An experimental perspective on embedded gapping in Persian

Bîlbîie, G.; Faghiri, P.

DOI
10.1515/tlr-2022-2097
Publication date
2022
Document Version
Final published version
Published in
The Linguistic Review

Gabriela Bîlbîie* and Pegah Faghiri

An experimental perspective on embedded gapping in Persian

https://doi.org/10.1515/tlr-2022-2097
Published online July 11, 2022

Abstract: This paper empirically tests the embedding constraints on gapping in Persian. It has been suggested that gapping differs from other kinds of ellipsis in banning embedding. However, the first counter-examples in the literature come from Persian. Following up on previous experiments on embedded gapping in several languages, we report the results of two acceptability judgment tasks. Our results show that, while embedded gapping is overall acceptable in Persian, speakers' acceptability judgements also vary depending on the semantic type of the embedding predicate, as well as the presence/absence of the complementizer. Data from Persian highlight that, despite the cross-linguistic variation observed with respect to the acceptability of embedded gapping, a general semantic constraint is at work across languages: non-factive verbs embed more easily than factive ones; inside factive verbs, semi-factive (cognitive) predicates embed more easily than true factive (emotive) ones. Moreover, whereas previous theoretical literature indicates no systematic preference for the absence or the presence of the complementizer in Persian, these new experimental data suggest a preference for complementizer drop. To account for the gradience observed in our experimental data, we propose an approach of gapping based on acceptability rather than grammaticality.

Keywords: complementizer; embedding; factivity; gapping; Persian

We are grateful to the anonymous reviewers for their insightful comments and suggestions that helped us to improve the quality of this paper. All errors or misunderstandings are our own. This work was supported by the LabEx Empirical Foundations of Linguistics (EFL) project, strand 2 *Experimental grammar from a cross-linguistic perspective*, operation SA2 *Experimental syntax* (Laboratoire de Linguistique Formelle – UMR 7110 CNRS et Université de Paris).

***Corresponding author: Gabriela Bîlbîie**, University of Bucharest, Bucharest, Romania & Laboratoire de Linguistique Formelle, Paris, France, E-mail: gabriela.bilbiie@lls.unibuc.ro
Pegah Faghiri, University of Amsterdam, Amsterdam, Netherlands, E-mail: pegah.faghiri@uva.nl

1 Gapping and embedding: an introduction

Ellipsis, and in particular gapping, has long been of interest to linguists (from Ross 1967, 1970 onwards). While most research has been done on English (and other Germanic languages), there are limited studies that have looked at ellipsis in other languages and, in particular, on Persian. The few existing gapping studies on Persian (e.g., Farudi 2013; Toosarvandani 2018) are rather theoretical and based on constructed data, obtained by informal introspective judgments. To our knowledge, gapping in Persian has never been experimentally investigated and the aim of this study is to shed light on some complex aspects of this phenomenon.

Gapping refers to constructions in which a sequence of phrases lacking a verbal head, but displaying a clausal content is coordinated with a full clause which specifies its form and interpretation. A typical example of gapping in Persian is given in (1), where one coordinates a full clause (*Ānāhitā māhi xord* 'Anahita ate fish'), called the source clause, with an elliptical clause (*Rod gušt* 'Rod meat'), called the target clause. The target clause only contains remnants (*Rod* 'Rod', *gušt* 'meat') which syntactically mirror some correlates in the source (*Ānāhitā* 'Anahita', *māhi* 'fish'). There is a missing material (called the gap) in the target clause, which is semantically reconstructed based on the material which is present in the source, namely antecedent (*xord* 'ate'). The minimal criteria which are usually taken into account to identify gapping configurations are the number of remnants and the gap category; therefore, it is usually assumed that the gapping construction has at least two remnants (unlike its related construction, stripping,[1] which displays a single remnant in the elliptical sequence), and it lacks at least the verbal head (unlike its related construction, pseudogapping,[2] which displays two remnants, along with an auxiliary or modal verb).

---

1 An example of stripping is given in (i). For more details on the varieties of stripping in Persian, see Rasekhi (2020).

(i) *Farnāz qormesabzi dorost kard=e yā Maryam?*
Farnaz *qormesabzi* correct do.PTCP=be.PRS.3SG or Maryam
'Did Farnaz make *qormesabzi* or Maryam?'
(Toosarvandani 2018: 934)

2 Pseudogapping is acceptable in English (i), but not in Persian (ii); see Farudi (2013).

(i) *John has read magazines and Peter has books.*

(ii) **Giti māhi xorde bud va Sārā gušt bud.*
Giti fish eat.PTCP be.PST.3SG and Sara meat be.PST.3SG
'Giti had eaten fish and Sarah had meat.'
(Farudi 2013: 150)

(1) *Ānāhitā māhi xord va Rod gušt.*
Anahita fish ate.3SG and Rod meat
'Anahita ate fish and Rod meat.'
(Farudi 2013: 57)

One of the specific properties of gapping is assumed to be the 'No Embedding Constraint', in particular the Downward Bounding Constraint postulated by Hankamer (1979) and discussed in detail by Johnson (2009, 2018). According to Hankamer (1979: 20), "the Gapping rule […] has to be constrained to operate strictly in structures directly conjoined with each other. This constraint can be viewed as a kind of bounding: we can say that the rule is downward bounded since it does not go down into subordinate clauses". This syntactic constraint would explain the ungrammaticality of the English examples in (2), as the missing material in gapping cannot be contained within an embedded clause:

(2) a. **Alfonso stole the emeralds, and* ***I think that*** *Mugsy the pearls*.
(Hankamer 1979: 19)
b. **Some had eaten mussels and* ***she claims that*** *others shrimp*. (Johnson 2009: 293)

However, it has been shown that this proposed syntactic constraint does not hold for Persian. Based on some elicited data given in (3), Farudi (2013) observes that in Persian embedded gapping is grammatical, with and without complementizer (compare (3a) and (3b–c)), under various kinds of verbs (compare (3a–b), (3c), and (3d)), regardless of the person of the embedding verb (compare (3a–b) and (3c)).

(3) a. *Māmān čāi xord va* ***fekr mi-kon-am*** *bābā qahve*.
mother tea ate.3SG and think IPFV-do-1SG father coffee
'Mother drank tea and I think Father (drank) coffee.'
b. *Jiān be Sārā gol dād va* ***fekr mi-kon-am ke*** *Ārtur be*
Jian to Sarah flower gave.3SG and think IPFV-do-1SG that Arthur to
Giti ketāb.
Giti book
'Jian gave flowers to Sarah and I think that Arthur (gave) books to Giti.'
c. *Mahsā in ketāb=ro dust dār-e va* ***Minu mi-dun-e ke***
Mahsa this book=OBJ like have-3SG and Minu IPFV-know-3SG that
māmān=eš un ketāb=ro.
mother=3SG that book=OBJ
'Masha likes this book and Minu knows that her mother (likes) that book.'

d. *Mehrān gušt=ro xord (mesl hamiše) vali* ***ta'job mi-kon-am ke***
Mehran meat=OBJ ate.3SG (like always) and surprise IPFV-do-1SG that
Rādmehr māhi=ro.
Rodmehr fish=OBJ
'Mehran ate the meat (as usual) but I am surprised that Rodmehr (ate) the fish.'
(Farudi 2013: 83)

The observation that embedded gapping is not constrained in Persian implies that the Downward Bounding Constraint is not a strong and universal syntactic constraint. However, we cannot confirm this without providing solid empirical evidence to support Farudi's counter-examples and claim.

Several reasons motivate the need for using experimental methods to assess the existing claims: as we already mentioned, previous data from Farudi (2013) are based on informal elicited data and some of her examples are questionable, in particular, when interspeaker variations are taken into account.[3] It is well-established now that for many syntactic structures, judgments can be much more versatile than we think and, if their elicitation does not follow precise methodological standards (Gibson and Fedorenko 2013), one can reasonably doubt their reliability. As pointed out by Dahl (1979: 141): "It is well-known among linguists that intuitions about the acceptability of utterances tend to be vague and inconsistent, depending on what you had for breakfast and which judgment would best suit your own pet theory." In the case of Persian, indeed some recent experimental studies have allowed to debunk certain well-established affirmations that were similarly based on unreliable informal grammaticality judgments (see, e.g., Faghiri and Samvelian 2016, 2021). Furthermore, corpus studies on other languages (e.g., English) suggest that gapping has a very low frequency in spontaneous language production and occurs much more often in written language than in spoken language (Meyer 1995; Tao and Meyer 2006) – it may even be restricted to formal registers (Goldberg and Florian 2018). Therefore, it is difficult to find naturalistic data with embedded gapping and, consequently, the most accessible empirically solid way to study the behavior of embedded gapping would be through experimentation. Finally, given that there are several competing syntactic analyses proposed for gapping (see Section 4) and that the data on embedding may constitute strong evidence in favor of one or the other approach, the theoretical stakes are high and therefore experimental data would give a safer ground to assess the evidence and evaluate competing analyses. Therefore, the main goal of this paper is

3 At this point, it is worth noting that the intuitions of the second author of this paper as well as an anonymous reviewer (both a native speaker of Persian) go against the data presented in Farudi (2013) in several occasions.

to test the embedding constraint on gapping in Persian using acceptability rating experiments.

