Syntax of negation in corrective *but* sentences: Evidence from syntax-semantics and prosody

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1. Introduction

This paper provides a syntactic analysis of corrective *but* sentences (i.e., *not…but…* sentences) with the following consequences: there is a use of negation that must be adjacent to conjunction. In this use, negation is also a focus-sensitive operator. My analysis of negation in corrective *but* contributes to the generalization that all focus-sensitive operators have two positions in a sentence. My syntactic analysis draws evidence from a mix of domains, from the more traditional sources of syntax and semantics to a prosodic experiment, following a tradition in the literature that looks to prosody for evidence for the syntactic structure (e.g. Bresnan 1971; Clemens and Coon 2018; Clemens 2021).

But in English has at least three uses: counterexpectation, semantic opposition and correction (e.g., Toosarvandani's 2014 taxonomy). This paper focuses on the corrective use of *but*. Each use of *but* requires contrast of some sort. In the counterexpectational use, the first conjunct creates an expectation that is rejected by the second conjunct (e.g., *Max eats spinach but hates it*). In semantic opposition, the conjuncts contrast with each other in two positions (e.g., *John is tall but Bill is short*). Corrective *but* requires presence of negation in the first conjunct and absence of negation in the second conjunct (1). Absence or presence of negation in both conjuncts is not possible (2)–(3).

(1) Max does*n't* eat spinach but chard. (Toosarvandani 2013:828)
(2) #Max eats spinach but chard.
(3) #Max does*n't* eat spinach but *not* chard.

Vicente (2010) and Toosarvandani (2013) argued that (1) must involve ellipsis. Specifically, the *remnant* (the phrase that survives ellipsis; *chard*) moves out of the ellipsis site, which then gets deleted:

(4) Max does [$_{vP}$ *not* eat spinach] but [$_{vP}$ chard$_i$ [~~eat t$_i$~~]].

Toosarvandani also discussed a type of corrective *but* sentences that is a minimal pair with (1), but puts negation before *spinach*:

(5) Max eats *not* spinach but chard.

He argued that (5) cannot involve ellipsis, but must be analyzed as coordination of two DPs, where the first DP is a negated DP:

(6) Max eats [$_{DP}$ *not* spinach] but [$_{DP}$ chard].

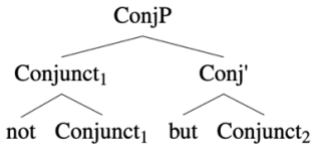
I agree with Toosarvandani on the analysis of (1), but not on the analysis of (5). I will provide evidence from syntax and semantics (section 2) and prosody (section 4) that suggests that in addition to the analysis without ellipsis (7a), (5) can also be analyzed as underlying coordination of larger phrases (e.g., two vPs, (7b); or two TPs, (7c)) plus ellipsis.

(7) *My analysis of (5)*
   a. Max eats [$_{DP}$ *not* spinach] but [$_{DP}$ chard].
   b. Max [$_{vP}$ eats *not* spinach] but [$_{vP}$ chard$_i$ [~~eat t$_i$~~]].
   c. [$_{TP}$ Max eats *not* spinach] but [$_{TP}$ chard$_i$ [~~he eats t$_i$~~]].

I analyze (1) as requiring ellipsis, but (5) as optionally involving ellipsis. This analysis, which assigns a single analysis to (1) but multiple possible analyses to (5), predicts that if the multiple possible analyses can lead to different meanings, then we should be able to observe ambiguity for sentences like (5), but only a single reading for sentences like (1). Section 3 shows that this prediction is borne out: in sentences like (1), negation and conjunction always take scope at their surface positions, but in sentences like (5), negation and conjunction can take scope at higher positions than their appear.

Not only does the evidence from section 3 support the analysis with ellipsis that section 2 argues for, but it also suggests that this ellipsis does not occur freely, but in a systematic way. Furthermore, facts based on scope also suggest that there is a close relationship between negation and *but*-coordination: negation always takes scope immediately below the conjunction, suggesting that negation is always the daughter of the first conjunct. I thus propose that *but* first merges with the second conjunct, and then merges with the merged product of negation and the first conjunct to derive the Conjunction Phrase (ConjP).

(8) *My preliminary analysis of corrective* but *coordination*



This analysis can account for the all the facts to be presented in this paper, except one thing: in (7b-c), which are my analyses of (5), negation is not the daughter of the first conjunct, but deeply embedded in the first conjunct, contrary to my proposed structure in (8). I will show that the structure I propose still applies in some way to (7b-c) because in those structures, negation actually takes scope above its surface position, and directly below the underlying conjunction.

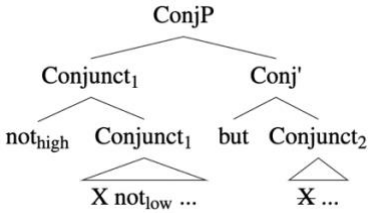
I therefore argue that in addition to ellipsis, there are two positions for negation: the higher position (which I call *high negation*) is interpreted, and is the daughter of the first conjunct. The lower position (which I call *low negation*) is semantically vacuous, and deeply embedded inside the first conjunct. Either position may be pronounced. When low negation is pronounced (pronounced negation is marked in italics, and silent negation in <>), because we do not see where high negation is, it has the effect that negation takes scope at a place higher than its surface position.

