > 0.2$ ), nor is there an interaction between  
483 Gap and Embedding ( $\beta=-0.02$ ,  $se=0.03$ ,  $p > 0.4$ ), reflecting that longer embedding does  
484 not change the ratings for gaps or RPs within island. This is particularly interesting for  
485 the gap conditions in light of the finding that longer embedding does significantly reduce  
486 the comprehensibility of gaps without islands. We come back to this point in the  
487 Discussion section.

488



489  
 490 **Figure 1:** z-transformed comprehensibility judgments for **Experiment 1**. The y-axis  
 491 indicates average ratings. On the x-axis, NI-2: non-island 2-level embedding; NI-3: non-  
 492 island 3-level embedding; I-2: island 2-level embedding; I-3: island 3-level embedding.  
 493 The solid line represents sentences with a RP, and the dashed line represents sentences  
 494 with a gap. Error bars indicate standard errors.

495  
 496

### 497 **Discussion of Experiment 1**

498

499 The most salient result from this first experiment is that, within islands, RPs are rated  
 500 higher than gaps. Such an effect provides evidence that intrusive RPs do indeed help  
 501 comprehension in cases where a syntactic violation complicates the overall processing of  
 502 the sentence. This finding thus constitutes a crucial difference with respect to those of  
 503 previous experiments, in which RPs were never rated better than gaps in islands.

504 With respect to embedding, grammatical dependencies with gaps receive reduced  
 505 ratings with 3-level embeddings, but embedding does not seem to have an effect on the  
 506 comprehensibility of resumptives – in complex 3-embedding dependencies, RPs are  
 507 never rated higher than gaps, nor are they rated higher than 2-embedding sentences with  
 508 RPs.

509 Overall, these results provide evidence that Italian RPs within islands do facilitate  
510 processing. This confirms our hypothesis that RPs could improve comprehensibility of  
511 island violations, in contrast to previously reported acceptability results on English RPs.  
512 However, this conclusion may be questioned on the ground that the observed effect may  
513 be due to some special properties of Italian RPs, rather than reflecting a more general  
514 rescuing effect of RPs. For example, Italian resumption, albeit ungrammatical in relative  
515 clauses, is a strategy that independently exists in the grammar. In particular, Italian  
516 requires the presence of resumptive clitic in Clitic Left Dislocation (CLLD, Cinque 1990,  
517 Belletti 2006) – a particular kind of unbounded dependency, as shown in (7).<sup>4</sup>

518

519 (7) a. Mario lo ho visto domenica

520 Mario him(CL) I saw on Sunday

521 ‘Mario I saw him on Sunday’

522 b.??Mario ho visto domenica

523 Mario I saw on Sunday

524 ‘Mario I saw on Sunday’

525

526 It is possible that the presence of a resumptive structure in the grammar might lead Italian  
527 speakers to be less biased against sentences with RPs across the board, putting the  
528 experimental subjects in a position to more easily perceive the processing facilitation

---

<sup>4</sup> Belletti (2006) analyzed this construction in terms of movement of a constituent to the left periphery of the sentence, with a clitic RP (*lo* in (7a)) that phonologically realizes the trace of the dislocated constituent. The only available reading of (7b) is one with contrastive focus on the dislocated constituent, such as “MARIO (and not Gianni), ho visto domenica”, translated as ‘MARIO (and not Gianni) I saw on Sunday’.

529 effect of RPs in islands. To assess whether the observed facilitation effect of RPs could  
530 be generalized, we performed the same task on English RPs in Experiment 2.

531

## 532 **3.2 Experiment 2**

### 533 **Materials, design and procedure**

534

535 The design was identical to Experiment 1. The procedure was largely the same as  
536 Experiment 1, but with two modifications. First, Experiment 2 was carried out on  
537 Amazon MechanicalTurk; and second, all materials were translated from the Italian  
538 stimuli in Experiment 1 and were presented in the written rather than auditory format.  
539 Participants first read a context sentence, then the target sentence, and finally were asked  
540 to judge how comprehensible the target sentence was on a scale from 1 to 7. Fifty-two  
541 self-reported native English speakers participated in the experiment (between 18-35 years  
542 old). Only subjects with a US IP address were allowed to participate. For the  
543 comprehensibility rating task, we gave participants the same instruction as Experiment 1:

544

545 “You will have to answer with a score ranging from 1 (the sentence is completely  
546 incomprehensible) to 7 (the sentence is perfectly comprehensible). We want you to judge  
547 these sentences based on how easy they are for you to understand.”

548

549 An example (with all conditions) participants received is given in (8):

550

551 (8) An example trial:

#### 552 **(Context)**

553 Have you heard? Yesterday there were riots in the streets. Some people were

554 wounded. Look here, they're talking about it in the paper.