The paper is structured as follows: In Section 2, we briefly discuss previous experimental studies on embedded gapping in other languages. In Section 3, we present our experimental data. In Section 4, we offer a theoretical perspective on gapping, discussing how the availability of embedded gapping in Persian challenges one of the most prominent syntactic analyses of gapping. In Section 5, we assess our experimental results in a cross-linguistic perspective, to corroborate our findings with the previous experimental results from other languages.

Before discussing embedded gapping in other languages, it is necessary to mention that Persian, a flexible word order language with a canonical SOV word order, allows both 'forward gapping' (i.e. the source clause precedes the elliptical clause, as in (1) and (4a)) and 'backward gapping' (i.e. the source clause follows the elliptical clause, as in (4b)),[4] unlike English, which always allows only forward gapping (5). Whereas the configuration with forward gapping (SOV+SO) is an unambiguous occurrence of gapping, the configuration with backward gapping (SO+SOV), as in (4b), is structurally ambiguous: it could be analyzed either as an instance of Right-Node Raising or as an instance of Argument Cluster Coordination. In the former case, an elliptical phrase lacking the head in final position (*Rodmehr gušt* 'Rodmehr meat') precedes a complete phrase which determines its interpretation (*Ānāhitā māhi xord* 'Anahita fish ate'), giving rise to an asymmetric structure (cf. van Oirsouw 1987; Wilder 1997). In the latter case, two clusters (non-standard constituents: *Rodmehr gušt* 'Rodmehr meat' and *Ānāhitā māhi* 'Anahita fish') are conjoined in the scope of a shared verbal head (*xord* 'ate'), by eschewing ellipsis (cf. Dowty 1988; Steedman 2000). As Farudi (2013) suggests, there are empirical properties supporting a different analysis for cases such as (4b) with backward gapping, compared to those of forward gapping. We mention here two of them: first, backward gapping requires a stricter morphological identity on the shared head (6b) than forward gapping (6a); second, clause final auxiliaries can be shared in the case of backward gapping (7b), but not with forward gapping (7a), which obligatorily targets both the auxiliary and the lexical verb (8).[5]

4 Though both forward and backward gapping are available, it seems that there is a stylistic and/or register-based preference: forward gapping is more common in (spoken and written) spontaneous and/or informal speech than backward gapping is, whereas backward gapping is favored in formal and stylish language productions. From a more general perspective, a preference for forward gapping could be explained in terms of processing: "An ellipsis which refers to a constituent not previously introduced, places a heavy burden on short-term memory. […] It is thus only natural that gapping of what is contextually known should be preferred." (Ramat 1987: 90).
5 For additional arguments, see Toosarvandani (2018). Also note that backward gapping is claimed to disallow embedded gapping in Persian, unlike forward gapping (see Farudi 2013).

Consequently, in this paper, we focus on the non-ambiguous gapping configuration, namely forward gapping.[6]

(4) a. *Rodmehr gušt xord va Ānāhitā māhi.*
Rodmehr meat ate.3SG and Anahita fish
'Rodmehr ate meat and Anahita fish.'
b. *Rodmehr gušt va Ānāhitā māhi xord.*
Rodmehr meat and Anahita fish ate.3SG
'Rodmehr ate meat and Anahita fish.'
(Farudi 2013: 65)

(5) a. *John ate fish and Mary meat.*
b. **John fish and Mary meat ate.*

(6) a. *man māhi xord-**am** va Giti gušt ~~xord~~*
I fish ate.1SG and Giti meat ate.3SG
'I ate fish and Giti (ate) meat.'
b. ??/**man māhi ~~xord-am~~ va Giti gušt xord*
I fish ate.1SG and Giti meat ate.3SG
'I ate fish and Giti (ate) meat.'
(Farudi 2013: 66–67)

(7) a. **Sārā be Giti pul dāde bud va Mahin be Maziar ketāb dāde ~~bud~~*
Sara to Giti money give.PTCP be.PST.3SG and Mahin to Maziar book give.PTCP be.PST.3SG
'Sara had given money to Giti and Mahin given books to Maziar.'
b. *Sārā be Giti pul dāde ~~bud~~ va Mahin az Maziar ketāb gerefte bud*
Sara to Giti money give.PTCP be.PST.3SG and Mahin from Maziar book take.PTCP be.PST.3SG
'Sara had given money to Giti and Mahin taken a book from Maziar.'
(Farudi 2013: 69, 70)

(8) a. *Sārā be Giti pul **dāde bud** va Mahin be Māziār ketāb.*
Sara to Giti money give.PTCP be.PST.3SG and Mahin to Maziar book
'Sara had given money to Giti and Mahin (had given) books to Maziar.'

6 Gapping does not seem to have a unique behavior cross-linguistically. According to Haspelmath (2007), the term of *gapping* is not always the most appropriate to describe the empirical facts observed with non-SVO languages or languages with free word order.

b. *Sārā be Giti pul **dāde bud** va Mahin be Māziār ketāb **bud**.*
'Sara had given money to Giti and Mahin had books to Maziar.'
c. *Sārā be Giti pul **dāde bud** va Mahin be Māziār ketāb **dāde**.*
'Sara had given money to Giti and Mahin given books to Maziar.'
(Farudi 2013: 68–69)

2 Previous experimental studies on other languages

After Farudi's (2013) first reported counter-examples from Persian, other scholars pointed out similar exceptions to the Downward Bounding Constraint in other languages. Some of them experimentally tested the conditions under which such embedding gapping was acceptable. We address here the experimental studies on Spanish (Bîlbîie and de la Fuente 2019) and Romanian (Bîlbîie et al. 2021), that make use of acceptability judgment tasks (Likert scale: 1–10) and analyze the results from 50 Spanish native speakers and 72 Romanian native speakers, respectively. Note that in both Romance languages the presence of the complementizer is obligatory in embedded contexts.

The experimental studies on Spanish and Romanian hypothesize that embedded gapping is acceptable in these languages, but it is semantically constrained; in particular, factivity is assumed to play a crucial role in explaining the acceptability of embedded gapping. Previous theoretical studies on Spanish fragments (de Cuba and MacDonald 2013) proposed a binary/categorical contrast between non-factive predicates, that allow embedding, and factive predicates, that do not allow embedding. However, Bîlbîie and de la Fuente (2019) and Bîlbîie et al. (2021) take into account a more fine-grained distinction, by paying attention to the heterogeneous behaviour of factive predicates. Consequently, they propose three semantic classes (cf. Karttunen 1971; Kiparsky and Kiparsky 1971; Hooper 1975): (i) non-factives, which do not presuppose the truth of their embedded complement, leaving room for doubt and uncertainty (e.g., *to think, to imagine, to suspect*), (ii) semi-factives (cognitive verbs, e.g., *to know, to see, to observe*), and (iii) true factives (emotive verbs, e.g., *to regret, to like, to be surprised*); the last two classes presuppose the truth of their embedded complement, in other words, the complement is an established fact. The three semantic classes which have been considered in these experiments are illustrated in (9) for Spanish. In the experimental condition in (9a), gapping is embedded under the non-factive verb *sospechar* 'suspect'. In (9b), gapping is embedded under the semi-factive verb

saber 'know', whereas in the condition in (9c), gapping is embedded under the true factive predicate *molestarse* 'be bothered'. In all of these experimental conditions, the complement clause is introduced by the complementizer *que* 'that', which is obligatory in Spanish.

(9) a. *Pablo pidió una cerveza y* ***sospecho*** ***que*** *Juan un whisky.*
Pablo ordered a beer and suspect.1SG that Juan a whisky
'Pablo ordered a beer and I suspect that Juan ordered a whisky.'

b. *Pablo pidió una cerveza y* ***sé*** ***que*** *Juan un whisky.*
Pablo ordered a beer and know.1SG that Juan a whisky
'Pablo ordered a beer and I know that Juan ordered a whisky.'

c. *Pablo pidió una cerveza y* ***me molesta*** ***que*** *Juan un whisky.*
Pablo ordered a beer and me bother.3SG that Juan a whisky
'Pablo ordered a beer and I am bothered that Juan ordered a whisky.'
(from Bîlbîie and de la Fuente 2019)

Crucially, the experimental results from Spanish and Romanian show a gradience rather than a clear-cut categorical contrast: embedded gapping is indeed acceptable in these two Romance languages, but the acceptability decreases depending on the semantic type of predicate. As summarized in Table 1, we see that in Spanish and Romanian (i) embedded gapping is very well accepted under a non-factive predicate compared to factive predicates; and (ii) within factive predicates, semi-factives embed better than true factives. The differences between non-factives and factives, between semi-factives and true factives, as well as between non-factives and semi-factives are all statistically significant.

