Intonation in yes-no responses[*]

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SUMMARY

In English, polar particles *yes/yeah* and *no* are ambiguous when used to respond to negative declaratives and interrogatives. This paper reports on a production experiment that elicited the intonation contours speakers use when responding to negative declaratives. We found that speakers most frequently use the Contradiction Contour (Liberman and Sag, 1974) when reversing, and they use declarative intonation when confirming, regardless of the particular polar particle used. Therefore prosody could disambiguate what is an otherwise ambiguous move in a dialogue.

RÉSUMÉ

En Anglais, les mots *yes/yeah* et *no* sont ambigus lorsqu'ils font parti d'une réponse à une question ou une phrase négative. Cet article décrit une expérience de production qui à enrégistré les intonations fait par les anglophones quand ils répondent aux phrases négatives. Nous avons trouvé que les sujets de l'expérience ont produit le «Contradiction Contour» (Liberman and Sag, 1974) le plus souvent en disant l'envers de la phrase, et qu'ils utilise l'intonation déclarative en confirmant la phrase, indépendamment de quel mot (*yes/yeah* et *no*) était utilisé. Donc, la prosodie pourrait lever l'ambiguïté d'une parole qui serait ambigue autrement.

1 INTRODUCTION

This paper discusses response patterns to yes no questions (YNQs) and declaratives in English, and describes two experiments that are designed to discover the role intonation contours play in the meaning of responses. Of particular interest will be reversing responses to negative declaratives and YNQs. I will argue that one specific intonation contour, the contradiction contour (CC) (Liberman

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and Sag, 1974)), plays a crucial role in the interpretation of the speaker's meaning in response to negative utterances. This argument is made on the basis of an experiment that shows that speakers us the CC on reverse responses, but not on confirm responses. This experiment suggests a follow-up perception experiment that could have an impact on how theorists account for yes-no responses in the world's languages and in English in particular. If participants are able to disambiguate on the basis of intonation contour, then any theory that aims to successfully capture the range of facts surrounding yes-no responses will need to consider the unique role the CC plays in revers responses.

In section 2, the range of possible and impossible responses to positive and negative YNQs and declaratives is laid out. Then in section 3, three recent theories of yes-no responses are briefly reviewed, with special attention paid to the way the authors explain reversals. Next in section 4, the contradiction contour (CC) is offered as a likely candidate for reverse response intonation. Then in section 5, I will describe the production experiment mentioned above that captured that the intonations speakers use in yes-no responses. Finally in section 6, I will outline the follow up perception experiment that aims to identify what role intonation plays in communicating speaker meaning in an otherwise ambiguous response. Predictions made by the various theories of yes-no responses currently available are discussed.

2 YES-NO RESPONSES

A yes-no response to an interrogative or declarative will be said to CONFIRM if and only if the response has the same polarity as the utterance it responds to. A response will be said to REVERSE iff it has the opposite polarity as the utterance it responds to. In (1), we see responses to positive interrogatives/declaratives. The sentences in parentheses can be pronounced overtly in conjunction with the yes-no response, or the yes-no response can be pronounced alone, the sentence in parentheses conveying the meaning of the yes-no response. A judgment marker in the parentheses (e.g. "(#...)") means that the utterance is infelicitous if the parenthetic sentence is pronounced. A judgment marker preceding parentheses (e.g. "#(...)") means that the utterance is infelicitous if the parenthetic sentence is not pronounced.

(1)   A: Matt called. / Did Matt call? / Matt called?

    a.   B: Yes. (Matt called.)
    b.   B: Yes. (# Matt did not call.)
    c.   B: No. (# Matt called.)
    d.   B: No. (Matt did not call.)

In (1a) and (1d), we see confirming and reversing responses respectively. In each, the sentence in parentheses can optionally be pronounced. On the other hand, if the sentences in parentheses in (1b) and (1c) are pronounced, those utterances become infelicitous. They can't properly be said to confirm or reverse. The intuition here is that in (1b) and (1c) there is some sort of clash between the meanings of the sentences in parentheses and the meanings of the words *yes* and *no* respectively. The meanings of *yes* and *no* have drawn the attention of researchers recently, and the findings of some recent research will be discussed below. If we restrict our attention to (1), we might be tempted to say that *yes* means CONFIRM and *no* means REVERSE, however as we will see in (2) the story

cannot be that simple.

(2)   A: Matt didn't call. / Did Matt not call? / Matt didn't call?

     a.   B: Yes. ?(Matt called.)

     b.   B: Yes. ?(Matt did not call.)

     c.   B: No. ?(Matt called.)

     d.   B: No. ?(Matt did not call.)

(2) exhibits the patterns of responses to negative interrogatives and negative declaratives. The "?"s preceding parentheses indicate that acceptability judgments of these responses are unclear when the sentences in parentheses are not pronounced. Perhaps acceptability judgments aren't the right way to put it though. If uttered in the absence of the following parenthetical sentences, the responses in (2) are not so much semantically anomalous as they are ambiguous. But they are (or can be) ambiguous *in* context, which is perhaps what makes the phenomenon interesting enough to have earned a name, NEGATIVE NEUTRALIZATION. (2a) and (2c) are reverse responses since they respond to sentences with negative polarity, while they themselves have positive polarity. (2b) and (2d) are confirm responses since they have the same (negative) polarity as the utterances they respond to. Therefore we cannot simply say that *yes* means CONFIRM and *no* means REVERSE since *yes* reverses in (2a) and *no* confirms in (2d). Notice however that these responses that break the simple confirm/reverse pattern ((2a) & (2d)) are actually identical to the acceptable uses of yes-no responses in (1); that is (1a) is identical to (2a) and (1d) is identical to (2d). It is due to the switch in polarity from A's utterance in (1) to A's utterance in (2) that the responses switch from CONFIRM to REVERSE. Moreover, it appears to be due to the same switch in A's utterance that (1b) and (1c) go from unacceptable to acceptable in (2b) and (2c). To summarize, the change in polarity of A's utterance from (1) to (2) enables *yes* to reverse (2a) and to no longer clash with a negative parenthetical sentence (2b), and it enables *no* to no longer clash with a positive parenthetical sentence (2c) and to confirm (2d).

