Research Article

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The syntax of non-canonical coordination in Jordanian Arabic: An experimental investigation

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Abstract: Non-canonical coordination occurs when non-constituents are conjoined. Two major types of non-canonical coordination are gapping and non-constituent coordination (NCC). Non-canonical coordination has received interest for its relevance to core issues in syntax, such as constituency and phrase structure. The aim of this article is twofold. First, it provides empirical evidence for non-canonical coordination from Jordanian Arabic (JA) via an experimental investigation. Two acceptability judgment tasks (rating on a Likert scale) were designed to investigate the status of gapping and NCC in JA. A generalized linear model (GLM) was fit to the data, using the (*glm*) function from the *mlogit* package in R. There was a main effect of gapping (χ^2 = 13.203, p < 0.001) and NCC (χ^2 = 15.371, p < 0.001) on the acceptability of the constructions in the positive direction. Second, the article provides an analysis of the facts that is couched in terms of left-to-right syntax via a hybrid analysis that assumes that non-canonical coordination can have two sources: a complementizer phrase source and a vP source.

Keywords: Jordanian Arabic, non-constituent coordination, gapping, ATB movement, ellipsis

1 Introduction

Coordination has long been used as a constituency test as it is assumed that coordination targets constituents of the same category (cf. Bruening and Al Khalaf 2018, 2020, Al Khalaf 2022). However, there are many cases in which it appears that non-constituents are conjoined, including gapping and non-constituent coordination (NCC), as in (1):

(1) a. John ordered spaghetti and Mary ~~ordered~~ pizza (Gapping)
b. Mary ate rice yesterday and ~~Mary ate~~ beans today (NCC)

Note that in gapping, a verbal element goes missing from a non-initial conjunct, whereas in NCC, the non-initial conjunct contains chunks of constituents that appear to be juxtaposed. The literature refers to these cases of coordination as non-canonical coordination as they do not conform to the general structure of a typical coordinate structure, where constituents of the same category are conjoined (refer to the study by Al Khalaf 2018, 2021 for consequences of coordinate structure on agreement). The standard assumption within phrase structure grammars, generally, is that non-canonical coordination has a more abstract level of

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representation where constituents are being conjoined, but later operations such as movement and ellipsis apply to this level, giving rise to what appears to be a coordination of non-constituents (e.g., Johnson 2009, Sailor and Thoms 2013, Chaves 2014, Bruening 2015, Potter et al. 2017).

Semantic scope ambiguity in non-canonical coordination, among other phenomena, sparked a debate on how this form of coordination is derived. If we consider examples as in (2), we can see that the structures give rise to two readings: one in which negation (and modality) outscope coordination (i.e., wide scope reading) and another where the two operators scope locally within each conjunct (distributive scope reading). Given this ambiguity, it can immediately be seen that the non-elliptical versions of these sentences give rise to only the latter one. This is a dilemma to phrase structure analyses assuming that non-canonical coordination is derived from an abstract level.

(2) a. Mrs. J can't live in Boston and Mr. J ø in LA (Kubota and Levine 2016, 109, (5a))
b. Sam sent no girl chocolates today and flowers yesterday (adapted from Osborne and Gross 2017, 669, (50a))

This article contributes to the debate on non-canonical coordination in two ways. First, it provides empirical evidence via an experimental investigation of non-canonical coordination in Jordanian Arabic (JA). Second, it will provide an analysis of non-canonical coordination in JA building on previous work. The rest of the article is organized as follows. Section 2 provides a theoretical background of previous work. Section 3 reports on an experimental investigation of non-canonical coordination in JA. In Section 4, we present an analysis of non-canonical coordination in a left-to-right syntax adopting a two-source analysis of non-canonical coordination. Section 5 is a conclusion.

2 Theoretical background

Before presenting an analysis of non-canonical coordination of JA, a theoretical background in non-canonical coordination is necessary. In this section, we present previous work on gapping and non-constituent to establish the background necessary for the analysis of non-canonical coordination in JA.

2.1 Gapping

Gapping occurs when verbal material in a non-initial conjunct is elided:

(3) John likes donuts and Mary ~~likes~~ croissant

There are two major analyses of gapping: reductionist and non-reductionist analyses. Reductionist analyses derive gapping via reduction mechanisms, such as movement and ellipsis, and in this case, coordination always operates on full-fledged constituents. A subset of these analyses assumes that in this case coordination operates at the complementizer phrase (CP) level (e.g., Jackendoff 1971, Ross 1967, Sag 1976, Pesetsky 1982, Williams 1977, Jayaseelan 1990). Another assumes that coordination operates at the VP/vP level (e.g., Coppock 2001, Yatabe 2001, Lin 2002, Crysmann 2003, López and Winkler 2003, Beavers and Sag 2004, Chaves 2007, Johnson 2009, Toosarvandani 2016).

