

# Affective reactions and context-dependent processing of negations

Enrico Rubaltelli\*  
University of Padova

Paul Slovic  
Decision Research & University of Oregon

## Abstract

Three experiments demonstrate how the processing of negations is contingent on the evaluation context in which the negative information is presented. In addition, the strategy used to process the negations induced different affective reactions toward the stimuli, leading to inconsistency of preference. Participants were presented with stimuli described by either stating the presence of positive features (explicitly positive alternative) or negating the presence of negative features (non-negative alternative). Alternatives were presented for either joint (JE) or separate evaluation (SE). Experiment 1 showed that the non-negative stimuli were judged less attractive than the positive ones in JE but not in SE. Experiment 2 revealed that the non-negative stimuli induced a less clear and less positive feeling when they were paired with explicitly positive stimuli rather than evaluated separately. Non-negative options were also found less easy to judge than the positive ones in JE but not in SE. Finally, Experiment 3 showed that people process negations using two different models depending on the evaluation mode. Through a memory task, we found that in JE people process the non-negative attributes as negations of negative features, whereas in SE they directly process the non-negative attributes as positive features.

Keywords: processing of negations; evaluation mode; affect; preference; joint vs. separate.

## 1 Introduction

The positive qualities of a stimulus can be described either in a direct or indirect fashion and sometimes the difference between these two perspectives is small and subtle. For instance, if a person tells you that “a cereal for breakfast is not high in fat” you may either think that it is low in fat or moderately fatty. Therefore, the above sentence leaves room for interpretations, since it explicitly communicated what is not present (lot of fats) but does not tell how lean those cereals are. It is possible that the evaluation context in which the cereal is described may affect the way they are judged. In other words, people may evaluate the same cereal as less attractive if they are told that “cereal from brand A is not high in fat and cereal from brand B is fat-free” than if they are simply told that “cereal from brand A is not high in fat.” The present paper will show that the specific context in which negations are processed has an effect on people’s inferences about the negation meaning, on their affective reactions and, in turn, on their preferences.

We hypothesize that the affective reactions induced by non-negative information (e.g., a cereal that is not high

in fat) are contingent on the evaluation context in which the negation is presented. In particular, we aim to show that the effect of the evaluation context on the affective reactions is induced by the different ways negations are processed, depending on whether an explicitly positive comparison (in the form of an affirmative sentence) is present or not. Such an inconsistency of preference may have important implications in several domains like, for instance, personnel selection and products advertisement. Numerous studies in the last few decades have shown a strong link between people’s affective reactions and their subsequent behaviors. (For a review see Peters, 2006.) Therefore, if the context in which a negation is evaluated may influence individuals’ feelings then it may also affect their actual choices.

Our hypotheses are supported by previous work on the processing of negations. There has been a long debate on how negations are actually processed and whether they increase the accessibility of information congruent with the actual state of affairs (“the cereal is not high in fat”) or the negated state of affairs (“the cereal is high in fat”) (Kaup & Zwaan, 2003; Kaup, Lüdtke & Zwaan, 2006a; Kaup, Yaxley, Madden, Zwaan & Lüdtke, 2006b). Such a debate led to the elaboration of two models that offer completely different accounts of the way negations are processed (Mayo, Schul & Burnstein, 2004; Kaup et al., 2006a). The first model is closer to the explanation offered by the propositional theories of language comprehension (McKoon & Ratcliff, 1992; Kintsch, 1988). This

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model is called the “schema-plus-tag” model (Clark & Chase, 1972; Fiedler, Walther, Armbruster, Fay & Naumann, 1996). It states that individuals process a negation by processing the core message (the schema; e.g., the cereal is high in fat) and then complete it with the negation tag. As stated by Mayo et al. (2004), this model entails two important implications. The first, is that people process the core schema and attach a negation tag to it, therefore allowing for a dissociation between them at a later point in time. The second implication pertains to the associations that the schema activates, which should be congruent with the negated state of affairs (high in fat) instead of being consistent with the actual state of affairs (not high in fat). Indeed, under the schema-plus-tag model people are supposed to attach the negation to the schema only after the schema-congruent associations have been activated. As a consequence, they end up understanding the negation and its meaning but at the same time they activate a series of associations that are incongruent with the intended meaning of the negation.

Alternatively, the proposers of the experiential-simulation model suggested a second way to process a negation, that is by fusing the negation tag into the core schema. In this case the sentence “the cereal is not high in fat” should be processed as “the cereal is low in fat”. The main consequence of using this model is that fusing the negation with the core concept allows people to activate associations that are congruent with the actual state of affairs. Therefore, the fusion model should reinforce the intended meaning of the message and make it more convincing. MacDonald and Just (1989) proposed a mechanism that accounts for the fusion of the negation tag into the core schema. They suggested that the negation tag should inhibit the activation of concepts that are congruent with the negated state of affairs. More recently, Kaup et al. (2006b) suggested an alternative mechanism which may account for the negation tag-core schema fusion process. The proposed mechanism entails that the negated state of affairs is simulated in an auxiliary representational system. In this way the representation of the negated state of affairs is not integrated with the representation of the described world. Instead, people should be able to juxtapose the two representations so that they can take into account the negated information. In other words, Kaup et al. suggested that the simulation of the negated state of affairs should be mentally rejected by the fact that it is simulated but not integrated with the representation of the described world.