(9) *My analysis of (5) plus positions of negation*

a. Max eats [$_{DP}$ *not* <not> spinach] but [$_{DP}$ chard].
b. Max [$_{vP}$ <not> eats *not* spinach] but [$_{vP}$ chard$_i$ [~~eat t$_i$~~]].
c. [$_{TP}$ <not> Max eats *not* spinach] but [$_{TP}$ chard$_i$ [~~he eats t$_i$~~]].

Below is my full analysis, incorporating ellipsis (of identical material X) and the two positions of negation:

(10) *My full analysis of corrective* but *coordination*



There has been a generalization in the literature based on the Question-particle and *only* that all focus-sensitive operators have two instances in a sentence (e.g., Lee 1999; Cable 2007; Hole 2015; Hirsch 2017;

Hole 2017; Quek and Hirsch 2017; Bayer 2018). I argue that negation in corrective *but* sentences is also a focus-sensitive operator, and that negation has two positions, consonant with this generalization.

This analysis of corrective *but* is identical to Wu's (2022b) analysis of *either…or…*, suggesting that negation, like *either*, has a close relationship with coordination. Parallel to the fact that *either* requires *or*, constituent negation requires *but*.[1]

(11) a. Max eats either spinach *(or chard). b. Max eats not spinach *(but chard).

Before delving into the data and analysis in the next sections, I want to introduce some terminology that will aid in understanding the data. If we adopt my analysis that negation is the daughter of the first conjunct, then corrective *but* sentences can be divided into two types. Many corrective *but* sentences seem to follow the generalization that negation is the daughter of the first conjunct (e.g., (5)). I call these sentences *neg(ation)-seems-normal* because they seem to be the banal cases from the perspective of my analysis. Other corrective *but* sentences seem to challenge my generalization that negation is the daughter of the first conjunct (e.g., (1)) because there, negation appears to be higher than the daughter of the first conjunct. I call these sentences *neg(ation)-seems-high*. According to my analysis, neg-seems-high is an illusion: negation is still the daughter of the first conjunct, but this has been obscured by ellipsis.

The following examples demonstrate that corrective *but* sentences can involve negative elements other than *not* (e.g., *no* and *neither*). They also show that neg-seems-normal does not require constituent negation, and neg-seems-high does not require sentence negation.

(12) *Neg(ation)-seems-normal*
a. Max eats [$_{DP}$ *not* spinach] but [$_{DP}$ chard].
b. He was [$_{DP}$ *no* recluse] but [$_{DP}$ a man of the world acquainted with public affairs].
(Toosarvandani 2013:830, 842)

(13) *Neg(ation)-seems-normal*
a. They had [$_{DP}$ *neither* obsession nor attraction] but [$_{DP}$ real love].

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[1] In contrast to constituent negation, sentence negation, *neither* and *not a single NP* can occur without *but*.

(i) a. Max doesn't eat spinach.
b. They had neither obsession nor attraction.
c. They saw not a single person.

Not {many/much/all/every} NP can occur without *but*, but only in the subject position (Klima 1964; Postal 1974):

(ii) a. {Not many friends/Not all his friends/Not everybody} came to the party.
b. *John invited {not many friends/not all his friends/not everybody} to the party. (Based on Kayne 1998:157)

No can occur in the object position without *but*, but only as the object of a verb that raises to T (e.g., *be* and *have*). When it is the object of a verb that doesn't raise to T (e.g., *become* and *own*), prosodic focus on the verb is required (observed by Bolinger 1983; Kayne 1998):

(iii) a. He {was/*became} no recluse.
b. He {has/*owns} no car.

I assume that the negation that can occur without *but* still has another form as a coordinator, which does require coordination. The negation that can occur without *but* is the non-coordinator homophone. I leave to future research exactly what types of negation have non-coordinator homophones and the conditions that license them. But I want to point out that the ungrammatical sentences above improve with *but*, suggesting that when negation is a coordinator, it is not subject to the restrictions that the non-coordinator form of negation is subject to.

(iv) a. John invited not all his friends but only some to the party.
b. He became no A+ student, but an A- student.

b. Max does [$_{vP}$ *not* buy spinach] but [$_{vP}$ grows it].

(14) *Neg(ation)-seems-high*

a. Max does*n't* eat [spinach] but [chard].

b. He met *not* a friend [of a linguist] but [of a philosopher].

Vicente (2010) and Toosarvandani (2013) have already argued that neg-seems-high must involve ellipsis, which I agree with. In support of this claim, Vicente provided evidence involving scope, word order, agreement in Spanish, locality and connectivity effects. I also agree with Toosarvandani's (2013) claim that neg-seems-normal has a structure that does not involve ellipsis, which was based on evidence involving scope, word order and locality effects. Due to limited space, I will not replicate those arguments that I agree with. Rather, this paper will focus on where Toosarvandani and I disagree and novel claims that were not made before: section 2 shows that neg-seems-normal can involve ellipsis. Section 3 provides further evidence for ellipsis in neg-seems-normal, and also evidence that negation has two positions in a sentence. I argue for the presence of ellipsis in neg-seems-normal in multiple ways at once: syntax and semantics (section 2) and prosody (section 4). Section 4 presents a prosodic experiment whose results are consistent with the current proposal for ellipsis in neg-seems-normal, but not with Toosarvandani's claim that neg-seems-normal does not involve ellipsis. This experiment not only demonstrates that prosodic evidence can shed light on the syntactic structure of neg-seems-normal sentences, but it also demonstrates with neg-seems-high sentences that syntactic theory can in turn provide a basis for investigating questions about the mapping process between syntax and prosody–their prosody suggest that the prosodic structure can be recursive just like the syntactic structure. Section 5 concludes the paper.