555

556 **(Target sentence)**

557 a. This is the boy that the cop who was leading the operation beat up. (Non island, 2-level  
558 embedding, Gap)

559 b. This is the boy that the cop who was leading the operation beat him up. (Non island, 2-  
560 level embedding, RP)

561 c. This is the boy that the newspaper reports that the cop who was leading the  
562 operation beat up. (Non island, 3-level embedding, Gap)

563 d. This is the boy that the newspaper reports that the cop who was leading the  
564 operation beat him up. (Non island, 3-level embedding, RP)

565 e. This is the boy that the cop who beat up was leading the operation. (Island, 2-level  
566 embedding, Gap)

567 f. This is the boy that the cop who beat him up was leading the operation. (Island, 2-level  
568 embedding, RP)

569 g. This is the boy that the newspaper reports that the cop who beat up was leading the  
570 operation. (Island, 3-level embedding, Gap)

571 h. This is the boy that the newspaper reports that the cop who beat him up was leading  
572 the operation. (Island, 3-level embedding, RP)

573

574 "How comprehensible is the last sentence?"

575

576 **Results**

577

578 The rating results are overall similar to the Italian results in Experiment 1 (Figure 2). We  
579 found a main effect of Island ( $\beta=-0.12$ ,  $se=0.02$ ,  $p < 0.0001$ ). However, the effect of  
580 Island is also modulated by the gap/RP difference. Although island conditions with gaps  
581 are rated significantly lower than their non-island counterparts (2-level embedding,  $\beta=-$   
582  $0.79$ ,  $se=0.09$ ,  $p < 0.0001$ ; 3-level embedding,  $\beta=-0.42$ ,  $se=0.09$ ,  $p < 0.0001$ ), ratings on  
583 RPs were not different between island and non-island conditions (2-level embedding,  
584  $\beta=0.12$ ,  $se=0.09$ ,  $p > 0.1$ , 3-level embedding,  $\beta=0.13$ ,  $se=0.09$ ,  $p > 0.1$ ). Like Experiment 1,  
585 we report below more detailed analyses for islands and non-islands conditions separately.

586

#### 587 *Without island*

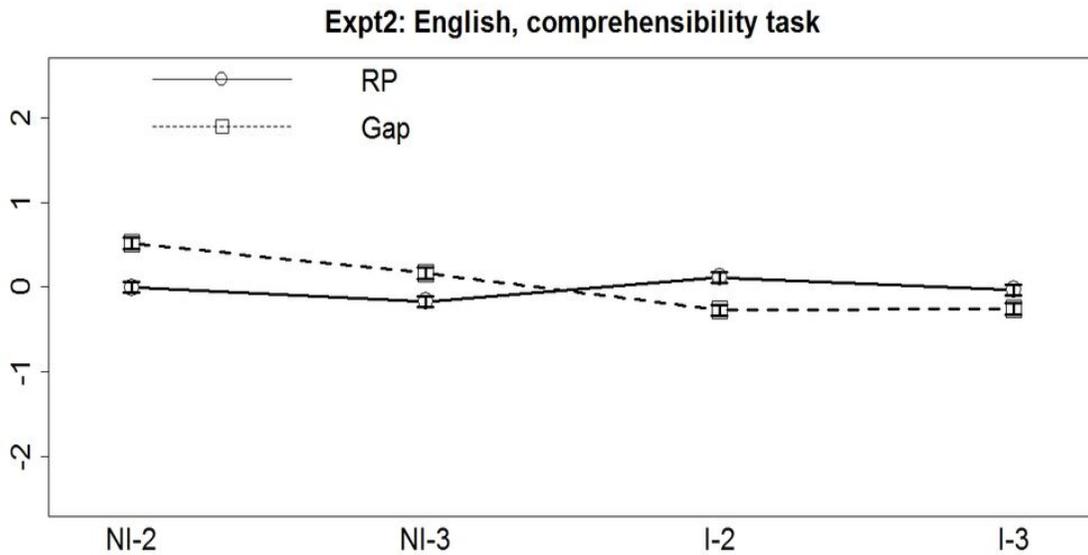
588 In the absence of island violations, gaps are more comprehensible than RPs, as reflected  
589 by a main effect of Gap ( $\beta=0.2$ ,  $se=0.05$ ,  $p < 0.0001$ ). Pair comparisons between gaps and  
590 RPs confirm that gaps are more comprehensible than RPs for both the shorter and the  
591 longer embeddings (2-level embedding:  $\beta=0.52$ ,  $se=0.09$ ,  $p < 0.0001$ ; 3-level embedding:  
592  $\beta=0.33$ ,  $se=0.09$ ,  $p < 0.001$ ). In addition, there is a main effect of Embedding ( $\beta=-0.12$ ,  
593  $se=0.03$ ,  $p < 0.01$ ). Longer embedding reduced the comprehensibility of gaps ( $\beta=-0.35$ ,  
594  $se=0.09$ ,  $p < 0.001$ ), and there is a similar but only marginal effect on RPs ( $\beta=-0.16$ ,  
595  $se=0.09$ ,  $p < 0.09$ ). There is no interaction between Gap and Embedding ( $\beta=-0.04$ ,  
596  $se=0.03$ ,  $p > 0.1$ ).