Mayo et al. (2004) suggested that individuals might use either the schema-plus-tag model or the fusion model depending on the inferences allowed by the sentence in which the negation is included. In particular, Mayo and colleagues found that the existence of a schema that accommodates the meaning of the original negation is crit-

ical in determining how a negation will be encoded. In the present study, we aim to show that the use of either one or the other model may be contingent on the context in which the negation is presented.

In a series of three studies we asked participants to judge explicitly positive stimuli (characterized by having positive features) and non-negative stimuli (characterized by not having negative features). Participants were presented with either one or both options, thereby using a joint (JE) versus separate (SE) evaluation paradigm. Previous studies have demonstrated numerous ways in which preferences elicited in JE and SE are inconsistent (Bazerman, Loewenstein & Blount, 1992; Hsee, 1996; Hsee, Loewenstein, Blount & Bazerman, 1999; Hsee, Zhang & Chen, 2004). To understand the kind of stimuli used in the present study, consider the example of the cereal that we presented earlier. Both a message saying that a cereal is “not high in fat” and a message saying that a cereal is “fat-free” communicate a similar, non-negative, value (i.e., in both cases the cereal does not have a lot of fat and this is positive for people’s health) but in different ways.

Throughout the three studies we find that people presented with either one or the other type of description do not necessarily evaluate them as equally good in their quest to be a healthy food. The positive and non-negative descriptions lead to similar judgments in SE. However, we find that the non-negative description is perceived in a less favorable way than the positive description when they are presented together. The difference appears to depend on how the negation is processed in joint versus separate evaluation. In addition, the different strategies used to process the negation in the two evaluation contexts seems to lead people to have a more fuzzy representation of the non-negative description in joint evaluation than in separate evaluation.

## 2 Experiment 1

The aim of Experiment 1 was to examine whether the non-negative description is evaluated differently depending on the evaluation mode.

Participants were presented with a pair of breakfast cereals (shown in Table 1). The features of the two cereals were described either in positive terms (e.g., a breakfast cereal which is characterized by having positive features) or non-negative terms (e.g., a breakfast cereal which is not characterized by having negative features). The attributes used to create the two descriptions were not the same; however the alternatives had always a clear positive or non-negative value.

Since we were interested in measuring people’s affective reactions toward the positive and non-negative options, we asked the participants to rate how attractive they

Table 1: Cereal profiles used in Experiment 1.

Imagine you are looking for a breakfast cereal. After checking among many different products, you have now reduced your choice to one of two brands:	
<b>Cereal Brand A [Positive Option]:</b>	<b>Cereal Brand B [Non-negative Option]:</b>
This brand of cereal is characterized by these features:	This brand of cereal is <u>not</u> characterized by these features:
<ul style="list-style-type: none"> <li>• Low in calories</li> <li>• Fat-free</li> <li>• Good source of protein</li> <li>• Chocolate flavor</li> <li>• High in fiber</li> <li>• Contains minerals</li> </ul>	<ul style="list-style-type: none"> <li>• High in fat</li> <li>• High in sodium</li> <li>• Added preservatives</li> <li>• High in carbs</li> <li>• No minerals</li> <li>• Low in vitamins</li> </ul>

found each alternative. We expected to find a difference between the two options in JE but not in SE. In particular, in JE the positive option should be more attractive than the non-negative option since in this condition the explicitly positive comparison should lead people to process the negation using the schema-plus-tag model. In fact, the schema-plus-tag model should induce individuals to perceive a difference between the two options, as it should activate associations that are congruent with the negated state of affairs (that is, the negative features of the alternative) rather than associations congruent with the actual state of affairs (that is, the lack of negative features). In other words, even if people are able to understand that the non-negative description of a cereal states that it is “not high in carbs”, they should activate a series of information that are congruent with “fatty or unhealthy foods.” The activation of such negative information should reduce the attractiveness of the non-negative option.

We also expected that the positive option would be judged in more or less the same way in both evaluation modes, since its features are explicitly stated and easy to understand. At the same time, the non-negative option is likely to be judged differently in the two evaluation modes if, in SE, it is processed using the fusion model instead of the schema-plus-tag model. In SE, there is not an explicitly positive comparison, so people should be free to use the processing strategy which helps them to create the clearer image of the stimulus they are presented with. On the other hand, in JE, participants are probably induced to process the non-negative alternative using a different strategy because this is the only way to make sense of the different format used to describe this alternative, compared with the positive one. It is likely

that people who are presented with both alternatives are puzzled by the fact that one alternative is described in explicitly positive terms while the other is described in non-negative terms. The schema-plus-tag model appears like a strategy that allows individuals to perceive a difference between the two alternatives, which is consistent with the use of different descriptions. In JE, people are likely to make the inference that the non-negative format has been used in order to suggest that a cereal that is “not high in fat” is still characterized by an higher quantity of fat than a “fat-free” cereal. The schema-plus-tag model seems more suited than the fusion model to allow people making such an inference.

Specifically, the hypotheses of Experiment 1 were the following:

H1: In JE, alternatives characterized by positive features should be rated as significantly more attractive than those characterized by non-negative features.

H2: When non-negative alternatives are evaluated in SE, their attractiveness should be judged significantly higher than in JE. In SE, the two alternatives should be judged about equally attractive.