2. Neg-seems-normal can be derived by ellipsis

This section presents three arguments that neg-seems-normal can be derived by ellipsis. They are based on constituency, scope and antecedent-contained deletion respectively.

2.1 Argument 1: Constituency

The first argument relies on the assumption that only constituents can be coordinated by *but*. If we find apparent coordination of non-constituents, then ellipsis must have occurred. Following is a baseline, where the conjuncts (bracketed) are constituents:

(15) *Coordination of apparent constituents (baseline)*

a. John looked at *not* [the planet with ice caps], but [the star with dark spots].

b. Mary played *not* [checkers from Egypt], but [chess from India].

In contrast, what appear to be coordinated in the following sentences are not constituents:[2]

(16) *Coordination of apparent non-constituents*

a. John looked at *not* [the planet with a telescope], but [the star with binoculars].

b. Mary played *not* [checkers today], but [chess yesterday].

We can use the cleft test, a basic constituency test to show that the bracketed parts in (16) are not constituents:

[2] The bracketed material in (16a) may be a constituent, if the sentence involves VP conjunction and ATB-movement of the verb (*looked*) and the preposition (*at*) out of the conjunction:

(i) John looked$_i$ at$_j$ not [$_{VP}$ t_i t_j the planet with a telescope] or [$_{VP}$ t_i t_j the star with binoculars].

While it is possible that the verb (*looked*) ATB-moves to v, there is unlikely to be another head position below v that the preposition can move to, therefore I consider the bracketed material not to be a constituent.

(17) *Coordination of apparent constituents (baseline)*
a. *It was [the star with binoculars] that John looked at.
b. *It was [chess yesterday] that Mary played.

If we posit ellipsis, then the underlying conjuncts are still constituents:

(18) *Apparent coordination of non-constituents must involve ellipsis*[3]
a. John [looked at *not* the planet with a telescope], but [~~looked at~~ the star with binoculars].
b. Mary [played *not* checkers today], but [~~played~~ chess yesterday].

2.2 Argument 2: Scope interactions with a subject quantifier

The second argument relies on sentences with a quantifier in the subject position, and negation and conjunction in the object position like (19). (19) has multiple readings. Toosarvandani (2013) used one of them as an argument that neg-seems-normal does not have to involve ellipsis. Here I focus on the other reading, spelled out below, where conjunction takes scope above the subject quantifier. This reading may not be the most obvious one, but this context highlights it: the caterer is deciding what alcohol to serve at colloquium parties, and wants to eliminate the drink that is drunk by at most five students because it is not economical. The speaker can say (19) to argue for the elimination of gin but not whiskey.

(19) At most five students drank *not* the whiskey but the gin. (Toosarvandani 2013:838)
✓∧ > ¬ > *at most five*: 'It's not the case that at most five students drank the whiskey, but it is the case that at most five students drank the gin.'

This reading follows naturally from ellipsis, but might be puzzling without ellipsis:

(20) *Analysis with ellipsis of (19)*
[At most five students drank *not* the whiskey] but [~~at most five students drank~~ the gin].

2.3 Argument 3: Antecedent-contained deletion (ACD)

The third argument is based on ACD. I will show that an analysis without ellipsis runs into problems with sentences involving ACD, while an analysis involving ellipsis avoids these issues.

ACD often involves a relative clause with VP-ellipsis (21a). Common analysis of ACD posits quantifier raising (QR) of the DP above the main verb (i.e., of *every philosopher that Mary did*, as in (21b)) in order to construct an antecedent VP (i.e., A in (21b), *talked to trace*) that is parallel to the elided phrase (i.e., E in (21b), *talk to trace*; Sag 1976; May 1985; Kennedy 1997; Fox 2002):

(21) a. John talked to every philosopher that Mary did.
b. John [every philosopher that Mary did [$_E$ ~~talk to t~~]]$_i$ [$_A$ talked to t_i].

Kennedy (1994) observed that if the DP that the relative clause attaches to is embedded in another DP, only the embedded DP can QR, but not the larger DP. I will apply this key observation to neg-seems-normal sentences that contain ACD:

(22) *ACD in neg-seems-normal*
John talked to *not* some linguist but every philosopher that Mary did.

[3] I assume that in (18a-b), the remnants move out of the ellipsis separately, like what we see in gapping:

(i) a. John [looked at **not** the planet with a telescope], but [the star]$_i$ [with binoculars]$_j$ ~~looked at t_i t_j~~.
b. Mary [played **not** checkers today], but [chess]$_i$ [yesterday]$_j$ ~~played t_i t_j~~.

According to Kennedy's observation, we can only QR the universal quantifier in (22), but not the larger DP conjunction. If we do not posit ellipsis for (22), then just QRing the universal quantifier would violate Coordinate Structure Constraint. Even if Coordinate Structure Constraint could be violated, it would lead to non-identical antecedent and elided phrase (23), where the antecedent is *talked to not some linguist but trace*, and the elided phrase is *talk to trace*.