Non-reductionist analyses, on the other hand, account for gapping without resorting to movement or ellipsis. These analyses do not assume that all forms of coordination where it appears that non-constituents are being conjoined are derived from larger constructions (i.e., CPs or little verb phrases). An example of this type of analysis is those proposed within the Categorial Grammar framework (e.g., Kubota and Levine 2015). We will not address this set of analyses here as this contribution does not aim to argue against non-generative accounts of non-canonical coordination. The major aim is to present empirical evidence for non-canonical coordination in JA and an analysis of this phenomenon within the Generative Grammar framework.

One type of criticism of reductionist analyses of gapping is that these analyses are unable to account for peculiarities of scope ambiguity in gapping (e.g., Siegel 1984, 1987, Oehrle 1987, McCawley 1993, Johnson 2004, Kubota and Levine 2016, Potter et al. 2017), as exemplified in (4):

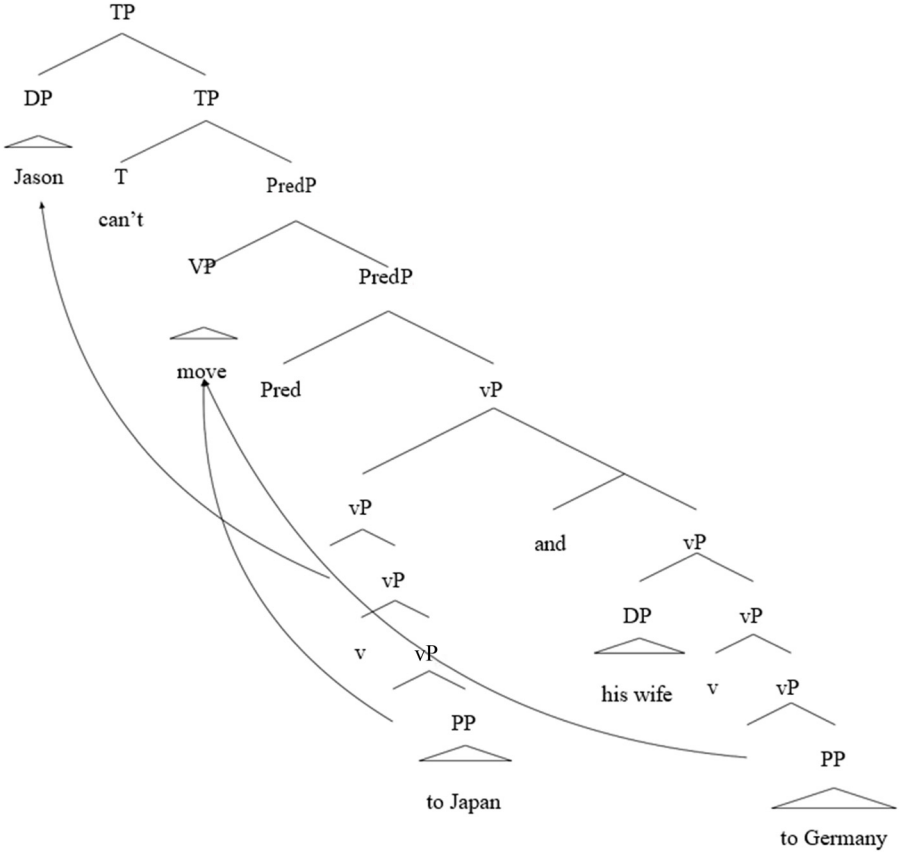
(4) Jason can't move to Japan and his wife ~~can't move~~ to Germany

Here, the ambiguity arises from the semantic scope of the modal and negation operators. In one reading, the modal and negation scope above negation. In this case, the sentence reads as: it is not possible for the two events of Jason moving to Japan and his wife moving to Germany to occur at the same time. In another reading, the modal and negation operators scope locally within each conjunct, and in this case, the sentence reads as follows: it is not possible for Jason to move to Japan, and it is not possible for his wife to move to Germany, as separate events independent of one another.

A major challenge to these analyses (which was reported in the literature) has two manifestations: (i) the untenability of vP-sized conjuncts proposal to account for the distributive scope reading analyses, and (ii) the untenability of CP-sized constituents proposal to account for the wide scope reading (Kubota and Levine 2016, Potter et al. 2017).

