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## How Judgments Change Following Comparison of Current and Prior Information

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### Abstract

Although much observed judgment change is superficial and occurs without considering prior information, other forms of change also occur. Comparison between prior and new information about an issue may trigger change by influencing either or both the perceived strength and direction of the new information. In four experiments, participants formed and reported initial judgments of a policy based on favorable written information about it. Later, these participants read a second passage containing strong favorable or unfavorable information on the policy. Compared to control conditions, subtle and direct prompts to compare the initial and new information led to more judgment change in the direction of a second passage perceived to be strong. Mediation analyses indicated that comparison yielded greater perceived strength of the second passage, which in turn correlated positively with judgment change. Moreover, self-reports of comparison mediated the judgment change resulting from comparison prompts.

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People encounter persuasive messages on many important issues, including business, health, politics, and social policy. Some of these messages contradict or support conclusions recipients reached based on prior messages, suggesting the need for a careful understanding of the impact of new messages that either support or contradict prior ones. For example, voters often confront new information that challenges (or supports) their initial views of a candidate and consumers often confront advertisements that challenge (or support) their views of particular products and brands. A new message may produce change because people consider it in light of a prior message (see Sherif & Hovland, 1961; for a review see Johnson, Maio, & Smith-McLallen, 2005) even though change may also result from reaching a conclusion from the current message without ever remembering the prior one (for arguments about online judgment construction, see Schwarz & Bohner, 2001; see also Wyer & Albarracin, 2005; Crano & Prislin, 2006). Therefore, knowledge of the conditions triggering change *after consideration of the prior judgment* is critical to a complete understanding of judgment change processes.

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One mechanism that can produce change to a prior judgment is *comparison* between two pieces of information associated with an object based on some dimension. Comparing prior and new information about an object (i.e., determining similarities and differences) should facilitate integration of prior and new evaluations and may produce true change to a previously stored judgment. The new and prior information sets may be compared on the extent to which each is strong, the extent to which each suggests that the object is positive, or both. But what would be the effects of this comparison on resulting judgments? For example, finding that prior and new information lead to the same conclusion can sometimes polarize that conclusion in ways not possible by mere integration without comparison. Moreover, finding that new information is credible even in light of contradictory prior information may lead to greater change in the direction of the new information than considering the new information in isolation or comparing but finding that the new information is weak. We propose that comparison of current information with past information can lead to both polarization in the direction of the initial information and change away from the initial information because of relative changes in the weight (how strong each piece is) and value of the new information (how much each piece suggests that the object is positive). Up to now, however, little if any research has addressed the effects of comparison on judgment change.

## The Nature and Effects of Comparison

People often change their judgments not because the earlier information is questioned, but rather, because judgments are formed anew when a judgment is necessary. For example, people's approval of a policy may shift over time due to changes in how their judgment is constructed (Schwarz & Bohner, 2001). Information about the favorable outcomes of a policy may bring about its initial approval, but later information about negative consequences of the same policy may prompt disapproval. In these situations, although there is an objective change in the expressed judgments, there is no change *upon consultation of the prior information*. Prior premises are neither confirmed nor denied because they are not considered at all.

Despite the wide applicability of this type of judgment construction (Bem, 1965; Schwarz & Bohner, 2001), change with a reconsideration of the prior information should also be possible. Somewhat surprisingly, however, comparison as a potential mechanism underlying this change has been neglected by prior research. Suppose that people try to decide if two pieces of information are equally supportive of a policy. When people compare currently and previously available information about a policy on how strongly the information supports the policy, judgment change might unfold, even under conditions that normally trigger minimal if any change. For example, judgments about a policy may become more positive when people compare favorable prior with strong new information on the policy relative to when people consider the new information alone.

At least two potential processes may mediate the influence of comparison on judgment change. One process may entail altering individuals' trust in the current information after comparing prior with current information. People who compare prior information with current, consistent information may see the current information as stronger (i.e., more valid) because it matches the prior information. The current information may be seen as corroborating prior impressions and generate the conclusion that the current information is stronger because it is supported by the prior information. As a result of perceiving the current message as stronger, the message can elicit more change toward its implications. Hence, evaluations may become more favorable following a comparison (vs. no comparison) of favorable prior and current information.

Likewise, albeit through a different strengthening mechanism, current information may occasionally become more influential after comparison with prior, *conflicting* information. For example, new information may be perceived as more convincing and deserving of greater trust when it remains credible after a comparison against prior, conflicting information. This possibility is of course contingent on the current information withstanding a challenge (from the prior information) and thereby means that the current information must be difficult to argue against (i.e., be of high quality). For example, prior research shows that information that remains credible following a persuasive attack actually appears more compelling and valid after that attack (Papageorgis & McGuire, 1961; Tormala & Petty, 2002). For example, in one classic demonstration of this principle (McGuire, 1964), mild, unsuccessful attacks against popular truisms (e.g., to brush one's teeth regularly) enhanced the perceived validity of these truisms as evidenced by less judgment change following a subsequent attack. Hence, new *strong* negative information about a policy may appear stronger and have more influence over subsequent judgments after a comparison (vs. no comparison) with prior positive information about the same policy. New information that is perceived to be weak, however, should not have this influence and may actually help to strengthen the initial judgment (Lord, Ross, & Lepper, 1979). Thus comparison could lead to polarization of the initial judgment rather than openness to the new, contradictory information.

The second process may entail changes to the perceived position of the information that is corroborated or discredited following a comparison. In addition to changes in the perceived strength of the new information, comparing new and prior judgment-related information may sometimes cause distortions in perceptions of the implications of the new information (Sherif & Hovland, 1961). For example, when the new information contradicts prior information, the two sets of information may appear more discrepant in direction due to the comparison. Such perceptual distortions may alter the perceived direction of the information to a greater extent when this information is juxtaposed to the old information than when it is not.