(23) *Analysis without ellipsis creates non-identical antecedent and elided phrase*
John [every philosopher that Mary did [$_E$ ~~talk to t~~]]$_i$ [$_A$ talked to [*not* some linguist] but t$_i$].

If (22) can involve ellipsis, we can avoid these problems simply by positing larger underlying coordination, and movement of only the universal quantifier in the second conjunct:

(24) *Analysis with ellipsis*
John [$_{vP}$ talked to *not* some linguist] but [$_{vP}$ [$_{DP}$ every philosopher that Mary did [$_E$ ~~talk to t~~]]$_i$ [$_A$ ~~talked to~~ t$_i$]].

3. Neg-seems-normal has more parses than neg-seems-high, and negation has two positions

According to my analysis, neg-seems-normal sentences have multiple possible analyses (i.e., analyses with ellipsis, see section 2, and analysis without ellipsis, see Toosarvandani 2013), but neg-seems-high sentences only one (i.e., analysis with ellipsis, see evidence from Vicente 2010 and Toosarvandani 2013). This makes a prediction: neg-seems-normal sentences should be able to have ambiguity, but neg-seems-high sentences cannot have ambiguity. This section shows that this prediction is borne out. Furthermore, I will argue based on the ambiguity of neg-seems-normal that there are two positions for negation in a sentence, though we only hear one, and only the higher position is interpreted as true negation.

First, the following neg-seems-normal sentence (25) is ambiguous. The key difference between its readings is in the scope interactions between negation, conjunction and the intensional verbs (underlined and expanded in the readings). Negation and conjunction can take scope below both verbs (reading 1), between them (reading 2), or above them (reading 3).

(25) Sherlock pretended to be looking for *not* a burglar but a thief. *Neg-seems-normal*
✓Reading 1: Sherlock <u>acted like</u> he <u>tried to find</u> someone who is [*not* a burglar but a thief].
✓Reading 2: Sherlock <u>acted like</u> [he did*n't* <u>try to find</u> a burglar, but he <u>tried to find</u> a thief].
✓Reading 3: [Sherlock did*n't* <u>act like</u> he <u>tried to find</u> a burglar, but he <u>acted like</u> he <u>tried to find</u> a thief].

In contrast, neg-seems-high sentences only have one reading, where the scope of negation and conjunction is frozen at negation's surface position (also observed by Kayne 1998):

(26) *Neg-seems-high that only has reading 2*
Sherlock pretended *not* to be looking for a burglar but a thief.

(27) *Neg-seems-high that only has reading 3*
Sherlock did*n't* pretend to be looking for a burglar but a thief.

The only reading of neg-seems-high sentences follows from ellipsis, once we recover the elided material:

(28) *Analysis of neg-seems-high (26)*
Sherlock pretended [$_{TP}$ *not* to be looking for a burglar] but [$_{TP}$ ~~to be looking for~~ a thief].

(29) *Analysis of neg-seems-high (27)*
Sherlock did [$_{vP}$ *not* pretend to be looking for a burglar] but [$_{vP}$ ~~pretend to be looking for~~ a thief].

Reading 1 of neg-seems-normal (25) follows from the analysis without ellipsis:

(30) *Analysis without ellipsis of neg-seems-normal (25) → Reading 1*
Sherlock pretended to be looking for [$_{DP}$ *not* a burglar] but [$_{DP}$ a thief].

Readings 2 and 3 of neg-seems-normal (25) follow from ellipsis, giving us higher scope of conjunction than its surface position:

(31) *Analysis with ellipsis of neg-seems-normal (25) → higher-than-surface scope of conjunction*

a. Sherlock pretend [to be looking for *not* a burglar] but [~~to be looking for~~ a thief]. *Reading 2*
b. Sherlock [pretended to be looking for *not* a burglar] but [~~pretend to be looking for~~ a thief].*R3*

Ellipsis can only give us the correct scope of conjunction in readings 2 and 3, but negation also takes higher-than-surface scope. This suggests that we need something besides ellipsis. Here I posit an instance of unpronounced negation (in <> in (32a-b)) at the left edge of the first conjunct. The unpronounced negation is interpreted as actual negation, and the pronounced negation is semantically vacuous.

(32) *Analysis with ellipsis of neg-seems-normal (25) → high-than-surface scopes of conjunction and negation*

a. Sherlock pretend [<not> to be looking for *not* a burglar] but [to be ~~looking for~~ a thief]. *R2*
b. Sherlock [<not> pretended to be looking for *not* a burglar but [pretend to be ~~looking for~~ a thief]. *Reading 3*

Here I discuss an alternative analysis that does not posit two positions for negation: perhaps there is no ellipsis at all, but just DP-conjunction *not a burglar but a thief* (similar to Penka and Zeijlstra's 2005 analysis of negative indefinites in Dutch and German). This DP-conjunction QRs to above *looking for* (for reading 2) or *pretended* (for reading 3), and then each conjunct (the indefinites) is reconstructed.

(33) *Alternative analysis without ellipsis of neg-seems-normal (25) → Reading 2*
Step 1 (QR): Sherlock pretended [*not* a burglar but a thief]$_i$ to be looking for t_i.
Step 2 (reconstruction): Sherlock pretended [*not* a burglar but a thief]$_i$ to be looking for t_i [a burglar] [a thief].