597

#### 598 *With island*

599 Within islands, RPs are once again more comprehensible than gaps across both 2 and 3-  
600 level embeddings (2-embedding,  $\beta=0.38$ ,  $se=0.09$ ,  $p < 0.0001$ ; 3-embedding,  $\beta=0.22$ ,

601  $se=0.09, p < 0.05$ ). We also observe that within islands, the depth of embedding does not  
602 have any effect ( $\beta=-0.03, se=0.03, p>0.2$ ), nor is there an interaction between Gap and  
603 Embedding ( $\beta=0.04, se=0.03, p>0.2$ ).  
604



605  
606

**Figure 2:** Comprehensibility judgments (z-transformed) for **Experiment 2**.

607  
608

### 609 **Discussion of Experiment 2**

610 Experiment 2 replicated the “comprehensibility rescuing effect” of RPs on syntactic  
611 islands in English with a comprehensibility judgment task. With respect to embedding,  
612 the pattern is also similar to Experiment 1. First, gaps in grammatical dependencies (i.e.,  
613 without islands) are considerably less comprehensible with three embeddings; but the  
614 effect of embedding disappears for gaps in ungrammatical dependencies (i.e., within  
615 islands). Second, embedding does not have a salient effect on the comprehensibility of  
616 RPs.

617 Overall, the observations above suggest that the findings of Experiment 1 were  
618 not due to language specificities of Italian, but to more general properties of intrusive  
619 resumption and the particular comprehensibility judgment task we employed. For both  
620 languages, we showed that when participants' attention is focused on assessing the  
621 comprehensibility difficulty, and when the test sentences are preceded by a context  
622 sentence, RPs can indeed facilitate processing. In the next two experiments, we aim to  
623 assess the impact of each of the two factors separately: Experiment 3 replaces the  
624 comprehensibility judgment with an acceptability judgment task, while Experiment 4  
625 tests for comprehensibility without a context sentence.

626

### 627 **3.3 Experiment 3**

#### 628 **Materials, design and procedure**

629

630 The design, stimuli, and procedure of Experiment 3 were identical to Experiment 2,  
631 except that acceptability judgments were elicited rather than comprehensibility  
632 judgments. All target sentences were still preceded by a context sentence. Thirty-six  
633 subjects participated in the experiment. We present below the specific instruction to the  
634 participants prior to the whole experiment:

635

636 Instruction to the participants:

637 "You will be given 104 short paragraphs, each of which contains 2-3 sentences. After  
638 each paragraph, you will have to answer the following question:

639

640 How acceptable is the last sentence of each paragraph?

641

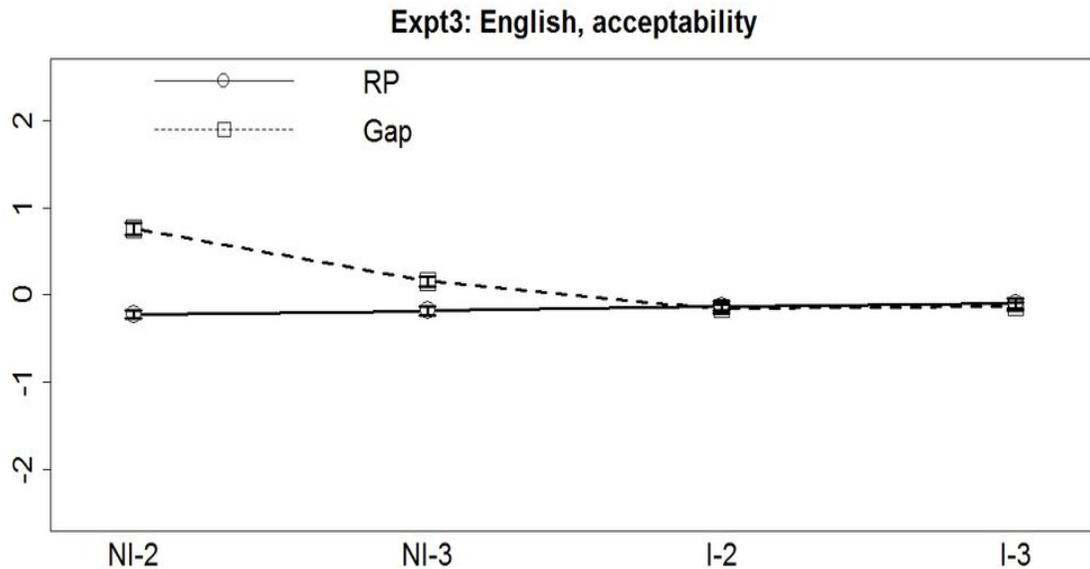
642 You have to answer this question with a score ranging from 1 (= the sentence is  
643 completely unacceptable) to 7 (the sentence is perfectly acceptable). Please make your  
644 judgments based on how good the last sentence sounds in English given the context it is  
645 in. "