Information-integration theory (Anderson, 1959) and social judgment theory (Sherif & Hovland, 1961) have served to model judgment change but have not explicated what ultimately influences how information becomes integrated. According to Anderson's *information-integration theory*, if a person receives  $n$  items of information, the response ( $R$ ) to the set of items ( $s, i \dots n$ ) is given by  $R = w_0s_0 + w_1s_1 + w_2s_2 + \dots + w_ns_n$ , where  $w_j$  are the weights and  $s_j$  are the scale values of each item. In our context, the strength (or weakness) of the information may be a subjective measure of its weight, whereas the information's perceived direction may be a measure of its scale value. Then comparison, which was not considered by Anderson, may lead to changes in either or both the weights or the scale values. Furthermore, social judgment theory (Sherif & Hovland, 1961; see Johnson et al., 2005) assumed that a perceptual comparison between prior and new information always takes place, and thus included no speculation about what can trigger comparison. In any case, comparison is theoretically different from integration, as two elements could be simply averaged without the weights or scale values being altered in relation to each other. This relative altering of the two elements is possible only via comparison, which was the subject of this paper.

Notably, research on comparative processes in judgment change has addressed comparisons among different issues or objects but not comparisons between sets of information about a single issue. For example, comparing a target object with other objects, such as comparing a product with the same product of a competing brand, triggers more impact of the information than simply analyzing the target object (Gentner & Markman, 1997; Muthukrishnan, Pham, & Mungalé, 1999; Muthukrishnan, Pham, & Mungalé, 2001;

Sanbonmatsu, Kardes, & Gibson, 1991). Although this prior work explored the effects of how new information is presented, the key comparison **between** prior and current information about a single object was not the focus of **past** research. The present work thus attempted to fill this gap and dovetails well with research on temporal self-comparisons (Albert, 1977; Zell & Alicke, 2009) although in an entirely different domain and with different predictions.

Other relevant research shows greater judgment change when new, persuasive information is comparable to the prior information (on which the initial judgment was based). For example, people who form judgments based on affective experiences (rational arguments) are subsequently more persuaded by new, affective experiences (rational arguments) than rational arguments (affective experiences) (Edwards, 1990; Edwards & von Hippel, 1995). As another example, people who form judgments of products to convey a positive image to an audience are subsequently more persuaded by advertisements that highlight image (vs. quality) information on the products (Snyder & DeBono, 1985). Although the processes responsible for these findings remain a mystery, the findings seemingly suggest the importance of the comparison processes that we formally explore in this research.

## Present Research

This paper presents four experiments investigating the role of comparison processes in judgment change. In each of the experiments, participants formed and reported initial judgments of a policy based on favorable written information about it. Later, they read a second passage containing new favorable or unfavorable information about the policy. In the first experiment, we presented the new information about the target policy along with the initial information (see Bruine de Bruin & Keren, 2003). Specifically, we presented participants with an initial passage advocating the institution of comprehensive exams at their university, after which they reported their judgments of the proposed policy. Following a brief delay, participants received a second passage also advocating the institution of comprehensive exams, which either included the initial information along with the new information (comparison inducement) or only included the new information (no-comparison inducement). After receiving the second set of passages, participants reported their judgments of the policy one more time. We expected that re-presenting the initial information along with the new information would increase the likelihood that participants would engage in comparison. We expected more positive attitudes toward the policy in the comparative presentation than the non-comparative presentation. We measured perceived information strength and direction as potential mediators of the judgment change process.

In Experiments 2 and 3, we used more direct manipulations of comparison by instructing some participants to compare the second set of information (all new information) with the initial information. Experiment 2 examined the possibility that participants who receive two positive sets of information may become more positive toward the policy when they received comparison instructions. Experiment 3 included a test of this possibility, but also contrasted it with judgment change when the new information set is negative and tested whether the effect of comparison depends on the perceived strength of the second information set. We predicted that comparison with new strong information would produce polarization in the positive direction when the new information is positive, but also more change in the negative direction when the new information is negative. This effect, however, should be confined to situations in which the second information set is perceived to be strong. Contradictory information that is perceived to be weaker may actually produce change in the direction of the initial judgment.

Experiment 4 replicated the negative information conditions of Experiment 3. However, Experiment 4 included a direct check for comparison processes. Following the final judgment measure, participants were asked questions about their attempts to determine if the first and second passage agreed, their recollection of the earlier passages (when reading the second passage set), and their comparison of their initial judgment with their earlier one. A resulting self-reported index of comparison processes was examined as a mediator of the effect of the comparison manipulation. Throughout the studies, we measured potential effects of our comparison manipulations on the degree to which participants exerted effort and thought about the second set of information, as comparison implies attention to the relation between prior and current information rather than mere elaboration of the second set.

## Experiment 1: Subtle Comparison Inducement

Experiment 1 tested the possibility of judgment polarization when people compare prior judgments with new consistent information. Participants formed and reported an initial judgment about a proposal to institute comprehensive exams on the basis of strong pro-exam information, and later received new strong information supporting comprehensive exams before reporting their judgment again. The experiment was designed to manipulate the degree to which participants compared their initial judgments with the new information they received. We expected that, compared to a control condition, participants who were induced to compare the initial pro-exam information with new pro-exam information would develop and report more positive exam judgments at the end of the experiment.

### Method

**Participants**—Seventy-six introductory psychology students (82% female) participated for course credit. The design had two cells (comparison or no-comparison).

