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The Effect of Construal Level on Subjective Probability Estimates

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Abstract

In a series of studies, we examined novel predictions drawn from a conceptualization of probability as psychological distance. Manipulating construal level in a number of different ways and examining a variety of probability judgments, we found that participants led to adopt a high-level-construal mind-set made lower probability assessments than did those led to adopt a low-level-construal mind-set. Moreover, this occurred even when construal level was manipulated in a context separate from the judgment task and the manipulation was unrelated in content to the events being judged. These findings suggest that broad processing variables can exert a widespread influence on probability judgment.

Can a general mind-set have a sweeping effect on probability judgment? Most studies of probability assessment examine attributes or descriptions of a focal event that influence judgments of that event's probability (e.g., Lichtenstein, Slovic, Fischhoff, Layman, & Combs, 1978; Tversky & Kahneman, 1974; Tversky & Koehler, 1994). One exception to this is research on negative-mood priming, which has been shown to increase judgments of the probability of negative events, even when the content of the priming is not similar to that of the events in question (E.J. Johnson & Tversky, 1983; Wright & Bower, 1992). We suggest that probability judgments may be broadly influenced not only by people's affective state, but also their general cognitive orientation. Specifically, we argue that people use their current construal level as a cue to inform judgments of probability, and that this results in a broad effect of construal level on probability judgment.

PROBABILITY AND CONSTRUAL

According to construal-level theory (Trope & Liberman, 2003), psychologically distant events are represented in an abstract, global fashion that emphasizes essentialities (high-level construals), whereas psychologically proximal events are represented in a more concrete, local fashion that incorporates peripheral concerns (low-level construals). Recently, research has suggested that people experience probability as one dimension of psychological distance (Bar-Anan, Liberman, & Trope, 2006; see also Prelec & Loewenstein, 1991), and, correspondingly, that improbable events are represented in a more high-level, abstract fashion than are probable events, which are instead construed in terms of their concrete and detailed features (Wakslak, Trope, Liberman, & Alony, 2006). That is, probability influences a set of distinct but related variables (e.g., identification of ends vs. means, broad vs. specific categorization, global vs. local processing) that are implicated in a general shift between abstract and concrete processing.

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Why does this association between probability and abstraction exist? One possibility is that in order to transcend current direct experience and consider unlikely possibilities, it is useful to move to the abstract level. Typically, people do not encounter unlikely events, and they therefore usually have limited information about specific aspects of such occurrences. Abstraction, which captures the essential aspects of an event but allows for multiple concrete manifestations of these defining elements, highlights those features of an event that are invariant across distance and unlikely to change with additional, concrete information. Thus, the uncertainty one typically has about concrete features of unlikely events may lead one to generally conceptualize improbable events in terms of their abstract properties.

Drawing on this logic, we propose that activating abstract construals will bring to mind an event's improbability, reducing one's estimate of the probability of that event. That is, because one tends to use abstraction in order to move beyond the factual and consider the unlikely, abstract representations should impart a sense of improbability and distance, whereas concrete representations should impart a sense of likelihood and proximity. Indeed, a comparable bidirectional link between *temporal* distance and abstraction was suggested by Liberman, Trope, Macrae, and Sherman (2007), who found that asking participants to focus on abstract rather than concrete aspects of an activity leads them to see the activity as more temporally distant (see also Kahneman & Frederick, 2002, who argued for the general use of correlated cues when making difficult judgments).

An effect of construal on probability judgment would also be consistent with research suggesting that vivid events (which are typically concrete) are judged as more likely than pallid events (cf. E.J. Johnson, Hershey, Meszaros, & Kunreuther, 1993; Sherman, Cialdini, Schwartzman, & Reynolds, 1985), a finding usually attributed to the availability heuristic (Tversky & Kahneman, 1974), in that a vivid event is easier to recall or imagine and this ease inflates likelihood judgments. Given prior research suggesting that construal effects operate at the level of mind-sets, such that construal-level orientations activated via procedural priming influence later, unrelated decisions (e.g., Fujita, Trope, Liberman, & Levin-Sagi, 2006), the current perspective suggests that a wider variety of manipulations than previously considered may influence probability judgment, even when these manipulations are only loosely or not at all related to the events being judged. Specifically, we expect that, in the absence of other information, people will judge an event under consideration as less likely to occur after they have been led to adopt a high-level-construal mind-set, rather than a low-level-construal mind-set.