As mentioned above in section 1, this paper will present a production experiment that shows that native speakers use different intonation contours depending on wether they are confirming or reversing. To the extent that these contours indicate clear meanings to hearers, the "?"s in (2) could be expected to go away; that is, hearers may be predicted to disambiguate the otherwise ambiguous yes-no responses in (2) on the basis of prosody. Several researchers currently claim that a simple yes-no response in the environment of A's utterance in (2), absent the enunciation of the parenthetical sentences, will *always* mean (2b) or (2d). A perception study using the intonation contours collected in experiment 1 could test the predictions of the current theories against the hypothesis that intonation contour disambiguates responses in (2).

Below is the yes-no response pattern to European French, a language that has a third polar particle, *si*, that is used only to reverse negative utterances.

(3)   A: Jean vient.
        Jean is-coming.
        "Jean is coming."

(4)   a.   B: Oui. (Jean vient.) ["Yes. Jean is coming."]

   b.   B: Oui. (# Jean ne vient pas.) ["Yes. Jean isn't coming."]
   c.   B: Non. (# Jean vient.) ["No. Jean is coming."]
   d.   B: Non. (Jean ne vient pas.) ["No. Jean isn't coming."]
   e.   B: # Si. ["Yes.]

In (4), we see that *si* is infelicitous in response to positive utterances. Otherwise, the yes-no response pattern is like English in (1).

(5)   A: Jean ne-vient pas.
          Jean comes   NEG
          "Jean isn't coming."

(6)   a.   B: # Oui. ["Yes."]
       b.   B: Non. (# Jean vient.) ["No. Jean is coming."]
       c.   B: Non. (Jean ne vient pas.) ["No. Jean isn't coming."]
       d.   B: Si. (Jean vient.) ["Yes. Jean is coming."]
       e.   B: Si. (# Jean ne vient pas.) ["Yes. Jean isn't coming."]

In (6), *oui* is no longer acceptable when responding to a negative utterance. Instead *si* is used to reverse. Notice that unlike English in (2), there is no ambiguity in French. Only *si* reverses negative utterances and only *non* confirms negative utterances. One question I will ask below is whether there is an intonation contour in English that reverses like *si* does for French. The answer will be that the contradiction contour reverses, but it's distribution is not as limited as French *si*, since the CC can appear in responses to positive utterances as well.

3   THREE ACCOUNTS

In this section, I will review three recent accounts of negative neutralization. First, Kramer and Rawlins (2009), which is a syntactic account making use of TP ellipsis and negative concord. Second, Krifka (2013), which is a semantic account that treats *yes* and *no* as propositional anaphora. Third, Farkas and Roelofsen (2012), which is an inquisitive semantic account that says that *yes* and *no* encode both "absolute" and "relative" polarity.

3.1   KRAMER & RAWLINS 2009

Kramer and Rawlins (2009) (K&R) argue that *yes* and *no* are elliptical constructions that require the presence of a feature [E] to license ellipsis. A yes response to a positive question is exhibited in (7).

(7)   A: Is Alfonso coming to the party?
       B: Yes.
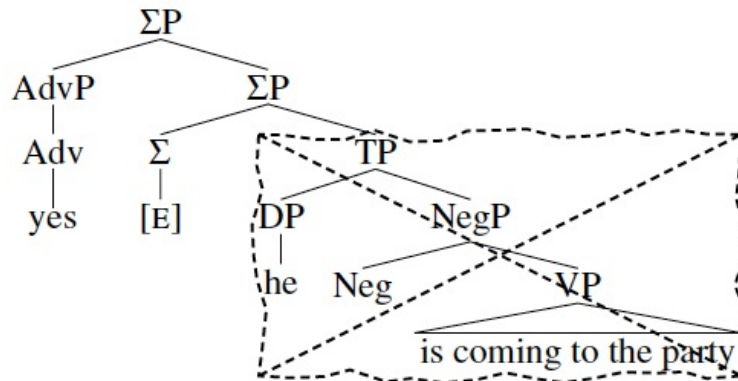
Yes is analyzed as an adverb that is adjoined to a sigma phrase node that sits atop TP in the tree structure. The feature [E] which licenses ellipsis appears under the sigma head. The dotted-line box indicates that the TP is elided and therefore unpronounced. Since the TP is an elliptical construction, it requires an antecedent, just as in VP ellipsis.

(8)   Maxine saw the man and Dave *did so* too.

In (8), the VP of the second conjunct is elided, with *did so* remaining in its place. Crucially, *did so* can only mean *saw the man*. The latter VP is said to be the antecedent for the elided VP. It is found in the first conjunct of (8). The TP in (7) is similarly said to rely crucially on an antecedent for it's meaning. The antecedent is to be found in A's question in (7). The question makes the TP *Alfonso is coming to the party* available as an antecedent for the yes response.[1]

(9)   A: Is Alfonso coming to the party?
       B: No.