**Procedure**—The experiment was administered by computer with *MediaLab* software (Jarvis, 2002). Each participant within an experiment session worked on individual computers separated by partitions. Participants were informed that they would read information about a proposed policy shift at the university. According to the information given to participants, the Board of Regents would soon meet to decide whether to approve a proposal to institute comprehensive exams as a graduation requirement for undergraduates. Participants received two messages separated by a time interval and reported their attitudes after the first and the second message.

**Presentation of initial information:** Judgment formation was induced at the beginning of the experiment session by having participants read two pro-exam arguments ostensibly excerpted from the comprehensive exam proposal. One of the excerpts indicated that the average starting salary of graduates increased over \$4000 during the two-year period in which the exams were held at another university. The other excerpt stated that scores on achievement tests had increased over the last five years for the universities with comprehensive exams. After reading these two arguments, participants reported their judgments of comprehensive exams.

**Time interval questionnaire:** After participants reported their initial exam judgment, they responded to a lengthy questionnaire (88 items from personality scales) that served the purpose of placing temporal distance between participants' initial judgment formation and the subsequent presentation of additional exam information. This time interval questionnaire was utilized in all studies.



**Second information set and comparison manipulation:** After completing the time interval questionnaire, participants learned that they would next read an additional set of excerpts from the comprehensive exam proposal. They were told that these new excerpts were not shown earlier because people tend to experience information overload when they are asked to process too much information at once. The new information stated that financial contributions to the university would improve significantly if the exams were instituted, and that the grade point average of undergraduates would increase just as it had at other universities that implemented the policy. When participants finished reading the second information set, they reported their exam judgments for the second time.

The content of the second set of pro-exam information constituted the experimental manipulation. For participants assigned to the no-comparison condition, the second passage set contained two new excerpts. For participants in the comparison condition, the second information set contained four passages: the two excerpts they had viewed previously, followed by the two new excerpts also viewed by participants in the no comparison condition. We expected that reading both sets of passages would increase participants' tendency to compare these two sets.

### Dependent Measures

**Judgments:** Participants reported their judgments before and after the comparison manipulation by answering 12 items, each of which offered a 10-point (0 to 9) scale for responses (see Albarracin & Kumkale, 2003; Albarracin & Wyer, 2001). For example, participants had to judge the institution of comprehensive exams as something *bad or good*, *unpleasant or pleasant*, something they *did not like or liked*, something that made them *angry or not angry*, and something that made them *not happy or happy*. Responses to these items were averaged to create a single judgment score for each participant (mean Cronbach's  $\alpha = .96$  across all experiments). We expected that recipients of the comparison manipulation would show more positive judgment change than other participants.

**Perceived information strength:** Before the judgment measure, participants rated the strength and persuasiveness of the two excerpts in the second passage set on a scale from 0 (*not at all*) to 9 (*extremely*). We combined these two excerpt ratings ( $r > .70$  in all experiments) to create an index of perceived information strength.

**Perceived information direction:** After the evaluation measure, participants rated the extent to which the first and second passages were supportive of comprehensive exams on a scale from 1 (*not at all*) to 9 (*extremely*).

**Amount of effort:** Also before the evaluation measure, we included an item to capture self-reported amount of effort devoted to reading the second passage ("To what extent did you make an effort to think about the last two excerpts you received?"). This response was provided on a scale from 0 (*not at all*) to 9 (*extremely*). This item was used to see if our manipulation might have increased general effort, as it is sensitive to both distraction and personal relevance manipulations (Albarracin & Wyer, 2001).

**Demand effects probe:** At the end of the study, participants were asked to guess the hypotheses they believed the study was testing. We used these open-ended responses to assess potential demand effects of the manipulation. If participants believed that we were seeking to confirm that people change (or maintain) their judgments, they might be more likely to change (or maintain) their judgments.

## Results and Discussion

**Pilot Testing of Passages**—To ensure that the passages in both information sets were equivalent in terms of information strength, we conducted a pilot study ( $N = 43$ ) in which participants viewed all four pro-exam proposal excerpts in succession, then rated the strength of each passage. The pilot study revealed that the perceived strength of the two passages used as the first and second information sets was above the 4.5 midpoint of the 0 to 9 response scale ( $M_s = 1.53$  and  $1.54$ ), both one-sample  $t_s(42) > 5.05$ ,  $p < .001$  in both cases. Moreover, the ratings for the first and second information sets did not differ from each other, paired  $t(42) = 0.67$ , *ns*. This finding conclusively supports the notion that the two information sets did not differ and that any judgment changes must be due to how the sets were presented rather than the nature of the sets. Moreover, our predictions concern the effects of presenting the first set twice or once on judgments of the second set, rather than simple differences between the first and second information set.

**Judgment Change**—We predicted that participants' judgments would become more favorable after viewing the second information set to the extent that the structure of the second information set facilitated comparison between the implications of the initial and new information. We thus analyzed change in judgments as a function of our comparison manipulation.

The mean initial evaluation score was 4.94 ( $SD = 1.65$ ). Initial (premanipulation) judgments did not vary across experiment conditions,  $F < 1$ , suggesting successful randomization. To assess the impact of the comparison manipulation on judgment change, we computed change scores by subtracting judgments following the presentation of the initial information from judgments following the presentation of the second information set. We then analyzed the impact of the manipulation on change using analysis of variance.<sup>1</sup> As expected, this analysis showed that participants in the comparison condition showed more positive judgment change than participants in the no-comparison condition ( $M_s$  change =  $0.48$  vs.  $-0.10$ ),  $F(1, 74) = 6.97$ ,  $p = .01$ . A comparison of each mean difference against a zero change standard indicated significant evaluation change in the comparison condition,  $p = .006$ , but not in the no-comparison condition,  $p = .49$ .