Unlike previous theoretical studies which postulate two different syntactic structures for non-factives versus factives (de Cuba and MacDonald 2013), Bîlbîie and de la Fuente (2019) appeal to semantic and discourse constraints to explain these effects and provide non-syntactic explanations for the observed gradience. On the one hand, semantically, a non-factive predicate, such as *sospechar* 'suspect' in (9a), can have a 'parenthetical' use, in that the content of its embedded complement is the main assertion of the utterance. At the discourse level, the first conjunct and the embedded gapped sequence under a non-factive verb answer the same question under discussion (QUD); in the example at stake, the QUD in the embedded clause is 'what drink did Juan order', similar to the QUD of the first conjunct 'what drink did Pablo order'. On the other hand, a factive predicate, such as *molestarse* 'be bothered' in (9c), puts its evaluative component in the foreground whereas the content of its embedded complement is backgrounded. Moreover, there is a discourse incongruence, as the first conjunct and the gapped sequence embedded under a factive verb do not answer the same QUD (in the example at stake, the embedded clause answers a different QUD, namely 'what effect did it

have on the speaker'), which gives rise to a decrease in acceptability. As for semi-factive predicates, they display a hybrid behavior: they presuppose the truth of their complement (like true factives), but this presupposition may be easily cancelled (cf. 'weak' presupposition triggers, see Jayez et al. 2015 a.o.) and they may thus come closer to non-factive predicates.

Finally, it is worth noting that, in both Romance languages, the authors observe no significant difference between embedded gapping under a non-factive verb and non-embedded gapping, which means that at least in some contexts embedded gapping is as natural as non-embedded gapping. Therefore, a typical (non-embedded) example of gapping such as (10) in Spanish gets roughly the same scores as the experimental condition in (9a), where gapping is embedded under the non-factive verb *sospechar* 'suspect'.

(10) *Pablo pidió una cerveza y Juan un whisky*.
'Pablo ordered a beer and Juan a whisky.'
(Bîlbîie and de la Fuente 2019)

Bîlbîie et al. (2021) ran a similar experiment in French, which similar to English, is assumed to not allow embedded gapping. The experimental results are given in the last column of Table 1. Though in French embedded gapping is overall much less acceptable than in Spanish or Romanian, the same sensitivity to the semantic type of the embedding predicate is observed: embedded gapping under a non-factive verb gets higher scores than under a factive verb, and embedding under semi-factives gets higher scores than under true factives.

In a parallel experimental study on embedded gapping in English, Bîlbîie et al. (to appear) observe that the Downward Bounding Constraint is too strong even for English. As English allows the complementizer drop in some complement clauses (see Jaeger 2006 for a detailed discussion), the authors considered both cases of embedding: embedded gapping under the complementizer *that* and embedded gapping without a complementizer, as illustrated by the experimental conditions in (11). The results of this study are given in Table 2. Though in English embedded

Table 1: Mean acceptability judgments (Likert scale: 1–10) for embedded gapping in Romance languages.

	Spanish	Romanian	French
Embedding under non-factives (ex. 9a)	8.98/10	8.19/10	5.51/10
Embedding under factives	7.45/10	6.90/10	4.40/10
Embedding under semi-factives (ex. 9b)	8.05/10	7.73/10	5.33/10
Embedding under true factives (ex. 9c)	6.86/10	5.99/10	3.86/10

Table 2: Mean acceptability judgments (Likert scale: 1–7) for embedded gapping in English.

	With complementizer	Without complementizer
Embedding under non-factives	4.60/7	5.31/7
Embedding under factives	2.73/7	2.76/7
Embedding under semi-factives	2.74/7	3.26/7
Embedding under true factives	2.71/7	2.29/7

gapping is degraded in the presence of the complementizer compared to Spanish or Romanian, we can observe a gradience in speakers' acceptability judgments depending on the semantic type of the embedding predicate. More importantly, embedded gapping gets higher scores under non-factive predicates in the absence of the complementizer. This shows that the omission of the complementizer *that* has an ameliorating effect on embedding gapping in English,[7] which is modulated by the semantic type of the embedding predicate. This effect is clearly visible with non-factive predicates, however it arises as well when we compare semi-factive to true factive predicates. The experimental results on English allow us to conclude that the Downward Bounding Constraint is affected not only by the semantic class of the embedding predicate, but also by the presence/absence of the complementizer.

(11) a. *At the bar, Paul ordered a beer and* ***I suspect (that)*** *John a whisky.*
b. *At the bar, Paul ordered a beer and* ***I know (that)*** *John a whisky.*
c. *At the bar, Paul ordered a beer and* ***I regret (that)*** *John a whisky.*
(from Bîlbîie et al. to appear)

Table 3 summarizes the main results for different languages which have been experimentally investigated for embedded gapping.

As Persian allows the omission of the complementizer,[8] we want to test embedded gapping in both syntactic contexts: with and without complementizer. One of the advantages of the experimental approach is the possibility to test the

7 As Bîlbîie et al. (to appear) observe, the fact that complementizer drop favors acceptability could be explained by frequency: in English, complementizer drop is very frequent (there are 85% complement clauses without *that* in corpora), hence a frequency effect on acceptability (Lau et al. 2016).

8 Persian has a unique complementizer *ke* to introduce embedded clauses and it is optional:

(i) *Giti mi-dānest (ke) Sārā gušt ne-mi-xor-ad.*
Giti IPFV-knew.3SG (that) Sara meat NEG-IPFV.eat-3SG
'Giti knew that Sarah does not eat meat.'

Table 3: Summary of the previous experimental studies.

Embedded gapping	Non-factive verb	Semi-factive verb	True factive verb
With complementizer	Spanish	Spanish	?Spanish
	Romanian	Romanian	?Romanian
	?French	??French	??French
	?English	??English	??English
Without complementizer	English	?English	??English

same hypothesis in different languages using comparable material. We thus built on the experimental design used in the studies mentioned above, adapting it for Persian.

3 Experimental data from Persian

3.1 Research questions, hypotheses and method

Recall that the informal Persian data gathered by Farudi (2013) show that embedded gapping is possible in Persian under a wide range of embedding predicates, irrespective of the semantic type of the predicate (see the data in (3) above, where one has the non-factive verb *fekr kardan* 'to think' in (3a–b), the semi-factive verb *mi-dun-e* 'to know' in (3c), and the true factive verb *ta'ajob* 'to be surprised' in (3d)). Also recall that, since in Persian the complementizer *ke* is optional in regular embedded clauses, embedded gapping should be possible both with and without complementizer. Therefore, according to Farudi (2013), there is no systematic (dis)preference for absence or presence of the complementizer.

Now, if we consider Farudi's (2013) assumptions and the previous experimental results from other languages, two main research questions arise: i) Is there an interaction between gapping and embedding, and between embedded gapping and factivity? ii) Is there an interaction between gapping and complementizer drop?

Firstly, similar to previous experimental studies, we expect an interaction both between gapping and embedding, and between gapping and factivity. In particular, contrary to Farudi's (2013) claim about the uniform behavior of embedded gapping in Persian, we expect to observe the same gradience across the three semantic classes of predicates (non-factives, semi-factives, true factives). Secondly, we expect an interaction between gapping and the complementizer drop. Recall that in Bîlbîie et al. (to appear) the effect of the latter in English is suggested

to be a frequency effect (see footnote 7), but we do not have similar corpus data on Persian to assess this hypothesis. However, if the complementizer drop does indeed play a role in the acceptability of embedded gapping cross-linguistically, then we would expect the same preference in Persian.

We have conducted two separate acceptability rating experiments to address each of these questions. Both of our experiments were carried out via web-based questionnaires administrated on the Ibex Farm (Drummond 2013). Participants were recruited by sharing the experiment links via social networks, and filled in the questionnaire on a voluntary basis (without receiving any compensations). Each questionnaire contained a form at the beginning that collected (anonymous) data on individual profiles, e.g., sex, age, region, languages. Importantly, only the results from monolingual Persian speakers were kept for analyses. After reading the instructions and answering the background questions, participants started by rating a number of practice items (unrelated to the question under study) in order to become familiar with the task.

In acceptability rating experiments, participants are asked to give a score on a Likert scale to rate the acceptability of a series of sentences they see on a screen. In our experiments, we used a 11-point scale going from 0 (lowest acceptability score: completely unacceptable) to 10 (highest acceptability score: completely acceptable). Sentences were presented in a Latin Square within-subjects design, so that participants were exposed to all experimental conditions, but never see the same item in more than one condition. Each experiment included a list of filler items combined with experimental items, consisting of a set of clearly ungrammatical control items as well as a series of items related to other studies (e.g., two studies on word order variations, reported in Faghiri and Samvelian 2021 and Faghiri and Thuilier 2021). Also, to make sure that participants actually read each sentence carefully before rating it, as it is now common practice in acceptability rating experiments, in both experiments we included (yes/no) content-related comprehension questions for a set of (filler and target) items and only took into account data from participants with more than 80% of correct answers.

