Abstract

There has been a substantial amount of research that has examined how context affects people’s understanding of negation. Many authors argue that negation is more plausible or natural in some contexts than in others. For these authors, it is reasonable to negate a proposition only when it is presupposed. However, this assumption has been indirectly inferred from comprehension studies. None of them checked if the frequency of the spontaneous use of negation depends on the context. In this paper we present two experiments on this topic. The participants read stories where a sentence is false; and were asked to produce a sentence that could be true. In the first experiment they produced more negations from multiple than from bipolar contexts (e.g., when the false sentence was “the car was red” as compared to “the car was big”). In the second experiment the context was logically dichotomized by adding disjunctions. In this case, incongruent contexts enhanced the use of negation. The results seem to support the idea that when there is a clear alternative, negation is seldom spontaneously produced even if it denies a presupposition.

1. Introduction

Under what circumstances do people decide to use negative sentences? One view holds that in some contexts negation intends to reject a presupposition. According to this view, there is no point in denying a proposition if there is no reason to believe the truth of that proposition (e.g., Strawson 1952). The sentence: “my cat is not a tiger” is an analytical truth that holds in any domain, but it would hardly ever be produced unless there is a reason for someone in a given context to believe that the statement “my cat is a tiger” is true (at least in a metaphorical sense). Thus, intelligible negation seems to depend on whether or not the
contents to be denied are accessible or easy to grasp. There is an obvious pragmatic consequence to this view: if people use negation to reject affirmative presuppositions, then it might be uttered in a limited number of contexts (e.g., Givón 1979; Schindele et al. this volume). For the previous example, “my cat is not a tiger”, it would make sense if, for example, the cat referred to looks like a tiger (due to its size, colors or behavior) or if the speaker attributes this assumption to the hearer. Out of a context like that, the sentence possibly calls for additional inference to be understood. This consequence has been already tested by investigating how people understand negative sentences (Wason 1965; de Villiers and Flusberg 1975; Glenberg et al. 1999; Giora et al. 2007; Lüdtke et al. 2006). A small amount of research, however, has been devoted to study context effects on the production of negation, although comprehension studies might be predictive about negation production as well.

As it has been clearly established through decades of psychological research on negation, affirmative and negative sentences are understood differently (Horn 1989). For instance, negatives usually taking longer to process than affirmatives (for an overview, see Wason and Johnson-Laird 1972; Clark and Chase 1972; Carpenter and Just 1975; Kaup et al. 2007). An additional processing stage is probably responsible for the observed asymmetry. However, the ultimate reason may be related to the pragmatic role of negation. It is, in this sense, that some works have recently tested if, within adequate contexts, negation would be processed as fast as affirmation. In one of these studies, Glenberg et al. (1999; Experiment 2) measured the reading times of affirmative and negative sentences (such as The couch was/was not black) following a sentence providing either a supportive or an unsupportive context. A supportive context might be: She wasn’t sure if a darkly colored couch would look the best or a lighter color. While the unsupportive context might be: She wasn’t sure what kind of material she wanted the couch to be made of. As predicted, results showed that contextual support affected the processing of negation, in that it neutralized the advantage of affirmative sentences over negative sentences found in the unsupportive contexts. Thus, results were in line with the contextual constraint hypothesis, that is, with negation feeling comfortable in some contexts but not in others. The facilitation, according to the authors, may arise from the coherence established between the discourse context and the particular property being negated. Indeed, while the supportive context provided the relevant or coherent domain for the critical sentence, the unsupportive context did not. However, as far as it can be inferred from the sample items, there exists another way by which the supportive context could be favoring the processing of negation. In addition to establishing coherence, the supportive context included a disjunc-
tion that made explicit the two poles of a bipolar attribute (e.g., *darkly* or *lighter*), while the unsupportive context simply mentioned the irrelevant or incoherent feature (e.g., *kind of materials*). Thus, it is possible that the supportive context had facilitated the comprehension of the negative sentences not by featuring coherent information but rather by highlighting the particular property that is being negated, the specific negated state of affairs (e.g., *darkly for black*).