646

## 647 **Results**

648 The results are presented in Figure 3. The effect of Island is significant ( $\beta=0.28$ ,  
649  $se=0.08$ ,  $p < 0.001$ ). But this effect is again modulated by the gap/RP difference. Similar  
650 to Experiment 2, although island conditions with gaps are rated significantly lower than  
651 their non-island counterparts (2-level embedding,  $\beta=-1.01$ ,  $se=0.1$ ,  $p < 0.0001$ ; 3-level  
652 embedding,  $\beta=-0.28$ ,  $se=0.09$ ,  $p < 0.001$ ), ratings on RPs were not different between  
653 island and non-island conditions (2-level embedding,  $\beta=0.09$ ,  $se=0.08$ ,  $p > 0.2$ ; 3-level  
654 embedding,  $\beta=0.08$ ,  $se=0.08$ ,  $p > 0.3$ ). Separate analyses for islands and non-islands  
655 conditions are presented below.

656



657  
658  
659  
660

**Figure 3:** Acceptability judgments (z-transformed) for **Experiment 3**.

661 *Without island*

662 Outside of islands, gaps are more acceptable than RPs with both shorter ( $\beta=0.98$ ,  
663  $se=0.09$ ,  $p < 0.00001$ ) and longer embedding ( $\beta=0.34$ ,  $se=0.09$ ,  $p > 0.7$ ,  $p < 0.001$ ).  
664 Furthermore, there is an interaction between Gap and Embedding ( $\beta=-0.16$ ,  $se=0.02$ ,  $p <$   
665  $0.00001$ ). Longer embedding reduced the acceptability of gaps ( $\beta=-0.60$ ,  $se=0.07$ ,  $p <$   
666  $0.00001$ ), but not of RPs ( $\beta=0.04$ ,  $se=0.07$ ,  $p > 0.6$ ).

667

668 *With island*

669 Crucially different from Experiment 1 and 2, within island, there is no difference between  
670 RPs and gaps, across both 2 and 3-level embeddings (2-level embedding:  $\beta=0.03$ ,  
671  $se=0.09$ ,  $p > 0.7$ ; 3-level:  $\beta=0.03$ ,  $se=0.09$ ,  $p > 0.7$ ). In addition, we once again observe  
672 that the depth of embedding does not have any effect ( $\beta=0.01$ ,  $se=0.03$ ,  $p > 0.5$ ), nor is  
673 there an interaction between Gap and Embedding ( $\beta=-0.003$ ,  $se=0.02$ ,  $p > 0.9$ ).

674

### 675 **Discussion of Experiment 3**

676

677 The crucial observation from Experiment 3 is that, when the experimental task is changed  
678 to acceptability judgments, RPs in islands are no longer rated higher than gaps. This  
679 result is in line with previous acceptability judgment studies in the literature (see section  
680 2.2). This also constitutes a crucial difference from the findings of Experiments 1-2, in  
681 which the ratings of RPs in islands were better than those of gaps under a  
682 comprehensibility task.

683

### 684 **3.4 Experiment 4**

#### 685 **Materials, design and procedure**

686

687 In order to evaluate the importance of the context sentence, in the final study, we restored  
688 comprehensibility instructions and presented the target sentence in isolation, with no  
689 context sentence introducing it. The design and procedure were otherwise identical to  
690 Experiment 2. Thirty-six participants participated in the study.