This analysis fails to account for the evidence for ellipsis in section 2, as well as neg-seems-normal with VP-conjunction (34), which can also have ambiguity, but VPs are usually assumed to not be able to QR:

(34) Sherlock pretended to be *not* singing but dancing.
✓Reading 1: Sherlock acted like he was doing something that was not singing but dancing.
✓Reading 2: Sherlock didn't act like he was singing, but he acted like he was dancing.

Having seen my analysis of neg-seems-high and neg-seems-normal, we may wonder why neg-seems-high can't have ambiguity. If it could, then (26) would have reading 3, contrary to fact:

(35) *Impossible reading 3 of (26)*

Sherlock [<not> pretended *not* to be looking for a burglar] but [~~pretended to be looking for~~ a thief].

This derivation is bad because ellipsis cannot apply here. Let us assume that in parallel to the movement of the remnant phrase *a thief, a burglar* moves to the parallel position in the first clause at LF. Furthermore, suppose ellipsis requires syntactic identity between an antecedent and the elided phrase (i.e., *pretended to be looking for trace*).

(36) *Impossible reading 3 of (26)*
Sherlock [[a burglar]$_i$ <not> pretended not to be looking for t_i] but [[a thief]$_j$ ~~pretended to be looking for t_j~~].

Because there is negation between *pretended* and *looking for* in the first conjunct, but no negation in the second conjunct, we cannot find an antecedent that is identical to the elided phrase.

To summarize, this section has argued that the fixed scope of conjunction and negation in neg-seems-high is a result of ellipsis, but this ellipsis is constrained by the identity requirement on ellipsis, and therefore it does not generate more readings than attested. The ambiguity of neg-seems-normal is a result of ellipsis, but there are more ellipsis options than in neg-seems-high because of the pied-piping of *not* in the antecedent. In neg-seems-normal, not only can conjunction take higher scope, but negation also can, suggesting that there are two positions of negation, and the higher position is interpreted.

4. Prosodic evidence

Have provided syntactic and semantic arguments for ellipsis based on constituency, scope interactions with a subject quantifier and intensional verbs, and antecedent-contained deletion, this section provides evidence from a prosodic experiment, adding to a small but growing literature that looks to prosody for evidence for syntactic theories (e.g. Bresnan 1971; Clemens and Coon 2018; Clemens 2021).

This prosodic experiment was designed to not only adjudicate between the competing syntactic analyses of neg-seems-normal, but also address another question about the mapping process between syntax and prosody. I will address this research question by examining the prosody of neg-seems-high sentences, whose syntactic analysis is less controversial than neg-seems-normal: the literature agrees that neg-seems-high sentences involve ellipsis. This uncontroversial analysis of neg-seems-high sentences makes them a great place to study an important question about the syntax-prosody mapping–whether the prosodic structure can be recursive. Therefore, the prosody of corrective *but* sentences can address two separate research questions: (a) what the correct syntactic analysis of neg-seems-normal is; and (b) whether the prosodic structure can be recursive and replicate the dominance relations in syntax, based on the prosodic study of neg-seems-high sentences.

This section will begin by introducing these two research questions in subsections 4.1 and 4.2 respectively, including the relevant hypotheses and their prosodic predictions. Then subsection 4.3 will present the prosodic experiment, its results and a discussion of their consequences for the research questions.

4.1. Competing syntactic analyses of neg-seems-normal and their prosodic predictions

This subsection reviews the competing syntactic analyses of a neg-seems-normal sentence like (37), and discusses their prosodic predictions.

(37) Max misses *not* spinach but chard.

Toosarvandani (2013) analyzed (37) as coordination of two DPs (38), and crucially it cannot involve any ellipsis. Thus, I call this *the strictly-DP-coordination approach*. This contrasts with my analysis in (39), which allows for structural ambiguity—neg-seems-normal can involve ellipsis, but it does not have to. I call this *the ambiguity approach*.

(38) *Analysis of (37) according to the strictly-DP-coordination approach*
Max misses [$_{DP}$ *not* spinach] but [$_{DP}$ chard].

(39) *Multiple analyses of (37) according to the ambiguity approach*
a. Max misses [$_{DP}$ *not* spinach] but [$_{DP}$ chard].
b. Max [$_{vP}$ misses *not* spinach] but [$_{vP}$ chard$_i$ ~~misses t$_i$~~].
c. [$_{TP}$ Max misses *not* spinach] but [$_{TP}$ chard$_i$ ~~he misses t$_i$~~].

To adjudicate between these two analyses, we can use an empirical generalization about English coordination that has been confirmed experimentally (e.g., Wagner 2005; Wagner 2010; Wu 2022a): in coordination, the size of the coordinated constituents is correlated with their prosody. For example, (40a) is coordination of two TPs, while (40b) can involve coordination of two DPs.

(40) a. [$_{TP}$ Lillian will look for Lauren] or [$_{TP}$ she will look for Bella].
b. Lillian will look for [$_{DP}$ Lauren] or [$_{DP}$ Bella] this Saturday.