A recent paper devoted to testing the pragmatic hypothesis (Lüdtke et al. 2006) has examined, in more detail, the role of explicit mentions and suggestions as compared to establishing coherence. The first experiment revealed that a mere suggestion of the relevant domain of the property being negated did not result in equivalent reading times of affirmatives and negatives. Instead, this effect was obtained only when the negated property was previously explicitly mentioned either individually or together with an alternative property or a possible actual state of affairs. In addition, in their second experiment, where no explicit mention of the negated property was made, Lüdtke et al. (2006) found that affirmative and negative sentences took equally long to read following contexts with a strong suggestion of the negated property compared to contexts with a weak suggestion of it, in which negations took longer to read. That is, it is not mere coherence within the discourse, but rather the anticipated relevance or salience of the negated state of affairs that seems to make a felicitous context for negation. It is interesting to note that these authors used bipolar properties in their second experiment (e.g., *dirty—clean*) as well as a context that referred to the actual state of affairs of the negative sentences. Thus, it seems that negation and affirmation sound equally natural when both are rejecting a contextually strong suggestion in so far as bipolar properties are concerned. Obviously, for a bipolar property, the negation of one of the poles implies an actual state of affairs somehow similar to the affirmation of the opposite pole (see also Mayo, Schul, & Burnstein 2004).

In summary, there is evidence demonstrating that statements take less time to comprehend within context than out of context and, more importantly, that in some felicitous contexts the widely acknowledged comprehension asymmetry between affirmation and negation is reduced (or even eliminated). Therefore, it is reasonable to assume that negation should not only be easier to comprehend in some contexts, but that within these felicitous contexts, people will be prone to produce negative sentences. To our knowledge, there is only one study that had directly examined how context can facilitate the spontaneous production of negations (Watson 1979). In this study, the participants were prompted to make descriptions of an entity (*a horse*) which, with respect to another similar entity
(another horse), either lacked a specific property (e.g., a saddle) or possessed a distinct property (e.g., white color). Negative utterances were used by children for referents which lacked a property possessed by a comparison item. On the contrary, affirmative descriptions were produced when an entity possessed a distinct attribute, which allowed its description to be really informative. Thus, it seems that if the actual state of affairs is not relevant for the communicative act, then negation is mandatory. The question may be, then, whether the low informative quality of an affirmative description constitutes a “natural” drive for the production of negations. In this sense, it is possible that explicit negations are expected to be used when the actual state of affairs is less accessible and when the context might affect this accessibility.

To test this prediction, we conducted two experiments in which the context was manipulated in two ways: first, by using bipolar (dark/light) vs. non-bipolar (blue, red, green . . .) attributes, and second, by using coherent vs. incoherent contexts. For bipolar attributes, it is predicted that negation will be less frequently produced because the actual state of affairs is associated with an alternative attribute (that is, not-red will be used more frequently than not-dark). In the second experiment, the influence of the type of attributes is reduced by making explicit the actual state of affairs for both bipolar and non-bipolar attributes thorough the usage of disjunctions.

2. Experiment 1: Production of negations with bipolar and non-bipolar attributes

2.1. Method

2.1.1. Participants. Sixty-five students of an introductory Psychology course of La Laguna University participated in exchange for course credit. They were all native speakers of Spanish.

2.1.2. Materials and Procedure. Twenty-four written stories were constructed that coherently described discourse contexts containing erroneous (or false) information (see Table 1). All stories started with a sentence stating that there was an error in a given information source (e.g., magazine). The next two sentences specified what exactly the error was. In the second sentence the target entity was mentioned (car) together with an appropriate attribute (color) that does not violate selection restrictions, thus providing the topic to which the error could be related. In the third and critical sentence, the error was specified in terms of an attribute being
mistakenly applied to the already mentioned entity (red to car) which was always perceived by a particular agent. In addition, the expression “In fact,” was given at the end of each story in order to guarantee that participants would correct the false information by producing statements that were considered to be potentially true.