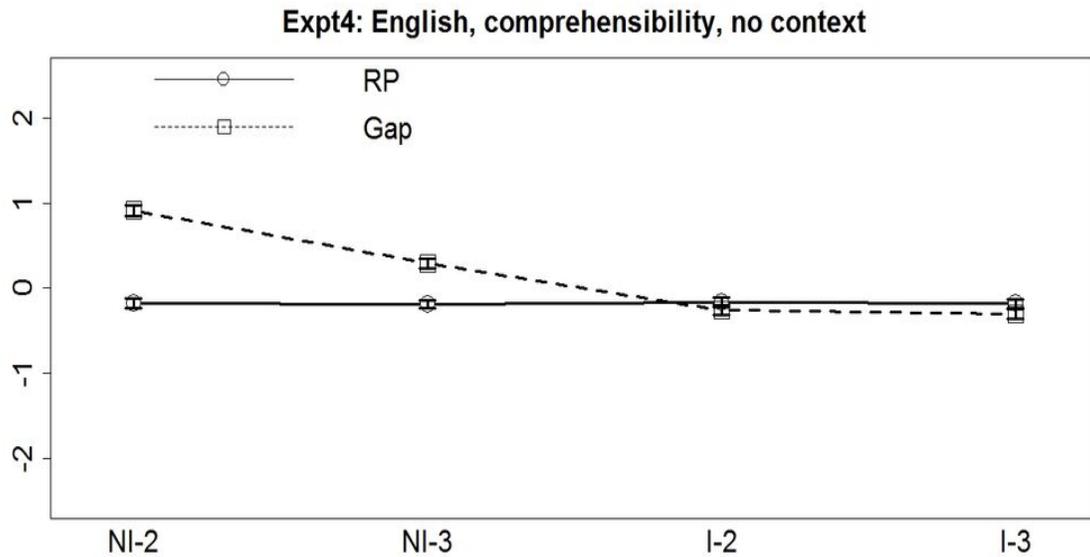
691

#### 692 **Results**

693 The results are presented in Figure 4. There is an effect of Island ( $\beta=0.59$ ,  
694  $se=0.08$ ,  $p < 0.0001$ ), and this effect is once again modulated by the gap/RP difference.  
695 Island conditions with gaps are rated significantly lower than their non-island  
696 counterparts (2-level embedding,  $\beta=-1.18$ ,  $se=0.08$ ,  $p < 0.0001$ ; 3-level embedding,  $\beta=-$   
697  $0.59$ ,  $se=0.08$ ,  $p < 0.0001$ ), but ratings on RPs were not different between island and non-  
698 island conditions (2-level embedding,  $\beta=0.01$ ,  $se=0.07$ ,  $p > 0.8$ ; 3-level embedding,

699  $\beta=0.008$ ,  $se=0.07$ ,  $p >0.9$ ). Separated analyses for island and non-island conditions are  
700 presented below.

701



702  
703  
704

**Figure 4:** Comprehensibility judgments (z-transformed) for **Experiment 4**.

705 *Without island*

706 Outside of islands, gaps are more comprehensible than RPs with both shorter ( $\beta=1.09$ ,  
707  $se=0.08$ ,  $p <0.0001$ ) and longer embedding ( $\beta=0.48$ ,  $se=0.08$ ,  $p < 0.0001$ ). In addition,  
708 there is an interaction between Gap and Embedding ( $\beta=-0.16$ ,  $se=0.03$ ,  $p <0.0001$ ),  
709 reflecting the fact that longer embedding reduced the comprehensibility of gaps ( $\beta=-0.63$ ,  
710  $se=0.08$ ,  $p < 0.0001$ ), but not of RPs ( $\beta=0.02$ ,  $se=0.08$ ,  $p > 0.8$ ).

711

712 *With island*

713 Although a trend can be observed in which RPs are more comprehensible than  
714 gaps with both 2 and 3-level embeddings, the difference is not statistically significant (2-  
715 level embedding:  $\beta=0.09$ ,  $se=0.07$ ,  $p >0.2$ ; 3-level embedding,  $\beta=0.12$ ,  $se=0.08$ ,  $p>0.1$ ).

716 We also observe that within islands, the depth of embedding does not have any effect  
717 ( $\beta=-0.01$ ,  $se=0.03$ ,  $p>0.8$ ), nor is there an interaction between Embedding and Gap ( $\beta=-$   
718  $0.007$ ,  $se=0.03$ ,  $p>0.8$ ).

719

#### 720 **Discussion of Experiment 4**

721 In Experiment 4, we restored the comprehensibility task while eliminating the initial  
722 context sentence. As in Experiment 3, no significant difference between RPs and gaps in  
723 islands was found, although there is a trend for RPs to be rated higher than gaps.  
724 Experiment 3 and 4 together show that both a comprehensibility task and a context  
725 sentence are important in order for the facilitation effect of RPs to emerge in the presence  
726 of islands. Regarding embedding, once again the depth of the dependency only had an  
727 effect on sentences with gaps, and only when no island violation was present.

728

#### 729 **3.5 Interim summary**

730 In four experiments, we compared gaps and resumptive pronouns with respect to two  
731 linguistic manipulations: the presence/absence of islands, and the number of embedded  
732 clauses. We also compared two different experimental tasks: a comprehensibility task and  
733 a more traditional acceptability task. Two main observations emerged from our results.  
734 First, resumptive pronouns did turn out to rescue islands to some degree, confirming the  
735 previously reported introspective judgments. Crucially, however, such effects only  
736 emerged with a comprehensibility task and with the presence of a context sentence that  
737 facilitated the retrieval of an antecedent. Second, the number of embeddings, which  
738 modulates the processing difficulty of long distance dependencies, only affected  
739 grammatical dependencies with gaps (i.e. with no islands and no RPs), in terms of both

740 acceptability and comprehensibility judgments. However, it did not show a significant  
741 influence on sentences with islands or RPs. In the discussion below we assess the  
742 implications of these findings.