3.2 Experiment 1

In this experiment, we tested the acceptability of embedded gapping in Persian in the presence of the complementizer *ke* 'that', to empirically observe the behavior of Persian with respect to the Downward Bounding Constraint. In addition, in line with the previous experimental studies on embedded gapping, we considered the factivity factor, in order to see whether Persian is also sensitive to the semantic class of embedding predicates or not.

3.2.1 Experimental design

We created a set of 24 experimental items following a 2 × 3 factorial design with two factors (GAPPING and EMBEDDING), respectively with two and three levels. We manipulated embedding on three levels by comparing non-embedded clauses with embedded clauses while varying the factivity of the embedding predicate (–Embedding, +Embedding/+Factive, +Embedding/–Factive). We prepared each sentence in two versions, one elliptical (+Gapping) and the other non-elliptical (–Gapping), to rule out any other source of variation that may be involved and to have a better control over the factors under study. This design gave rise to 6 conditions illustrated in (12).

(12) a. **[+Gapping, –Embedding]**
šab=e arusi Ava lebās=e sefid mi-puš-ad va Ali lebās=e
night=EZ[9] wedding Ava cloth=EZ white IPFV-wear-3SG and Ali cloth=EZ
mahalli
local
'On the wedding night, Ava wears a white dress and Ali a traditional cloth.'

b. **[+Gapping, +Embedding/–Factive]**
šab=e arusi Ava lebās=e sefid mi-puš-ad va ***šenide=am***
night=EZ wedding Ava cloth=EZ white IPFV-wear-3SG and heard=COP.1SG
ke *Ali lebās=e mahalli*
that Ali cloth=EZ local
'On the wedding night, Ava wears a white dress and I have heard that Ali (wears) a traditional cloth.'

c. **[+Gapping, +Embedding/+Factive]**
šab=e arusi Ava lebās=e sefid mi-puš-ad va ***xošhal=am***
night=EZ wedding Ava cloth=EZ white IPFV-wear-3SG and happy=COP.1SG
ke *Ali lebās=e mahalli*
that Ali cloth=EZ local
'On the wedding night, Ava wears a white dress and I am happy that Ali (wears) a traditional cloth.'

d. **[–Gapping, –Embedding]**
šab=e arusi Ava lebās=e sefid mi-puš-ad va Ali lebās=e
night=EZ wedding Ava cloth=EZ white IPFV-wear-3SG and Ali cloth=EZ
Mahalli mi-puš-ad
local IPFV-wear-3SG

9 The Ezafe, realized as an enclitic, links the head noun to its modifiers and to the possessor NP (see Samvelian 2007).

'On the wedding night, Ava wears a white dress and Ali wears a traditional cloth.'

e. **[–Gapping, +Embedding/–Factive]**
šab=e arusi Ava lebās=e sefid mi-puš-ad va ***šenide=am***
night=EZ wedding Ava cloth=EZ white IPFV-wear-3SG and heard=COP.1SG
ke *Ali lebās=e mahalli mi-puš-ad*
that Ali cloth=EZ local IPFV-wear-3SG
'On the wedding night, Ava wears a white dress and I have heard that Ali wears a traditional cloth.'

f. **[–Gapping, +Embedding/+Factive]**
šab=e arusi Ava lebās=e sefid mi-puš-ad va ***xošhal=am***
night=EZ wedding Ava cloth=EZ white IPFV-wear-3SG and happy=COP.1SG
ke *Ali lebās=e mahalli mi-puš-ad*
that Ali cloth=EZ local IPFV-wear-3SG
'On the wedding night, Ava wears a white dress and I am happy that Ali wears a traditional cloth.'

Similar to (12), in all our 24 sentences, the main verb is a transitive verb in the present tense of the indicative mood. Sentences include an animate agentive subject and an inanimate object used in its bare form, to avoid any ambiguity and also to avoid differential object marking (as in Spanish and Romanian). It should be noted that Persian makes use of the subjunctive/indicative distinction. In all sentences, we have used an embedding verb that accepts an indicative continuation. As our stimuli are in form of written text (as it is the case in the other languages that have been investigated so far), we prepared our sentences according to the (standard) written convention, hence using the formal variant of the coordination conjunction, i.e. *va* 'and',[10] in all sentences.[11] In order to facilitate gapping, each sentence begins with a circumstantial frame-setter adjunct.

Importantly, in line with the experimental studies mentioned above, we took the heterogeneous behavior of factive predicates into account and considered a fine-grained classification. Consequently, in half of our [+factive] condition we

10 There are two variants of this additive conjunction, used depending mainly on register: the unbound *va* in formal and standard written Persian and the enclitic *=o* in colloquial speech.

11 An anonymous reviewer has questioned our use of the written standard conventions, arguing that gapping is not used in the formal language. We do not agree with this claim, since in written Persian elliptical structures are, on the contrary, very common, redundancy being (stylistically) disfavored. We will come back to this in the next section (see footnote 12). Moreover, it is interesting to note that, even in English, gapping is considered to be favored in the formal register (see Section 1). Albeit it should be noted that, while we have used the standard written convention in our stimuli, our sentences do not sound very formal given their content.

Table 4: Embedding verbs (by factivity) used in our experimental items.

Non-factives	
šenide=am	'I have heard'
fekr mi-kon-am	'I think'
be nazar=am mi-res-ad	'It seems to me'
Semi-factives	
xabardār šode=am	'I have learned/I have been told'
mi-dān-am	'I know'
dide=am	'I have seen'
motevvajeh šode=am	'I have noticed'
True factives	
mote'asef=am	'I am sorry'
xošhāl=am	'I am happy'
ta'ajob kard-am	'I was surprised'
jāleb bud	'It was interesting'

used a true factive predicate (e.g., "I am happy") and in the other half a semi-factive one (e.g., "I know"). In the [–factive] condition we used non-factive predicates such as "I think/have heard that". All the embedding verbs used in our items are listed in Table 4.[12]

These items were combined by a series of 58 filler items of which 20 sentences were ungrammatical controls. The experiment included a total of 82 items and in average took less than 10 min to complete.

A total of 158 Persian native speakers volunteered to complete the questionnaire of which we report the results of 119 monolingual participants (68 females and 52 males) who were scored as valid (mean age: 29, mode: 35, range: 18–69).

3.2.2 Results and discussion

The acceptability judgments were analyzed via a mixed-effect linear regression modelling using the LME4 package (Bates et al. 2015) in R (R Development Core Team 2008). We included the predictors Gapping, Embedding and Factivity as binary (sum-

12 It should be noted that Persian has a very limited number of simple verbs and its verbal lexicon consists mainly of complex predicates (or light verb constructions). Also, in Persian material, it was not possible to use exactly the same material as used in the other experiments. For instance, we could not find as many different non-factive verbs as in English, because, while there are exact equivalents for different verbs, like *I think*, *I imagine*, *I suspect*, they do not share the same type of usage, and basically the best equivalent for all the three would be *fekr mi-kon-am*.

Table 5: Mean acceptability judgments (0–10) for Experiment 1.

	Gapping	No gapping
No embedding	8.16	7.39
Embedding	6.59	7.45
Embedding under non-factives	6.89	7.52
Embedding under factives	6.29	7.38
Ungrammatical controls		1.08

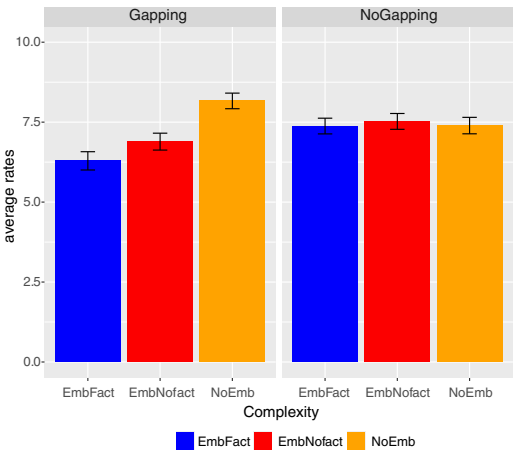

Figure 1: Experiment 1: mean acceptability judgments (0–10) for all 6 conditions.

coded) fixed effects, and Items and Participants as random effects (Barr et al. 2013). Table 5 and Figure 1 provide mean rates of the acceptability judgments given by the participants to the set of items in all 6 conditions. The summary of results for the fixed effects is given in Table 6, whereas in Figure 2, we provide separate graphs for Gapping by Embedding and by Factivity as binary variables.