The total set of attributes (e.g., big), attribute domains (e.g., size), and entities (e.g., car) appearing in the stories included forty-eight attribute domains, aligned with forty-eight corresponding attributes which formed the bipolar and non-bipolar conditions. Additionally, twenty-four target entities were chosen so that they made up appropriate topics for at least one bipolar and one non-bipolar attribute (and attribute domain). As a result, we had four distinct predications for each target entity: bipolar-attribute (big) or non-bipolar attribute (red), and bipolar-domain (size), or non-bipolar domain (color). The bipolar attribute was only congruent with the bipolar domain while the non-bipolar attribute was only congruent with the non-bipolar domain. The manipulation of attribute and domain gave place to the experimental factors manipulated in the present experiment. As a result, four different versions of each story were created by counterbalancing the two experimental factors: bipolarity (bipolarity/non-bipolarity of the attribute mentioned in the critical sentence) and coherence (coherent/incoherent relations between the second sentence and the critical sentence).

The experiment was administered to the entire class of participants. Each was given a 3-page booklet that included 24 stories (six per
condition). The booklets were prepared so that no participant encountered the same story in more than one condition, and there were two different random orders of the problems for each condition. The first page included the following instructions (translated from Spanish):

You are going to be presented a series of stories. In each of them a character realizes that some information is erroneous. Bearing this fact in mind, your task will be to complete the sentence that starts as follow “In fact . . .”. You should complete the sentence on the dotted line at the end of each text.

In addition, participants were told to read the instructions carefully. They were given no time limit to complete the completion task.

2.2. Results and discussion

The completions were classified according to one of the following categories: Negation (if explicit negation was included), Alternative (if an alternative to the critical attribute was included: e.g. young in the place of old, or red in the place of blue) or Other (when there were miscellaneous responses, e.g., when there was no response, or when the participants erred by using the same attribute or by not taking into account the attribute proposed). The overall percentages for each category were as follows: 25% for negation, 60% for Alternative, and 9% for “Other”. We used the number of negations (to the target sentence) for the analyses. Five participants were excluded from the analyses because they had more than eight “Other” responses. Table 2 reports the percentages of negations in the target sentence. We performed analyses of variance (ANOVA) to examine the effects of context and attribute upon the production of negations. We found main effects of bipolarity ($F_1(1, 59) = 7.935, p < 0.01; F_2(1, 23) = 8.179, p = 0.009; \eta^2 = 0.067$). As expected, people produced more negations for non-bipolar attributes (14%) than for bipolar attributes (11%). So we can conclude that the introduction of an explicit negation in production is sensitive to whether or not the actual state of affairs is accessible.

However, there was no reliable effect for the context coherence ($F < 1$). The interaction between bipolarity and coherence did not reach significance ($F_1(1, 59) = 2.869; p = 0.096; F_2(1, 23) = 0.660, p = 0.425$). Planned comparisons showed that there was a reliable difference between the two incongruent conditions in the sense that the non-bipolar attributes yielded more negations (33%) than the bipolar attributes (21%; $t(59) = 3.366; p < 0.01$; all $p$ values reported are two-tailed); moreover this difference was much weaker for the coherent conditions (23% for
bipolar and 27% for non bipolar; \( t(59) = 1.440; \ p = 0.155 \) than for the incoherent conditions (21% for bipolar and 29% for non bipolar; \( t(59) = 3.366; \ p < 0.01 \)). It is possible that the higher effect of bipolarity for the incoherent paragraphs has to do with participants ignoring the context and centering on the target sentences.