743

#### 744 **4. General discussion**

##### 745 **4.1 Acceptability, comprehensibility, and introspective judgments**

746 The first important finding from our results is that comprehensibility ratings better  
747 quantified the previously reported introspective judgments from professional linguists  
748 than acceptability ratings. This raises an important question about the effect of tasks in  
749 obtaining metalinguistic judgments. The traditional acceptability judgment task focuses a  
750 speaker's attention to the overall naturalness of a sentence, an important component of  
751 which is the syntactic well-formedness (i.e., grammaticality). Acceptability ratings,  
752 therefore, are largely determined by the syntactic form of a sentence, although it is also  
753 well documented that other factors, such as processing complexity, could influence the  
754 outcome of these judgments (e.g., Miller and Chomsky, 1963). It has long been  
755 recognized by linguists that intrusive resumptive pronouns are not grammatical in  
756 English (Kroch, 1981; Prince, 1990; Erteschik-Shir, 1992; Asudeh, 2004, 2011);  
757 therefore it should not be surprising that the amelioration effects of RPs reported in  
758 previous introspective judgments could not be detected by the acceptability judgment  
759 task. The comprehensibility task we adopted, on the other hand, shifted the speaker's  
760 attention from judging the overall naturalness of a sentence to a narrower focus of  
761 assessing whether and how easily a given sentence is interpretable (see more qualification  
762 below). This task is better suited to capture the amelioration effects of RPs.

763           Before we discuss further how resumptive pronouns help with the comprehension  
764 process, it is important to note that our results do not imply that just about any  
765 ungrammatical sentence can be perceived to have an improved status as long as speakers  
766 can somehow make sense of it. Particularly pertinent to this discussion are the  
767 experimental results from Maclay and Sleator (1960). In that study, participants gave  
768 judgments to sentences under three different types of task instructions, and we discuss  
769 two of them here, which are most relevant for the current purpose. Under one task,  
770 participants judged whether a given string of words formed a “grammatical” English  
771 sentence; in a different task, participants judged whether the same string of words formed  
772 a “meaningful” English sentence. Under both tasks, participants gave gradient judgments  
773 to different kinds of stimuli that were constructed based on syntactic well-formedness and  
774 semantic meaningfulness, and there was also a task effect on some of the stimuli types.  
775 Since the sentence stimuli in that study were not parallel to the ones we used in the  
776 current study, a direct comparison is not possible, but it is crucial to note that  
777 ungrammatical sentences like “Yesterday I the child the dog gave” received almost  
778 identical ratings both in terms of “grammaticality” and “meaningfulness” judgments  
779 (both at 26% “Yes” responses, see Table IV in Maclay and Sleator, 1960). This suggests  
780 that the mere possibility of constructing a sensible interpretation out of an ungrammatical  
781 sentence, which in the case above is based on speakers’ real world knowledge, is not  
782 sufficient to boost its comprehensibility rating (assuming the “meaningfulness” judgment  
783 is similar to the comprehensibility judgment in the current study). Given these  
784 considerations, we want to emphasize that the improved comprehensibility ratings of RPs  
785 (over gaps) observed in the current study, and the amelioration effects of RPs reported

786 previously by trained linguists, were not reflecting just *any* kind of sensicality or  
787 plausibility judgments. We instead argue that RPs, being anaphoric, aid parsing in very  
788 particular and yet principled ways. More specifically, they help to construct a locally  
789 coherent parse, and they also help to retrieve the left-hand side of a non-local  
790 dependency. Both of these effects fit into a larger picture of standard parsing procedures.  
791 We elaborate on them in the sections below.

792

#### 793 **4.2. The processing facilitation effect of resumptive pronouns in islands**

794 In this section we discuss the facilitation effect observed for RPs within islands.  
795 One possibility, as argued by Asudeh (2004, 2011, 2012, see section 2.3), is that RPs can  
796 facilitate the comprehension of an utterance through assuring that the sentence is locally  
797 well-formed. Crucially, Asudeh’s model separates the parsing benefits of RPs from the  
798 grammaticality of the construction, suggesting that RPs, while unable to render the  
799 structure grammatical, can at least facilitate the construction of a well-formed local parse.  
800 We note that the local coherence effect is not limited to Asudeh’s model and the  
801 phenomenon of resumption. It is well known, for instance, that a coherent local parse can  
802 sometimes affect performance independent of the global parse. Tabor et al. (2004)  
803 showed that speakers were distracted by the presence of a locally coherent string when  
804 interpreting a globally difficult structure. In the sentence “The coach smiled at the player  
805 tossed a frisbee”, for instance, the local structure “the player tossed a frisbee” should be  
806 parsed as a reduced relative clause (i.e. “the player <who was> tossed a frisbee”).  
807 However, it was shown that participants tend to parse the local string “the player

808 tossed...” as a subject-verb structure, possibly because of the overwhelming parsing  
809 complexity at the global level.<sup>5</sup>