This difference in syntactic structure is reflected in their prosody: *Lauren* in (40a) is followed by a stronger prosodic boundary than *Lauren* in (40b) (strength of a boundary can be detected durationally, as we will see later). Following this empirical observation that size of coordination affects prosody, the two syntactic approaches make different predictions about the prosody of (37). The strictly-DP-coordination approach predicts that (37) should have the prosody of DP-coordination. We can test this prediction by comparing the prosody of (37) with that of a sentence that is uncontroversially DP-coordination, such as (41). I use the collective predicate *mix* in (41) to make sure it involves DP-coordination. The strictly-DP-coordination expects the prosodic boundary in (37) to be no different from the boundary in (41) (Figure 1).

(41) Max doesn't mix spinach and chard.

In contrast, the ambiguity approach claims that (37) can involve vP- and TP-coordination. Suppose that when producing a structurally ambiguous sentence, the speaker chooses any one of the possible parses when saying it. This means that the speaker will sometimes produce (37) as DP-coordination, sometimes as vP-coordination and other times as TP-coordination. If we can look at many speakers' many productions of (37), and can take an "average" of their prosodic realizations across these many instances of production, then the ambiguity approach predicts that on average, the prosodic boundary in (37) should be stronger than that of (41) because of previous findings that coordinated TP has a stronger prosodic boundary than coordinated DP. (Figure 2).

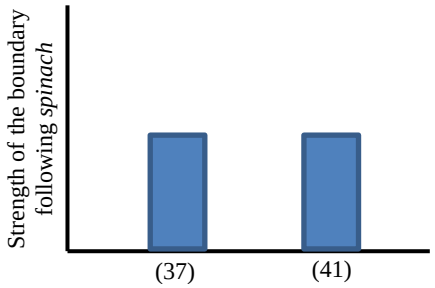

Figure 1: *Prediction of the strictly-DP approach.*

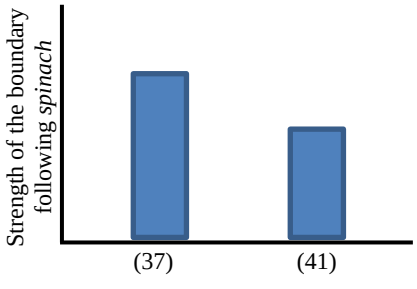

Figure 2: *Prediction of the ambiguity approach.*

4.2. Competing theories of syntax-prosody mapping and their prosodic predictions for neg-seems-high

Having discussed the competing syntactic analyses of neg-seems-normal (37), I now show that the uncontroversial syntactic analysis of neg-seems-high (42) can in turn shed light on syntax-prosody mapping, the second research question that the prosodic experiment will address.

(42) Max does*n't* miss spinach but chard.

The literature agrees that (42) involves vP-coordination (43), specifically a vP that contains a DP (Vicente 2010; Toosarvandani 2013):

(43) *The analysis of (1a) according to both approaches*
Max does [$_{vP}$ not miss spinach] but [$_{vP}$ chard$_i$ ~~miss t$_i$~~].

To my knowledge it has not been studied before how in English, a vP that contains a DP is mapped onto prosody. This is the second research question that this prosodic experiment wants to address (i.e., what sorts of syntactic phrases are mapped onto prosody).

Different theories on syntax-prosody mapping make different predictions about this question. They fall into two types: one that follows the Strict Layer Hypothesis (e.g. Nespor and Vogel 1986; Selkirk 1986; Pierrehumbert and Beckman 1988), and assumes the prosodic structure is flatter than the syntactic structure and not recursive; and the other where the prosodic structure can be recursive and replicate the dominance relations in syntax (e.g. Truckenbrodt 1995, 1999; Selkirk 2009; Wagner 2010; Selkirk 2011; Elfner 2012; Ito and Mester 2013, 2015; Elfner 2015; Bennett et al. 2016). The first type of theories would neutralize the difference between a vP that contains a DP and a syntactic phrase that doesn't dominate any other phrase. The second type would map the vP that contains a DP to a stronger prosodic constituent than a phrase that doesn't dominate any other phrase. For concreteness, I discuss an example theory of each type.

Among the theories that respect the Strict Layer Hypothesis, edge-based theory aligns edges of syntactic maximal projections XPs (i.e., DP and vP in our case) to edges of prosodic constituents. Assuming that English aligns the right edge of DP and vP to the right edge of a phonological phrase (φ), and following versions of edge-based theory that do not allow recursive prosodic structure (i.e., a φ cannot dominate another φ, e.g. Selkirk 1986),[4] *spinach* in (43) would be followed by a single φ-boundary (44) because it is at the right edge of a DP and a vP. Note that the prosodic structure is flatter than the syntactic structure here because the two XP-boundaries correspond to a single φ-boundary.

(44) *Prosodic structure of (43) assigned by edge-based theory*
Max doesn't miss spinach)$_φ$ but chard.

Contrast edge-based theory with theories that do allow recursive prosodic structure. For example, Match Theory matches syntactic phrases to φ (e.g. Elfner 2012, 2015), and would assign the following prosodic structure to (43), where *spinach* is at the right edge of two φs: one that is mapped from the DP *spinach*, and the other that is mapped from the vP *miss spinach*:

(45) *Prosodic structure of (43) assigned by Match Theory*
Max doesn't miss spinach)$_φ$)$_φ$ but chard.

[4] There are versions of edge-based theory that do allow for recursivity. For example, Selkirk (1995) and Truckenbrodt (1995, 1999) posited a ban against recursive prosodic structure which is violable. If other constraints dominate this constraint against recursivity, they could lead to recursive prosodic structure. The discussion here applies to edge-based theory (or any theory of syntax-prosody mapping) that bans recursivity in English coordination.