In this article, we describe a series of studies that examined this prediction. Furthermore, we demonstrate the robustness of the effect by showing that a number of distinct construal manipulations have converging effects on probability judgment, and that the effects occur both when construal is manipulated within the context of the focal event and when it is manipulated outside that context.

STUDY 1: ATTRIBUTE ALIGNABILITY

According to M.D. Johnson (1984), individuals asked to compare alternatives with non-directly comparable attributes will seek comparability by representing the alternatives at increasingly high levels of abstraction. Drawing on this work, Malkoc, Zauberman, and Bettman (2008) developed a comparison task to manipulate abstraction. Participants in the concrete condition compare two products with alignable attributes (information about the same attributes is provided for the two products); participants in the abstract condition compare two products with nonalignable features (information about different attributes is provided for the two products). Participants in Study 1 completed this task and then judged the likelihood of an event involving the compared objects. We expected participants in the

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abstract, nonalignable condition to make lower likelihood judgments than those in the concrete, alignable condition.

Method

Participants—Twenty-six undergraduates (20 women, 6 men) participated for course credit.

Materials and Procedure—Participants were asked to imagine that a group they belonged to was considering running a raffle for a camera. According to the scenario, the group was unsure what camera people would want, so they selected two cameras that fit individuals' typical needs, were similarly priced, and were equally good "deals." The raffle winner would be allowed to choose either camera as the prize.

Participants were then presented with the specifications for the two cameras and asked to describe the pros and cons of selecting one or the other. In the alignable condition, participants compared two digital cameras, with information about the same seven features provided for each camera (e.g., battery life, digital zoom). In the nonalignable condition, participants compared a digital camera with a traditional camera, with information about seven different features provided for each camera (e.g., battery life for the digital camera, focus for the traditional camera). Immediately after comparing the cameras, participants indicated how likely they thought it was that the group would actually sponsor the raffle (1 = *not very likely*, 7 = *very likely*).[1]

Results and Discussion

To confirm that alignability influenced abstraction, an independent rater coded participants' written evaluation responses, classifying mentioned attributes as concrete (attributes that were directly associated with the object or represented features a product possessed; e.g., "camera X is compact") or abstract (attributes that were general, were inferred from concrete attributes, or represented qualities provided by one or more attributes; e.g., "camera X is easy to carry around"; see Malkoc et al., 2008). A single degree-of-abstraction variable was computed as the number of abstract minus concrete attributes mentioned; a score of zero indicated equal numbers of abstract and concrete attributes. Scores in the nonalignable condition ($M = 3.15$, $SD = 3.41$) were significantly greater than zero, $t(12) = 3.33$, $p < .01$, whereas scores in the alignable condition ($M = -2.54$, $SD = 2.03$) were significantly less than zero, $t(12) = -4.52$, $p < .001$. Thus, it appears that participants in the nonalignable condition processed the raffle prizes abstractly, and participants in the alignable condition processed the raffle prizes concretely.

Likelihood judgments were analyzed as a function of alignability condition. As expected, participants in the nonalignable condition judged the group as less likely to sponsor the raffle ($M = 4.08$, $SD = 1.44$) than did participants in the alignable condition ($M = 5.08$, $SD = 0.76$), $t(18.19) = 2.21$, $p < .05$, $d = 0.87$ (equal variances not assumed).[2] That is, performing a comparison task that invoked abstract, high-level processing was associated with lower probability judgments about an associated event than was performing a comparison task that invoked concrete, low-level processing.

[1]Participants in all studies were explicitly told that they should not worry if they felt they had minimal information and that there were no correct or incorrect responses.

[2]After making the probability judgment, participants responded to a number of follow-up items, indicating how it would feel to win the raffle, their familiarity with digital and traditional film cameras, their current mood, and the effort they had put into the experimental task. None of these variables explained the relationship between alignability and probability judgment.

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STUDY 2: CATEGORIZATION PRIMING

In Study 1, we found that a manipulation involving objects related to an event influenced judgments of that entire event's likelihood. In Study 2, we investigated an even broader effect, predicting that once a high-level-construal mind-set (rather than a low-level-construal mind-set) is activated, events in general will feel less likely, even if those events are entirely separate from the construal manipulation. To test this prediction, we used a categorization task that prompted abstract or concrete thinking and then asked participants to make probability judgments about various unrelated events.

Method

Participants—Ninety students (68 women, 22 men) participated for course credit.

Materials and Procedure—Participants completed a booklet supposedly containing various measurement scales being pilot-tested. Embedded in this booklet was a 40-word categorization task that served as the manipulation of construal (Fujita et al., 2006). Participants in the high-level-construal condition generated a superordinate category for each word (e.g., *table*, *book*) by answering the question, "_____ is an example of what?" Participants in the low-level-construal condition generated a subordinate exemplar for each word by answering the question, "An example of _____ is what?" Next, participants completed a supposedly unrelated questionnaire in which they read about seven actors, each contemplating whether to do an activity. For each item, participants judged how likely the person was to do that activity, on a scale from 1 (*not likely*) to 7 (*very likely*).[3] Table 1 presents the items and participants' mean likelihood judgments.

Results and Discussion

We examined the effect of construal level on probability assessment across the seven judgments. As expected, participants primed to have a high-level-construal mind-set (i.e., those who generated superordinate categories) indicated that the activities were less likely to occur ($M = 4.67$, $SD = 0.74$) than did participants primed to have a low-level-construal mind-set (i.e., those who generated subordinate exemplars; $M = 5.07$, $SD = 0.67$), $t(88) = 2.62$, $p = .01$, $d = 0.59$. This finding supports the notion that a cognitive mind-set can influence unrelated probability judgments.

STUDY 3: WHY VERSUS HOW PRIMING

Study 3 expanded on these findings by using a different construal manipulation and examining a different class of probability judgments. High- and low-level construals differ not only in whether broad categories or specific exemplars, respectively, are considered, but also in whether end states of actions (the "why" of activities) or the means by which actions are accomplished (the "how" of activities) are emphasized (cf. Liberman & Trope, 1998). In Study 3, we investigated whether activating a mind-set that involves emphasizing the why, rather than the how, of an activity produces lower probability judgments. Furthermore, we expanded beyond judgments of behavioral intention (our focus in Study 2) to examine judgments regarding the likelihood of random events.

[3]In Studies 2 through 4, after participants made their probability judgments, they responded to follow-up items, indicating their mood; the effort it had taken to think about the events; the ease of responding to questions about the events; the events' familiarity, importance, and enjoyableness; and the ease/difficulty of the study's particular construal manipulation. Furthermore, participants in Study 4b indicated the extent to which they pictured the events vividly. None of these variables explained the relationship between construal level and probability judgment.

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Method

Participants—Twenty-seven students (23 women, 4 men) participated for course credit.

Materials and Procedure—The study's general procedure was based on Study 2, but a different construal priming technique and different judgment items were used. We adapted a priming procedure developed by Freitas, Gollwitzer, and Trope (2004). Participants in both construal conditions worked on a task involving the activity "improve and maintain good health." Participants in the high-level-construal condition connected this activity to increasingly abstract goals by answering a series of "why?" questions, whereas participants in the low-level-construal condition connected this activity to increasingly concrete activities by answering a series of "how?" questions. Next, participants completed a supposedly unrelated questionnaire that included six items, each inquiring about the likelihood of an event happening to a protagonist (e.g., "Tom is waiting for the subway. How likely is the train to be late?"). Three positive and three negative or neutral items were used. Judgments were made on scales ranging from 1 (*not likely*) to 7 (*very likely*). Table 2 presents the items and participants' mean likelihood judgments.

Results and Discussion

We examined the effect of construal level on probability judgment across the six events.[4] As expected, participants in the high-level-construal condition made lower likelihood judgments ($M = 3.36$, $SD = 0.63$) than did those in the low-level-construal condition ($M = 3.89$, $SD = 0.47$), $t(24) = 2.44$, $p < .05$, $d = 1.00$. Follow-up analyses confirmed that this effect did not differ as a function of item valence: A 2 (valence: positive vs. negative) × 2 (construal condition: high-level vs. low-level) mixed-design analysis of variance (ANOVA) conducted on the average likelihood ratings of the three positive items and of the three negative-neutral items revealed a main effect of construal condition, $F(1, 24) = 5.93$, $p < .05$, $\eta^2 = .20$, but no significant interaction with valence ($F < 1$). Thus, being in a "why," rather than a "how," mind-set led participants to judge events as less likely to occur, and this effect did not differ significantly across positive and negative events.

STUDY 4A: GLOBAL VERSUS LOCAL FOCUS

Studies 1 through 3 established that adopting a high-level-construal orientation leads to lowered estimates of the likelihood of events, whether the events are related or unrelated to the context of the construal-orientation manipulation. We had predicted this effect on the basis of the association between abstraction and probability. One might argue, however, that because conceptual manipulations of construal level can differ in vividness (an exemplar, for instance, is often more vivid than a category), participants might have found it easier to visualize responses required in the concrete manipulations than to visualize those required in the abstract manipulations used in Studies 1 through 3. If so, this ease (rather than concrete thinking per se) might have been responsible for the diffuse elevation of probability judgment that we observed in the concrete-construal conditions, as compared with the abstract-construal conditions. Although this would be a novel finding, it differs from our proposed account. In Study 4, therefore, we attempted to disentangle ease and construal level by using a perceptual manipulation of construal in which participants focused on either global or local perceptual stimuli. Past research suggests that global stimuli are perceived more immediately than local stimuli (Navon, 1977), and ease of processing would therefore not be a viable explanation for higher judgments of likelihood in the local than in the global condition.

[4]One participant was an outlier (more than 1.5 × the interquartile range below the first quartile) and was removed from the analysis.

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Method

Participants—Twenty-two students (11 women, 11 men) participated for course credit.

Materials and Procedure—Participants completed a series of supposedly unrelated questionnaires. In the first questionnaire, participants were presented with a series of large letters, each of which was composed of repetitions of a given small letter (e.g., a large *A* created out of small *H*s; cf. Navon, 1977). These types of letters have been used to examine global and local processing, and have recently been used to induce a high-level-construal or low-level-construal mind-set (Smith, Wigboldus, & Dijksterhuis, 2008). Participants in the global, high-level condition were asked to identify the large letters, whereas those in the local, low-level condition were asked to identify the small letters. Twenty-four items were presented, four to a page. Thus, participants in the high-level condition repeatedly attended to the global stimulus, whereas those in the low-level condition repeatedly attended to the local stimulus. After this manipulation, participants completed the likelihood-judgment items used in Study 2 (of the form "How likely is X to do Y?") and in Study 3 (of the form "How likely is X to happen?").

Results and Discussion

A 2 × 2 mixed-design ANOVA with condition (global vs. local) as a between-subjects factor and question type ("How likely is X to do Y?" vs. "How likely is X to happen?") as a within-subjects factor indicated that participants in the high-level, global condition made lower probability estimates ($M = 3.65$, $SE = 0.15$) than those in the low-level, local condition ($M = 4.10$, $SE = 0.15$), $F(1, 20) = 4.27$, $p = .05$, $\eta^2 = .18$. There was also a significant, but irrelevant, effect of question type, $F(1, 20) = 58.79$, $p < .001$; "How likely is X to do Y?" questions elicited higher likelihood judgments overall ($M = 4.59$) than did "How likely is X to happen?" questions ($M = 3.16$). There was, however, no Question Type × Condition interaction ($F < 1$), which suggests that the global/local manipulation affected the two types of likelihood judgments similarly.

STUDY 4B: HIERARCHICAL SHAPES

One limitation of Study 4a is that the stimuli in the letter task contained more local than global elements. Given the association between frequency and probability, it is possible that participants in the local condition made higher probability judgments because the greater frequency of target stimuli had a diffuse effect on later probability judgments. In Study 4b, we replicated Study 4a conceptually, holding target frequency constant across construal-level conditions.

Method

Participants—Fifty-eight students (41 women, 15 men, 2 unknown) participated for course credit.

Materials and Procedure—The procedure was the same as in Study 4a, except that the letter task was replaced with a hierarchical-shape task (Gasper & Clore, 2002) in which participants saw a series of large shapes made up of smaller shapes. Participants in the local condition circled each small shape, and participants in the global condition circled each large shape. However, whereas each page in the local condition presented a single item centered on the page, each page in the global condition contained multiple items, such that the total number of circled items was identical across conditions. For example, one shape consisted of a large triangle constructed from three small rectangles (one in each corner of the triangle). In the local condition, one such shape appeared by itself on a page, and participants circled the three small rectangles. In the global condition, three such items

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appeared on the same page, and participants circled the three large triangles. Thus, the number of circled targets was equated across conditions. After completing nine pages of this task, participants made the same probability judgments as in Study 4a.

Results and Discussion

A 2 × 2 mixed-design ANOVA with condition (global vs. local) as a between-subjects factor and question type ("How likely is X to do Y?" vs. "How likely is X to happen?") as a within-subjects factor revealed that participants in the global condition made lower probability estimates (M = 3.98, SE = 0.09) than did those in the local condition (M = 4.23, SE = 0.09), $F(1, 56) = 4.11$, $p < .05$, $\eta^2 = .07$. There was also a significant, but irrelevant, effect of question type, $F(1, 56) = 124.35$, $p < .001$; "How likely is X to do Y?" questions elicited higher likelihood judgments overall (M = 4.71) than did "How likely is X to happen?" questions (M = 3.49). There was, however, no Question Type × Condition interaction (p = .93), which suggests that the global/local manipulation affected the two types of likelihood judgments similarly.

GENERAL DISCUSSION

Given the central role of probability in judgment and decision making, understanding the way people make probability judgments is critical. Probabilities are often difficult to assess objectively, and research has pointed to various cues used to inform probability judgments. The studies presented in this article suggest that construal level acts as such a cue, even when it is a function of stimuli encountered outside the context of the judgment task. This novel transfer effect suggests that properties brought to the judgmental context by the decision maker can be cues for probability judgment, much as are cues emanating from the target itself. Furthermore, the findings suggest that construal level may have a broad influence on judgment and decision making via its influence on probability judgment, in addition to its previously documented effects on assessments of value (see Trope, Liberman, & Wakslak, 2007, for a review).

This investigation builds upon past research related to the availability heuristic, which showed that vivid events (which are presumably easier to recall and imagine) are judged as more likely than less vivid events. Extending beyond this research, our studies point to a range of variables that can influence probability judgment and demonstrate that these effects can operate at the level of cognitive mind-sets. Furthermore, our results seem to be attributable to abstraction, rather than to ease of responding. We found that the effect persisted in Studies 4a and 4b, when the construal manipulation was unrelated to processing ease or fluency; in addition, as mentioned in footnote 3, we collected self-reports of ease of responding in Studies 2 through 4 and did not find that these measures explained any of the reported effects. Thus, it does not seem that ease is solely responsible for the effect of abstraction on probability judgment; rather, degree of abstraction itself can be used as a cue in judgments of likelihood.

On that note, it is important to clarify the notion of abstraction to which we refer. The general tendency to think abstractly that we believe is associated with improbability should be manifest across an array of tasks and measures. If one is categorizing objects, abstraction is evidenced in terms of broad categorization; if one is thinking about goals, abstraction will be conveyed by identifying actions in terms of their end states. Moreover, inasmuch as procedures related to each of these specific domains involve abstraction, engaging in such procedures (regardless of the specific domain in question) should foster a sense of improbability. In future research, it might be possible to develop a content-free measure of abstraction and to use it to examine abstraction as a mediator of the effects observed in these studies; in the meantime, because we do not believe that abstraction in any particular domain

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should be uniquely responsible for the effects of construal on probability judgments, we did not use measures of such domain-specific abstraction to examine mediation. Rather, we presented converging evidence for an effect of construal on probability judgment, showing that probability judgments are similarly influenced by a variety of manipulations related to unique, but associated, dimensions along which processing can be more or less abstract.

Another important point of clarification relates to the output of the effects we have described. Our basic proposal is that abstraction reduces probability judgments. An implicit aspect of this idea is that the judgment one is faced with is key: If one is presented with an event (e.g., the train will be late), abstraction should decrease one's judgment of the likelihood of this event, but if one is presented with the event's complement (e.g., the train will be on time), abstraction should dampen probability estimates for this event as well. A related interesting issue involves possible effects of considering complementary events sequentially. If one is at a high level of construal and considers first the likelihood of the train being late and then the likelihood of the train being on time, judgments regarding the latter question might be constrained by judgments regarding the former question. Investigation of such constraints is important, in that it would give insight into the depth at which the judgments of probability that we studied are encoded and the degree to which they influence subsequent judgments.

Finally, by linking construal level and probability, the current findings point to a range of experiences that might influence probability judgment. That is, inasmuch as a global, high-level-construal orientation has been evoked by activities as diverse as contemplating one's values and priorities (Wakslak & Trope, 2008), using adjectives (rather than verbs) to describe something (Stapel & Semin, 2007), and even working in a room with a high ceiling (Meyers-Levy & Zhu, 2007), each of these experiences should dampen the perceived probability of an event under consideration. Moreover, although individuals in the real world will often have considerably more information available to inform their probability judgment than did the participants in the current studies, assessment of precise probabilities is notoriously difficult. Accordingly, the consistent basic effect we have demonstrated suggests that one's current construal level will provide a readiness to see an event under consideration as more or less likely. Furthermore, even in situations in which an event's probability is known, interpretations of probability may vary considerably (e.g., "very likely" means different things in different contexts; cf. Weber & Hilton, 1990). It is intriguing to consider whether construal level might have an influence in this context as well, coloring the subjective interpretation of likelihood statements. Indeed, given that probability judgments pervade most aspects of people's lives, it is fascinating to consider the variety of ways in which construal may influence these critical judgments.

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TABLE 1

Likelihood Judgments as a Function of Construal Level: Study 2

	Construal level	
Question	**Low (exemplars)**	**High (categories)**
1. Christine is thinking of visiting a friend in Philadelphia for a weekend. How likely is she to do so?	5.22 (1.15)	4.69 (1.19)
2. Rob is majoring in philosophy and is considering going to law school. How likely is he to apply?	5.12 (0.98)	4.92 (1.15)
3. Erin is thinking about going shopping for some new shoes. How likely is she to go?	5.66 (1.02)	5.41 (1.17)
4. Scott is deciding whether or not to join a cooking class. How likely is he to sign up?	4.63 (0.94)	4.20 (1.12)
5. Peter is thinking about buying a new computer. How likely is he to do so?	5.00 (1.05)	4.59 (1.00)
6. Jana is deciding whether or not to throw a housewarming party. How likely is she to have it?	5.07 (0.91)	4.61 (1.10)
7. Rachel is considering whether or not to get a pet. How likely is she to get one?	4.76 (1.16)	4.29 (1.06)

Note. Standard deviations are given in parentheses. The difference between conditions was significant for Questions 1, 4, 6, and 7, $p \leq .05$; the difference between conditions was marginally significant for Question 5, $p < .10$.

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TABLE 2

Likelihood Judgments as a Function of Construal Level: Study 3

	Construal level	
Question	**Low (“how”)**	**High (“why”)**
1. Kerri is going on a cross-country road trip. How likely is she to meet someone from her hometown?	2.47 (1.06)	2.91 (1.45)
2. Tom is waiting for the subway. How likely is the train to be late?	4.33 (1.23)	3.45 (1.75)
3. Jack is looking through his mail. How likely is he to get a credit-card offer in the mail?	5.93 (0.96)	4.82 (0.98)
4. Sheila enters a lottery that her work organization is running. How likely is she to win the prize?	2.53 (1.19)	1.45 (0.69)
5. Lea is planning on going to the drugstore to buy shampoo. How likely is it that the item will be on sale?	3.73 (1.22)	3.45 (1.57)
6. Kaila commutes by car to work every day. How likely is she to get a dent in her car?	4.33 (1.11)	4.09 (0.70)

Note. Standard deviations are given in parentheses. The difference between conditions was significant for Question 3, $p < .01$, and for Question 4, $p < .05$.