Table 6: Experiment 1: summary of results for fixed effects.

	Estimate	Std. error	Df	*t*-Value	Pr(>|*t*|)
(Intercept)	7.27036	0.23808	59.06762	30.538	<2e-16
Gapping	−0.11337	0.09656	61.98.968	−1.174	0.2448
Embedding	−0.24760	0.10077	33.93.913	−2.457	0.0193
Fact	−0.19209	0.04731	742.18596	−4.060	5.42e-05
Gap:Emb	−0.33118	0.04633	2466.87260	−7.149	1.15e-12
Gap:Fact	−0.11643	0.04586	2485.44206	−2.539	0.0112

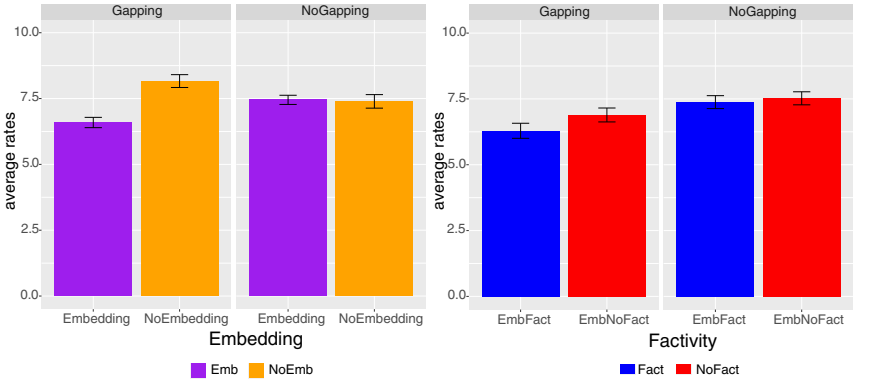

Figure 2: Experiment 1: mean acceptability judgments (0–10) for gapping by embedding and by factivity.

As shown in Table 6, we found a negative main effect of Embedding (Est. = –0.248; $p < 0.05$), confirming, as expected, that sentences with an embedded construction are overall less acceptable than sentences with no embedding. The results also showed a significant negative interaction between Embedding and Gapping (Est. = –0.331; $p < 0.01$), highlighting the combined degrading effect of the two factors. The results do not show any main effect of Gapping.[13] In other words, embedded gapping has a negative effect on the acceptability of sentences, whereas non-embedded gapping does not result in lower acceptability. Moreover, the results showed a negative main effect of Factivity (Est. = –0.192; $p < 0.01$) as well as an interaction between Factivity and Gapping (Est. = –0.116; $p < 0.05$). This means that, while factive embedding is overall less acceptable than non-factive embedding, the acceptability of sentences with gapping is even lower compared to non-elliptical sentences. In sum, gapping is acceptable in coordinated sentences, but when embedded, in particular under a factive verb, the acceptability decreases significantly.

13 There is however a numerical difference between the scores in the elliptical versus non-elliptical conditions in simple (non-embedding) sentences, as shown in the mean values (see Table 5). This suggests a preference for elliptical sentences when there is no embedding involved. While, as an anonymous reviewer has pointed out, this may seem strange because redundancy is not uncommon in language, this result is not surprising given the fact that our stimuli are in the written form. Indeed, in Persian redundancy is generally disfavored in the written language, where elliptical structures are, on the contrary, stylistically preferred. Recall that in these coordinated structures the two head verbs are linearly very close in the non-embedding sentences, hence the redundancy is highlighted in these sentences, in comparison to the sentences with embedded gapping. We will get back to this in Section 5.

Table 7: Mean acceptability judgments (0–10) for Experiment 1: zoom into factivity.

	Gapping	No gapping
Embedding under factives	6.29	7.38
Semi-factives	**6.66**	**7.37**
True factives	**5.99**	**7.39**
Embedding under non-factives	6.89	7.52

Bold values of semi-factives and true factives as these two classes are of interest.

We then explored the semantic type of embedding factive predicates, by comparing true factive predicates with semi-factive predicates (see Table 7). We observe a difference between true factive and semi-factive predicates in the Gapping condition (see Figure 3). Analyzing the subset of embedded items (1904 datapoints) via mixed-effect modelling, the results (see Table 8) show that (i) with respect to the main effect of factivity, true factives have a larger negative coefficient than semi-factives (regardless of gapping), and (ii) there is a significant interaction showing that gapping significantly worsens the acceptability only with true factives.

Considering our predictions formulated in Section 3.2, we observe that they are all borne out by the data. First, we found significant interactions between gapping and embedding, as well as between gapping and factivity, showing that gapping is less acceptable when it is embedded in general, and when it is embedded under a factive predicate in particular. Furthermore, we observe the expected gradience

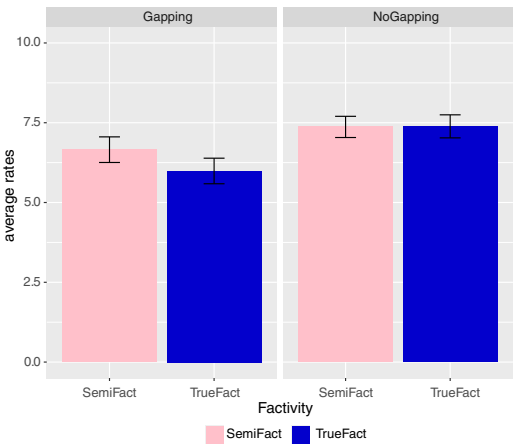

Figure 3: Experiment 1: zoom into factive verbs.

Table 8: Experiment 1 – zoom into factivity: summary of results for fixed effects.

	Estimate	Std. error	Df	*t*-Value	Pr(>|*t*|)
(Intercept)	7.22308	0.24336	8.974.581	29.681	<2e-16
SemiFact	−0.25813	0.12746	117.388.958	−2.025	0.043068
TrueFact	−0.47463	0.12822	17.925.635	−3.702	0.000285
Gapping	−0.35311	0.10021	10.865.543	−3.524	0.000624
SemiFact:Gap	−0.08431	0.11131	29.882.658	−0.757	0.449382
TrueFact:Gap	−0.27331	0.10748	45.192.367	−2.543	0.011330

across the three semantic classes of predicates (non-factives, semi-factives, true factives): true factives yield the lowest acceptability mean rate among the three, while non-factives yield the highest mean rate.

3.3 Experiment 2

In this experiment, we tested the acceptability of embedded gapping in Persian in the absence of the complementizer *ke* 'that', in order to study whether the presence/absence of the complementizer plays a role in the acceptability of embedded gapping in Persian as it is shown to play a role in English.

3.3.1 Experimental design

We prepared a set of 20 experimental items following a 2 × 2 factorial design, manipulating the presence/absence of the complementizer *ke* 'that' in elliptical versus non-elliptical sentences. The design gave rise to the four conditions illustrated in (13). In all the items, we use non-factive embedding predicates; everything else is similar to the items in Experiment 1.

(13) a. **[+Gapping, +Complementizer]**
šab=e arusi Ava lebās=e sefid mi-puš-ad va ***šenide=am***
night=EZ wedding Ava cloth=EZ white IPFV-wear-3SG and heard=COP.1SG
ke Ali lebās=e mahalli
that Ali cloth=EZ local
'On the wedding night, Ava wears a white dress and I have heard that Ali (wears) a traditional cloth.'

b. **[+Gapping, –Complementizer]**
šab=e arusi Ava lebās=e sefid mi-puš-ad va ***šenide=am***
night=EZ wedding Ava cloth=EZ white IPFV-wear-3SG and heard=COP.1SG
Ali lebās=e mahalli
Ali cloth=EZ local
'On the wedding night, Ava wears a white dress and I have heard Ali (wears) a traditional cloth.'

c. **[–Gapping, +Complementizer]**
šab=e arusi Ava lebās=e sefid mi-puš-ad va ***šenide=am***
night=EZ wedding Ava cloth=EZ white IPFV-wear-3SG and heard=COP.1SG
ke *Ali lebās=e mahalli mi-puš-ad*
that Ali cloth=EZ local IPFV-wear-3SG
'On the wedding night, Ava wears a white dress and I have heard that Ali wears a traditional cloth.'

d. **[–Gapping, –Complementizer]**
šab=e arusi Ava lebās=e sefid mi-puš-ad va ***šenide=am***
night=EZ wedding Ava cloth=EZ white IPFV-wear-3SG and heard=COP.1SG
Ali lebās=e mahalli mi-puš-ad
Ali cloth=EZ local IPFV-wear-3SG
'On the wedding night, Ava wears a white dress and I have heard Ali wears a traditional cloth.'