**Perceived Information Strength**—One mechanism that may underlie the effects on judgment change is that participants who analyze the strength of the second set in relation to an initial, similar set have corroborating information and thus may increase their trust in the information. We therefore examined whether increases in the perceived strength of the second information set induced by the comparison manipulation were responsible for the observed changes in judgments. The passage strength ratings of participants in the comparison condition were significantly higher than the strength ratings made by participants in the no-comparison condition ( $M_s = 6.80$  vs.  $5.59$ ),  $F(1, 74) = 8.86$ ,  $p = .01$ . A mediation analysis is summarized in Figure 1. According to a bootstrapping of indirect effects corresponding to this model, perceived passage strength was a plausible mediator of the effects of the manipulation on evaluative judgment change (95% CI = 0.01 to 0.20). Nonetheless, mediation analysis is a correlational procedure, and, both here and in subsequent studies, this model was indistinguishable from a model in which evaluation change is the mediator and second passage strength is the outcome. However, subsequent studies continued to measure alternative processes that may produce this effect (i.e., effort, thought about the second passage), and Experiment 4 measured reported comparison in a

<sup>1</sup>The statistical significance of reported effects found with ANOVA models using raw change scores as the dependent variable (posttest minus pretest) was not meaningfully changed when ANCOVA models (dependent variable = posttest; covariate = pretest) were used to detect change.



direct fashion. Nonetheless, this first study implied that the comparison manipulation had changed the perceived strength of an information set that was selected to be strong to begin.

**Perceived Direction of the Information and Amount of Effort**—We also analyzed the perceived direction of the information sets and perceived effort as a function of the comparison manipulation. These measures were not affected by the manipulation here or in any subsequent study,  $F < 1$ . Therefore, they receive no further attention.

**Demand Probes**—Most participants thought that the study was simply examining judgments of comprehensive exams, but some thought that the study had something to do with evaluation change or maintenance. Of the 37 participants in the comparison condition, five guessed that the study pertained to evaluation change or stability. Of the 39 participants in the no-comparison condition, seven guessed that the study pertained to judgment change or stability. When these 12 participants were removed from the sample, the experiment manipulation still predicted judgment change,  $F(1, 62) = 5.60, p = .02$ , and the mediational analyses was also significant. Demand effects were similarly ruled out in subsequent studies, but are not covered for the sake of brevity.

**Discussion**—Briefly, as predicted, participants who received the new information in an easy to compare format developed more positive judgments than participants who did not receive the information in this format. Importantly, of the two mechanisms that could underlie these effects, only perceived information strength seemed to play a role. In contrast, the perceived direction of the information was not contingent on our comparison manipulation.

One aspect of this study deserves consideration, however. It is conceivable that a second passage repeating previously seen information could have been subjectively stronger than a second passage without repetition merely due to the repetition and not due to joint consideration of the information. Although the remainder of the studies directly manipulated processing instructions to induce comparison, the joint presentation used in Experiment 1 is often used to promote comparison in natural conditions. Therefore, there is ecological value in this manipulation even though the comparative process could not be ensured. Later manipulations were more direct and the last experiment also included a direct measure of comparison between the current and prior information.

## Experiments 2 and 3: Direct Comparison Instructions

### Experiment 2

In Experiment 2, we induced comparison directly by giving participants explicit instructions to compare the initial information to new information. We expected that this modified comparison inducement would lead to evaluation polarization as in Experiment 1 because both the initial and new information supported the exam. Specifically, we predicted that participants who received explicit comparison instructions would tend to show more positive evaluation change than participants who did not receive comparison instructions.

### Method

**Participants**—Eighty introductory psychology students (74% female) participated for course credit. The design included a comparison condition and a no-comparison condition.

**Procedure**—The information sets were the same equivalent sets shown to participants in the no-comparison condition in Experiment 1 (two pro-exam proposal excerpts followed by two new pro-exam excerpts). Participants reported their attitudes initially after the first

passages and then later after the second set of passages, albeit using different scales. After reading the first excerpts and reporting judgments for the first time, participants in comparison conditions were first shown the scale number they had earlier chosen in response to the statement, “The institution of comprehensive exams is something *I like/I dislike*.” That is, the question was represented and participants viewed their prior answer again. These participants were then asked to think about how their prior evaluation of comprehensive exams (formed after they read the first two excerpts) compared with their new thoughts about comprehensive exams.

**Dependent Measures**—Experiment 2 included all of the same measures used in Experiment 1, but the response scales were modified. Specifically, we varied the scales to minimize participants' concern about maintaining or avoiding response consistency after being reminded of their initial reported judgment. Thus, participants provided premanipulation responses on 1 to 7 scales and posttest responses on 1 to 11 scales.

## Results and Discussion

**Judgment Change**—Initial evaluative judgments (after the first set of excerpts) had a mean score of 4.03 ( $SD = 1.03$ ), and did not differ across experiment conditions,  $F < 1$ . Because assessing evaluation change in Experiment 2 involved comparing measures that used different response scales, we analyzed change with analysis of covariance (ANCOVA) that included posttest evaluations as the dependent variable and initial evaluations as the covariate. When the effect of the experiment manipulation was entered in the ANCOVA, the analysis revealed a significant effect of the comparison manipulation on judgments,  $F(2, 77) = 7.43, p = .008$ . Means indicated that participants in comparison conditions had significantly more positive posttest exam judgments than participants in the-no comparison condition ( $M_s$  [adjusted for Time 1 evaluations] = 6.78 vs. 5.93).