## 2.1 Method

*Participants and design.* One hundred seventy-one American undergraduate students (46.2% females; mean age 19 years) participated in Experiment 1. Participants were randomly assigned to one of the three experimental groups: 56 in JE, 57 in the first SE condition (positive alternative), and 58 in the second SE condition (non-negative alternative). In JE, one participant did not answer to the questionnaire.

Table 2: Mean attractiveness of alternatives in Experiment 1.

Description	Joint Evaluation			Separate Evaluation		
	<i>N</i>	Mean	SD	<i>N</i>	Mean	SD
Positive	55	2.33	1.92	57	1.79	2.23
Non-negative	55	.96	2.32	58	1.90	2.28

NOTE: Analysis of variance showed a significant interaction effect,  $F(1, 112) = 6.37$ ,  $\eta^2 = .05$ ,  $p < .02$ .

*Materials and procedure.* As stated above, participants were presented with either both or only one type of cereal (positive or non-negative). Each option was described using six attributes. The positive option was created by telling people that an option “x” has some positive features, while the non-negative description was induced by saying that an option “y” does not have some negative features.

In JE, participants were presented with both pairs of alternatives and were asked to rate the attractiveness of each option within a pair. In SE participants were presented with either the positive or the non-negative description from both pairs and judged only the attractiveness of that option.

*Dependent measures.* Participants rated the attractiveness of the options on a 9-point scale ranging from -4 to 4. (-4 was labeled as “very unattractive” while 4 was labeled as “very attractive”; the mean point was labeled as “neither attractive nor unattractive.”)

## 2.2 Results

As shown in Table 2, in JE, the positive description was judged more attractive than the non-negative description,  $t(54) = 3.40$ ,  $p < .01$ . As expected, there was no statistically significant difference between positive and non-negative descriptions in SE. Therefore, this pattern of results supports Hypothesis 1.

Consistent with Hypothesis 2, the non-negative cereal brand was rated significantly more attractive in SE than in JE,  $t(111) = -2.16$ ,  $p < .05$ . On the other hand, the attractiveness of the positive cereal brand was not rated significantly different in JE and SE. An analysis of variance showed a significant interaction effect. (See note to Table 2.)

## 2.3 Discussion

The pattern of results found in Experiment 1 suggests that people are not consistent when judging, together or separately, stimuli that have almost the same affective value,

but are described in a positive versus non-negative fashion.

What was particularly interesting in Experiment 1 was that, in JE, the non-negative description led the cereals to be judged less attractive than when they were presented in SE. On the other hand, the attractiveness judgments of the positive option were not significantly different in the two conditions. Moreover, in JE, the option described in non-negative terms was judged significantly less attractive than the option described in positive terms.

Overall a similar pattern of results is consistent with our main hypothesis that people are using two different strategies to process the negations depending on the evaluation context in which the negations are presented. Indeed, people’s affective reactions toward the non-negative description seem to change in a way that is compatible with the activation of associations made possible by the schema-plus-tag model in JE and by the fusion model in SE.

On the other hand, the rating of attractiveness of the positive option does not change in the two evaluation modes because this option is an explicit and direct description of the features of an object. Therefore, people can evaluate it only in one way regardless of the particular evaluation context in which it is presented.

## 3 Experiment 2

Results from Experiment 1 suggested that the absence of an explicitly positive option may induce people to switch strategy and engage in the use of the fusion model. Such a switch may have a strategic nature since the fusion model should allow people to create a clearer representation of the non-negative description. For instance, using this strategy they may perceive “a cereal not high in fat” as “a cereal low in fat.” On the other hand, the schema-plus-tag model induces people to focus on the features that are not characterizing an alternative; to use the schema-plus-tag strategy means that “a cereal not having high fat” may be perceived as either having a low amount or an average amount of fat.

Table 3: Manager profiles used in Experiment 2.

Imagine you have to select a manager for a job in an organization. After assessing many different candidates you have now reduced your choice to one of two managers:	
<b>Manager A [Positive Option]:</b>	<b>Manager B [Non-negative Option]:</b>
This manager is characterized by these features:	This manager is <u>not</u> characterized by these features:
<ul style="list-style-type: none"> <li>• High composure</li> <li>• Exceptional decisional skills</li> <li>• Superior organizational skills</li> <li>• Highly self-confidence</li> <li>• Moderately competitive</li> <li>• High communication skills</li> </ul>	<ul style="list-style-type: none"> <li>• Low composure</li> <li>• Poor decisional skills</li> <li>• Poor organization skills</li> <li>• Low self-confidence</li> <li>• Extremely competitive</li> <li>• Low communication skills</li> </ul>

Experiment 2 investigates whether judging the non-negative description in JE induces less clear a feeling than judging it in SE. If this is the case, it would support the hypothesis that in SE people switch to a strategy like the fusion model in order to create a more clear cut representation of this option (that is, inverting the value of the features from non-negative to positive).