We cannot directly compare the predictions of these theories (44) and (45) experimentally, but we can test them by comparing the prosody of (42) with a sentence like (41). Both edge-based theory and Match Theory would assign the following structure to (41) because *spinach* is at the right edge of a DP and no other XP.

(46) *Prosodic structure of (41) assigned by edge-based theory and Match Theory*
Max doesn't mix spinach)$_{\varphi}$ and chard.

Edge-based theory predicts that the prosodic boundary following *spinach* is the roughly same for (41) and (42) because *spinach* is at the right edge of a φ in both (Figure 3), while Match Theory puts *spinach* at the right edge of two φs in (42) but only a single φ in (41) (Figure 4).

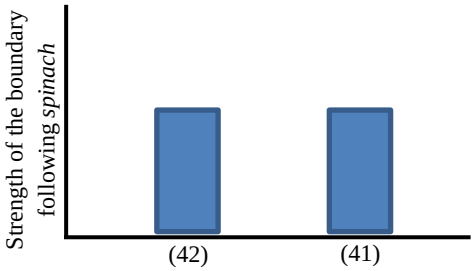

Figure 3: *Prediction of edge-based theory*.

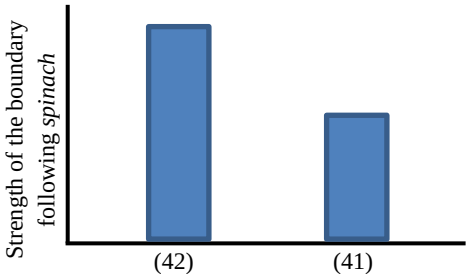

Figure 4: *Prediction of Match Theory.*

4.3. The experiment

4.3.1. Materials

The speech materials for the experiment consisted of 8 sets of dialogs in 3 conditions (the two corrective *but* types and the *and*-sentence), exemplified by (37), (41) and (42). Each target sentence was shown to the subjects along with a leading context sentence and an interlocuter, speaker A's utterance, to elicit the intended information structure in the target sentence, speaker B's utterance. For example, the following materials were presented to the speaker to elicit (37), (41) and (42); (37) and (42) had the same context and speaker A's utterance.

(47) Context: Max has been on an all-meat diet, and misses something in particular. They're debating about what Max misses.
A: Max misses spinach.
B1: He misses not spinach but pears.
B2: He doesn't miss spinach but pears.

(48) Context: Max is particular about his smoothie: he mixes all sorts of ingredients, except a vegetable and a fruit.
A: Which vegetable and which fruit doesn't Max mix?
B: He doesn't mix spinach and pears.

To make sure the difference between the sentences is minimal, I make (41) answer to a double *wh*-question rather than a single *wh*-question, so that all the target sentences have the same focus structure and involve double focus. If the question were a single *wh*-question like *What doesn't Max mix?*, its answer (49B) would put broad focus on the entire conjunction phrase:

(49) A: What doesn't Max mix?
B: Max doesn't mix [spinach and chard]$_{F}$.

But due to the contrastive nature of the corrective *but* sentences, each conjunct in (37) and (42) (i.e., *spinach* and *chard*) is focused separately:

(50) a. Max does*n't* miss [spinach]$_F$ but [chard]$_F$. b. Max misses *not* [spinach]$_F$ but [chard]$_F$.

Comparing a sentence with broad focus (49B) with ones with double focus (47B1&B2) may create a confound, if focus can affect prosodic boundaries. Therefore, to eliminate this confound and make sure that all the target sentences put focus on each conjunct, I made (41) answer to a double *wh*-question.

The speaker was to read the context silently, and say the dialog in the given order. Every speaker saw all 24 items. There were 100 filler items, which all contained a context, a question and an answer.

4.3.2. Participants

I conducted a production study with 18 native speakers of North American English (14 female, 4 male, age 19 to 50), who were all university students and working professionals living in X and Y Cities. They were remunerated a small sum for their time, and granted their written consent to being tested.

4.3.3. Data collection

Recording took place in two events. The first event took place in a sound-attenuated booth at XX University for 3 of the 18 participants, and the second event took place in a quiet, non-reverberant room at YY University for the other 15 participants. In each event, participants were seated in front of a computer, which displayed one context-question-answer trio at a time. The stimuli plus fillers were presented in pseudo-randomized order, and the order of items was different for every participant. Participants were given instructions about the task at the beginning of the experiment, which asked them to first read each trio quietly to themselves, and only proceed to read it out loud when they were ready. They could take as long as they wanted. They were asked to imagine they were playing three different roles in each trio, and to act out the dialogues naturally rather than reading the sentences mechanically. If the participants were not satisfied with their rendition of an item (a common reason was that they stumbled over some words), they were allowed to say it again. If they asked to repeat an item, we only considered the rendition they were happy with, and discarded the previous renditions.

4.3.4. Data processing and analysis

The recordings were aligned with the Montreal Forced Aligner (McAuliffe et al. 2017), using the pretrained acoustic model English (US) ARPA acoustic model (Gorman et al. 2011), and duration was calculated with the forced-aligned boundaries. I measured the duration of the last rime of the word immediately before the prosodic boundary (e.g., for (37), (41) and (42), *ach* of *spinach*). I chose this durational measure because as Wightman et al. (1992) showed, the final rime of a word is lengthened before a phrase boundary, and the stronger this boundary, the longer the rime. Thus, the duration of the last rime of *spinach* in (37), (41) and (42) is correlated with the strength of the prosodic boundary following *spinach*.