**Perceived information strength:** The experimental manipulation had a significant impact on the perceived strength of the second information set,  $F(1, 78) = 5.36, p = .02$ . Participants in the comparison condition viewed the second excerpt set as stronger ( $M = 8.15$ ) than participants in the no-comparison condition ( $M = 6.98$ ). Moreover, a bootstrapping analysis of indirect effects supported that perceived information strength mediated the effect of the comparison inducement (95% CI: 0.07 to 0.56). This path analysis is summarized in Figure 2.

**Discussion**—In Experiment 2, as in Experiment 1, comparing the information linked to prior evaluations with new information produced judgment polarization. Moreover, the evaluation change was mediated by changes in the strength of the second information set, suggesting that the comparison might have altered these perceptions.

## Experiment 3

Experiments 1 and 2 demonstrated that a direct comparison instruction produced judgment polarization. However, given that the second set of information had the same evaluative implications as the first, it is plausible that the comparison instructions could have caused the initial judgment to become more polarized without any involvement of the second information set (Tesser, 1978). Specifically, just thinking about a piece of information can produce polarization, and so our procedures could have elicited this effect (Tesser, 1978). Thus, Experiment 3 was designed to contrast polarization following positive information from change following negative information that is perceived to be strong. For this purpose, the comparison instructions used in Experiment 3 were crossed with two types of information presented after the comparison instructions. Only the instructions but not the representation of the prior response were used in subsequent experiments. In one condition,

participants received information favoring the comprehensive exam policy both initially and after the comparison instructions. In the other condition, participants who previously received favorable information received new information attacking this policy.

## Method

**Participants**—One hundred and eighty two introductory psychology students (64% female) participated in the study for course credit. The design was a 2 (comparison vs. no comparison)  $\times$  2 (direction of new information set: positive vs. negative) factorial.

**Procedures and Measures**—The two comparison levels were achieved by either introducing the comparison instructions or not. Specifically, before receiving the second passage, participants in comparison conditions were told that, while reading the message, they would have to think about how their previous evaluation of comprehensive exams (formed after you read the first two excerpts) compared with their new thoughts about comprehensive exams. Participants in the no-comparison condition did not receive these instructions.

The initial information was the same used in the earlier studies. However, the new information was either the same as in the earlier studies (i.e., positive in direction) or opposite in direction to the initial information (i.e., negative in direction). The new anti-exam passage implied that comprehensive exams interfere with students' motivation and ability to learn important material not covered by the exam. Pretestings of passages presented simultaneously in counterbalanced order showed that the selected information sets were opposite in direction to the first but, once again, equivalent in strength. The questionnaire measures were the same as in Experiment 1 except that responses were provided on scales from 1 to 9.

## Results and Discussion

**Evaluation Change**—The mean evaluation score before the comparison and information direction manipulation was 4.63 ( $SD = 0.13$ ) and did not vary significantly as a function of either the comparison instructions or the direction of the second information set,  $F$ s for main effects and interaction  $< 1$ . Judgment change was analyzed as a function of the comparison instructions and the direction of the second information set. The relevant means appear in Figure 3. Not surprisingly, there was a significant effect of information direction demonstrating that the negative information produced more negative change than the positive set ( $M$ s =  $-0.45$  vs.  $0.19$ );  $F(1, 178) = 13.26, p < .001$ . Also, as expected, a significant interaction between the comparison instructions and the direction of the second information set was obtained,  $F(1, 178) = 8.37, p < .001$ . As shown in Figure 3, positive information yielded polarization in the positive direction when participants received comparison instructions but not otherwise ( $p$  for contrast across comparison conditions = .05). Correspondingly, negative information yielded greater change in the negative direction when participants received comparison instructions than when they did not ( $p$  for contrast across comparison conditions = .03). When the mean change in comparison conditions was compared with zero standards, one-sample  $t$ -tests indicated significant differences for positive information ( $p = .015$ ) as well as negative information, ( $p = .001$ ). There were no differences from zero in either of the no-comparison conditions ( $p > .35$  in both cases). Again, this supports judgment stability in no comparison conditions but polarization and change when people compare strong new information with a prior point of view.

**Perceived Information Strength**—The experimental manipulations also had a significant impact on the perceived strength of the second information set,  $F(1, 180) = 4.56, p = .03$  but no main or interactive effects of information direction. Participants in the

comparison condition viewed the second information set as stronger ( $M = 6.19$ ) than participants in the no-comparison condition ( $M = 5.55$ ). Importantly, perceived strength of the new information mediated the effects of the manipulation on evaluation change. For simplicity, the mediation analysis was conducted after rescored evaluation change in the negative-information condition in a way that more positive scores reflected greater evaluation change in the direction of the second information set. The relevant findings are presented in Figure 4 and bootstrapping procedures to estimate indirect effects suggested that information strength correlated with evaluation change (95% CI = .02 to .34).

### **Supplementary Analyses of the Interactive Influences of Perceived Information Strength on Polarization**

—Although we found evidence of greater impact of the new information in comparison conditions, this finding has to be interpreted in the context of other findings showing that prior judgments prevent new information from having an impact (e.g. Lord, Ross, & Lepper, 1979). As a result, one may expect that a comparison induction could lead to simple polarization of initial attitudes rather than increased influence of the new information. The basic premise for the prediction of more change in the direction of new information following comparison is that participants who compare new *strong* information with prior information will find the new information stronger for having overcome their initial, contradictory evaluation (see Figure 4). Even though we selected strong information and the findings in Figures 3 and 4 indicate that the information was strong to most participants, the obtained interaction between the comparison manipulation and information direction should be contingent on the perceived strength of the new information. That is, if one selected participants who perceived the new information to be weak, one should see entrenchment in prior attitudes rather than greater influence of the new information.