Previous research by Oaksford and Stenning (1992), investigating the negation paradigm selection task (Evans & Lynch, 1973), found that rules like “if there is not- $p$ , then there is  $q$ ” are perceived as less clear. Such rules have some commonalities with the non-negative descriptions that we are using in the present studies. For instance, Oaksford and Stenning consider the proposition not- $p$  as unclear because it is not informative about what should be present ( $p$ ,  $q$  or not- $q$ ). In addition, Carpenter, Just, Keller et al. (1999) suggested that both construction and maintenance of the representation during comprehension is more complex for negative sentences. Accordingly, these authors found higher levels of fMRI-measured activation in the left posterior temporal region (a region that is classically associated with language) during the comprehension of negative sentences than in the evaluation of affirmative sentences. These studies seem to suggest that when people are able to engage in the fusion strategy then they should end up with a more clear feeling toward the non-negative description.

Moreover, we decided to investigate how easy people find to judge the non-negative description in JE and SE. Our hypothesis is that people should find this alternative less easy to judge in JE than in SE since they have a less clear perception of what characterize the non-negative option when it is paired with an explicitly positive alternative.

Finally, participants were also asked to rate how good or bad their feeling was toward the stimuli. If, in JE, participants have a less clear perception of the feeling induced by the non-negative option and rate it less easy to judge then they should also perceive it less good than the positive one. Consequently, in addition to trying to replicate the results of the first experiment we hypothesized that:

H3: In JE, positive alternatives should induce a clearer and more positive affective reaction than non-negative alternatives. In addition, positive alternatives should be rated easier to process than non-negative alternatives.

H4: Non-negative alternatives should also induce a clearer and more positive affective reaction in SE than in JE. In addition, these alternatives should be rated easier to evaluate in SE than in JE. No differences are expected for the positive alternatives in the two evaluation modes.

### 3.1 Method

*Participants and design.* One hundred fifty Italian undergraduate students (58.2% females; mean age 22 years) participated in the study. Participants were randomly assigned to one of the three experimental conditions as in Experiment 1. The experimental design was the same as in the previous experiment.

*Materials and procedure.* Participants were presented with two pairs of options. The pair of cereal brands presented in Experiment 1 and a pair of managers (shown in Table 3). For each pair, one option had a positive description of the features characterizing it whereas the other had a non-negative description. Positive and non-negative options were induced in the same way as in Experiment 1, that is, manipulating the quality of their features. The positive and non-negative cereal brands were exactly the

Table 4: Mean attractiveness of alternatives in Experiment 2.

Option	Joint Evaluation			Separate Evaluation			
	<i>N</i>	Mean	SD	<i>N</i>	Mean	SD	
Cereal	Positive	49	3.12	1.13	50	2.68	1.86
	Non-negative	49	.51	2.53	50	2.24	1.83
Manager	Positive	49	2.88	1.05	50	1.88	1.70
	Non-negative	49	.84	2.08	50	2.86	1.40

NOTE: Analyses of variance showed a significant interaction effect for both pairs of stimuli: respectively,  $F(1, 98) = 16.28$ ,  $\eta^2 = .14$ ,  $p < .01$  for cereals, and  $F(1, 98) = 39.48$ ,  $\eta^2 = .29$ ,  $p < .01$  for managers.

same as in the previous study. Managers were described using the same features (personality traits) but with opposite value (e.g., a manager characterized by having high decisional skills versus a manager characterized by not having low decisional skills). Once again, each option was described using six attributes.

The procedure was the same as in Experiment 1. However, in the present study, after rating the attractiveness of each option, participants were asked to answer three more questions. The first new question asked participants to rate how clear a feeling they had toward the options, the second asked them to rate how easy to evaluate they found each option, and the third asked them to rate (as good or bad) their affective reactions. In JE, individuals rated both options from the first pair on the first scale, then they went on rating the same options on the second scale and so on until they had answered the fourth question. After rating the first pair of options on all scales, participants were presented with the second pair of options and answered the questions in the same way as for the first one. In SE, participants were presented with only one option at a time, rating it on all four scales.

*Dependent measures.* Participants rated the attractiveness of the alternatives on a 9-point scale ranging from -4 to 4 as in Experiment 1. (-4 was labeled as "very unattractive" and 4 was labeled as "very attractive"; the mid point was labeled as "neither attractive or unattractive.") Participants clearness of the feeling induced by each option was rated on a 7-point scale ranging from 0 to 6. (0 was labeled as "not at all clear" and 6 was labeled as "very clear.") Easy in evaluating the alternatives was rated on a 7-point scale ranging from -3 to 3. (-3 was labeled as "very difficult" and 3 was labeled as "very easy"; the mid point was labeled as "neither difficult nor easy.") Finally, the affective reaction induced by the options was rated on a 7-point scale ranging from -3 to 3. (-3 was labeled as "very bad" and 3 was labeled as "very good"; the mid point was labeled as "neither bad nor good.")

### 3.2 Results

*Judgments of attractiveness.* As shown in Table 4, participants' ratings of the attractiveness of each alternative replicated the pattern of results found in Experiment 1. Therefore, in JE, we found that the positive description was judged more attractive than the non-negative description: respectively,  $t(48) = 6.81$ ,  $p < .01$  for cereals, and  $t(48) = 5.98$ ,  $p < .01$  for managers. In SE, no statistically significant difference was found between the two cereal brands, while the non-negative manager was judged more attractive than the positive one ( $p < .01$ ). Both the non-negative cereal brand and manager were judged more attractive in SE than in JE: respectively,  $t(97) = -3.90$ ,  $p < .01$  for the cereal and  $t(97) = -5.70$ ,  $p < .01$  for the manager. In addition, the judgment of the positive cereal was not significantly different in the two evaluation modes, whereas the positive manager was judged significantly less attractive in SE than in JE ( $p = .01$ ). As a consequence, for the two managers we found a reversal. Analyses of variance showed a significant interaction for both pairs of stimuli (see note to Table 4).