810 In addition to helping with the local parse, RPs can also aid the dependency  
811 formation between a “filler” – which is looking for a gap – and the argument position that  
812 the RP occupies. First of all, in a complex syntactic structure, such as syntactic islands, it  
813 may be relatively difficult to identify where the tail of a dependency is. But a resumptive  
814 pronoun provides a clear perceptual cue for that. Second, compared to gaps, resumptive  
815 pronouns also provide explicit morphological cues, such as information about the  
816 animacy, gender, number, and person features of the antecedent, which guide the retrieval  
817 of the appropriate antecedent more quickly. Such cue-based retrieval mechanisms in  
818 pronouns fit into a more general memory retrieval architecture that accounts for many  
819 other phenomena in sentence processing (e.g. Lewis and Vasishth 2005). Gaps, on the  
820 other hand, provide little information beyond the verb subcategorization cues to help  
821 identify the appropriate antecedents. The processing difference between gaps and  
822 pronouns discussed here may also underline some intuitions suggested in the previous  
823 proposals pertaining to the linguistic difference between gaps and RPs. For example,  
824 many previous proposals have suggested that while gaps are bound variables, intrusive  
825 RPs are anaphorically linked to their antecedents (Chao and Sells, 1983; Prince, 1990;  
826 Erteschik-Shir, 1992; Alexopoulou and Keller, 2007; Han et al., 2012; Clemens et al.,  
827 2012), and this difference is somewhat responsible for the fact that gaps are more  
828 sensitive to syntactic islands, whereas RPs can find their contextually salient discourse  
829 antecedents despite the intervening island boundaries (e.g. Clemens et al., 2012).

---

<sup>5</sup> Although Tabor et al. (2004) cautiously pointed out that it was unclear whether the locally coherent parse is the cause or the consequence of the global parsing complexity.

830           The anaphoric status of RPs also explains why the presence of a context sentence  
831 in our experiments had a significant impact on the comprehensibility ratings of RPs. In  
832 about one quarter of the experimental stimuli, the antecedent is directly mentioned in the  
833 context sentence. Two examples are given in (9) and (10). In examples like this, the  
834 context sentence serves to boost the salience of the relevant antecedent, making it more  
835 accessible for an anaphoric expression (Gundel et al., 1993; Erteschik Shir 1992; Ariel,  
836 1990; Roberts, 2010).

837 (9)    Context: In the high school where I graduated, a **janitor** suddenly decided that he  
838 wanted a better education.

839           Sentence: This is the **janitor** that the teacher who tutors **him** is really nice.

840

841 (10)   Context: The newly graduated mechanical **engineers** have gone through a series  
842 of job interviews, and some of them already received good news.

843           Sentence: This the **engineer** that the manager who hired **him** has shown to trust  
844 young people.

845

846 For the majority of the experimental items, the context sentence did not directly mention  
847 the antecedent, as shown in the examples (11) and (12) (with (11) reproduced from (6)):

848 (11)   Context: Yesterday there were riots in the street, and some people were wounded  
849 by the police.

850           Sentence: This is the **guy** that the cop who beat **him** up must be suspended.

851

852 (12)   Context: In track and field, someone always tries to cheat.

853           Sentence: This is the **runner** that the umpire who disqualified **him** behaved very  
854 professionally.

855

856 In these examples, even though the antecedent for the pronoun wasn't explicitly  
857 mentioned in the context, the context sentence nevertheless sets up a situation model for  
858 the listener, which aids the memory maintenance of the antecedent-pronoun relationship.

859 This is in line with Ariel's (1990) claim that the task of retrieving an antecedent is easier  
860 whenever the pronoun and the antecedent are part of a frame that is known and well-

861 defined. It is also possible that an explicit background context can facilitate the memory  
862 encoding of an antecedent, boosting its degree of discourse familiarity. A number of  
863 researchers (e.g. Ariel, 1990; Roberts, 2010) have argued that the more familiar the  
864 antecedent is, the easier it is to retrieve the antecedent later.

865

### 866 **4.3. Resumptives under longer dependencies**

867 Although the processing facilitation effect of RPs in syntactic islands is relatively  
868 clear in our results, their facilitation effect in longer dependencies (e.g., multiple  
869 embeddings) is not very robust. This finding is by and large consistent with previous  
870 studies that have experimentally examined the effect of RPs in structures with multiple  
871 embeddings (see section 2.2). In this section we discuss some possible reasons for this  
872 result.

873 Generally speaking, it is well-established that dependency length has an effect on  
874 processing complexity: Longer dependencies are generally more difficult to process than  
875 shorter ones, as reflected in both offline and online measures of processing complexity  
876 (Gibson 1998; Warren and Gibson 2002; Van Dyke and Lewis 2003; Lewis and Vasishth  
877 2005; Lewis et al., 2006). There are a number of possible underlying sources for the  
878 length effect. The memory representation of the retrieval target (e.g., the filler) could  
879 have decayed over a long period of time; more linguistic material introduced by the  
880 longer dependency could increase the likelihood of similarity-based interference (e.g., the  
881 features on the retrieval target are shared by some other entities in working memory), or  
882 semantic integration over longer distance and more linguistic material could be more  
883 costly than the integration of a simpler dependency. All of these possibilities could

884 overload the parser and result in higher processing difficulty, making the construction of  
885 a coherent message difficult.