We combined these 20 items with 42 fillers, of which 8 were clear ungrammatical sentences. The experiment included a total of 62 items and in average took about 7 min to complete. A total of 74 Persian native monolingual speakers (41 females and 33 males) completed the questionnaire of which we report the results of 69 who were scored as valid (mean age: 36, mode: 38, range: 18–62).

3.3.2 Results and discussion

Table 9 and Figure 4 provide the mean acceptability judgments across different conditions. We observe that in sentences with gapping the presence of complementizer yields lower acceptability.

Here again, we analyzed the data via a mixed-effect linear regression modelling including the predictors Gapping and Complementizer as fixed effects, and Items and Participants as random effects. The results (see Table 10) show, as expected, a significant negative interaction between the two factors (Est. = –0.087; $p < 0.05$), confirming the negative effect of the presence of the complementizer in elliptical sentences.

Table 9: Mean acceptability judgments (0–10) for Experiment 2.

	Gapping	No gapping
Complementizer	7.84	8.17
No complementizer	8.15	8.09
Ungrammatical controls		1.64

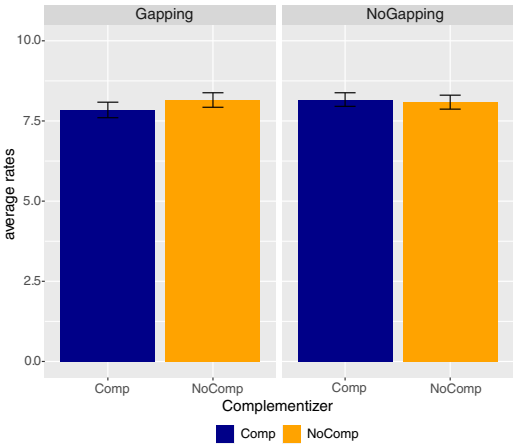

Figure 4: Experiment 2: mean acceptability judgments (0–10) for gapping by complementizer.

Table 10: Experiment 2: summary of results for fixed effects.

	Estimate	Std. error	Df	*t*-Value	Pr(>|*t*|)
(Intercept)	8.06493	0.17074	7.669.039	47.235	<2e-16
Gapping	−0.06315	0.09709	6.421.094	−0.650	0.5177
Comp	−0.04852	0.04498	3.600.583	−1.079	0.2879
Gap:Comp	−0.08717	0.04210	124.082.757	−2.070	0.0386

Considering our research question, these results suggest that complementizer drop has the same effect in Persian as in English. This may imply that this tendency is a cross-linguistic preference, or it may be the case that, similar to English, it is related to frequency in Persian as well. Current data do not allow us to rule out any of these possibilities.

3.4 Preliminary conclusion

From an empirical perspective, if we compare our experimental results and the elicited data from Farudi (2013), we get a more nuanced picture. First, Farudi's (2013) study suggests that all embedding predicates behave the same, whereas our study shows gradience across the three semantic classes (non-factives vs. semi-factives vs. true factives), that is, the acceptability of embedded gapping is largely affected by the semantic class of embedding predicates. Second, in Farudi's (2013) study, the presence/absence of the complementizer is ignored, suggesting that complementizer drop is not expected to play any role. However, our experimental results show that speakers do manifest preferences, in that embedded gapping in the absence of the complementizer gets higher scores than in sentences where the complementizer is present. Overall, we can conclude that both factivity and the absence/presence of the complementizer play a role in the acceptability of embedded gapping in Persian. In addition, from a cross-linguistic perspective, Persian constitutes one more argument against the Downward Bounding Constraint postulated by Hankamer (1979) and Johnson (2018).

4 Consequences for the syntactic analysis of gapping

In the literature, gapping has received several syntactic analyses, each of them claiming to account for the properties of this elliptical construction. They can be classified in two main accounts, according to the size of coordination: (i) a Large Conjunct Gapping (LCG) account, involving a 'high' coordination that occurs at the clausal level; (ii) a Small Conjunct Gapping (SCG) account, involving a 'low' coordination that occurs at the subclausal level, targeting roughly VP-sized constituents.

Within LCG accounts, gapping is assumed to involve either deletion of a phrasal projection of the verb (Hankamer 1979; Ross 1967, 1970 a.o.), preceded in some versions by remnants movement to left-peripheral positions (Hartmann 2000; Sag 1976 a.o.) as illustrated in (14a), or a dedicated form-meaning rule that maps a fragment to a clausal meaning (Abeillé et al. 2014; Culicover and Jackendoff 2005; Ginzburg and Sag 2000; Steedman 2000 a.o.) as illustrated in (14b).

(14) Large Conjunct Gapping approaches

a. *Paul ordered a beer and* $_{TopP}$*[John*$_1$ $_{FocP}$*[a whisky*$_2$ $_{TP}$*[*~~t_1 *ordered* t_2~~*]]].*

b. *Paul ordered a beer and* $_{S}$*[*$_{NP}$*[John]* $_{NP}$*[a whisky]].*

Within SCG accounts, gapping is explained either by a non-elliptical analysis which appeals to across-the-board movement of the shared material (and asymmetric extraction of preverbal non-shared constituents in the first conjunct, cf. Johnson 2009) as illustrated in (15a), or by a deletion operation targeting a VP-sized constituent (Coppock 2001; López and Winkler 2003 a.o.) as illustrated in (15b), in both analyses remnants being extracted to the left periphery in some functional projections. For the purpose of this paper, we are not going into the details of each of these variants.

(15) Small Conjunct Gapping approaches

a. *Paul$_1$ $_{TP}$[ordered$_2$ [$_{vP}$[t_1 t_2 a beer] and $_{vP}$[John t_2 a whisky]]].*

b. *Paul ordered a beer and $_{VP}$[John$_1$ $_{VP}$[a whisky$_2$ $_{VP}$[~~t_1 ordered t_2~~]]].*

What is crucial here is the prediction that each of these two main accounts makes with respect to the behavior of gapping under embedding. The LCG account predicts the embedding of the gapped sequence, as the elliptical sequence is assumed to have a clausal structure. The mainstream deletion-based analysis (14a) postulates a TP-deletion in the gapped sequence after the movement of remnants to left-peripheral positions. Under such an analysis involving leftward movement of remnants, embedded gapping is allowed only in some specific configurations, namely only under some specific embedding predicates which allow leftward movement, namely 'bridge' verbs (cf. Hooper and Thompson 1973; Erteschik-Shir 2006). Consequently, in this account, embedded gapping should be available only under non-factive predicates (since semi-factive and true factive predicates are assumed to not allow extraction, cf. 'non-bridge' verbs). In addition, for languages that allow complementizer drop, the deletion-based LCG account predicts availability of embedded gapping under non-factive predicates only with an overt complementizer, since activation of the left periphery of the clause for a topic or focus constituent is assumed to force the presence of a complementizer (Doherty 2000; Grimshaw 1997). On the other hand, the construction-based LCG account (14b) considers the gapped clause as a fragment, which is a non-finite clause. Therefore, under such an account, embedded gapping should be allowed only in the absence of the complementizer (as complementizers such as *that* in English require a finite clause).

Meanwhile, the SCG accounts in (15) automatically rule out any configuration of embedded gapping. As gapping involves a coordination of *v*Ps, a single T head being shared across all conjuncts, there is no finite verbal element in the gapped sequence. Moreover, a TP from a matrix clause cannot dominate the *v*P of an embedded sequence. Therefore, in the case of embedded gapping, the single T head cannot be shared by the first conjunct and the *v*P constituent that is embedded inside the second conjunct.

It is precisely the impossibility of embedding the gapped sequence in English (see examples in (2) above) that constituted the main syntactic motivation for a SCG account of gapping in Johnson's perspective (in addition to semantic motivation, such as the wide scope of modal and negation with gapping, cf. Siegel 1984, 1987). In particular, based on the behavior of gapping under embedding in English, Johnson (2018) built on the Downward Bounding Constraint postulated by Hankamer (1979) and reiterated it as following: "Let α be some member of the verbal sequence of the right conjunct, and β be the set of elements in the sequence that c-command α. If gapping […] includes α then it must include β." (Johnson 2018: 579). According to Johnson, the Downward Bounding Constraint is therefore a consequence of a SCG account of gapping.

In the light of our experimental results from Persian (and other languages), if we compare the predictions made by the two main syntactic approaches of gapping in terms of embedding, we definitely could not adopt any SCG account of gapping. According to the SCG account, any occurrence of embedded gapping should be ruled out, as gapping only involves a 'low' coordination of *v*Ps, with a single T head that is shared by the two 'small' conjuncts. Any occurrence of gapping that contains the head of a CP (e.g., a complementizer) in the gapped sequence should be ungrammatical. Our experimental results go against this prediction. We observed that embedded gapping in Persian is acceptable, being highly above the ungrammatical controls. Consequently, we cannot maintain a SCG account for embedded gapping in Persian.