*Clarity of feeling.* As shown in Panel 1 of Table 5, the pattern of results for clarity of feeling is consistent with the ratings of attractiveness and also with Hypotheses 3 and 4. In JE, results showed that the positive descriptions induced a clearer feeling than the non-negative descriptions: respectively,  $t(48) = 5.69$ ,  $p < .01$  for cereals, and  $t(48) = 6.14$ ,  $p < .01$  for managers. In SE, no statistically significant difference was found between the two descriptions of the cereals, whereas the non-negative manager induced a clearer feeling than the positive one ( $p = .02$ ). Both non-negative descriptions induced a clearer feeling in SE than in JE: respectively,  $t(97) = -2.11$ ,  $p < .04$  for the cereal brand and  $t(97) = -4.34$ ,  $p < .01$  for the manager. Analyses of variance showed a significant interaction effect for both pairs of stimuli (described in the note to Table 5).

Table 5: Mean clarity of feeling, ease of evaluation and affective reactions (Experiment 2).

Option		Joint Evaluation			Separate Evaluation		
		<i>N</i>	Mean	SD	<i>N</i>	Mean	SD
<i>Panel 1: Mean clarity of feeling</i>							
Cereal	Positive	49	4.86	1.56	50	4.52	1.42
	Non-negative	49	3.22	1.93	50	3.96	1.53
Manager	Positive	49	4.61	1.61	50	3.86	1.13
	Non-negative	49	3.06	1.75	50	4.42	1.34
<i>Panel 2: Mean ease of evaluation</i>							
Cereal	Positive	49	2.39	.95	50	1.84	1.18
	Non-negative	49	.61	1.77	50	1.26	1.43
Manager	Positive	49	2.18	1.17	50	.66	1.47
	Non-negative	49	.45	1.71	50	1.18	1.51
<i>Panel 3: Mean affective reaction</i>							
Cereal	Positive	49	2.07	1.17	50	1.66	1.33
	Non-negative	49	.41	1.70	50	1.44	1.22
Manager	Positive	49	1.96	1.04	50	1.08	1.07
	Non-negative	49	.71	1.24	50	1.60	1.07

NOTE: Interaction effects. Ease of evaluation:  $F(1, 98) = 9.57, \eta^2 = .09, p < .01$  for cereal brands;  $F(1, 98) = 28.78, \eta^2 = .23, p < .01$  for managers. Ratings of feelings clarity:  $F(1, 98) = 6.98, \eta^2 = .07, p < .01$  for cereal brands;  $F(1, 98) = 37.88, \eta^2 = .28, p < .01$  for managers. Affective reaction:  $F(1, 98) = 15.68, \eta^2 = .14, p < .01$  for cereal brands;  $F(1, 98) = 32.29, \eta^2 = .25, p < .01$  for managers.

*Ease of evaluation.* Once again the pattern of results is highly consistent with Hypotheses 3 and 4 (see Panel 2 of Table 5). In JE, participants rated both positive descriptions easier to evaluate than the non-negative descriptions: respectively,  $t(48) = 6.57, p < .01$  for cereals, and  $t(48) = 5.73, p < .01$  for managers. The positive cereal brand was also rated easier to evaluate than the non-negative one in SE ( $p < .05$ ). In SE, the non-negative manager was judged easier to evaluate than the positive one but this difference is only marginally significant ( $p < .09$ ). Both non-negative descriptions were rated easier to evaluate in SE than in JE: respectively,  $t(97) = -2.01, p < .05$  for the cereal brand and  $t(97) = -2.26, p < .03$  for the manager. On the other hand, both positive descriptions were judged less easy to evaluate in SE than in JE ( $p < .05$ ). Analyses of variance showed significant interactions for both pairs of stimuli (see note to Table 5).

*Affective reactions.* Panel 3 of Table 5 shows the mean ratings for the affective reactions induced by each alternative. The pattern of results is consistent with the data found on the other measures and seems to confirm Hypotheses 3 and 4. In JE, the positive descriptions induced a significantly more positive affective reaction than the

non-negative descriptions: respectively,  $t(48) = 5.94, p < .01$  for cereals and  $t(48) = 5.63, p < .01$  for managers. In SE, no statistically significant difference was found between the two cereal brands, whereas the non-negative manager induced a significantly more positive feeling than the positive one ( $p < .03$ ). Both non-negative descriptions of the cereal brand and the manager induced a significantly more positive feelings in SE than in JE: respectively,  $t(97) = -3.49, p = .01$  for the cereal and  $t(97) = -3.81, p < .01$  for the manager. Finally the positive manager induced significantly less positive feelings in SE than in JE ( $p < .01$ ). Once more, analyses of variance showed a significant interaction for both pairs of stimuli (note to Table 5).

### 3.3 Discussion

Experiment 2 results were, again, in favor of the hypothesized shift in the strategy used to process the non-negative description in JE and SE. As expected people found the feeling induced by the non-negative description less clear when this alternative was presented along with an explicitly positive alternative rather than in SE. Consistently,

in JE, this alternative was also rated less easy to judge and induced a less favourable feeling than the positive description. However this difference was not significant in SE. For the pair of managers, the results went even beyond the expected pattern since we found a reversal on almost all dependent variables (for the ease of evaluation the difference in SE was marginally significant).