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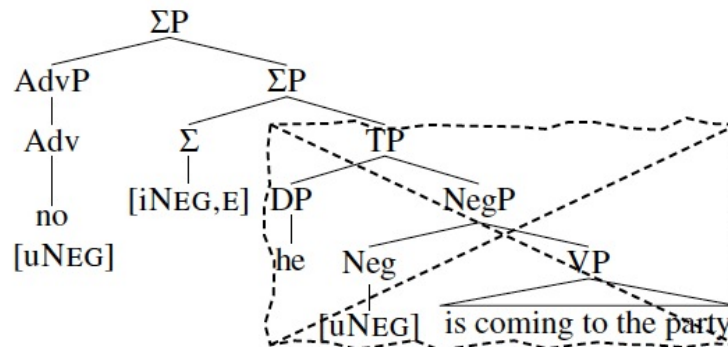
[1] N.b. that the antecedent TP takes the form of an interrogative while the elided TP takes the form of a declarative. K&R must take it for granted that the TP antecedent made available by the question is in its uninverted form. Notice further, *yes* cannot be understood as attached to an elided TP in the form of a question, e.g. Yes (Is Alfonso coming to the party?). Even if B utters *yes* with a rising, question intonation, she does not appear to be repeating the question, but is instead indicating uncertainty about the truth of her statement.
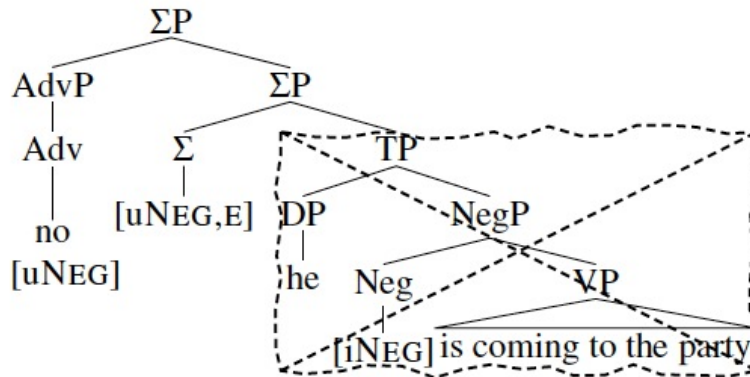
A no response to A's question in (7) uses negative concord. Multiple [Neg] features are present but only one is interpretable [iNeg] in the Sigma head. Notice there is a [uNeg] feature in the TP. There cannot be an [iNeg] because the identity condition on ellipsis requires that the TP of the response be the same as the TP of the question, which contains no negation.

(10)   A: Is Alfonso not coming to the party?
        B: Yes.
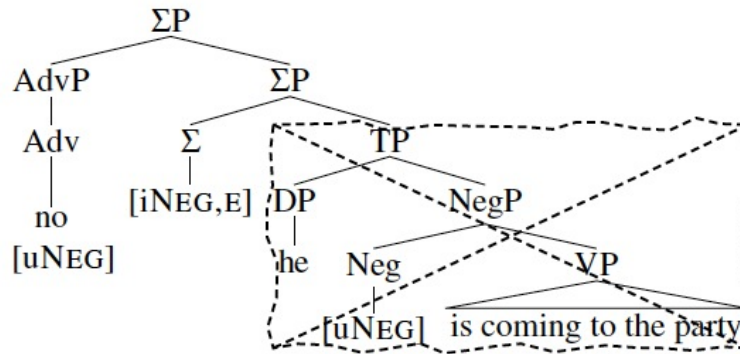
In (10), we see a yes response to a negative question. The TP is elided and is therefore identical to the antecedent in A's question. An interpretable negative [iNeg] feature appears in the TP due to the negation in the question. *Yes* is adjoined to SigP. Notice that it has no polarity features. This is what allows a yes response to adjoin to a negative TP. If *yes* had an affirmative feature [iAff], then [iAff] and [iNeg] would clash, and the sentence would not be felicitous.

(11)   A: Is Alfonso not coming to the party?
        B: No.

In (11), we see a no response to a negative question. Again the TP is elided and is therefore identical to the antecedent in A's question. *No* has an uninterpretable negative [uNeg] feature. This means *no* requires an interpretable feature to check against for the derivation to compute. It enters into a negative concord chain with the other [Neg] features and the [iNeg] feature in the TP keeps the derivation from crashing.

To capture the fact that *no* is also capable of reversing negative declaratives and interrogatives, K&R are forced to say that *no* is ambiguous between a negative [uNeg] and a reverse [uRev] meaning.

(12)   A: Is Alfonso not coming to the party?
         B: No, he DID go.

In (12), *no* introduces a [uRev] feature and it requires an intonational peak on *did* which introduces an [iRev] feature. Therefore, they argue, the presence of the auxiliary is required.However, they do not explain why they think the [iRev] intonation cannot simply appear on *no* itself since the presence of intonation contours on monosyllabic words is well attested (e.g. *Duh*). Moreover, the presence of an intonational peak does not clearly indicate reverse, since a speaker could respond to (12) with "No, he DIDN'T go". K&R don't mention that speakers also often reverse by saying things like "Yes, he did go." Under their account they would have to say that *yes* is also ambiguous, except it is ambiguous between meaning [uRev] and nothing at all.

One final problem for K&R is pointed out by Krifka (2013): since *yes* has no polarity features, it is predicted to be acceptable in the following dialogue, contrary to fact.