Therefore, we should adopt a LCG account of gapping. However, the deletion-based LCG account seems to be a bit problematic as well, since, in our experiments, we do not observe a categorical contrast between non-factive ('bridge') and factive ('non-bridge') predicates, as predicted by this account. We observed indeed a difference in acceptability between non-factive and factive predicates (non-factive embedding configurations getting higher score than factive embedding ones), but the factive configurations still receive much higher scores than ungrammatical controls. In addition, our experimental results show a preference for the complementizer omission, which is not expected under a deletion-based LCG account. Therefore, based on our experimental results, we consider that the construction-based LCG account seems to be a better fit to account for the preferences we observe in our data. One of the advantages of a constructionist LCG approach of gapping is the fact that we do not have to postulate two different syntactic structures for non-factives ('bridge' verbs) and factives ('non-bridge' verbs) as in the deletion-based LCG account. In a construction-based perspective, gapping makes use of a dedicated rule mapping a headless structure (i.e. a fragment) to a clausal meaning. In addition, the rule of gapping has its specific constraints; crucially, as discussed in Section 2, the gapped clause must address the same QUD as the

antecedent clause. We therefore automatically get the gradience we observed across the three semantic classes of predicates. In addition, as the gapping fragment is non-finite, the preference we observe for embedded gapping without complementizer is not surprising. Providing an exhaustive syntactic analysis of embedded gapping in Persian is beyond the scope of this paper. For more details about its application in embedded gapping, see Bîlbîie and de la Fuente (2019) and Bîlbîie et al. (to appear).

By considering non-syntactic constraints such as the QUD-based constraint, the construction-based LCG account of gapping could integrate the notion of acceptability. We consider the latter as being more adequate than the categorical notion of grammaticality. The theoretical notion of grammaticality refers to the hypothesis of a given sentence possibly being generated by the grammar of the language or not. Grammaticality is not gradable, but rather binary (i.e. sentences are either grammatical or ungrammatical). Acceptability, on the other hand, is gradable (i.e. sentences can be fully acceptable or partially acceptable, all the way down to completely unacceptable). While there is unquestionably a relation between the two notions, it is now well-established that grammaticality does not fully reflect the actual acceptability that speakers attribute to sentences. Not only we now know that some sentences may be judged poorly by speakers because of parsing difficulties, but also that speakers could perceive sentences considered ungrammatical by linguists as acceptable with a reliable interpretation. In other words, it is now broadly accepted that (un)grammaticality and (un)acceptability are not necessarily equated. However, the exact way in which these two notions interact, and the precise role played by performance factors in the evaluation of (un)grammaticality and (un)acceptability by speakers are to date unknown and subject of ongoing research (see, e.g., Tubau et al. 2020 for a review). Importantly, beyond factors related to processing complexities that are widely considered as performance factors, there is much less agreement on the role played by other (non-syntactic) factors related to the context and/or to the content. In the absence of a clear theory to account for the relation between grammaticality and acceptability in full extent, we assume that the latter is a more reliable notion to account for embedded gapping.

Moreover, the kind of behavioral data that we have gathered in this study is based on the notion of acceptability, that is, whether a sentence sounds more or less acceptable in a particular context. These data (those reported in our study on Persian alongside similar data from the four other languages) have allowed to highlight the role that a non-syntactic factor plays in improving the acceptability of embedding gapping, namely the factive/non-factive type of the embedding verb, explained as a QUD-based constraint, while previous accounts that included the

'No Embedding Constraint', based on the notion of grammaticality, fall short of accounting for the data in its full extension.

5 Towards a crosslinguistic perspective on embedded gapping

The comparison of our experimental results on Persian with the experimental results from Spanish, Romanian, French, and English (cf. Section 2) allows to observe some cross-linguistic effects. In all these languages, embedded gapping conditions are rated lower than the other experimental conditions, but higher than the ungrammatical controls. There is a significant interaction between gapping and embedding; namely, embedded constructions are rated lower with gapping than with no gapping. Moreover, there is a significant interaction between gapping and factivity: embedding under a factive verb is rated lower than under a non-factive verb, independently of language and/or independently of ellipsis. Crucially, in all these languages, embedded gapping is sensitive to the semantic class of embedding predicate: embedding under true factive verbs is rated lower than under semi-factive verbs. Finally, for languages which allow embedding without a complementizer, such as Persian and English, we observe that the presence/absence of the complementizer influences acceptability, that is embedded gapping without a complementizer is rated higher than gapping embedded under an overt complementizer. In other words, complementizer drop renders embedded gapping more acceptable.

Based on these rich experimental data from several languages, we can now conclude that both factivity and the presence/absence of the complementizer affect the acceptability of embedded gapping in a given language. In other words, these are not language-specific but rather cross-linguistic preferences.

Moreover, the Downward Bounding Constraint is not universal, and therefore must be reconsidered. Embedded gapping is acceptable in some languages (e.g., Persian, Spanish, Romanian), and less so in others (e.g., English, French). The strong version of the constraint does not hold even for languages that are supposed to exclude embedded gapping (e.g., English, French, cf. Section 2). We can now conclude that, instead of having a 'hard' syntactic constraint à la Johnson, we rather have a 'soft' constraint, involving gradient judgments. As Sorace and Keller (2005) mention, 'soft' constraints are generally at the interface between syntax and other domains. Indeed, the effects we observe with embedded gapping cross-linguistically could receive a non-syntactic explanation. As discussed in length by Bîlbîie and de la Fuente (2019) and Bîlbîie et al. (to appear), the effect of the

semantic class of the embedding predicate could be explained by a discourse constraint. More precisely, as non-factives do not presuppose the truth of their complement clause and do not contribute the main point of utterance, both the embedded gapped clause and the source clause may address the same QUD. This explains the higher scores that we get for embedding under non-factives than under factives. On the other hand, as factives presuppose the truth of their complement clause and contribute to the main point of utterance, in these cases, the embedded gapped clause and the source clause do not answer the same QUD. This explains the lower scores for factive predicates compared to non-factive ones. As for the intermediate class of semi-factives, they may come closer to non-factives in cases where presupposition is suspended, which explains why this class gets higher scores than true factives. For an exhaustive analysis of embedded gapping, see Bîlbîie and de la Fuente (2019) and Bîlbîie et al. (to appear).

Finally, it is interesting to note that there are differences with respect to the preferences between gapping structures and their non-elliptical counterparts. The results of previous experimental studies show no clear preference for one or the other structure in Romance (Bîlbîie et al. 2021), whereas English disprefers gapping, favoring a non-elliptical structure (Bîlbîie et al. to appear; Carlson 2001). As for Persian, our results may suggest that there is, on the contrary, a preference for gapping. This preference may be due to the fact that redundancy in general is stylistically strongly disfavored in written Persian; in other words, speakers are used to elliptical structures in written language. However, future research is needed to i) establish the preference for gapping in Persian and the potential role of register/style independently and ii) investigate cross-linguistic preferences in comparable material.

From a methodological perspective, all these experimental studies show the importance of having high methodological standards in linguistics, when it comes to gathering data. The experiments allowed us to highlight some differences that we would not have been able to see via informal introspective judgments or corpus data, in order to have a clear and nuanced picture. Once again, experimental studies show that some linguistic phenomena, such as embedded gapping, are better described in terms of acceptability rather than grammaticality.

We close this paper with a quote by Borsley (2005: 1479): "It is not really clear when informally gathered intuitions provide a satisfactory basis for research and when more formal methods of data gathering are necessary. […] However, some things are fairly clear. It is clear that informally gathered intuitions are not always a satisfactory basis for syntactic theorizing. It is also clear that experimental methods are sometimes necessary and may provide richer data than informal methods. […] Above all it is clear that questions about data are more important than is sometimes assumed."

References

Abeillé, Anne, Gabriela Bîlbîie & François Mouret. 2014. A Romance perspective on gapping constructions. In Hans Boas & Francisco Gonzálvez-García (eds.), *Romance perspectives on construction grammar*, 227–267. Amsterdam/Philadelphia: John Benjamins.

Barr, Dale J., Roger Levy, Christoph Scheepers & Harry J. Tily. 2013. Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language* 68(3). 255–278.

Bates, Douglas, Martin Maechler, Bolker Ben & Steve Walker. 2015. Fitting linear mixed-effects models using lme4. *Journal of Statistical Software* 67(1). 1–48.

Bîlbîie, Gabriela & Israel de la Fuente. 2019. Can gapping be embedded? Experimental evidence from Spanish. *Glossa: A Journal of General Linguistics* 4(1). 1–39. Special issue *Experimental Approaches to Ellipsis*.

Bîlbîie, Gabriela, Israel de la Fuente & Anne Abeillé. 2021. L'ellipse verbale enchâssée dans les langues romanes. *Langages* 223(3). 61–80.

Bîlbîie, Gabriela, Israel de la Fuente & Anne Abeillé. to appear. Factivity and complementizer omission in English embedded gapping. Special issue on ellipsis to appear in *Journal of Linguistics*.