One complication in analyzing the effect of the perceived strength of the new information is that perceived strength was influenced by the comparison manipulation (Figure 4). Therefore, we had justification for performing separate analyses of the two comparison conditions. Although an analysis of attitude change as a function of perceived new information strength, the comparison manipulation, and information direction was statistically significant, it is statistically invalid to introduce perceived strength as a covariate when the covariate is itself influenced by the manipulated factor. Nonetheless, the perceived strength of the new information was not influenced by information direction, allowing us to examine the effects of this measure along with information direction. In this case, the comparison conditions may show that the polarization in line with the new information seen in Figure 3 occurred only when the new information was perceived to be strong. An analysis of covariance of attitude change as a function of the continuous perceived strength measure (entered as a covariate) and direction for the group of participants who underwent a comparison manipulation revealed a significant interaction between these two factors;  $F(1, 84) = 35.91, p < .001$ .<sup>2</sup> To decompose this interaction, we plotted the effects of information direction in comparison conditions for participants for whom perceived the strength of the second information set was at either one standard deviation above the mean (high perceived strength group) or one standard deviation below the mean (low perceived strength group). As shown in Figure 5, as in Figure 3, a positive information direction led to more positive evaluation change than a negative information direction when the new information was perceived to be strong ( $M_s = 1.22$  vs.  $-1.04$ ;  $p$  for contrast = .001). Contrarily, a positive information direction led to more *negative* judgment change than a negative information direction when the new information was perceived to be weak ( $M_s = -0.56$  vs.  $0.50$ ;  $p$  for contrast = .01). This pattern of results indicates that the stronger new information changed

<sup>2</sup>Note that this covariance analysis is identical to a multiple regression approach to moderation.

evaluations in line with the direction of this information whereas the weaker information reinforced initial judgments.

The same analysis in the condition without the comparison induction showed a different interaction pattern,  $F(1, 86) = 11.08, p < .001$ . In this group, a positive information direction led to more positive evaluation change when the new information was perceived to be strong ( $M_s = 0.68$  vs.  $-0.30$ ;  $p$  for contrast =  $.01$ ) but also when the new information was perceived to be weak ( $M_s = 0.43$  vs.  $-0.32$ ;  $p$  for contrast =  $.06$ ). Thus, these findings suggested that, in the absence of a comparison manipulation, participants formed a new judgment based on the current information and thus prior attitudes had little biasing influence. The new judgment, however, was slightly more influenced by the new information when this information was stronger than when it was weaker.

**Discussion**—Experiment 3 replicated the earlier findings suggesting more judgment change in comparison-inducement than control conditions. This study also replicated the earlier analyses suggesting that the comparison inducement increased the perceived strength of the new information. This finding is consistent with the notion that the comparative inducement might have increased the weight of the second information set. Nonetheless, the absolute level of the perceived strength of the second information set was also important. When people compared new weak information with their prior attitudes, they simply reinforced their prior judgments. Moreover, neither this nor the earlier experiments could verify that the comparison inducements actually triggered comparative processing. Therefore, Experiment 4 was designed to provide this evidence.

#### Experiment 4: Process Evidence

Experiment 4 was designed to confirm that the comparison manipulation activated comparison goals, by including a measure of self-reported comparison. All participants received an initial positive passage followed by a negative one (see negative information conditions of Experiment 3). After reporting post-manipulation evaluations, participants answered five questions about their strategies in relation to the first and second passages. These measures were expected to mediate the effects of the comparison prompts. In addition, even though the earlier measures of effort did not suggest that the comparison manipulation increased attention to the passage, more evidence about potential effects on interest and amount of thought was desirable. Therefore, we included two additional questions in which participants were asked to report how interesting the second set of excerpts were and how much they thought about the second set of excerpts.

#### Method

**Participants and Design**—Fifty introductory psychology students (80% female) participated in the study in exchange for credit. The experiment had a comparison condition and a no comparison condition.

**Procedures and Measures**—The passages used in this study were the same as in the negative information condition of Experiment 3. Also, judgments were measured with the same procedures used in Experiment 3.

**Self-reported comparison:** At the end of the study, detailed measures of the comparison process were introduced. Specifically, participants answered five questions asking whether, while they were reading the last set of excerpts, they tried to see if these arguments agreed with those in the first set of excerpts, thought about the opinion they formed on the basis of the first set of excerpts, compared and contrasted the last two excerpts with the first two excerpts, and recalled the arguments contained in the first set of excerpts. In addition,

participants were asked whether they had compared the evaluation as reported the second time with the evaluation they reported initially. In all cases, responses were provided on scales from 1 (*not at all*) to 9 (*extremely*). Cronbach's alpha for all five items was .70, which justified obtaining an average as an index of self-reported comparison. This self-report measure can be used to capture explicit comparative processes and similar measures have been used in past research (see Gibbons & Buunk, 1999).

**Interest and thought elicited by the second passage:** Before reporting their judgments of the topic, participants rated the extent to which the second passage set was interesting and the extent to which they thought about the arguments while reading the second set. Responses were provided on scales from 1 (*not at all*) to 9 (*extremely*). These two items were highly correlated ( $r = .73, p < .001$ ) and were averaged into an index of thought about the second passage set.

## Results and Discussion

Premanipulation evaluations had a mean of 5.37 ( $SD = 1.86$ ). These evaluations did not vary significantly as a function of the comparison instructions,  $F < 1$ , indicating that randomization was successful. Thus, we analyzed change scores as a function of the comparison instructions. As in the prior studies and consistent with the selection of a strong second information set, evaluative judgments changed more when participants received the comparison instructions than when they did not ( $M_s = -1.49$  vs.  $-0.70$ ),  $F(1, 48) = 4.33, p = .04$ . When compared with a zero standard, both conditions presented significant differences ( $p < .001$ ).