One major analysis of gapping within the generative framework is Johnson (2009) who derives the construction from vP-sized conjuncts. In his analysis, verbal elements from within the conjuncts undergo an across-the-board (ATB) movement to a higher verbal projection, namely Pred. This is in addition to other movements, such as the movement of the subject of the initial conjunct from spec-vP to spec-TP, as illustrated in (5) for (4) (Johnson uses a multiple branching structure for coordination; we use binary branching structure here. Clearly, Johnson's analysis accounts for the wide-scope reading of negation and the modal):

(5)



As can be seen, an ATB movement analysis accounts only for the distributive scope reading of gapping. More recently, Potter et al. (2017) argue that gapping can be derived from two sources: a clause-sized source and a vP-sized source. Thus, the vP source will give us the wide-scope reading of semantic operators, whereas the CP source will give us the distributive reading of these operators. Potter et al. provide evidence for this argument from the fact that gapping interacts with independent factors, such that a particular reading of the two possible readings is syntactically constrained. To clarify, consider the examples in (6):

(6) (Potter et al. 2017, (39))
   a. To Mary, James didn't give a cupcake or Bill chocolates
   b. With only ten dollars between them, James could get a sandwich, and Mary a bowl of soup
   c. Often, James orders mussels, and Mary shrimp
   d. Never does Kim play bingo or Sandy chess

In Potter et al.'s analysis, a constituent appears in a Topic Phrase in examples like (6a, b) (Rizzi 1990). Hence, necessarily, the gapping here should be derived from a CP-sized source because it is impossible for the topicalized phrase to scope over the coordinate structure unless the coordination is clausal. Given this, the availability of a distributive-scope reading in particular is due to a syntactic constraint on the structure. On the other hand, a constituent appears in a Focus Phrase in examples like (8a, d) (Rizzi 1990, Haegeman 2000). Here, only a wide-scope reading is available and the coordination is necessarily at the vP level because the focus phrase appears within the TP. As we can see, the readings are syntactically constrained. In Section 4, we will adopt a modified version of Potter et al.'s analysis to account for gapping in JA.

2.2 NCC

As noted earlier, NCC is among the topics that have received special attention in the recent work in coordination (e.g., Osborne 2008, Hofmeister 2010, Sailor and Thoms 2013, Bruening 2015, Kubota and Levine 2015). Just like gapping, NCC received reductionist (e.g., Wilder 1997, Crysmann 2003, Beavers and Sag 2004, Hofmeister 2010, Sailor and Thoms 2013, Bruening 2015) and non-reductionist analyses (e.g., Dowty 1988, Steedman 1989, Kubota and Levine 2015). The former attempts to derive NCC via movement or ellipsis.

Again, scope ambiguity in NCC was among the major challenges to reductionst analyses; NCC exhibits the same type of scope ambiguity observed in gapping. For instance, in (7a), the negative operator in *no girl* can have a wide scope reading in which the sentence means: it is not the case that Sam sent a girl chocolates today and flowers yesterday; this reading is unavailable in the non-elliptical version of the structure in (7b), where the negative operator has a distributive scope. The problem here is that the non-elliptical version of the structure allows for only the latter reading, namely the distributive scope reading of negation. This is a serious problem for reductionist analyses.

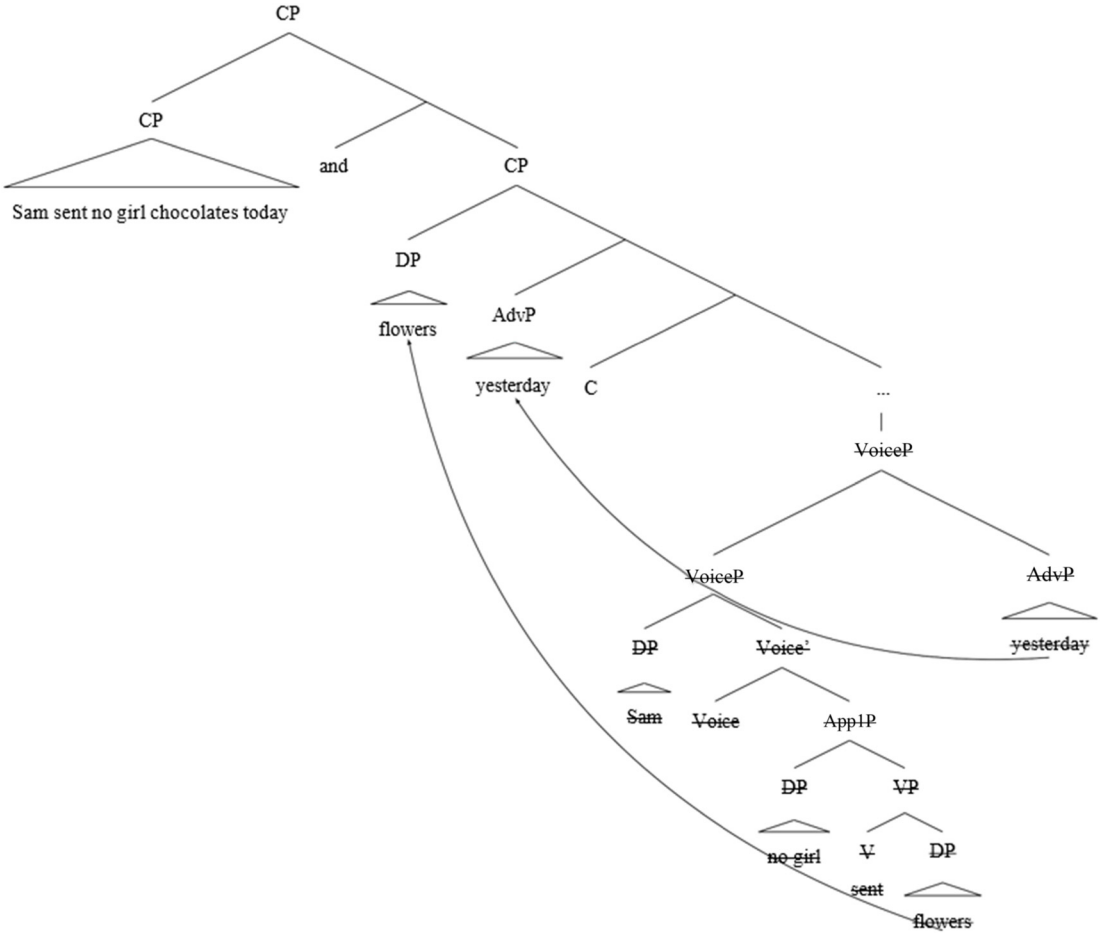
(7) (adapted from Osborne and Gross 2017, 669, (50))
   a. Sam sent no girl chocolates today and flowers yesterday
   b. Sam sent no girl chocolates today and sent no girl flowers yesterday