Borsley, Robert. 2005. Introduction. *Lingua* 115(11). 1475–1480. Special issue *Data in theoretical linguistics*.

Carlson, Katy. 2001. The effects of parallelism and prosody in the processing of gapping structures. *Language and Speech* 44(1). 1–26.

Coppock, Elizabeth. 2001. Gapping: In defense of deletion. In *Proceedings from the annual meeting of the Chicago Linguistic Society*, vol. 37, 133–148. Chicago, IL: Chicago Linguistic Society.

Culicover, Peter & Ray Jackendoff. 2005. *Simpler syntax*. Oxford: Oxford University Press.

Dahl, Östen. 1979. Is linguistics empirical? A critique of Esa Itkonen's *linguistics and metascience*. In Thomas A. Perry (ed.), *Evidence and argumentation in linguistics*, 13–45. Berlin/New York: Mouton de Gruyter.

de Cuba, Carlos & Jonathan E. MacDonald. 2013. On the referential status of embedded polarity answers in Spanish. In Jennifer Cabrelli Amaro, Gillian Lord, Ana de Prada Pérez & Jessi Elana Aaron (eds.), *Selected proceedings of the 16th hispanic linguistics symposium*, 312–323. Somerville, MA: Cascadilla Press.

Doherty, Cathal. 2000. *Clauses without that: The case for bare sentential complementation in English*. New York: Routledge.

Dowty, David. 1988. Type raising, functional composition, and non-constituent conjunction. In Richard Oehrle, Emmon Bach & Deirdre Wheeler (eds.), *Categorial grammar and natural language structures*, 153–198. Dordrecht: Kluwer.

Drummond, Alex. 2013. Ibex farm. http://spellout.net/ibexfarm/ (accessed 2 August 2018).

Erteschik-Shir, Nomi. 2006. Bridge phenomena. In Martin Everaert & Henk van Riemsdijk (eds.), *The Blackwell companion to syntax*, vol. 1, 284–294. Malden, Ma/Oxford: Blackwell Publishing.

Faghiri, Pegah & Juliette Thuilier. 2021. Contribution méthodologique à l'étude de l'ordre des mots: jugements d'acceptabilité et complétion de phrases. *Langages* 223(3). 25–42.

Faghiri, Pegah & Pollet Samvelian. 2016. How much structure is needed? The case of the Persian VP. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.),

Proceedings of the joint 2016 conference on head-driven phrase structure grammar and lexical functional grammar, 236–254. Stanford, CA: CSLI Publications.
Faghiri, Pegah & Pollet Samvelian. 2021. The issue of "separability" in Persian complex predicates. In Berthold Crysmann & Manfred Sailer (eds.), *One-to-many relations in morphology, syntax and semantics*, 117–149. Berlin: Language Sciences Press.
Farudi, Annahita. 2013. *Gapping in Farsi: A cross-linguistic investigation*. Amherst, MA: University of Massachusetts Amherst dissertation.
Gibson, Edward & Evelina Fedorenko. 2013. The need for quantitative methods in syntax and semantics research. *Language and Cognitive Processes* 28(1–2). 88–124.
Ginzburg, Jonathan & Ivan A. Sag. 2000. *Interrogative investigations: The form, meaning and use of English interrogatives*, vol. 123. Stanford, CA: CSLI Publications.
Goldberg, Adele & Florian Perek. 2018. Ellipsis in construction grammar. In Jeroen van Craenenbroeck & Tanja Temmerman (eds.), *The Oxford handbook of ellipsis*, Chapter 8, 188–205. Oxford: Oxford University Press.
Grimshaw, Jane. 1997. Projection, heads, and optimality. *Linguistic Inquiry* 28(3). 373–422.
Hankamer, Jorge. 1979. *Deletion in coordinate structures*. New York: Garland Publishing.
Hartmann, Katharina. 2000. *Right node raising and gapping. Interface conditions on prosodic deletion*. Amsterdam/Philadelphia: John Benjamins.
Haspelmath, Martin. 2007. Coordination. In Timothy Shopen (ed.), *Language typology and syntactic description complex constructions*, 2, 1–51. Cambridge: Cambridge University Press.
Hooper, Joan. 1975. On assertive predicates. In John P. Kimball (ed.), *Syntax and semantics 4*, 91–124. New York: Academic Press.
Hooper, Joan & Sandra Thompson. 1973. On the applicability of root transformations. *Linguistic Inquiry* 4. 465–497.
Jaeger, T. Florian. 2006. *Redundancy and syntactic reduction in spontaneous speech*. Stanford: Stanford University dissertation.
Jayez, Jacques, Valeria Mongelli, Anne Reboul & Jean-Baptiste van der Henst. 2015. Weak and strong triggers. In Florian Schwarz (ed.), *Experimental perspectives on presuppositions*, 173–193. Cham: Springer.
Johnson, Kyle. 2009. Gapping is not (VP)-Ellipsis. *Linguistic Inquiry* 40. 289–328.
Johnson, Kyle. 2018. Gapping and stripping. In Jeroen van Craenenbroeck & Tanja Temmerman (eds.), *The Oxford handbook of ellipsis*, Chapter 23, 562–604. Oxford: Oxford University Press.
Karttunen, Lauri. 1971. Some observations of factivity. *Papers in Linguistics* 4. 55–69.
Kiparsky, Paul & Carol Kiparsky. 1971. Fact. In Danny D. Steinberg & Leon A. Jakobovits (eds.), *Semantics. An interdisciplinary reader in philosophy, linguistics and psychology*, 345–369. Cambridge: Cambridge University Press.
Lau, Jey Han, Alexander Clark & Shalom Lappin. 2016. Grammaticality, acceptability, and probability: A probabilistic view of linguistic knowledge. *Cognitive Science* 41(5). 1202–1241.
López, Luis & Susanne Winkler. 2003. Variation at the syntax-semantics interface: Evidence from gapping. In Kerstin Schwabe & Susanne Winkler (eds.), *The interfaces: Deriving and interpreting omitted structures*, 227–248. Amsterdam/Philadelphia: John Benjamins.
Meyer, Charles F. 1995. Coordination ellipsis in spoken and written American English. *Language Sciences* 17. 241–269.
R Development Core Team. 2008. *R: A language and environment for statistical computing*. Vienna: R Foundation for Statistical Computing.

Ramat, Paolo. 1987. *Linguistic typology*. Berlin/New York: Mouton de Gruyter.
Rasekhi, Vahideh. 2020. Stripping structures with negation in Persian. In Richard K. Larson, Sedigheh Moradi & Vida Samiian (eds.), *Advances in Iranian linguistics*, Chapter 12, 257–273. Amsterdam/Philadelphia: John Benjamins.
Ross, John Robert. 1967. *Constraints on variables in syntax*. Cambridge, MA: MIT dissertation.
Ross, John Robert. 1970. Gapping and the order of constituents. In Manfred Bierwisch & Karl Erich Heidolph (eds.), *Progress in linguistics*, 249–259. La Haye: Mouton.
Sag, Ivan A. 1976. *Deletion and logical form*. Cambridge, MA: MIT dissertation.
Samvelian, Pollet. 2007. A (phrasal) affix analysis of the Persian Ezafe. *Journal of Linguistics* 43(3). 605–645.
Siegel, Muffy. 1984. Gapping and interpretation. *Linguistic Inquiry* 15(3). 523–530.
Siegel, Muffy. 1987. Compositionality, case, and the scope of auxiliaries. *Linguistics and Philosophy* 10. 53–76.
Sorace, Antonella & Frank Keller. 2005. Gradience in linguistic data. *Lingua* 115(11). 1497–1524. Special issue *Data in theoretical linguistics*.
Steedman, Mark. 2000. *The syntactic process*. Cambridge: MIT Press.
Tao, Hongyin & Charles F. Meyer. 2006. Gapped coordinations in English: Form, usage, and implications for linguistic theory. *Corpus Linguistics and Linguistic Theory* 2(2). 129–163.
Toosarvandani, Maziar. 2018. In Jeroen van Craenenbroeck & Tanja Temmerman (eds.), *The Oxford handbook of ellipsis,* Chapter 35, 934–961. Oxford: Oxford University Press.
Tubau, Susagna, Urtzi Etxeberria, Viviane Déprez & Maria Teresa Espinal. 2020. Editorial: What are (un)acceptability and (un)grammaticality? How do they relate to one another and to interpretation? *Frontiers in Psychology* 11. 621267.
van Oirsouw, Robert. 1987. *The syntax of coordination*. London/New York: Routledge.
Wilder, Chris. 1997. Some properties of ellipsis in coordination. In Artemis Alexiadou & Tracy Alan Hall (eds.), *Studies in universal grammar and typological variation*, 59–107. Amsterdam/Philadelphia: John Benjamins.