(13)   A: Is Alfonso coming to the party?
         B: Yes, he isn't.

(13) is parallel to (1b) above, and any account of yes-no responses in English will need to exclude it.

3.2   KRIFKA 2013

Krifka argues that *yes* and *no* are propositional anaphora like *that* and *so*.

(14)   a.   Two plus two isn't five.
         b. $[_\phi$ NEG $[_\psi$ two plus two is five]]
         c.   Everyone knows *that*.
         d.   *That* would be a contradiction.

In (14), we see that a negative utterance like (14a) makes two possible discourse referents available: ϕ which includes negation and ψ which does not. In (14c), *that* picks up ϕ as its antecedent, and therefore means "2+2≠5". In (14d), *that* picks up ψ as its antecedent, and therefore means "2+2=5".

Krifka analyzes *yes* and *no* in a similar way to *that*, but the response particles perform speech acts. *Yes* picks up a discourse referent as an antecedent and asserts it. *no* picks up a discourse referent as an antecedent and negates it.

(15)   a.   Maxine arrived on time.
         b.   Did Maxine arrive on time?
         c. $[_\psi$ Maxine arrived on time.]
         d.   ASSERT(ψ) = Yes. (Maxine arrived on time.)
         e.   ASSERT($\neg\psi$) = No. (Maxine did not arrive on time.)

Notice in (15) that both a positive declarative and it's interrogative counterpart only make one discourse referent available as an antecedent, ψ. Despite the fact that YNQs are traditionally analyzed semantically as a set of propositions, Krifka argues that a postive YNQ only makes one discourse referent available. This is how his account avoids predicting unattested patterns like (1b), (1c) and (13). *Yes* can only pick up ψ and assert it. *No* can only pick up ψ and negate it.

(16)   a.   Maxine did not arrive on time.
       b.   Did Maxine not arrive on time?
       c. $[_\phi$ NEG $[_\psi$ Maxine arrived on time.$]]$
       d.   ASSERT(ψ) = Yes. (Maxine arrived on time.)
       e.   ASSERT(ϕ) = Yes. (Maxine didn't arrive on time.)
       f.   ASSERT($\neg\psi$) $\approx$ ASSERT(ϕ) = No. (Maxine did not arrive on time.)
       g.   ASSERT($\neg\phi$) $\approx$ ASSERT($\neg\neg\psi$) $\approx$ ASSERT(ψ) = No. (Maxine arrived on time.)

Krifka accounts for negative neutralization in (16) by analyzing negative declaratives and negative interrogatives as introducing two possible discourse referents ϕ and ψ, just like they do in (14). Now *yes* and *no* can assert either discourse referent. In (16d), *yes* picks up ψ as its antecedent and asserts it, reversing the negative utterance, while in (16e) it picks up ϕ as antecedent, confirming the negative utterance. In (16f), *no* picks up ψ and negates it, confirming the negative utterance, while in (16g) it picks up ϕ and negates it, which reverses the negative utterance. Krifka is able to account for the response patterns in (1) and (2).

Krifka points out that reverse responses ((16d) and (16g)) in his system require a REJECT operator. Without going into detail, the operator is necessary to keep the context set from containing contradictory propositions. In some languages, REJECT is encoded lexically by special response particles that are reserved for reverse responses, e.g. German *doch* and European French *si*. In English, Krifka says it is encoded with a "protest prosody", however he doesn't define what he means by this. Since *doch* and *si* only respond to negative declaratives/interrogatives, Krifka analyzes them as having a presupposition that the proposition they respond to is negative. Therefore, in a French translation of (16), *si* would need to pick up the discourse referent ϕ as its antecedent. Then, in order to reverse the initial utterance, *si* must assert the negation of ϕ, which ultimately produces ψ. Therefore, *si* and *doch* essentially do what *no* does in (16g). Though the logic of this account works perfectly, it leaves Krifka in the strange position of needing to claim that *si* and *doch* are special kinds of *no*. He makes this claim about *doch*, however initial discussions with native speakers of German and French suggest that this is a strange claim to make. This is especially true for French, where the two options of response to utterances like (16) are *si* and *non*, with the former meaning that Maxine arrived on time and the latter meaning that she didn't.

Krifka claims that speakers should normally interpret an isolated utterance of *no* to as (16f) over (16g) since the latter is made more complicated by the computation of double negation. Therefore, he claims that the responses in (16d), (16e) and (16g) will normally be accompanied by an overt sentence to clarify the intended meaning.

3.3 FARKAS & ROELOFSEN N.D.

Farkas and Roelofsen (2012) (F&R) also claim like Krifka that *yes* and *no* are anaphoric expressions. Declaratives and interrogatives are proposals to update the common ground (CG). Propositions are sets of possible CG updates. Polar particles like *yes* and *no* are anaphoric expressions bound by the possible updates that propositions make available. *Yes* and *no* encode two features:

(17) a. Absolute polarity: [+] or [−] marks the polarity of the response.
      b. Relative polarity: [same] marks confirming responses that have the same absolute polarity as the antecedent; [reverse] marks rejecting responses which have the reverse absolute polarity from the antecedent.
      c. *yes* = [same] and [+]
      d. *no* = [reverse] and [−]

Below we see F&R's system in action for responses to positive and negative questions.

(18) a. Did Dave smile?
      b. [same, +] Yes. (Dave smiled.)
      c. [reverse, −] # Yes. (Dave didn't smile.)
      d. [same, +] # No. (Dave smiled.)
      e. [reverse, −] No. (Dave didn't smile.)