Overall, the results concerning the clearness of the feeling experienced toward the alternatives suggest that, in SE, the non-negative description is processed in a way that communicates a clearer and more precise meaning. Such a conclusion seems consistent with our reasoning that people process the non-negative alternative using the fusion model when it is presented in isolation rather than paired with a positive comparison. The results from Experiment 2 also fit the hypothesis that people strategically, although not consciously maybe, switch between the schema-plus-tag model and the fusion model. This switch of strategy may meet the individuals' aim of reducing the effort and gaining a more clear cut understanding of the actual state of affairs. In addition, the switch may be facilitated in SE, as people are less likely to think about the positive alternative, so they should not infer that the negation may have been used to emphasize the differences between the two stimuli. Noticeably, participants are almost forced to use the schema-plus-tag model in JE since this is the only way to take into account the potential differences existing between the positive and non-negative descriptions. Indeed, from a conversational point of view, when people are presented with an alternative positively framed and an alternative described in non-negative terms the most obvious inference is that the different formats have been used to communicate the existence of a gap between the two alternatives (Grice, 1975; Glenberg, Robertson, Jansen & Johnson-Glenberg, 1999). Moreover, the two descriptions should induce the receiver of the message to think that the non-negative alternative may be good but not as good as the explicitly positive one.

## 4 Experiment 3

Experiment 2 showed further support for the hypothesis that people use different processing strategies to understand the meaning of a negation depending on the evaluation context. However, we still lack specific evidence about the process that lays behind the evaluations provided by the participants in Experiments 1 and 2. Experiment 3 tries to overcome this limitation by way of a memory task applied to investigate how non-negative attributes are processed and recalled in the two evaluation modes.

To investigate whether the use of the two strategies is

contingent on the evaluation context, participants in Experiment 3 were asked to perform a memory task. We expected that in JE they would recollect most of the attributes associated with the non-negative option as negations of negative features (e.g., "not high carb"), whereas in SE they should recollect many of the same attributes as affirmations.

Therefore, in Experiment 3 we again tested Hypotheses 1 and 2 from the two previous studies as well as the following hypothesis:

H5: If a non-negative alternative is evaluated in JE then its features should be recalled in the same format used to present it (e.g., not high in fat), whereas if a non-negative alternative is evaluated in SE then its features should be recalled with an inverted format compared with the format used to present it (e.g., low in fat).

### 4.1 Method

*Participants and design.* Eighty five Italian undergraduate students (60% females; mean age 22 years) participated in the study. Data were collected in a laboratory setting and individuals participated one at a time. Participants were randomly assigned to one of the three experimental conditions as in the two previous experiments. The experimental design was also the same as in Experiments 1 and 2.

*Materials and procedure.* Participants were presented with three pairs of stimuli; two of them were those used in Experiment 2 (cereal brands and managers), whereas the third stimulus was a pair of cars. Again positive and non-negative descriptions were induced by describing one option in each pair through a list of positive features and describing the other option through a list of negative features which do not characterize it. Each option was described using the same six attributes already presented in the previous experiment. Cars were described using the same six attributes either in positive or non-negative format (see Table 6).

Participants were presented with either one or both alternatives from each kind of stimulus and were asked to rate how attractive they found each alternative as in Experiments 1 and 2. After providing ratings for one stimulus (e.g., cereal brands) and before being presented with the next one (e.g., managers) participants were asked to fill in labyrinths for about six minutes. After completing this filler task participants were asked to list the attributes associated with the alternatives they rated a few minutes earlier (in JE participants had to recall and list the attributes of both the positive and non-negative descriptions). They were only presented with the name of the alternative (e.g., cereal brand A) so they would be free to write the attributes either as negations of negative features (e.g., not high calories) or in the format of an af-



Table 6: Car profiles used in Experiment 3.

Imagine you are looking for a new car. After checking among many different models, you have now reduced your choice to one of two possible cars:	
<b>Car A [Positive Option]:</b> This car is characterized by these features:	<b>Car B [Non-negative Option]:</b> This car is <u>not</u> characterized by these features:
<ul style="list-style-type: none"> <li>• Low fuel consumption</li> <li>• Low air pollution</li> <li>• High comfort</li> <li>• Low noise</li> <li>• High discount on the starting price</li> <li>• High safety standards</li> </ul>	<ul style="list-style-type: none"> <li>• High fuel consumption</li> <li>• High air pollution</li> <li>• Low comfort</li> <li>• High noise</li> <li>• Low discount on the starting price</li> <li>• Low safety standards</li> </ul>

firmation (e.g., low calories). The order of presentation of the three pairs of stimuli was counterbalanced within each experimental condition.

*Dependent measures.* Participants rated the attractiveness of each alternative on a 9-point scale ranging from -4 to 4 as in the previous experiments.