To account for this peculiarity, Sailor and Thoms (2013) argue that NCC is derived from two sources: a vP source and a CP source. These two sources undergo a series of movements in the non-initial conjunct plus ellipsis of the remnants to derive the surface constructions. For instance, in examples like (7a), the distributive scope reading of negation occurs when NCC is derived from conjoined CPs as in (7b). Sailor and Thoms call the constituents that move to the edge of the non-initial conjunct chunks. The derivation is illustrated in (8) for (7a).[1] The derivation

1 We use a binary-branching coordinate structure. Following Bruening (2001, 2010), in double object constructions, the theme is an argument of the verb and the goal is introduced by an Appl(icative) head that takes VoiceP as an argument. V moves to Voice via Appl. These assumptions are not crucial to the core arguments of the analysis, however.

above accounts for the distributive scope reading of NCC. As for the wide scope reading, it occurs when coordination is low at the vP level. In this case, the negation will necessarily outscope coordination. As before, a series of movements occur in the non-initial conjunct followed by an ellipsis of the remnant of the movement.[2] Thus, for Sailor and Thoms, the ambiguity in NCC is structural.

(8)



3 An experimental investigation of non-canonical coordination in JA

In this section, we report on two experiments that investigated the acceptability of gapping and NCC in JA. Informal collection of judgments by speakers of JA shows that these constructions are acceptable. However, a more systematic study of the phenomenon will be more reliable following much recent literature on experimental syntax. This way, we will avoid introspection that is known to be affected by bias from the side of the researchers. We should note that the investigation aims to establish empirical evidence for the existence of non-canonical coordination in JA and an analysis of this phenomenon in general. We will not aim to study semantic ambiguity in non-canonical coordination here, though it is an issue crucial to be investigated in future work (cf. Al Khalaf and Mashaqba 2023). Note also that the analyses that will be adopted below were motivated by scope

2 We assume that the negative determiner is a composition of a higher sentential negation and a lower indefinite at LF (Johnson 2009, Penka 2011). *Flowers* and *yesterday* undergo movement to the edge of the conjunct they occur in. *Sent* and *girl* undergo ATB movement outside the coordinate phrase (*girl* and the negation combine to form *no girl*).

ambiguity, but they were proposed to account for cases of non-canonical coordination more generally, which explains why we adopted them to explain the JA data, and why the background about ambiguity that motivated them was presented.

Experiment (1) tested the status of gapping in JA, and Experiment (2) tested the status of NCC in JA. Each experiment had eight sets of items that came in pairs: a full-fledged coordinate phrase and a reduced one (gapping and NCC). A set of fillers, equal in number to the set of test items, were mixed with the test items in each experiment (Appendix shows the full list of fillers). The fillers were sentences that involve no coordination, to make sure that the participants did not reason about the purpose of the study or the nature of the constructions being investigated. Half of the fillers were ungrammatical sentences. The order of the items was randomized for each participant to guard against any bias in the response that might result from the order of presentation.

The participants in the experiments were recruited from cities in Jordan like Amman, Zarqa', and Al-Balqa' via snowball sample technique. The surveys which the participants filled out clearly asked whether they were native speakers of JA. Only native speakers were included in the study.