In (18b) and (18e) we see felicitous yes-no responses to a positive question. (18c) and (18d) are predicted to be infelicitous since there is a mismatch between the absolute and relative polarity features needed for the response on the one hand, and the words *yes* and *no* being used to spell them out on the other hand.

(19) a. Did Dave not smile?
      b. [reverse, +] Yes. (Dave smiled.)
      c. [same, −] Yes. (Dave didn't smile.)
      d. [reverse, +] No. (Dave smiled.)
      e. [same, −] No. (Dave didn't smile.)

In (19b) and (19d), we see reverse responses. In the former, *yes* is felicitous because it spells out the [+] feature. In the latter, *no* is felicitous because it spells out the [reverse] feature. (19c) and (19e) are confirm responses. The former is felicitous because *yes* spells out the [same] feature. The latter is felicitous because *no* spells out the [−] feature.

F&R claim that negative neutralization is explained as the double duty done by *yes* and *no* in spelling out both absolute and relative polarity features. As we can see by observing the range of facts in (1) and (2), F&R's account seems to restate the puzzle. Namely in response to positive utterances, confirm responses are themselves positive and reverse responses are themselves negative. This observation might lead us to claim that *yes* = confirm and *no* = reverse. However, in response to negative utterances, confirm responses are themselves negative while reverse responses are themselves positive. Suddenly, *yes* reverses by saying something positive (19b) and *no* confirms by saying something negative (19e). But we can't simply say that *yes* makes positive assertions

while *no* makes negative assertions because the former confirms with a negative utterance (19c) and the latter reverses with a positive utterance (19d). F&R account for this range of observations by saying that *yes* both confirms and makes positive assertions and that *no* both reverses and makes negative assertions. The data is accounted for, but rather than feeling that we have an explanation of yes-no responses, we feel the observations have just been encoded in the form of "features". Why are *yes* and *no* able to spell out just one of their features at a time? I.e., why doesn't *yes* appearing with a [reverse] feature cause the derivation to crash? F&R offer no explanation of this.

F&R claim that [reverse, +] responses are most marked because [reverse] is more marked than [same] and [+] is marked in the environment of [reverse]. They use this markedness ranking to explain why languages use special response particles like *si* and *doch* to spell out [reverse, +] responses. English, they claim, requires an overt TP for [reverse, +] responses, e.g. "Yes/no, he DID smile."

4   CONTRADICTION CONTOUR

All three accounts discussed above argue that reverse responses in English require some overt pronunciation of a following sentence. I would agree that in the wild, it is probably true that both confirm and reverse responses to negative utterances almost always are followed by some overt pronunciation of a following sentence because these are ambiguous utterances and speakers want their utterances to be clear. However, I want to question (i) whether it is correct to encode this requirement into the grammar, and (ii) whether it is correct to only encode it for reverse responses. In other words, just because an utterance is ambiguous, do we want our grammar treat that utterance as if it were infelicitous?

Furthermore, all three accounts mention the use of prosodic intonation in reverse responses without going into much detail about the intonation used. What does reverse intonation sound like? What does confirm intonation sound like? If there are special response intonations, must they appear on the auxiliary of the response, or can they appear on the yes-no response itself? Experiment 1 described below addresses these questions. Experiment 2 (outlined below, but not yet implemented) is designed to address the question of whether hearers can determine the meaning of an otherwise ambiguous yes-no response.

Experiment 1 finds that one previously studied intonation contour is used in reverse responses: the contradiction contour (CC). This contour is discussed in Liberman and Sag (1974) who write, "this contour is appropriate just when the speaker is using the utterance that bears it to contradict."

(20)   A: Jane drinks coffee.
        B: Jane   doesn't drink coffee.
        ToBI: L*(+H) L−   H%

The ToBI transcription indicates by "L*" that there is a low primary tone on *Jane*. "(+H)" indicates an optional rise directly after the low tone. This rise, if present, occurs across the utterance of *Jane*. The "L−" indicates that there is another low tone beginning with *doesn't* that continues across the entire utterance until the very end of *coffee*, where "H%" indicates an utterance final rise. Notice than the use of the CC is infelicitous when confirming:

(21)   A: Jane drinks coffee.
        B: # Jane   drinks coffee.
        ToBI: L*(+H) L−   H%

Since the CC is used when a response reverses and it is infelicitous precisely when a response confirms, we might expect CCs to appear on reverse responses in the data we have been observing, and not on confirming responses. Experiment 1 checks to see that this is so. Once we ascertain that it is, we can check to see if this difference in pronunciation will alert hearers as to whether a response is confirming or reversing when the words *yes* and *no* are otherwise ambiguous. If hearers can disambiguate on the basis of intonation contour, then CC would be shown to do the same work as *si* in French and *doch* in German.

5   EXPERIMENT 1: PRODUCTION

Experiment 1 is a production study designed to capture the intonation contours speakers produce on yes-no responses to both positive and negative utterances. Having noticed negative neutralization in English, and reverse particle *si* in French, I wanted to see if the intonation differed on reverse and confirm responses in English.

5.1   PARTICIPANTS, DESIGN AND PROCEDURE

There were 12 north american English speakers, mostly McGill undergraduates. There were six items, each comprised of six conditions, four experimentals and two controls. The experiment was within-participant with each participant seeing every trial. The trails were pseudo-randomized so that participants never saw the same condition twice in a row, and never saw two trials from the same item twice in a row.