The memory task required participants to recollect the attributes associated with each alternative. For the analysis, we computed an average index of the way people remembered the attributes. We gave a value of one to each attribute recalled as a negation of a negative feature, and we gave a value of zero to each attribute recalled as an affirmation. Then we computed the average measure of recall within each participant and separately for each stimulus. Therefore, the final index of how features were recalled was a percentage ranging between zero and one and it was computed as the percentage of times the attributes were recalled as negations of negative features. That is, scores closer to zero indicated the use of the fusion model whereas scores closer to one indicated the use of the schema-plus-tag model. On average, only 17% of attribute recollections were in error. Therefore, since participants' recollections were quite accurate, we decided to treat these errors in the way the attributes were recollected as missing data. People made two types of errors. On some occasions, participants inverted the value of the attributes but without dropping the negation tag (e.g., "not high in fat" recollected as "not low in fat"). On other occasions, participants recollected the correct attribute but dropping the negation tag (e.g., "not high in fat" recollected as "high in fat"). Despite our expectation of finding a high number of errors of the second type (dropping of the negation tag), the most frequent errors were those of the first type. It is possible that these errors were due to

the specific task as people were required to recollect six attributes in SE and twelve attributes in JE (six for each alternative; no errors were made for the positive alternatives). The errors were more frequent in JE, especially for the manager. It is possible that the participants found the memory task a bit too demanding and therefore ending up making some unexpected errors.

Non-negative features were remembered as negative attributes (e.g., the attribute "not high in fat" remembered as "high in fat") only in four occasions. Interestingly, despite expecting many of these errors in JE when people were supposed to use the schema-plus-tag model, three out of four of these errors happened to be in SE. In every case the negation tag was dropped from one of the attributes describing the non-negative car, whereas this type of error was never made when participants were asked to recollect the features associated with a non-negative cereal brand or manager. It is possible that the low frequency of attributes recollected without a negation tag (e.g., high calories) may have depended on the relatively short time (six minutes) that elapsed before the memory task. If the delay before the recollection had been longer, the number of times the negation tag was dropped might have been higher.

## 4.2 Results

*Ratings of attractiveness.* Once more, results showed the same pattern as in the previous experiments. In JE, options characterized by non-negative features were judged significantly less attractive than those characterized by positive features, and the non-negative descriptions were rated more attractive in SE than in JE. Finally, in SE, the difference between positive and non-negative descriptions was not statistically significant within any pair of

Table 7: Mean recall scores for the attributes associated to each of the non-negative frame options in JE and SE

	Joint Evaluation			Separate Evaluation		
	<i>N</i>	Mean	SD	<i>N</i>	Mean	SD
Car	25	.61	.47	27	.24	.38
Cereal	25	.55	.48	27	.17	.33
Manager	22	.59	.50	27	.26	.40

Notes: All entries represent the percentage of times that an attribute was recalled as a negation of a negative feature.

stimuli. We did not replicated the preference reversal found between the two managers in Experiment 2. However, in SE, the non-negative manager was rated higher than the positive one, but these differences were not significant. Therefore, the different results found, for the managers, in Experiment 3 compared with Experiment 2 may depend on the smaller number of participants tested.

*Recall of the attributes.* The average index of the way people remembered the attributes associated with each option is shown in Table 7. As expected, recall fit the schema-plus-tag model better in JE than in SE. For instance, the first feature associated with the non-negative car was related to the fuel consumption (see Table 6). In JE, most participants (66.7%) recalled this feature as a negation of a negative attribute (“not high in fat”) while in SE most participants (82.4%) recalled the same feature as an affirmation (“low in fat”). Therefore, when non-negative options were presented in isolation people appeared to use the fusion model more often than the schema-plus-tag model. Such a pattern of results supports Hypothesis 5. The differences between the scores found in the two evaluation modes are significant for all the non-negative descriptions ( $p < .02$ ).

## 5 General discussion

In three experiments we showed that the way people process negations is contingent on the evaluation mode (joint versus separate). In addition, the different strategies used to process negations can influence people’s affective reactions and induce them to show inconsistency of preference. Indeed, previous work on the role of emotions in decision-making showed that affective reactions are often used as a cue to decide which alternative is the best to choose (see Peters, 2006 for a review). Therefore, finding that affective reactions can be influenced by the cognitive processes used to comprehend a sentence means that such cognitive processes are likely to have an effect on people’s behaviors, too.

Experiment 3 provided confirmation of the different

processes hypothesized to influence the comprehension of negations in the two evaluation contexts. One of the main reasons behind the switch people made between the schema-plus-tag and the fusion model might be related to inferences induced by conversation norms in JE but not in SE (Grice, 1975; Glenberg et al., 1999). Indeed, when a non-negative description is paired with an explicitly positive one the receiver of the message may infer that the non-negative format has been used to underline the differences between the two stimuli. For instance, it is reasonable to think that, in JE, the receiver of the message might be induced to believe that the non-negative format (“not high in fat”) has been used to suggest that this alternative is characterized by an average quantity of fat and is, therefore, not as good as the positive one (“fat-free”) with which it is directly comparable. From a more practical point of view, because of this type of inference by the receiver of the message, such a solution may be used by a company to present an advertisement describing its product in positive terms and the products of the competitors in a non-negative way.

On the other hand, in SE, people are free to use both models but end up using the fusion model probably because it allows them to have a more precise understanding of the non-negative description. By inverting a negation into an affirmation (e.g., processing “not high fat” as “low fat”) participants are able to focus on a feature that they perceive as an actual quality of the non-negative alternative. In accord with such an explanation, the present findings suggest that the fusion model constrains the interpretation of the message toward the positive side of the good/bad continuum. In addition, by activating associations with the actual state of affairs, the fusion model induces positive affective reactions which, in turn, make the non-negative description significantly more attractive in SE than in JE. On the other hand, the schema-plus-tag model would only allow people to bear in mind what is not characterizing the non-negative alternative, leaving them with a fuzzier image of that stimulus.