The participant's task was to rate sentences on a scale from 1 to 7 according to how natural the sentences sounded to him/her. The experiments were posted online via Google Forms in the form of online surveys. The online surveys presented clear instructions on how the rating on a Likert scale should be done with an example at the beginning of each survey. Each participant participated in only one survey.

3.1 Experiment (1): The status of gapping in JA

3.1.1 Items

Experiment (1) investigated the acceptability of gapping in JA. The experiment had a simple design, with one independent variable (Gapping) and a dependent variable (Rating). We show a sample item set from Experiment (1) in (9). The set is a pair of a full-fledged coordinate constituent and a reduced one (gapping).

(9) a. riim katbat masraħiyyah w sarah katbat qasˤiidah
Reem wrote play and Sarah wrote a poem
'Reem wrote a play and Sarah wrote a poem'

b. riim katbat masraħiyyah w sarah qasʕiidah
Reem wrote play and Sarah poem
'Reem wrote a play and Sarah a poem'

Eight sets of items like (9) were mixed with eight fillers. Experiment (1) had a within-subject design, in which each participant in this experiment rated a total of 24 items.

3.1.2 Participants

A total of 102 native speakers of JA were recruited to participate in this experiment. Nineteen participants were excluded from the study because they scored less than 70% on the filler items, which indicates that they were not attending to the task. This left 83 participants in the analysis.

3.1.3 Results

The results were analyzed using R (R Core Team 2021). To simplify the results, we converted the Likert scale values for Rating to binary values of 'Acceptable' (4–7) and 'Unacceptable' (1–3) and named the new variable Acceptability. To test for any possible effects of gapping on Acceptability, a generalized linear model (GLM) was fit to the data, using the (*glm*) function from *mlogit* package (Participant was not included as a random factor). The results are shown in Table 1. The intercept, as thankfully highlighted by an anonymous reviewer, represents

Table 1: Results of GLM: gapping ~ acceptability

	Estimate	Std. error	*Z* value	Pr(>|*z*|)
(Intercept)	1.23327	0.09341	13.203	$<2 \times 10^{-16}$***
Gapping_No Gap	0.12656	0.13455	0.941	0.347

*** indicates high significance.

the forecasted value of the dependent variable when all independent variables are set to zero. Importantly, it does not signify interaction. Conversely, interaction is specifically observable between two factors, namely Gapping and Acceptability in this context. We present the distinctions between the two levels of acceptability.

As shown in Table 1, there is a main effect of gapping in the positive direction ($\chi^2 = 13.203$, $p < 0.001$). Figure 1 shows the percentage of Acceptability values for Gapping factors (Gap and NoGap). As can be seen, the general population finds gapping acceptable. (The *y*-axis shows the overall number of test items *participant.)

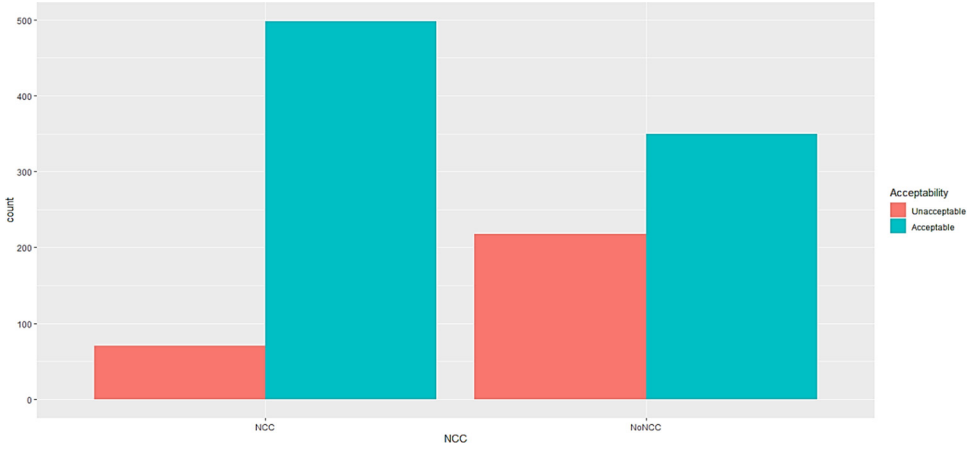


Figure 1: Acceptability percentages for gapping constructions in JA.

3.1.4 Conclusion

The results of the empirical investigation of gapping constructions in JA show that the larger population of native speakers of JA find gapping constructions acceptable as those that involve no gapping.

3.2 Experiment (2): The status of NCC in JA

3.2.1 Items

Experiment (2) examined the acceptability of NCC speakers of JA. The experiment had a simple design, with one independent variable (NCC) and a dependent variable (Rating). In (10), we show a sample set of test items in Experiment (2). The set is a pair of a full-fledged coordinate phrase and a reduced one (NCC).