886         If resumptives can aid the processing of complex dependencies via facilitating  
887 comprehensibility, one may expect that RPs in longer dependencies would result in  
888 higher comprehensibility than gaps, or RPs in longer dependencies should receive higher  
889 comprehensibility rating than RPs in shorter dependencies. However, neither prediction  
890 was completely borne out in the current results: RPs in longer dependencies did not  
891 receive higher comprehensibility ratings than gaps; and RPs in sentences with three-  
892 embeddings received the same, but not higher, comprehensibility ratings as RPs in  
893 sentences with two-level embeddings. We discuss below a number of possibilities that  
894 could explain these results.

895         The first consideration concerns our stimuli. The current design only compares  
896 sentences with 3-level and 2-level embeddings. Since these two conditions only differ for  
897 one level of embedding, the facilitation effect of RPs may not be detectable. It is possible  
898 that the benefit of RPs on comprehensibility becomes observable only when there is a  
899 larger difference in embedding, as shown by the original example in Erteschik-Shir  
900 (1992) (see the example in (3)). The results from Alexopoulou and Keller (2007) also  
901 showed that the largest effect of embedding on resumption was observed when zero-  
902 embedding was compared to other levels of embedding.

903         It should also be pointed out that while the longer dependencies with RPs were  
904 not rated more comprehensible than the shorter ones, the lack of improvement can be  
905 reinterpreted as evidence for the processing facilitation effect of RPs. In three out of the  
906 four experiments (i.e. Experiment 1, 3, 4, but not Experiment 2), for the no-island

907 proportion of the conditions, there is a robust interaction between Gap/RP and the level  
908 of embedding--while longer dependencies with gaps received lower ratings than short  
909 dependencies with gaps, the same degradation was not observed with RPs, suggesting a  
910 neutralization of the negative effect of embedding. This is in line with previous findings  
911 (e.g. Alexopoulou and Keller, 2007; Hofmeister and Norcliffe, 2013; Han et al., 2012).  
912 This interpretation, however, should also be treated with some caution. It is possible that  
913 the stable low ratings of RPs across different number of embeddings may simply reflect a  
914 “floor effect”—that is, resumption in two and three-level embeddings are so bad that they  
915 are already at the bottom of participants’ judgment scale.

916         Finally, rather than broadly stating that longer dependencies are always more  
917 costly than shorter ones, it is worth considering the exact source of complexity associated  
918 with dependency length. One of the major candidates discussed in the literature is the  
919 increasing likelihood of similarity-based interference when more material is introduced  
920 by longer dependencies (Lewis et al., 2006; Lewis and Vasishth, 2005). Under this  
921 account, memory retrieval of a target is guided by a set of retrieval cues/features (e.g., an  
922 animate subject is being cued as a retrieval target). If the retrieval target shares features  
923 with other representations in the working memory, feature similarity among different  
924 representations will prevent the correct target from being retrieved accurately due to cue  
925 overload. Van Dyke and Lewis (2003) showed that sentences with similar length but  
926 different degrees of retrieval interference led to different processing complexity,  
927 suggesting that, rather than length per se, it is cue overload that caused difficulty for the  
928 parser. Coming back to the current study, it is possible that in some of our stimuli, the

929 short and long conditions, though different in length, may not be different in overlapping  
930 cues. We illustrate this by the example in (6) above, repeated here as (13).

931

932 (13) a. 2-embedding, non-island, RP

933 This is the boy that the cop who was leading the operation beat *him* up.

934 b. 3-embedding, non-island, RP

935 This is the boy that the paper reports that the cop who was leading the operation  
936 beat *him* up.

937

938 At the RP “him”, the parser is looking for a [+singular, +masculine, +animate] noun as  
939 the retrieval target. In the short condition (13a), in addition to the correct target “the guy”,  
940 it also contains one interfering NP “the cop”, which shares all the features with the right  
941 target and therefore is a serious competitor. The long condition (13b) contains two  
942 additional NPs “the cop” and “the paper,” but “the paper” is at best a very weak  
943 competitor since it does not share many features with the retrieval target. In other words,  
944 although (13b) is longer than (13a), one does not necessarily expect processing  
945 complexity difference between the two. This could explain why we found no  
946 comprehensibility rating differences between long and short sentences with RPs.

947

## 948 **5. Conclusion**

949 To conclude, this paper provides novel empirical evidence that intrusive  
950 resumptive pronouns indeed can “rescue” syntactic islands, confirming previously  
951 reported introspective judgments by trained linguists. Yet, the rescuing effect is crucially

952 not at the level of grammaticality or acceptability, but at the level of sentence  
953 comprehension/comprehensibility. We also argued that the facilitation effect of RPs on  
954 comprehension follows from the general parsing mechanisms that subserve sentence  
955 comprehension. Methodologically speaking, our findings contribute to a more nuanced  
956 understanding of the nature of different types of metalinguistic judgments. Behavioral  
957 judgments, such as acceptability judgments or truth value judgments, form the primary  
958 empirical base for linguistic theories. It is therefore of crucial interest for future research  
959 to be able to more precisely characterize the specific linguistic properties that each type  
960 of judgment task targets and what factors may influence these judgments.

961

962 **Acknowledgments** (to be added)

963

964

965 **References**

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