It is noteworthy that the kind of attributes used in the present study are different from the concepts used in pre-

vious studies on the processing of negations (e.g., Kaup et al., 2006a). In fact, a negation may induce different types of inferences. For instance, if a person says that a door is not closed, that can mean only that the door is open. Therefore, in such a circumstance using the schema-plus-tag model or the fusion model may lead to rather small differences in people's understanding of the sentence and reactions to it. The only difference should arise from the type of associations activated by the two models (congruent with the negated state of affairs for the schema-plus-tag model and congruent with the actual state of affairs for the fusion model). However, in the present study we presented alternatives characterized by the presence/absence of attributes that were, in most of the cases, not clearly bipolar. In other words, the attributes we used are usually qualified by an adjective (e.g., high or low) and can be represented along a continuum. Experiment 2 showed that, using these type of attributes, the schema-plus-tag model induces a less clear understanding of the non-negative alternative. Consistently, people found this alternative more difficult to judge in JE than in SE. Future studies should investigate whether the typology of attribute used to describe a non-negative stimulus has a role in modulating people's affective reactions in JE and SE or not.

It is also important to observe that the present findings are difficult to explain through the "evaluability hypothesis" proposed by Hsee to account for JE/SE inconsistency. Despite finding a preference inconsistency induced by the way negations are processed in JE and SE, we also found that people judged the non-negative description as easier to evaluate in SE than in JE. However, no difference was found on how easy to evaluate the positive alternative was in JE and SE. In contrast with our findings, the evaluability hypothesis suggests that some attributes are easier to evaluate in JE, where different alternatives can be compared to each other, than in SE, where no comparisons are available. For instance, Hsee (1996) showed that a group of students asked for their willingness to pay for a used dictionary, in SE, preferred a product with 10,000 entries and looking like new to a product with double the entries of the first but also characterized by a torn cover. In SE, the number of entries is difficult to evaluate and both dictionaries look like they have a lot of items, whereas the presence of defects is very easy to judge even without a comparison. On the other hand, in JE the number of entries is extremely easy to judge and people are more willing to pay for the dictionary with more entries despite its torn cover. Hence, Hsee's results are quite the opposite to those found in the present paper. It is likely that this difference arises from the fact that our attributes are all constructed in the same way therefore it is not possible to distinguish between features that are easy or difficult to evaluate. Therefore, the way we

constructed the alternatives is likely to have led people to make their evaluations on the basis of their overall impression of the stimuli rather than concentrating on specific attributes. In addition, the shift from one processing strategy to the other and the different associations that these strategies activate for all the attributes should have induced people to perceive the non-negative alternative, rather than specific features, as less easy to evaluate in JE than in SE. For this reason we decided to talk about non-negative and positive descriptions instead of focusing on the specific attributes describing each alternative. Indeed, the pattern of results was the same when we used exactly the same attributes to describe positive and non-negative alternatives (as we did both for the cars and the managers) and when we used partially different attributes (as we did for the two cereal brands, as shown in Table 1).

Future research should address some open questions. A first issue deals with the explanation we provided for the preference inconsistency observed in the present study. We believe that the main explanation for our findings is the shift of strategy used to process the negations in the two evaluation modes. However, the reader may wonder whether other cognitive mechanisms are involved either as additional explanatory factors or alternative accounts for the present findings. For instance, simple contrast effects might possibly explain the results. Such a conclusion could arise from the recognition that, besides finding a significant difference in JE, in many cases we found a small difference between positive and non-negative alternatives in SE, too. This may mean that, in SE, people prefer the positive alternative but are not able to appreciate the difference between the two stimuli to the extent of showing a significant preference for the positive description over the non-negative one. On the other hand, the difference becomes stronger in JE as people, comparing the two alternatives, are able to better differentiate between them. We acknowledge that such a contrast effect may play a role in the type of effect obtained in the present study. However, we find difficult to consider it as the main explanation of the present results. In fact, in Experiment 2 the non-negative manager was evaluated more favorably than the positive one in SE. Therefore, future studies should investigate whether contrast effects are involved at all or if they are involved only for particular types of stimuli (i.e., only for products like cereals or cars).

Finally, one may ask whether our findings can be generalized also to other domains in which negations are not involved. Similar findings could be found presenting ambiguous and clear alternatives in JE and SE. Of course, in such a circumstance the preference inconsistency cannot be explained by the shift in the strategy used to process a negation. However, to the extent that a non-negative description processed using the schema-plus-tag model

does not allow one to state clearly which characteristics define that alternative, then it could be defined as an ambiguous object. Therefore, it is plausible to expect that ambiguous alternatives will induce less positive affective reactions when they are paired with clear options rather than in separate evaluation. Indeed, previous findings by Fox and colleagues (Fox & Tversky, 1995; Fox & Weber, 2002) seem to suggest that this hypothesis is correct; yet these studies did not measure people's affective reactions, hence further work is needed to understand whether ambiguity may have a role in a type of JE/SE inconsistency similar to the one described in the present paper.

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