(10) a. ʕumar ʔixtar salma la-lʔintixabat atˤ-tˤulabijja w sara la-musabaqit aš-šeʕir
Omar chose Salma for-elections student and Sarah for-competition poetry
'Omar chose Salma for student elections and Sarah for poetry competition'

b. ʕumar ʔixtar salma la-lʔintixabat atˤ-tˤulabijja w ʕumar ʔixtar sara
Omar chose Salma for-elections student and Omar chose Sarah
la-musabaqit aš-šeʕir
for-competition poetry
'Omar chose Salma for student elections and Sarah for poetry competition'

As in Experiment (1), eight sets of items like (10) were mixed with eight fillers. The fillers were like the ones in Experiment (1). Similarly, Experiment (2) had a within-subjects design, in which each participant in this experiment rated a total of 24 items.

3.2.2 Participants

A total of 101 JA native speakers were recruited to participate in this experiment. Thirteen participants were excluded from the study because they scored less than 70% on the filler items. This left 88 participants whose results were included in the study.

3.2.3 Results

Similarly, the results of Experiment (2) were analyzed using R (R Core Team, 2021). To simplify the results, we converted the Likert scale values for Rating to binary values of 'Acceptable' (4–7) and 'Unacceptable' (1–3) and named the new variable Acceptability. As before, to test for any possible effects of NCC on Acceptability, a GLM was fit to the data, using the (*glm*) function from the *mlogit* package. The results are shown in Table 2.

Table 2: Results of GLM: NCC ~ acceptability

	Estimate	**Std. error**	***Z* value**	**Pr(>|*z*|)**
(Intercept)	1.9621	0.1276	15.371	$<2 \times 10^{-16}$***
NCC_NoNCC	−1.4887	0.1541	−9.662	$<2 \times 10^{-16}$***

*** indicates high significance.

As can be seen, there is a main effect of NCC in the positive direction ($\chi^2 = 15.371$, $p < 0.001$). Figure 2 shows the percentages of the Acceptability options for the two NCC factors (NCC and NoNCC).

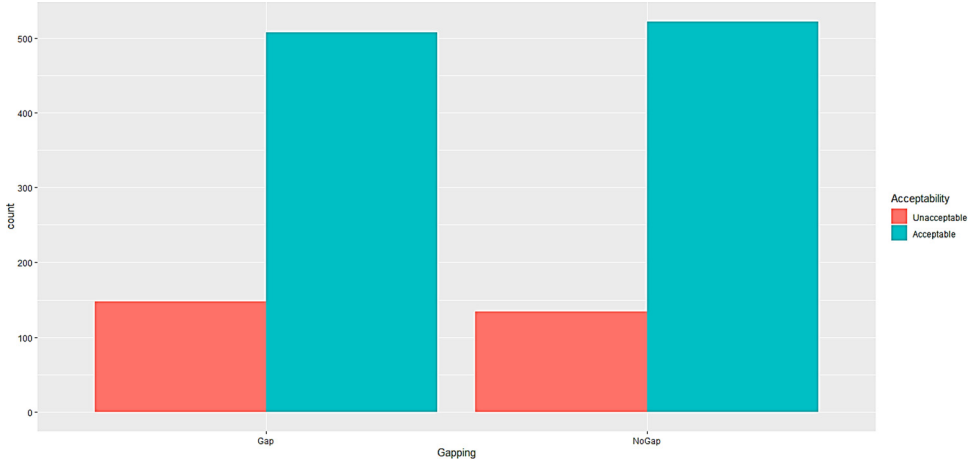


Figure 2: Acceptability percentages for NCC constructions in JA.

3.2.4 Conclusion

The results of the empirical investigation show that JA speakers find NCC constructions acceptable to a significantly higher degree than the non-NCC ones.

4 Analysis

Having established the empirical background of non-canonical coordination JA, we now turn to presenting an analysis of the data. As pointed out earlier, the major aim of the study is to show through an experimental investigation that non-canonical coordination is attested in JA. The other aim is to present an analysis of non-canonical coordination building on previous work.

4.1 Assumptions

We adopt the view that coordination targets constituents (i.e., phrases or clauses) of the same category. Thus, where it appears that non-constituents are being conjoined, some reduction processes (movement or ellipsis) have been applied. This is a long-standing assumption within phrase structure grammars, such as the Generative Grammar framework. We also adopt the view that non-canonical coordination (i.e., gapping and NCC) can be derived from two sources: a CP source and a vP source (Potter et al. 2017, Sailor and Thoms 2013). We will show below that the CP source captures the distributive scope reading of scope-taking elements in non-canonical coordination, whereas the vP source captures the wide-scope reading of these elements. The last assumption has to do with the way syntactic structures are derived. We assume, following Phillips (1996, 2003), Bruening (2014), and Osborne and Gross (2017), that syntactic structures can be derived from left to right, reflecting how sentences are processed. Within this framework, displaced elements are merged before their lower copies in the base position. This way of merge and derivation allows for lower copies to be minimal, which means that some elements in the higher copies can be skipped in the lower copies (more clarification below).

4.2 Derivation of non-canonical coordination

The empirical investigation of NCC was not concerned with the ambiguity debate. However, any analysis of NCC should account for the ambiguity issue – given that no systematic study was done to establish the acceptability of NCC in JA, as far as we know. We will thus explain the derivation of examples that give rise to ambiguity below. Moreover, it is ambiguity that motivated the two-source analysis that we adopt here. Consider the following example from JA:

(11) ʕali aʕtˤa wala bint šukulatˤa ilyoum w ward mabariħ
Ali gave no girl chocolates today and flowers yesterday
'Ali gave no girl chocolates today and flowers yesterday'

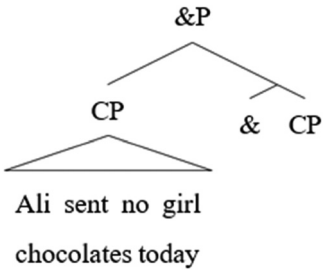
As can be seen, the sentence gives the right to ambiguity as explained in Section 2. The non-elliptical version allows only for a distributive reading:

(12) ʕali aʕtˤa wala bint šukulatˤa ilyoum w ʕali aʕtˤa wala bint ward mbariħ
Ali gave no girl chocolates today and Ali gave no girl flowers yesterday
'Ali gave no girl chocolates today and Ali gave no girl flowers yesterday'

We propose that the structure involving NCC is derived from full-fledged sources: a CP source and a vP source. The former gives rise to a distributive-scope reading. That is, the girl to which Ali did not give chocolates or flowers is not the same girl or does not have to be the same girl. The CP source undergoes ellipsis, giving us the surface structure of NCC. We adopt the analysis advanced by Sailor and Thoms (2013), where the chunks in the non-initial conjunct undergo topicalization to the left edge of the conjunct, followed by an ellipsis of the remnant of movement (Section 2). To explain how the analysis works for (11), the

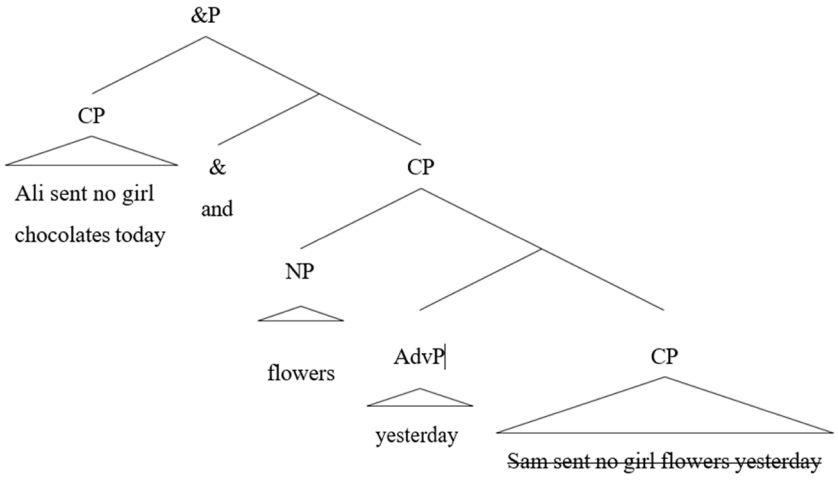
derivation begins from left to right by constructing the first conjunct. The structure of coordination we adopt is the one proposed by Collins (1988) where coordination projects its own phrase (i.e., &P). For simplification, we will use the English translation of the Arabic words in the tree.

(13)



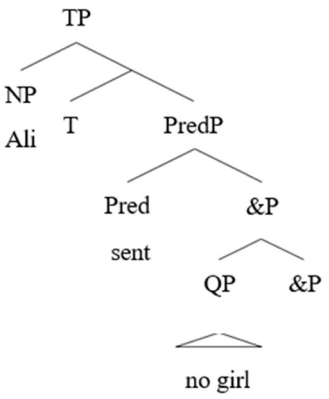
The derivation continues with merging the constituents from left to right. The non-initial conjunct is merged. Following Sailor and Thoms, the chunks that survive deletion in the non-initial conjunct focus move to the left edge of the non-initial conjunct. Then, the remnant of the movements is elided:

(14)



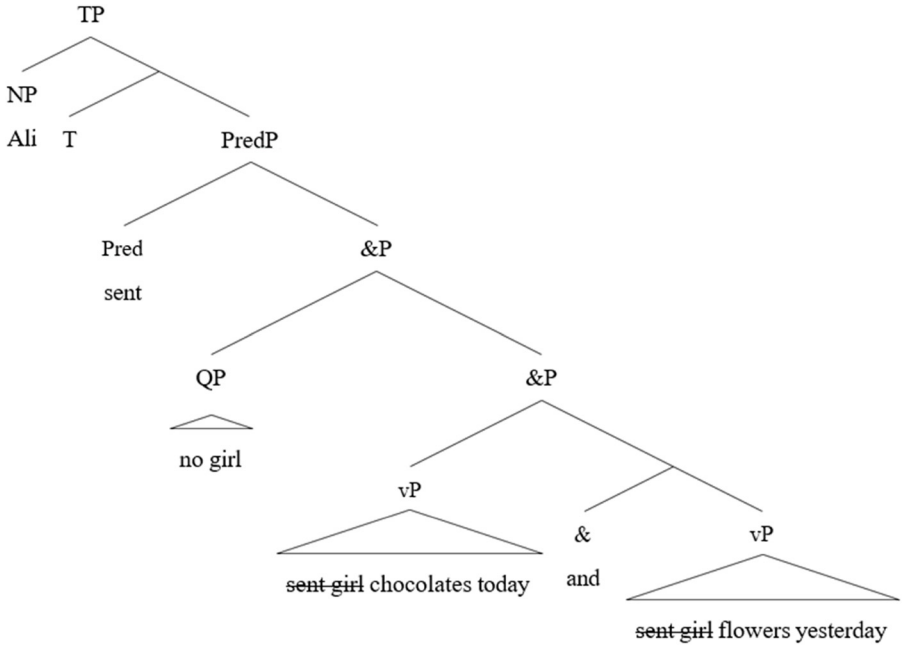
As can be seen, negation occurs in all conjuncts; hence, the distributive scope reading of negation. The wide-scope reading of negation, on the other hand, is derived when negation outscopes the coordination. We propose that this reading is derived from the vP source of NCC, where negation occurs outside coordination. In this case, ATB movement applies to the vP source of non-canonical coordination. As assumed earlier, in a left-to-right syntax, when ATB movement applies, the lower copies of the moved phrase can be minimal, as an effect of distance during processing. To explain, the derivation of the vP source of (11) proceeds as follows. The subject 'Ali' is merged followed by T. Following Johnson (2009), there is a PredP projected above vP. The verb undergoes ATB movement to Pred. The indirect object *no girl* undergoes movement to the edge of vP. Note that displaced copies are merged first in left-to-right syntax:

(15)



The derivation continues with building &P. Only minimal copies of the moved phrases are merged in the lower positions as an effect of distance from the landing site. Therefore, the quantifier 'no' is skipped from lower copies and only 'girl' is merged:

(16)



Note that the negative quantifier occurs outside negation, accounting for the wide-scope reading of negation. Note also that the same type of analysis applies to gapping to derive the ambiguity.

5 Conclusion

In this article, we presented empirical evidence for non-canonical coordination in JA. Two experiments were conducted to investigate the status of gapping and NCC in JA. The results of the experiments indicate that these constructions are acceptable for most of the speakers consulted. We then presented an analysis that captures semantic scope ambiguity in non-canonical coordination. The analysis is couched in terms of left-to-right syntax building on previous work that suggested that non-canonical coordination can have a CP source and a vP source. The data and analysis contribute to the debate on constituency and phrase structure.

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Data availability statement: The data sets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Appendix

Filler Items

Grammatical fillers:

(1) Salma ʔaʕtˤat ʕali hadiyah b-youm miilad=uh
Salma gave Ali present in-day birth=his
'Salma gave Ali a present on his birthday'

(2) ʕali tˤalab biitza min il-matˤʕam
Ali ordered pizza from the-restaurant
'Ali ordered pizza from the restaurant'

(3) itˤ-tˤullab sallamu il-wajib la-l-mʕalmih
The-students submitted the-assignment to-the-teacher
'The students submitted the assignment to the teacher'

(4) Muna ma bitħib taakul brokli
Muna neg like eat broccoli
'Muna does not like broccoli'

Ungrammatical Fillers:

(5) *il-ktaab qaraʔt ma Salma
the-book read neg Salma
Intended: 'Salma didn't read the book'

(6) *it-taqriir muna ilyaumi katabat
the-report Muna daily wrote
Intended: 'Muna wrote the daily report'

(7) *ʕali ʕazam ma wahid asˤħaab=uh min
Ali invited neg one friend=his of
Intended: 'Ali didn't invite any of his friends'

(8) *il-balad yutruk bidduh ʕali
the-country leave want Ali
Intended: 'Ali wants to leave the country'