Participants were presented with a context story to read on a computer screen. After they had read it, they pressed a key to hear a question through headphones. Then they pressed a key to respond to the question. Participants were given a script to use for responding. Their responses were recorded. Then participants were asked to judge the naturalness of the response on a scale from 1 to 5. Below are example contexts, questions and responses for reverse response and a confirm response.

(22)   Reverse context:
        You are at home eating lunch. After several days of rain it's warm and sunny, and you are planning to go to the park after you finish eating. Your new roommate walks in and asks if you want to go to the movies with him this afternoon. You like movies and want to see a film that's currently at the theater, but not today because the weather is so nice you want to take advantage of it by being outside. When you tell him you'll pass, your new roommate asks:
        Q: You don't like movies?
        A: No ___ I like movies.

(23)   Confirm context:
        You are at home eating lunch. After several days of warmth and sun a storm has moved
        in and it's raining. As you eat, you are trying to figure out what you will do with your
        afternoon. Your new roommate walks in and asks if you want to go to the movies with him.
        This would be a good solution except that you hate movies and prefer to spend your time
        reading or talking with friends. When you tell him you'll pass, your new roommate asks:
        Q: You don't like movies?
        A: No ___ I don't like movies.

The "___" in the responses indicated to participants that they should pause between the polar particle
and the following sentence. This was done to ensure that participants produced an intonation contour
unique to the polar particle rather than producing a single contour across the entire utterance.[2]

(24)   Experimental conditions
        a. **Question**: You don't like movies?
        b. **Yes-Reverse (Y-Rev)**: Yeah, I like movies.
        c. **No-Reverse (N-Rev)**: No, I like movies.
        d. **Yes-Confirm (Y-Con)**: Yeah, I don't like movies.
        e. **No-Confirm (N-Con)**: No, I don't like movies.

(25)   Control conditions
        a. **Question**: Do you like movies?
        b. **Yes**: Yeah, I like movies.
        c. **No**: No, I don't like movies.

5.2 PREDICTIONS

As was explained in section 4, the contradiction contour (CC) can appear in reverse contexts, and
it cannot appear in confirm contexts. Therefore, the Y-Rev and N-Rev conditions were predicted
to elicit the CC, while the Y-Con and N-Con conditions were predicted not to elicit a CC. Based
on personal intuitions, Y-Con and N-Con were predicted to elicit even or falling intonation. The
control conditions were not expected to elicit different intonations from one another; speakers were
expected to use the same intonation on the Yes condition as on the No condition. The intonation
expected was even or falling.

5.3 RESULTS AND DISCUSSION

Intonation contours were grouped into five categories which were given names that describe the
behavior of the pitch. Fall Rise (FR): the pitch optionally rises at the beginning, then falls and has a
final rise. N.b. FR is the CC. Rise Fall (RF): the pitch rises then falls. Fall (F): the pitch falls across

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[2] Since the theories described in section 3 argue that reverse responses require an intonational peak on an auxiliary, they
   may claim that we have forced speakers to do something outside of their grammar, however, as we will see, participants
   judged the reverse responses to be natural in follow up questions.

the utterance. Even (E): the pitch maintains an even tone. Question Rise (QR): the pitch track rises as it would in a typical YNQ.

In the graph below, on the horizontal axis we see each intonation category within each of the six conditions. On the vertical axis is the number of attestations of intonation contours across all participants. So each bar represents the number of attestations of a particular contour in a particular condition across all participants and items.
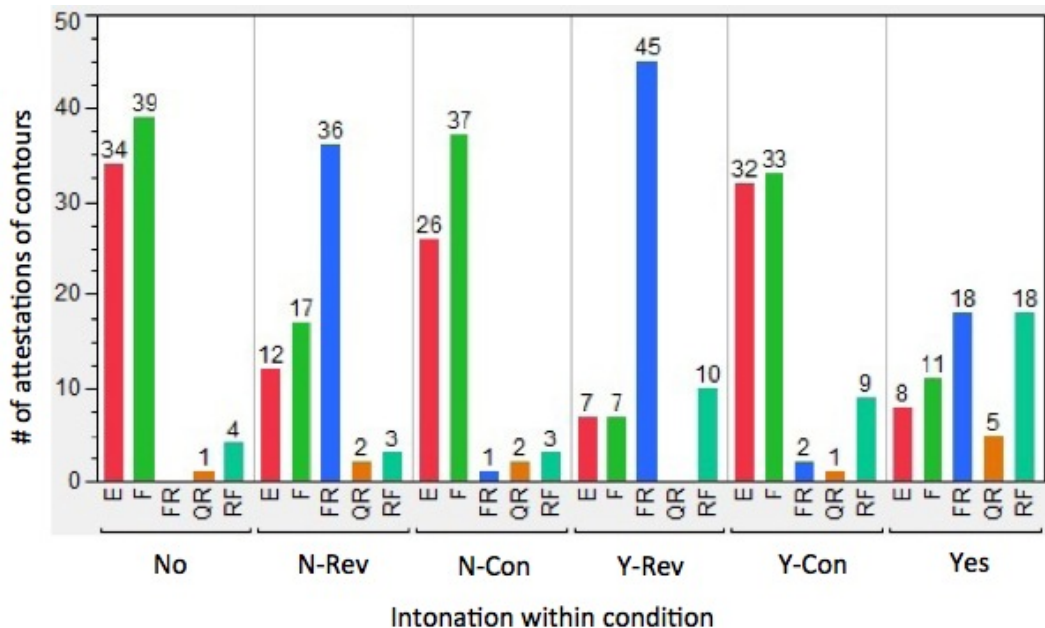

(26)   Percent attestation of intonation contours by condition:

     a.   **Y-Rev**: 65% FR responses. Next most frequent contour is 14.5% FR.

     b.   **N-Rev**: 51% FR responses. Next most frequent is 25% F.

     c.   **Y-Con**: 43% F and 43% E. FR is negligible.

     d.   **N-Con**: 54% F and 38% E. FR is negligible.

     e.   **Yes**: 30% FR, 30% RF, 40% other.

     f.   **No**: 50% F and 43.5% E.