I fitted a linear mixed effects model, with the duration of the last rime as the dependent variable, and item as fixed effects. I calculated p-values using Satterthwaite's degrees of freedom method. The model included random intercepts by speaker and item group, and random slope by speaker.

4.3.5. Results

The last rime before *but* in corrective *but* sentences with sentence negation (i.e., items like (42), leftmost box in Figure 5) is 50.6 ms longer than the average duration of the last rime before *and* in *and* sentences (i.e., items like (41), rightmost box in Figure 5; $p < 0.001$). The last rime before *but* in corrective *but* sentences with constituent negation (i.e., items like (37), middle box in Figure 5) is 52.7 ms longer than the average duration of the last rime before *and* in *and* sentences (i.e., items like (41), rightmost box in Figure 5; $p < 0.001$). Finally, the last rime before *but* in corrective *but* sentences with sentence negation (i.e., items

like (42), leftmost box in Figure 5) does not differ significantly in duration from that in corrective *but* sentences with constituent negation (i.e., items like (37), middle box in Figure 5). In Figure 5, the top and bottom of the boxes are the 75th and 25th percentiles, and the middle line is the median. The red dot is the mean, and the red lines are standard error bars.

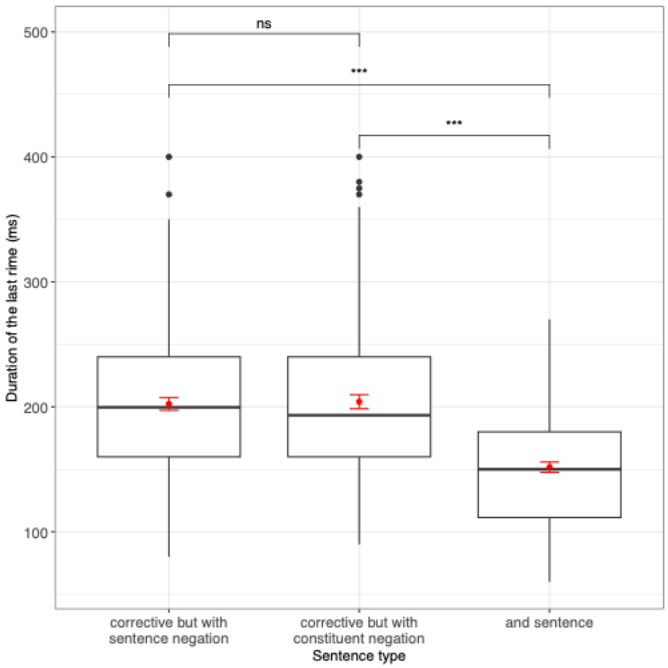

Figure 5: *Duration of the final rime before* but / and.

4.3.6. Discussion

The durational pattern suggests that the prosodic boundary before *but* does not differ significantly for corrective *but* with sentence negation (e.g., (42)) and corrective *but* with constituent negation (e.g., (37)), but those boundaries are larger than the boundary before *and* (e.g., (41)). This is consistent with the ambiguity approach to neg-seems-normal and mapping theories that allow for recursive prosodic structures. The fact that the prosodic boundary before *but* in neg-seems-normal is greater than the prosodic boundary before *and* in *and*-sentences suggests that neg-seems-normal sentences are structurally ambiguous: they can not only be analyzed as DP-coordination, but also larger coordination with ellipsis. The fact that a vP that contains a DP (e.g., the vP in (42)) corresponds to a stronger prosodic phrase than just a DP (e.g., the DP in (41)) suggests that the prosodic structure is not completely flat. One way to implement this is to allow for recursive φs (i.e., a φ can dominate another φ), and boundary strength depends on the number of φ-levels that a φ dominates.

5. Conclusion

This paper has proposed an analysis for corrective *but* sentences that involves ellipsis and two positions for negation. Ellipsis creates the illusion that negation is higher than it actually is (neg-seems-high). Neg-seems-normal has multiple analyses, leading to possible ambiguity: an analysis without ellipsis, which derives the surface scope of negation and conjunction, and analyses with ellipsis, which derive higher scope of negation and conjunction than their surface positions. Furthermore, negation has two positions in a corrective *but* sentence, with the higher position being the daughter of the first conjunct. Either position of negation can be pronounced, but only the higher position is interpreted as actual negation.

Negation…*but*… has identical behavior to *either…or…*, and my analysis is also identical to Wu's (2022b) analysis of *either…or…*. My analysis also echoes previous proposals for focus-sensitive operators

such as the Question-particle and *only* (e.g., Lee 1999; Cable 2007; Hole 2015; Hirsch 2017; Hole 2017; Quek and Hirsch 2017; Bayer 2018), which posit two positions for the operator. This suggests that all focus-sensitive operators, as is exemplified by negation, may have two occurrences in a sentence. Furthermore, this paper has demonstrated the mutual reinforcement of syntactic theory and prosodic experimentation: we can draw evidence for syntactic theories from prosodic experiments, and on the other hand syntactic theories lay the foundation for investigations of syntax-prosody mapping.

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