### Table 2. Total number and percentage of negations for the target sentence in Experiment 1

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Context</th>
<th>Coherent</th>
<th>Incoherent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bipolar</td>
<td>( 84 )</td>
<td>( 76 )</td>
<td>(23%)</td>
</tr>
<tr>
<td>Non-Bipolar</td>
<td>( 97 )</td>
<td>( 105 )</td>
<td>(27%)</td>
</tr>
</tbody>
</table>

3. **Experiment 2: Production of negations with disjunctive contexts**

In the previous experiment we found that people produced negations more frequently when the actual state of affairs was less accessible, that is, in the non-bipolar domains, and particularly, when the context was incoherent. However we might hypothesize that context effects are not restricted to bipolarity but may also occur through other context manipulations. In general, making explicit the actual state of affairs will inhibit people’s use of negation. In this experiment we are going to test this hypothesis by using disjunction to make the two states of affairs explicit.

3.1. **Method**

3.1.1. **Participants.** Sixty-three students of an introductory Psychology course of La Laguna University participated for extra course credit.

3.1.2. **Materials and procedure.** We used the 24 stories constructed for Experiment 1 (see Table 3), only here the second sentence of each story was replaced by a disjunction which specified the possible alternative attributes (*the car was red or green*). This disjunction made explicit two possibilities for both bipolar and non-bipolar attributes. The procedure and design were the same as in Experiment 1.
3.2. Results and Discussion

The same categorization of responses as in Experiment 1 was applied. The overall percentages in this experiment were as follows: Negation (17%), Alternative (72%) and “Other” (4.6%). We excluded three participants from the analyses according to the same criterion as in Experiment 1. The number and the percentages of negations are presented in Table 4.

Results revealed a main effect of context coherence \( F_1(1, 59) = 31.06; p < 0.001; F_2(1, 23) = 119.566, p < 0.05; \eta^2 = 0.299 \), in the sense that the participants produced more negations for incoherent contexts (14%) than for coherent ones (3%). However, the effect of bipolarity was only marginally significant \( F_1(1, 59) = 3.902; p = 0.053; F_2(1, 23) = 1.602, p = 0.218 \) with the non-bipolar attributes yielding more negations (9%) than the bipolar attributes (8%). The interaction between both factors

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Table 3. Examples of each one of the four paragraph conditions used in Experiment 2

<table>
<thead>
<tr>
<th>COHERENT-BIPOLAR</th>
<th>COHERENT-NON-BIPOLAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>In a magazine there was some wrong information</td>
<td>In a magazine there was some wrong information</td>
</tr>
<tr>
<td>They discussed if the car was big or small</td>
<td>They discussed if the car was red or green</td>
</tr>
<tr>
<td>Juan realized that the information mistakenly stated that the car was big</td>
<td>Juan realized that the information mistakenly stated that the car was red</td>
</tr>
<tr>
<td>In fact, the car.........................</td>
<td>In fact, the car.........................</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INCOHERENT-BIPOLAR</th>
<th>INCOHERENT-NON-BIPOLAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>In a magazine there was some wrong information</td>
<td>In a magazine there was some wrong information</td>
</tr>
<tr>
<td>They discussed if the car was red or green</td>
<td>They discussed if the car was big or small</td>
</tr>
<tr>
<td>Juan realized that the information mistakenly stated that the car was big</td>
<td>Juan realized that the information mistakenly stated that the car was red</td>
</tr>
<tr>
<td>In fact, the car.........................</td>
<td>In fact, the car.........................</td>
</tr>
</tbody>
</table>

Table 4. Total number and percentage of negations for the target sentence in Experiment 2

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Context</th>
<th>Coherent</th>
<th>Incoherent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bipolar</td>
<td>20</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5.5%)</td>
<td>(26%)</td>
<td></td>
</tr>
<tr>
<td>Non-Bipolar</td>
<td>25</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(7%)</td>
<td>(30%)</td>
<td></td>
</tr>
</tbody>
</table>
was not reliable \((F_1(1, 59) = 1.000; p = 0.321; F_2(1, 23) = 0.512, p = 0.481)\).