In the graph, the four experimental conditions are in the middle, and the two controls are on either side. The FR contour in blue is overwhelmingly attested in the reverse conditions, Y-Rev and N-Rev. However, FR appears negligible in the confirm conditions, Y-Con and N-Con. Therefore, as predicted, the contradiction contour (which is equivalent to FR) appears when reversing and not when confirming. Moreover, the CC appears majority of the time when reversing, 65% for Y-Rev and 51% for N-Rev.

Another prediction borne out is that the confirming conditions overwhelmingly elicited even and falling intonation. So our experimental conditions did divide along the lines of reverse vs. confirm with the former eliciting primarily FR intonation and the latter eliciting primarily F or E intonation.

One prediction not borne out is that the control conditions did not elicit the same intonation. The Yes condition elicited primarily FR and RF intonations, while the No condition elicited primarily F and E intonation. So the latter patterned with confirm responses in the experimental conditions. Perhaps the reason we see a large amount of FR in Yes is because the context used in that condition was the same as the reverse context used for Y-Rev and N-Rev. The reverse contexts were designed to make the participant think the questioner expected a negative answer, so it would make sense that even if the question was phrase with positive polarity, the participant would be likely to use CC to contradict the bias towards a negative answer that the context created.
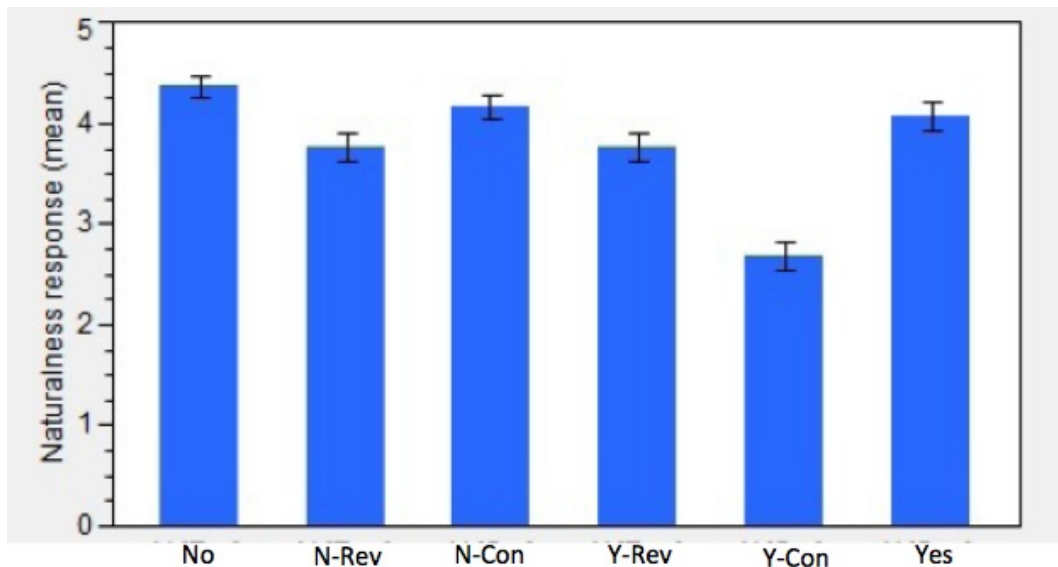
Above is the outcome of the naturalness response follow up question. With the exception of the Y-Con condition, participants found the conditions equally natural averaging at about 4 out of 5.

5.4 CONCLUSION

Experiment 1 was designed to answer a few questions that were posed in section 4: What does reverse intonation sound like? Reverse intonation sounds like FR, i.e. the CC. What does confirm intonation sound like? Confirm intonation appears to be even or falling. Can these response intonation contours appear on the polar response particles themselves? Yes. Since FR is restricted to the reverse conditions, it may be expected to disambiguate responses in the environment of negative neutralization, doing work similar to *si* and *doch*.

Future work includes a follow-up perception study to see whether hearers can disambiguate on the basis of intonation contours. Also, work needs to be done to explicitly determine the semantic and pragmatic contributions of the CC. The CC's contributions in these areas have always been vaguely defined. A more comprehensive study of its distribution might lead to a more specific semantic description, similar to what Constant (2012) does for the contour rise fall rise (RFR).

6   EXPERIMENT 2: PERCEPTION

In this section, a follow-up perception study is outlined in some detail. Experiment 2 is in the planning stages at the time of this publication.

Repeated here is the phenomenon of negative neutralization seen in section 2.

(27)   A: Matt didn't call. / Did Matt not call? / Matt didn't call?

a.	B: Yes. ?(Matt called.)	Reverse
b.	B: Yes. ?(Matt did not call.)	Confirm
c.	B: No. ?(Matt called.)	Reverse
d.	B: No. ?(Matt did not call.)	Confirm

Experiment 1 showed that speakers use the CC on the reverse responses (27a) and (27c), but never on the confirm responses (27b) and (27d). Current theories claim that while intonation plays a role, reversals require a reduced clause to disambiguate these more marked responses. Holmberg (N.D.) is another author researching negative neutralization whose work was not reported here. A reviewer for his paper reported the following is acceptable for him:

(28)   A: Is John not coming?
        B: Yeah. He's just getting his coat.