If the process promoted by the comparison prompts is actually comparative, we should obtain differences in self-reported comparison without necessarily observing differences in the amount of thought about the second information set. Analyses of variance were therefore conducted on the indexes of self-reported comparison and thought about the second information set. As expected, participants who received comparison prompts engaged in greater comparison than participants in control conditions ( $M_s = 6.66$  vs.  $5.73$ ),  $F(1, 48) = 4.45, p = .04$ . Contrary to possible effects on attention to the second information set, however, there were no significant differences in self-reported thought about the second information set ( $M_s = 7.29$  vs.  $6.79$ ),  $F(1, 48) = 1.27, p = .28$ . A mediation analysis including these two indexes appears in Figure 6. Using bootstrapping procedures, this analysis revealed a significant indirect effect of the manipulation via self-reported comparison (95% CI =  $-.65$  to  $-.04$ ) but a nonsignificant indirect effect via self-reported thought about the second information set (95% CI =  $-.12$  to  $.39$ ).

Overall, these data suggest that a comparative process explained effects of the comparison manipulation on judgment change. The most important threats to mediational evidence would be demand effects and the presence of a spurious relation. In this respect, there was no evidence whatsoever that participants guessed what we are testing as to “fake” the whole mediational chain of events (see demand probes section of Experiment 1). With respect to a spurious relation, of the effect of the comparison manipulation on attention failed to *mediate* judgment change, which greatly supports the uniqueness of our comparison measure. In particular, self-reported thought did not mediate effects on change, further suggesting that the process evidence was uniquely localized on self-reported comparison.

## General Discussion

Despite abundant speculation about the mechanisms of judgment change, there has been little if any consideration of the effects of comparing earlier and later information about an issue. Four experiments reported in this paper showed that comparison processes can



produce judgment change in response to information that both confirms and counters a prior judgment. In this research, the effects of comparison seemed due to changes in the perceived strength of the new, strong information when considered jointly with the initial information. These strength judgments led to greater weighing of the new information set, while the value or perceived direction of the information was unaffected. Importantly, a process measure included in Experiment 4 confirmed that the comparison inducement activated a comparative process. In contrast, over four experiments, general measures of processing effort were unaffected by the comparison manipulation.

Comparison processes may be enhanced when prior evaluations, associated information, or both are chronically accessible. For example, comparison inducements may be most effective when situational reminders facilitate retrieval of prior information (Albarracin, Wallace, & Glasman, 2004). When the prior information is lost or difficult to recall, however, people who attempt to compare new and prior information may fail. In these situations, they may simply construct an online judgment based on the new information, or, if they can retrieve their prior overall judgment, they might simply adhere to it. Given the import of these issues, future research with systematically manipulated accessibility should be conducted.

Of course it is possible that contrastive comparison, namely the comparison in which people search for differences rather than similarities, is responsible for our effects. Although this is certainly an issue for future research, we believe that the effects of comparison when the compared information leads to the same conclusion, suggests otherwise. That is, information that supports prior information is likely to highlight overlap rather than differences. Therefore, a comparison manipulation is likely to simply enhance that process.

Our experiments showed that the effects of comparison on judgment change were mediated by changes in the perceived strength of the information. These changes in the perceived strength of the information are of course inherent to the idea of comparative processing of information. These are, however, not the only possible changes. In addition, perceptual comparative processes could induce perceptions that the second information set is either more in favor of or more against a given recommendation than an initial anchor. Despite the finding that our comparison inducements did not alter perceived direction, these effects might emerge if one induces comparison among people who are distracted or unmotivated to think about those issues. Being unable to seriously judge the validity of the information, they may still be able to establish the direction of the information and to use their prior evaluations as anchors in those assessments. Future research might provide evidence to build a more complete picture of comparison processes in comparative judgment change.

In terms of the applied implications of our research, the present findings highlight that the use of advertisements that trigger comparison with prior attitudes may be particularly effective at attaining the most degree of attitude change in line with the new ad. For example, political ads trying to counter an existing attitude towards a policy may be most effective if the ads use the same format, characters, or music of ads associated with the initial attitude. Likewise, explicit reminders of a previous position, such as a general dislike for a political candidate, may facilitate greater efficacy of the new message. Overall, the strategic use of comparative cues may be instrumental to the goals of the persuader trying to change prior positions.