As in the previous experiment, there was no difference, in the coherent contexts, between bipolar (6%) and non-bipolar (7%) attributes \((t = 0.843; p = 0.403)\). The difference, in the incoherent contexts, between bipolar (26%) and non-bipolar attributes was only marginally reliable \((30%; t = 1.949; p = 0.056)\). Thus, it seems that the effect of bipolarity found in the previous experiment was mainly due to the accessibility of the actual state of affairs. When this was made explicit (by expressing both alternatives in a disjunction) the effect of the ambiguity of the context became apparent and bipolarity was no longer necessary to help the alternative come to mind.

4. General discussion

In two experiments we examined how people produce negative sentences in contexts varying in the accessibility of the actual state of affairs. In Experiment 1, we manipulated the bipolarity of an entity’s attributes and coherence relations. The latter manipulation was a function of making explicit an attribute domain (e.g., red) and an attribute belonging in either the same (e.g., color) or a different domain (e.g., size), while the accessibility of the actual state of affairs was made up by using bipolar (e.g., big-small) and non-bipolar attributes (e.g., red, yellow, blue, green). Findings show that there was a general preference to producing negated sentences following non-bipolar attributes (e.g., ‘re’), for which the actual state of affairs refers to an unspecific set of possibilities. In addition, this preference appeared to be modulated, although only in a trend-wise form, by the coherence of the context, which, crucially to our conclusions, did not show any direct effect on negative sentence production. It was not the coherence of the context itself that determined the production of negations (for a different view, see Glenberg et al. 1999).

In Experiment 2 the context was manipulated in a similar way. The only difference was the introduction of a disjunction which included two attributes of the same domain (e.g., red or green) in place of the word referring to the attribute domain. This context manipulation was expected to render equivalent the accessibility of the actual state of affairs for the two kinds of attributes, the bipolar and non-bipolar. As predicted, we found an effect of context coherence but not of attribute type, which only marginally approached significance. Therefore, it is the accessibility of the actual state of affairs and not the use of bipolar attributes itself what affects the production of negations. Bipolar attributes can make
the actual state of affairs more available (when we know that the car is not dark, we can think easily that it may be light). However, as we have shown in Experiment 2, the same effect can be obtained by different means.

The major conclusion of these experiments is that negations are more felicitously produced when the actual state of affairs is inaccessible. In other words, people prefer to produce negations whenever an affirmative description of the actual state of affairs is not accessible. Concretely, when people are prompted to describe a state of affairs and it is not accessible in an affirmative way, they are most likely to produce negative utterances even though no highly expected presupposition is to be denied.

Experiments using isolated sentences show systematically that longer times are needed to process negative compared to affirmative sentences (for a review, see Carpenter & Just 1975; Giora 2006; Kaup et al. 2007; Wason & Johnson-Laird 1972). Pragmatic accounts of negation attribute this fact to the idea that to understand a negative sentence one first has to process the affirmative concept within the scope of negation. The purpose of negation is, therefore, to reject a presupposition or suppress the negated concept. In that case, the accessibility of the negated state of affairs should be the main property that makes a context felicitous for negation. Consistent with this idea, several comprehension studies have demonstrated that when the negated state of affairs is highly expected (by explicit mentions or by inferences), negative sentences seem to be as easy to understand as affirmatives (Glenberg et al. 1999; Kaup et al. 2003, 2006; Giora et al. 2007; Schindele et al. 2008 this volume). In this paper we have shown that, in addition to rejecting presuppositions, negations may also be facilitated by other contexts. Thus, one kind of context that seems to make negation likely to be produced might involve some degree of uncertainty or low informativeness. In these cases, speakers reject a statement because they don’t have enough information which warrants affirmation. Further research is needed to explore other contexts that make the production of negative sentences more likely to occur.

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References


Giora, Rachel. 2006. Anything negatives can do affirmatives can do just as well, except for some metaphors. Journal of Pragmatics 38; 981–1014.