As Holmberg correctly points out, (28) is a problem for his theory as well as any theory that predicts reversals require some overt TP of the form "John is coming". The goal of experiment 2 is to see whether hearers can interpret the meaning of responses in (27) even when the sentences in parentheses are not pronounced. That is, can we remove the "?"s from (27)? If hearers do feel that they can interpret the meanings of these responses, how will they interpret them? Will they interpret them as reverses if they are pronounced with the CC, and confirmations if pronounced even or falling? Or will they always interpret them as confirmations as the theories in 3 would predict?

6.1   DESIGN

Participants will see the same contexts described above on a computer screen. Then they will hear the question through headphones, followed by a single *yeah* or *no* response. The responses will be taken from the recordings made in experiment 1. Participants will be asked to choose the meaning of the response.

(29)   A: Matt didn't call?
        B: No.
        Choose: (i) called *or* (ii) didn't call

In (29), the participant hears A's utterance and then B's utterance and then chooses (i) or (ii). Participants will then be asked to judge the naturalness of the response, and also how certain they are that the response means what they said it means. There will be (at least) four experimental conditions: (i) *yes* with FR/CC, (ii) *yes* with F or E, (iii) *no* with FR/CC, and (iv) *no* with F or E.

6.2   PREDICTIONS

The table below spells out predictions made by the theories outlined in section 3, as well as a fourth theory that considers the contribution of CC (CC Hypo.). The CC Hypothesis predicts that when the CC is present on a yes/no response, hearer's will identify that response as a reversal of the preceding utterance.

Table 1: Predictions made by theories for a perception study.

	Y-CC	N-CC	Y-E/F	N-E/F
CC Hypo.	Rev	Rev	Con	Con
K&R	Con	Con	Con	Con
F&R	Con	Con	Con	Con
K	Rev	Con	Rev	Con

The CC Hypo. predicts that in the conditions where CC is present in the response, participants will interpret the response to mean REVERSE (Rev). When even or falling intonation is present, speakers will interpret the response to mean CONFIRM (Con). Since both K&R and F&R claim that solo yes-no responses confirm and that only responses that include an unelided TP reverse, both accounts predict that participants will interpret all conditions as Con. Krifka (K) says that speakers will interpret *no* to mean Con since it is simpler than computing a double negation. Therefore both N conditions are predicted to be Con. Moreover, he says because *no* means Con as a default, *yes* will be assumed to mean Rev as a default. So all Y conditions are predicted to be Rev.

It will be interesting to see how certain participants are that the responses mean what they have chosen. One possibility is that while they will feel certain that the CC responses mean Rev, they may not be sure what the E/F responses mean. As we saw in the results from experiment 1, although speakers overwhelmingly used CC in the reverse conditions, they also used E and F to a lesser extent. So in the absence of other cues, participants may not be sure whether the E/F conditions mean Rev or Con.

If the CC Hypo. makes the correct predictions then that means the CC has a strong effect, similar to that of *si* and *doch*, and will therefore need to be accounted for by any theory of negative neutralization. If one of the other theories' predictions are borne out, then it means that (i) that theory is on the right track, and (ii) that the CC is a subtle enough prosodic cue as to be unnoticed by hearers.

7   CONCLUSION

I have reviewed current literature on the phenomenon of negative neutralization in English, and I have presented new data from a production experiment that potentially bears on that phenomenon. In particular, the experiment shows that the contradiction contour may play an active role in responses to both positive and negative interrogatives and declaratives. It shows that entire intonation contours

appear on the words *yes* and *no* alone. It also shows that intonation contours pattern according to whether the response confirms or reverses, and not according to what word is used in the response or whether the responses have positive or negative polarity.

The intonation contour recorded in the experiment that seems to contribute the clearest meaning is the contradiction contour. From prior research (Liberman and Sag, 1974) we know that the CC can appear on utterances that contradict, but what is meant by "contradict" is not made explicit. Therefore, open questions include, on what kinds of utterances is the CC licensed, and can we conclude from this descriptive information what the CC's semantics and pragmatics are more precisely?

Finally, a follow up perception experiment is outlined with the goal of seeing if intonation contours can disambiguate otherwise ambiguous yes-no responses in the environment of negative neutralization. If the experiment shows that they can, then existing theories of yes-no responses will need to be revised to include a more central role for intonation contours. Moreover, it would mean that the CC, and also falling and even intonation, makes a unique semantic and pragmatic contribution to an utterance. Therefore, one would like to study these contours more closely to understand what contribution it is that they make to a speaker's ability to convey and interpret natural language meaning.

REFERENCES

Constant, N. (2012). English rise-fall-rise: a study in the semantics and pragmatics of intonation. *Linguistics and Philosophy*, 35(5):407–442.

Farkas, D. and Roelofsen, F. (2012). Polar initiatives and polarity particle responses in an inquisitive discourse model. UC Santa Cruz.

Kramer, R. and Rawlins, K. (2009). Polarity particles: an ellipsis account. In *The Proceedings of NELS*, volume 39.

Krifka, M. (2013). 2013. In Kiefer, F. and Lee, C., editors, *Contrastiveness and scalar implicatures*. Springer.

Liberman, M. and Sag, I. (1974). Prosodic form and discourse function. In *Proceedings of Chicago Linguistics Society (CLS)*, volume 10, pages 402–415.