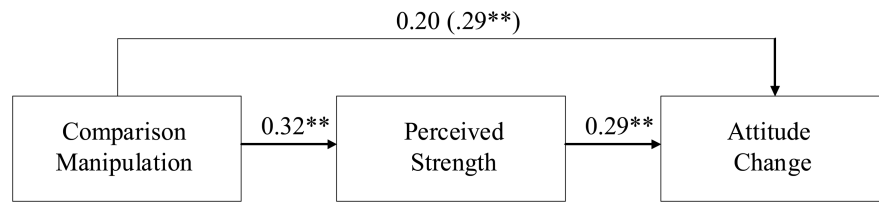
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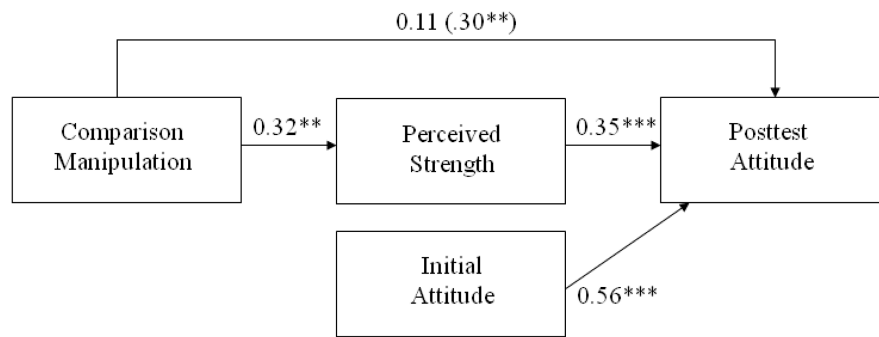
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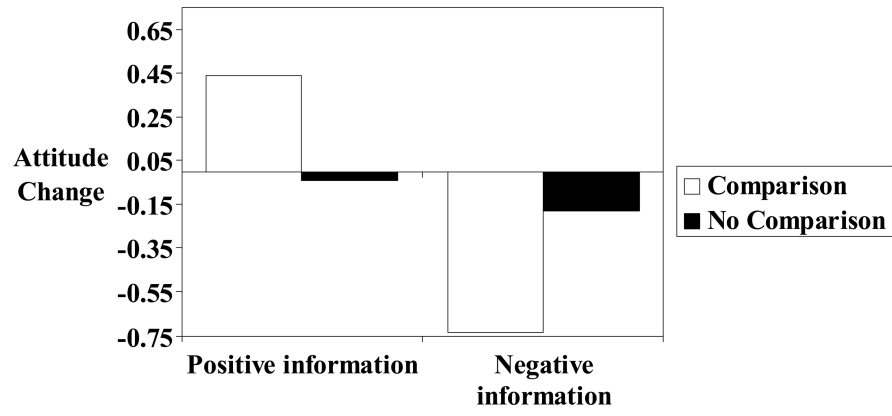
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**Figure 1.** Mediation analysis: Experiment 1. Coefficients are standardized beta weights; parenthetical coefficient entails the direct effect of the comparison manipulation. \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

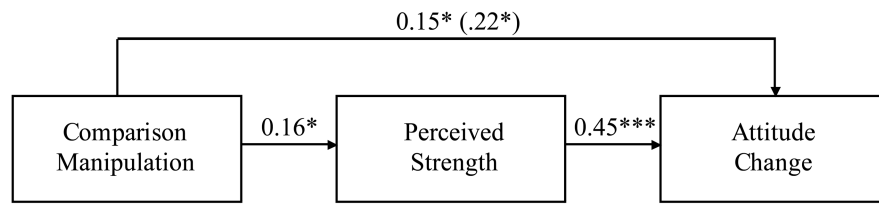


**Figure 2.** Mediation analysis: Experiment 2. Coefficients are standardized beta weights; parenthetical coefficient entails the direct effect of the comparison manipulation. \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

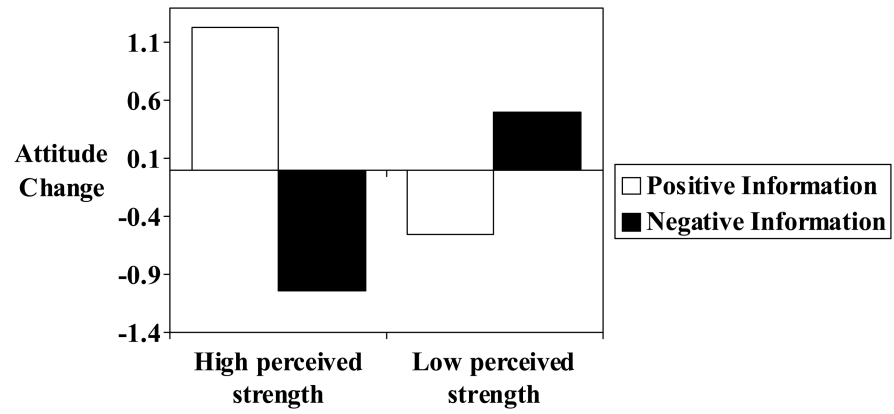


**Figure 3.**  
Means: Experiment 3.

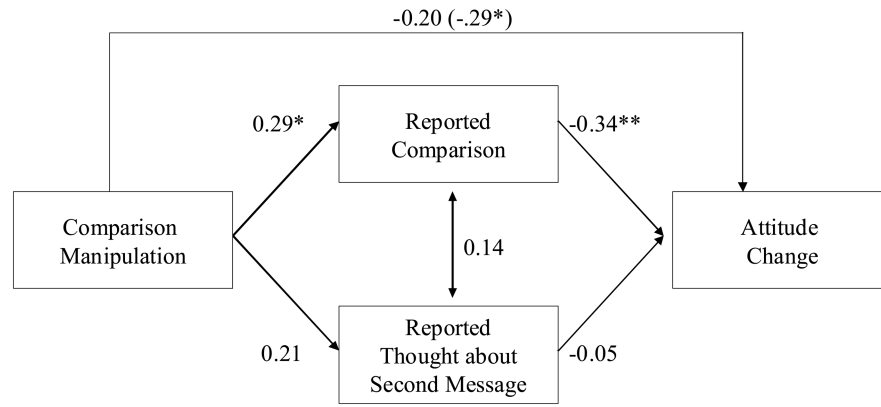




**Figure 4.** Mediation analysis: Experiment 3. Coefficients are standardized beta weights; parenthetical coefficient entails the direct effect of the comparison manipulation. Top and bottom panel are for positive and negative information. \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .



**Figure 5.** Attitude change means as a function of information direction and perceived information strength in the comparison and control conditions: Experiment 3.



**Figure 6.** Mediation analysis: Experiment 4. Coefficients are standardized beta weights; parenthetical coefficient entails the direct effect of the comparison manipulation. The coefficient immediately before represents the regression weight when self-reported comparison and thought were controlled for. \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .