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Seeing the Forest When Entry Is Unlikely: Probability and the Mental Representation of Events

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Conceptualizing probability as psychological distance, the authors draw on construal level theory (Y. Trope & N. Liberman, 2003) to propose that decreasing an event's probability leads individuals to represent the event by its central, abstract, general features (high-level construal) rather than by its peripheral, concrete, specific features (low-level construal). Results indicated that when reported probabilities of events were low rather than high, participants were more broad (Study 1) and inclusive (Study 2) in their categorization of objects, increased their preference for general rather than specific activity descriptions (Study 3), segmented ongoing behavior into fewer units (Study 4), were more successful at abstracting visual information (Study 5), and were less successful at identifying details missing within a coherent visual whole (Study 6). Further, after exposure to low-probability as opposed to high-probability phrases, participants increasingly preferred to identify actions in ends-related rather than means-related terms (Study 7). Implications for probability assessment and choice under uncertainty are discussed.

Keywords: probability, likelihood, construal level theory, psychological distance, abstract

A lotto jackpot. A career opportunity. A first date. Like countless issues encountered on a daily basis, probability assessments are an important aspect of each of these events. What are the odds of picking the winning numbers in a lottery? Is the likelihood of obtaining a given job high, low, or somewhere in between? What is the probability of seeing someone again after a first date has reached its end?

In line with its ubiquitous nature, an extensive research literature has examined the manner in which individuals generate and utilize probabilities. For example, a large body of research has investigated the way in which probabilities are inferred, suggesting that heuristics and biases systematically lead to nonnormative probability estimates (e.g., Fischhoff, 1975; Kahneman & Miller, 1986; Lichtenstein, Slovic, Fischhoff, Layman, & Combs, 1978; Tversky & Kahneman, 1973). Further, researchers have identified a variety of contextual factors that influence judgments of probabilities, such as mood effects (e.g., Johnson & Tversky, 1983) and framing effects (e.g., Tversky & Koehler, 1994). Research on choice under uncertainty has also examined the role that probability plays in shaping preferences and decisions. Classic decision theories suggest that probabilities are integrated with outcome values to determine choice. In expected utility theory, for example, probabilities of particular outcomes associated with an option are used to weight the value of those outcomes, which are then combined in a linear fashion to generate the expected utility of the option as a whole. In prospect theory, the weighting function involves a transformation of probability said to be induced by the psychophysics of chance (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). Researchers in this area have obtained extensive support for these general propositions, while at the same time adding theoretical refinements that more precisely specify the manner of the probability–value–preference relationship for a variety of differing circumstances (for reviews, see Ajzen, 1996; Shafir, in press).

Whereas a great deal of research has investigated probability judgments and related decision-making consequences, little or no research has examined how the probability of an event might influence the event's mental representation. Indeed, such an effect would violate an important assumption underlying the standard expected utility model, namely, that probability and outcome value are independent entities. Recently, this independence assumption has been questioned by researchers who have argued that the weight attached to the probability of an outcome depends on properties of the outcome such as its affective nature (Rottenstreich & Hsee, 2001) and its rank within the outcome distribution (Weber, 1994). Considering whether probability influences the representation of the object itself (which is, after all, the source of outcome value) would similarly lead to a violation of the independence assumption, albeit in an entirely different manner.

Why might we expect probability to influence mental representation? In the current research, we suggest that probability is an important determinant of the psychological distance of an event and, as such, has systematic effects on mental representation. We begin our discussion of this proposal with a more detailed description of our conceptualization of probability as a form of distance and then move on to apply recent theorizing on the relationship between distance and abstraction to generate predictions about the relationship between probability and mental representation.

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Probability as Psychological Distance

An event can be said to be psychologically distant when it is not part of one's direct experience. Psychologically distant events belong to the past or future rather than the present. They take place in distant rather than near locations or occur to other people rather than to oneself. Therefore, the greater the temporal, spatial, or social distance from an event, the more distal it appears to be (see Liberman, Trope, & Stephan, in press). Independent of its spatiotemporal and social distance, an event is removed from one's direct experience when it could have happened but has not actually happened, when it is possible but not certain. An uncertain event would thus seem more distant than a certain event, and the lower the certainty (or likelihood) associated with the event, the greater its psychological distance. For example, receiving an A on an exam would seem distant when this is the grade one could receive rather than the grade one has received, and the lower the likelihood of actually receiving this grade, the greater its psychological distance. Perhaps reflecting this relationship, even colloquially, people sometimes use words implying distance when describing likely and unlikely events; for example, an unlikely event is sometimes referred to as a "remote possibility," a likely event as a "near certainty," and so on.

In line with these observations, researchers studying time discounting have noted the similarity between intertemporal and risky decisions (Keren & Roelofsma, 1995; Prelec & Loewenstein, 1991). Some researchers have even proposed that this similarity is a reflection of the existence of a single underlying psychological process that results in both temporal and probabilistic discounting. For example, Rachlin, Raineri, and Cross (1991) explained probabilistic discounting within a temporal framework in which individuals interpret probabilistic outcomes as repeated gambles. On average, the lower the probability of an outcome, the more gambles one must experience before that outcome is realized, and thus the farther away the outcome is expected to be in the future. Others (e.g., Fehr, 2002) have claimed that probability is the more fundamental dimension, suggesting that temporal discounting occurs because people associate future events with a lower likelihood of actual occurrence (but see Green & Myerson, 2004, for a criticism of each of these two perspectives).

Despite differences regarding the question of fundamentality (see also Boroditsky, 2000), each of these perspectives exemplifies the common meaning that probability shares with other distance dimensions. The view of probability as psychological distance may thereby be useful in understanding probability as a dimension that is unique but that, at the same time, shares similarities with other forms of psychological distance. Further, drawing on recent research conducted within the framework of construal level theory (CLT; Liberman, Trope, & Stephan, in press; Trope & Liberman, 2003) that examines the effects of psychological distance on mental construal, conceptualizing probability as distance leads to systematic predictions about the relationship between an event's probability and its mental representation.

Probability and Mental Construal

CLT proposes that psychologically distant events are represented by their essential, abstract, and global features (high-level construals), whereas psychologically near events are represented by their incidental, concrete, and local features (low-level construals). A series of studies on temporal distance have provided support for this proposal. Liberman, Sagristano, and Trope (2002), for example, found that increasing temporal distance from future events leads individuals to categorize objects associated with the events into fewer, broader categories and to organize preferences for events around simpler, more coherent structures. Similarly, perceivers tend to use more generalized, abstract concepts such as traits and values when describing and predicting temporally distant behavior (Nussbaum, Trope, & Liberman, 2003). Differences in construal are also evident in judgments and decisions made about psychologically distant events. For example, people's decisions are increasingly driven by superordinate concerns (ends) and central features, over subordinate concerns (means to the ends) and peripheral features, as the event becomes removed in time (Liberman & Trope, 1998; Sagristano, Trope, & Liberman, 2002; Trope & Liberman, 2000).

Why are distant things represented at this higher level of abstraction? One possibility is that this stems from the relationship between direct experience and knowledge about an event. When something occurs in the "here and now" we tend to have a lot of information about it (we are, after all, experiencing it currently), and we therefore think of it in concrete, low-level terms. In contrast, we have less information about an event that we do not directly experience, leading us to form a more abstract and schematic representation of the event. It makes sense, then, that when an event is proximal (i.e., minimally removed from direct experience), we treat it as we would an event that we directly experience and approach it with a concrete processing orientation. On the other hand, when an event is distant (i.e., significantly removed from direct experience), we treat it as we would an event that we do not directly experience and approach it with an abstract processing orientation. CLT thus assumes that psychological distance becomes associated with abstract processing, and that this association influences the level of construal at which an event is represented, even in situations where one has equivalent knowledge of a distal and a proximal event.

We expect that probability, like time and space, is associated with abstraction. This follows from the logic outlined above. When something is likely to occur to you, it is likely to become part of your direct experience, and so we expect that you will treat it as you would an event that is part of your direct experience and approach it with a concrete processing orientation. Something unlikely to happen, in contrast, would be treated in the same manner as an event that is removed from direct experience and approached with an abstract processing orientation. For example, an unlikely event would be represented in terms of its global meaning, whereas a more likely event would be represented in terms of its more detailed features. Likewise, an unlikely action would be represented in terms of its superordinate goal, whereas a likely action would be represented in terms of subordinate, specific means for attaining the goal. Further, because of the association that we believe exists between probability and abstraction, we would expect to find these relationships even in situations where people have equal knowledge about low-likelihood and high-likelihood events.

Indeed, recent evidence in the domain of preferences is in line with our claim that the likelihood of an event influences the level at which it is construed. For example, Todorov, Goren, and Trope

(in press) distinguished between desirability concerns, a high-level consideration pertaining to the end state of an outcome or activity, and feasibility concerns, a low-level consideration pertaining to the manner in which that end state is to be reached (see Liberman & Trope, 1998). They found that whereas preferences for low-likelihood events were driven primarily by desirability concerns over feasibility concerns, this was not the case for high-likelihood events. Similarly, R. Kivetz and Simonson (2002) found that preferences for low-likelihood events were driven by higher order concerns than preferences for high-likelihood events. In particular, conceptualizing the choice of luxurious over practical promotion rewards as a form of self-control in which one exerts self-control in order to indulge in luxuries, they found increased selection of luxurious rewards when outcomes were described as unlikely. However, given that construal level can only be inferred from choice in these studies, alternative explanations can be used to account for some of these findings (see, e.g., Rottenstreich & Hsee, 2001, for an explanation that makes use of a modified version of prospect theory's weighing function).

In the current research we therefore take a more fundamental approach. In place of examining probability's effect on preferences that are presumed to result from a change in construal, we examine the manner in which probability affects the construal of events themselves. We hypothesize that decreasing the probability of a given event will enhance the tendency to activate high-level construals of that event—that is, to represent the event by its abstract and general features. Unlikely events should thus be represented in a structured manner that emphasizes superordinate aspects, whereas likely events should be represented in a less structured, contextualized manner that includes subordinate aspects.

To test this prediction, in a series of seven experiments we manipulate information about the probability of an event and assess the level of construal at which the event is represented. We predict that thinking of an event as unlikely will make participants more broadly categorize sets of related objects (Study 1), more inclusively categorize weak category exemplars (Study 2), provide more general event descriptions (Study 3), chunk actions into more broad units (Study 4), more successfully structure visual information (Study 5), and less successfully locate missing pictorial details (Study 6). In addition, in a final study (Study 7) we manipulate high or low probability through a semantic priming technique and examine resulting preferences for ends-related or means-related action identification.

Further, because past research has found that positive mood, relative to negative or neutral mood, promotes more global, as opposed to local, processing (e.g., Gasper & Clore, 2002), in many of our studies we include a measure of mood in order to show that mood does not mediate the effect of likelihood on construal. Additionally, one may raise the concern that the reason low-likelihood events are represented abstractly is that people process them with minimal effort and attention. Our studies deal with this concern in various ways: by including measures of attentiveness, by introducing measures that should not be affected by motivation, and by considering the effect of likelihood on construal of self-irrelevant events. In the General Discussion we return to these alternative explanations and address them again in light of the results of our studies.

Study 1: Breadth of Categorization

One way to conceptualize the abstractness of categories is by their level of breadth. Abstract categories (e.g., clothing) are more broad and inclusive than concrete, subordinate categories (e.g., polo shirts). The present study tested the prediction that individuals will use fewer, more broad categories to classify objects that relate to events described as unlikely to occur than to classify objects related to events described as likely to occur. Participants imagined themselves in various situations that were described as either likely or unlikely to actually happen and classified the objects related to each situation into as many groups as they deemed appropriate. We tabulated the number of categories into which the objects were classified and examined the effect of the probability manipulation on this measure.

Method

Participants. Ninety-five students (70 women, 25 men) at New York University participated in the study in exchange for course credit. Participants were randomly assigned to condition.

Materials and procedures. Participants were asked to imagine that they were planning on engaging in each of four different scenarios (hosting a friend in New York City, going on a camping trip, moving apartments, and having a yard sale) that were described as almost certain to occur or almost certain not to occur.

Each scenario was presented on a separate page, along with a list of 37–38 items that related to the described activity. The scenarios and items were adapted from Liberman et al. (2002). The high-likelihood versions of the scenarios (with low-likelihood versions in parentheses), as well as the items to be grouped for each scenario, are presented below:

> *NYC visit scenario:* Imagine that a friend of yours made plans to visit the city one weekend. . . . Three days before her planned trip you speak to her and find out that she is just getting over the flu. Although she has been sick, she is 95% positive that she will be all better by the weekend. (She is 95% positive that she will still be sick by the weekend.) She lets you know she is almost certain to come on her planned trip (almost certain not to come on her planned trip.) [The items to be grouped were 59th Street Bridge, Metropolitan Opera, West Village, Madison Square Garden, Stomp, Verrazano Bridge, Grant's Tomb, Rockefeller Center, Metropolitan Museum of Art, Apollo Theatre, Wall Street, Shea Stadium, Museum of Modern Art, South Street Seaport, *Les Miserables*, Staten Island Zoo, Washington Square Park, Battery Park City, Fifth Avenue, Rockaway Beach, Times Square, Chinatown, *Hedwig and the Angry Inch*, Macy's, Coney Island, Museum of Natural History, Yankee Stadium, Chrysler Building, The Cloisters Museum, East Village, Statue of Liberty, Guggenheim Museum, Empire State Building, Central Park, Radio City Music Hall, Brooklyn Bridge, and Flatiron Building.]
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> *Camping scenario:* Imagine that you are planning to go with friends on a camping trip, assuming the weather cooperates. . . . You check the weather forecast and find out there is a 95% chance of sunny skies (95% chance of rain) for the days of the scheduled trip—which means you will almost certainly go on the trip (almost certainly not go on the trip). [The items to be grouped were brush, tent, matches, camera, soap, gloves, bathing suit, shovel, fishing pole, hat, snorkel, shirts, sweater, sneakers, coat, raft, dog, boots, marshmallows, socks, blanket, flashlight, pants, sunglasses, rifle, shoes, cigarettes, rope, hot dogs, canteen, toothbrush, underwear, beer, sleeping bag, pillow, insect repellant, potato chips, and ax.]
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> *Moving out scenario:* Imagine that you have applied for a job with a company that has offices in Boston and New York City. If you get the

> job in the Boston office you will relocate. . . . A friend of yours works at the firm. . . . He tells you that he hears they are almost certain to offer you a job in the Boston (New York) office. Looks like you will probably be moving (probably not be moving). [The items to be grouped were desk, VCR, pets, blinds, computer, pictures, coats, answering machine, paintings, blender, refrigerator magnets, stereo, shirts, silverware, bed, musical instrument, spatula, tapestries, jewelry, plants, tables, letters, underwear, CDs, wok, telephone, posters, microwave oven, dresser, rugs, dinner plates, printer, videocassettes, pants, TV, tools, shelves, and alarm clock.]
>
> *Yard sale scenario:* Imagine that you are moving out of town and . . . decide to have a yard sale to get rid of some of your old stuff. . . . The only large enough space for the sale that you can think of is your friend's backyard. When you ask your friend to use her space she says she is 95% sure that she does not need her backyard that day (95% sure that she needs her backyard that day) and you can probably use it (probably can't use it). Looks like you probably will be able to have the sale (probably will not be able to have the sale). [The items to be grouped were chairs, rollerblades, sweaters, crib, candy dish, fish tank, board games, blender, bikes, coats, dumbbells, infant clothes, books, coffeemaker, puzzles, plates, CDs, toaster, toys, cutlery, shoes, skis, chess set, birdcage, ties, baseball cards, picture frames, juicer, ceramic figurines, glassware, boots, dolls, clock, records, T-shirts, lamps, skateboards, and paint brushes.]

After reading about each situation, participants read the following instructions:

> Take a look at the following items and place them into groups by writing the items that belong together next to each other on the right, and then circling the items that belong in the same group. Please make sure to include every item, even if you would not use it in reality. Additionally, please do not overlap, that is, place each item in only one group.

After grouping the items on that page, participants moved on to the next scenario. Each scenario in the questionnaire was in the same probability condition, and the order of the scenarios was counterbalanced across participants. After completing the questionnaire booklet, participants completed the Positive and Negative Affect Scale (PANAS) mood measure (Watson, Clark, & Tellegen, 1988), after which they were debriefed, thanked for participating, and assigned the appropriate course credit.

Results and Discussion

We counted the number of groups into which participants classified the objects related to each scenario. Because the distributions were positively skewed, before analyzing the data we transformed the responses using a logarithmic function. We then submitted the responses for each scenario into a mixed-design analysis of variance (ANOVA), with scenario as a within-subject factor and probability condition as a between-subjects factor. A significant effect of scenario (followed by Bonferroni post hoc tests) indicated that individuals made more groups in the moving apartments and friend visiting New York City scenarios than in the yard sale and camping trip scenarios, $F(3, 276) = 7.47$, $p < .001$, partial $\eta^2 = .075$. Further, as predicted, participants used fewer categories in classifying objects about unlikely events ($M = 6.17$, $SD = 1.83$) than about likely events ($M = 6.90$, $SD = 1.86$), $F(1, 92) = 4.70$, $p < .05$, partial $\eta^2 = .049$. Finally, the interaction between scenario and probability condition did not reach significance, indicating that the effect of probability condition did not significantly differ across the scenarios.

Two sets of relevant third factors were examined with the participants' responses to the PANAS measure. First, general positive and negative mood scales were constructed to examine the role of general mood. Results indicated that there were no differences between the low-likelihood and high-likelihood conditions in either positive or negative mood. Moreover, although negative mood did significantly predict breadth of categorization ($B = -.25$, $F(1, 90) = 6.11$, $p < .05$; see Isen & Daubman, 1984, for a relevant discussion), adjusting for both positive and negative mood as covariates did not change the pattern of results reported above, suggesting that they do not mediate the effect of probability on construal.

In addition, in order to examine whether high-likelihood and low-likelihood participants differed in task involvement, we constructed an attentiveness scale by averaging the three items included on the PANAS short form that are proposed to fall on an attentiveness factor: attentive, alert, and determined (Watson et al., 1988). If participants in the high-likelihood condition were more involved in the grouping activity, we would expect them to report heightened attentiveness. In contrast to this speculation, there were no differences between the low-likelihood and high-likelihood conditions on this factor. Moreover, attentiveness did not predict breadth of categorization, nor did adjusting for it as a covariate change the pattern of results reported above. These findings suggest that attentiveness does not mediate the effects of probability on mental construal.

The study's results are thus consistent with the assumption that unlikely events are represented in terms of abstract categories, whereas likely events are represented in terms of more specific, low-level categories. As expected, the same set of objects was classified into broader categories when they were part of an unlikely, as opposed to likely, situation. Further, results showed that this effect was not due to effects of general mood or to heightened attentiveness on the part of the high-likelihood condition participants. In Study 2 we expand on this finding by using a realistic, as opposed to hypothetical, situation. In particular, we focus on the relationship between probability and the degree to which atypical and typical exemplars are included in a given category.

Study 2: Inclusiveness of Categorization

In Study 2, participants believed that they were either likely or unlikely to receive a voucher for a series of objects that they viewed. They then rated these exemplars in terms of the degree to which they belonged to a given category. Exemplars were categorized as either typical or atypical category members on the basis of Rosch's (1975) norms. We expected those who believed that they were unlikely to receive the objects to be more broad and inclusive in their categorization. We thus hypothesized that participants would be more likely to include the atypical exemplars in the given categories when they believed that they were unlikely to receive the objects than when they believed that they were likely to receive the objects. Because thinking more abstractly should not affect ratings of typical exemplars (e.g., a table should be rated a strong member of the category furniture regardless of whether it is represented concretely or abstractly), we did not expect typical exemplar ratings to differ between likelihood conditions.

Method

Participants. Fifty-two students (38 women, 14 men) at New York University participated in the study as part of a classroom exercise. Participants were randomly assigned to condition.

Materials and procedures. Participants received a booklet labeled "Consumer Research Study." The first page of this booklet explained that the purpose of the study was to investigate the manner in which people think about and evaluate different categories of consumer products. Further, participants read that in order both to show their appreciation and to make the experience more similar to actual consumer behavior, the manufacturers of the products featured in the study agreed to provide the experimenters with samples of the products to be raffled off to participants. Participants in the high-probability condition were told that on the basis of the number of product samples provided and the number of people expected to participate in the study, they were "almost certain" to receive a voucher for each product they evaluated. Those in the low-probability condition were told that there was a "1/100 chance" that they would receive a voucher for each product they evaluated.

After reading the introduction, participants proceeded to the actual product evaluations. On each page of the booklet they saw both the name and picture of a particular consumer product. They were then asked to rate the item on a 10-point scale to indicate how much they felt it did or did not belong to a given general category (e.g., Isen & Daubman, 1984). A rating of 1 meant that the item *definitely does not belong to the category*; 5 meant the item *does not belong to the category, but is very similar to members of that category*; 6 meant the item *does belong to the category, but is not a very good example of it*; and 10 meant the item *definitely does belong to the category*.

In all, we presented participants with four exemplars from each of three object categories: furniture, clothing, and vegetables. According to Rosch's (1975) norms, we selected two typical exemplars (e.g., *shirt, pants*) and two atypical exemplars (e.g., *purse, ring*) for each category. The order of presentation of the category and exemplar (i.e., whether the category was presented first or the product presented first), as well as the order of presentation of the three categories, was counterbalanced and did not affect the results. All items in a given category were presented before moving on to the next category, and within each category, a typical exemplar was presented first and then the other three exemplars were presented in a random order. After completing the categorization task, participants indicated on 9-point scales how positive (1 = *positive*, 9 = *negative*) and happy (1 = *happy*, 9 = *unhappy*) they felt. They were then debriefed, probed for suspicion, and thanked for their participation.

Results and Discussion

Table 1 presents the ratings of the typical and atypical exemplars. A mixed-design ANOVA was performed on these ratings with probability as a between-subjects factor and average ratings of the typical and atypical exemplars as a repeated measures factor. A main effect of rating type confirmed that the typical exemplars were in fact recognized as substantially better category members than were the atypical exemplars, $F(1, 50) = 820.55$, $p < .001$, partial $\eta^2 = .94$. Further, a main effect of probability that approached significance indicated that participants who believed they were unlikely to win the items tended to be more inclusive in their categorizations than those who believed they were likely to win the items, $F(1, 50) = 2.84$, $p = .10$, partial $\eta^2 = .05$. However, this was qualified by the predicted interaction, $F(1, 50) = 3.75$, $p = .06$, $\eta^2 = .07$. As expected, participants who believed that they were unlikely to receive the products were more inclusive in their categorization of atypical exemplars ($M = 4.00$, $SD = 1.50$) than those who believed that they were likely to receive the products ($M = 3.25$, $SD = 1.15$), $t(50) = 2.04$, $p < .05$, $d = .58$. In contrast, likelihood had no impact on typical exemplar ratings ($p > .78$).

Table 1
Exemplar Ratings as a Function of Probability of Obtaining Items (Study 2)

	Probability			
	High ($n = 26$)		Low ($n = 26$)	
Dependent variable	*M*	*SD*	*M*	*SD*
Atypical exemplar ratings	3.25	1.15	4.00	1.50
Typical exemplar ratings	9.60	0.61	9.55	0.75

Further results suggest that these findings are not due to effects of mood. Likelihood had no impact on either of the two affect items (ps $> .50$), nor were these items associated with the inclusion measures (ps $> .16$). In addition, adjusting for these as covariates did not change the results of the analyses reported above, suggesting that the effect of likelihood on construal is not mediated by mood.

As expected, then, participants who believed that they were unlikely to obtain a voucher for the products were more inclusive in their categorization of atypical exemplars than those who believed that they were likely to receive the products. This was not the case for typical exemplar ratings. Further, if participants in the low-likelihood condition are merely processing the stimuli in a less effortful manner, there would be no reason to expect them to provide uncommonly inclusive ratings of atypical exemplars (see Rosch, 1975, for previously established norms). Study 2 thus provides further evidence that items associated with low probability are represented in a more abstract, inclusive manner than items associated with high probability. However, like Study 1, this study focused exclusively on object categorization. In Study 3, therefore, we shift our attention from the categorization of concrete objects to the categorization of a more complex social event.

Study 3: Generality Versus Specificity of Description

In Study 3, participants were able to sign up to be considered for a research assistantship position that they believed they were either likely or unlikely to get. At the beginning of an unrelated experiment they read a flyer describing the opportunity in both general and specific terms. At the end of the session, they were given a surprise recall task in which they provided (a) an open-ended description of the assistantship that they had read about earlier and (b) a preference for either a general or specific description on a forced-choice measure. We predicted that participants who believed they were unlikely to get the research assistantship would show a greater tendency to describe the position in general, as opposed to specific, terms than those who believed they were likely to get the research assistantship.

Method

Participants. Thirty-nine students (25 women, 13 men, 1 unknown) at New York University participated in the study in exchange for course credit. Participants were randomly assigned to condition.

Materials and procedures. Before the start of an unrelated study, participants received a flyer advertising a research assistant position in the psychology department. "Research Assistant Needed for Helping Behavior Study!" was printed in capital letters at the top of the flyer. Underneath this general title, participants were provided with a more specific description of the study the assistant would be involved with, including a description of the duties of the assistant. In particular, participants were told that the purpose of the experiment was to look at the impact of a mood induction on later helping behavior. A research assistant was needed to act as a confederate in the study by dropping a book in front of the participant and tallying whether the participant picked up the book.

Before reading the actual flyer, participants read a brief introduction purportedly from the experimenters. In the low-probability condition, the introduction explained that the experimenters might not need every person who signs up. Further, participants read,

> The last time we recruited people this way we got 49 signups for 2 spots, so a lot of people who wanted to volunteer did not get the opportunity. We would imagine that this time we'll have similar numbers and roughly 5% of the people who sign up will be asked to help. We'll pick these people randomly from the list of those who volunteer.

In the high-probability condition participants read that although the experimenters could not be sure that they would need everyone who signs up,

> The last time we recruited people this way we got 49 signups for 46 spots, so most people who wanted to sign up did in fact get the opportunity. We would imagine that this time we'll have similar numbers and roughly 95% of the people who sign up will be asked to help. We'll pick these people randomly from the list of those who volunteer.

After reading the introduction and attached flyer, participants indicated their interest in the position by writing their name and email address on a sign-up sheet.

Next, participants moved on to complete an unrelated study consisting of rating graduate schools and job opportunities. Upon conclusion of this unrelated experiment, participants were given a "surprise recall" test in which they were asked, first, to describe the research assistantship that they had read about and, on a subsequent page, to choose which of two descriptions they preferred to use to identify the behavior of "acting as a confederate in the assistantship." One of the choices consisted of a general description ("conducting helping behavior research"), whereas the second choice consisted of a specific description ("dropping a book in front of participants"). Finally, participants were fully debriefed, thanked for their participation, and assigned the appropriate course credit.

Results and Discussion

Sixty-five percent of participants signed up to be considered for the research position. This percentage did not differ between the low- and high-probability conditions (68.4% of low-probability condition participants vs. 65% of high-probability condition participants), $\chi^2(1, N = 39) = 0.05$, $p = .82$. Analyses conducted using only the subset of participants who signed up for the assistantship were consistent with those of the complete sample; we therefore report a single set of results using the larger group.

Participants' free-response descriptions of the assistantship were coded for level of specificity by two independent coders ($r = .92$, $p < .01$); any differences were resolved by discussion to form a single index.[1] Responses mentioning the specific methodology of the study or duties of the assistant were coded 1; responses reflecting the general nature of the investigation were coded 0. Analysis of these ratings indicated that participants who believed that they were unlikely to get the assistantship position were more general, as opposed to specific, in their descriptions than those who believed that they were likely to get the assistantship position, $\chi^2(1, N = 31) = 3.88$, $p < .05$. Whereas those in the high-probability condition overwhelmingly provided specific descriptions as opposed to general ones (88.2% to 11.8%), this preference was less strong for those in the low-probability condition (57.1% to 42.9%).

We next turned our attention to the forced-choice identification of the assistantship. Results indicated that whereas 75% of those in the high-probability condition chose the specific description, "dropping a book in front of participants," and only 25% chose the general one, "conducting helping behavior research," this preference was reversed for those in the low-probability condition (42.1% to 57.9%), $\chi^2(1, N = 39) = 4.36$, $p < .05$.

As expected, then, participants were more likely to provide a general description, as opposed to a specific one, when they believed that they were unlikely to be hired for the research assistant position. This was the case both for participants' self-generated descriptions and for their preference between provided descriptions. This latter finding weakens the argument that the observed pattern is due to low-probability participants having a low motivation to encode the details of the study. In fact, even when both an accurate general description and an accurate specific description were provided (thus minimizing reliance on encoding), low-likelihood participants continued to show a preference for using a general description. Further, these findings were obtained despite the fact that participants in both groups were equally likely to sign up for the advertised position. Thus, in the context of a realistic, self-relevant, and consequential likely or unlikely event, participants showed the predicted construal effects. In the next study we expand on these findings by looking at the manner in which probability influences the construal of an ongoing behavioral sequence.

Study 4: Behavior Segmentation

Newtson (1973, 1976) argued that perceivers register information from ongoing behavior episodes by subjectively dividing them into units of meaningful action. In Study 4, we assess the construal of personally relevant ongoing behavior using the behavior segmentation technique developed by Newtson. Participants viewed a short movie of a woman engaging in a series of activities that participants believed they were either likely or unlikely to engage in themselves. Participants' task was to identify informative segments in the sequence by pressing a key each time they perceived that a meaningful action had ended and another had begun. As behavior is represented at a higher level, incidental features of behavior should be omitted from individuals' representation of the behavior, resulting in segmentation of the video into fewer, larger behavioral chunks. Thus, we expect that participants will engage in grosser unitizing of the behavioral sequence when they believe that they will be unlikely to engage in the depicted behaviors than when they believe they will be likely to do so.

[1] Four students did not provide any response to the open-ended question; in addition, data from 5 participants were not used because they failed to correctly identify the study that had been described.

Method

Participants. Twenty-one students (15 women, 6 men) at Tel Aviv University took part in the study in exchange for course credit. Participants were randomly assigned to condition.

Materials and procedure. Upon arriving at the lab, each participant was seated in front of a computer. In the high-probability condition, the experimenter delivered the following instructions (with the low-probability version in parentheses):

> This experiment has two parts. You will now do the first part of the experiment, which involves watching a short movie. In the movie you will see a woman doing the second part of the experiment. After watching the movie I would like you to fill out this short questionnaire, and then you will cast a lot by drawing a note from the basket. In this basket there are 95 (5) notes saying "continue to the next part," and 5 (95) saying "thank you and goodbye." The note that you draw will determine whether you continue to the next part or not. As you can understand, there is a very high (low) probability that you continue to do the second part of the experiment.

After explaining the structure of the experiment, the experimenter delivered the following instructions, adapted from previous unitization studies (e.g., Lassiter, Geers, Apple, & Beers, 2000; Lassiter, Stone, & Rogers, 1988).

> What I would like you to do as you view this short movie is to segment the behavior into whatever actions seem natural and meaningful to you. Simply press the ENTER key when, in your judgment, one meaningful action ends and another begins. . . . These should be whatever actions seem natural and meaningful to you. There are no "right" or "wrong" ways to do this.

Further, in order to make sure that participants did not link their behavior in the unitization task to their later performance in the second half of the experiment, participants were reassured that the experiment was not about memory and that if they were to continue to the next part of the experiment, they would be given all of the information necessary to complete it.

The short movie that the participants viewed lasted for 5 min and was filmed in color without sound. It depicted a woman doing what was referred to as the second part of the experiment. The woman was seen folding papers, drawing geometrical shapes on them, and counting the shapes. After completing the unitization task, each participant drew a note from the basket saying, "Thank you and goodbye," after which he or she was debriefed, thanked, and assigned the appropriate course credit.

Results and Discussion

The number of segments into which participants unitized the behavioral sequence was examined as a function of probability condition.[2] Because the distributions were positively skewed, we transformed the responses using a logarithmic function and conducted our analysis on this transformed variable. As expected, participants who believed that they were unlikely to continue to the next part of the experiment and perform the observed actions unitized the behavioral sequence into fewer segments ($M = 14.8$, $SD = 14.8$) than did participants who believed they were likely to do so ($M = 49.4$, $SD = 31.8$), $t(18) = 3.38$, $p < .05$, $d = 1.54$.

Thus, consistent with CLT, ongoing behavior associated with low probability was represented by fewer, more general units of perception. Furthermore, these results were obtained despite emphasizing to participants that the study did not involve memory and that if they were to continue to the next part of the experiment they would be given all of the necessary instructions at that time. In Study 5, we further expand on these results by looking at a substantially different measure of construal, the ability to detect structure and to abstract visual information.

Study 5: Abstracting Visual Information

In Study 5, participants were presented with two tasks, the Snowy Pictures Test (SPT; Ekstrom, French, Harman, & Dermen, 1976) and the Gestalt Completion Test (GCT; Ekstrom et al., 1976). The SPT presents participants with a series of images of simple objects hidden within complex patterns of noise; participants attempt to name the obscured objects. The GCT presents participants with a series of fragmented pictures that participants attempt to recognize. Although the two tasks are not identical, they are similar in that they both involve the ability to abstract visual information and to detect structure (see Förster, Friedman, & Liberman, 2004, for a similar argument). In the current experiment each participant completed both tasks, one of which they associated with high probability and one of which they associated with low probability. We expected that participants would do better on each task when it was associated with low probability. In addition, the within-subject manipulation of probability allowed us to compare participants' performance on the task they associated with low probability with the task they associated with high probability. We expected participants to be more successful at the task they associated with low probability than at the task they associated with high probability.

Method

Participants. Thirty-four students (27 women, 7 men) at New York University participated in the study in exchange for course credit. Participants were randomly assigned to condition.

Materials and procedures. Participants came to the lab believing they would participate in a study on visual perception. Upon arriving they were told that the actual experiment would consist of a computerized task but that before moving to a computer cubicle to complete the study they would have a chance to complete a paper-and-pencil practice version of the task in order to familiarize themselves with it. They were then given a booklet containing the aforementioned practice material. An introductory page explained that the experiment was the third experiment in a line of research focusing on how people perceive pictures; it then went on to describe the experimental task participants would engage in. Next, participants read that a small percentage of people signed up for the experiment would be randomly assigned to complete a different task. This other task was supposedly a study that the experimenters had conducted the prior semester, for which they had decided they needed a few additional participants. Participants were told that the actual experiment would consist of 100 trials on the computer and that before beginning it, they would have a chance to practice a paper-and-pencil version of both tasks. This practice session was described as an opportunity for participants to familiarize themselves with the way each one of the tasks worked, and participants were reassured that their performance would not be examined. After finishing the practice session, the participants would move to the computer, where they would be randomly assigned to complete one of the two experimental tasks that they had previously practiced.

[2] Unusual responses were assessed by counting the number of times each participant pressed the *ENTER* key twice during the same second. One participant was 12.4 standard deviations above the mean of this measure and was therefore removed from subsequent analysis.

In all cases, participants were given the same two tasks to complete, the SPT and the GCT. The likelihood of receiving each task was varied between participants. Half of the participants were told that the SPT was the likely task and the GCT was the unlikely one, and the other half that the GCT was the likely task and the SPT the unlikely one. Thus, the probability manipulation occurred between subjects vis-à-vis each individual task but also within subjects in that all participants completed one task they believed they were likely to receive at the experimental session and one they believed they were unlikely to receive. Before completing each task, participants read a brief introduction to the task and were provided with a sample item. Further, a note was included on top of each of these instruction sheets; the high-probability version of this (with the low-probability version in parentheses) said, "Note: 95% (5%) of participants will receive this task for the actual experiment." Participants were given 3 min to complete the 12 SPT items and 90 s to complete the 8 GCT items. The order of the tasks was counterbalanced and did not affect the results. After completing the two tasks, participants were debriefed and extensively probed for suspicion about the nature of the experiment. No participants raised questions about why they were instructed to practice both experimental tasks if the computer would only assign them to one, nor did any participants successfully link the experimental manipulation with the experimenters' predictions.

Results and Discussion

For both the SPT and the GCT, performance was calculated by summing the number of correctly identified items. To compare responses across the two different tasks, we converted responses to each task into z scores. These standardized responses were then subjected to a 2 × 2 mixed-design ANOVA, where the repeated measure was the task (the SPT and GCT) and the between-subjects factor was the likelihood of completing the two tasks in the actual experimental session (SPT likely/GCT unlikely vs. SPT unlikely/GCT likely). Figure 1 illustrates the significant interaction between task and likelihood condition, $F(1, 32) = 11.75$, $p < .01$, $\eta^2 = .27$. As expected, participants performed better on the task that they believed they were unlikely to later complete than on the task that they believed they were likely to later complete, regardless of whether the SPT was the likely task and the GCT the unlikely task or vice versa. Indeed, matched t tests indicated that participants in the SPT likely/GCT unlikely condition performed better on the GCT than on the SPT, $t(16) = 2.30$, $p < .05$, $d = .67$, whereas participants in the SPT unlikely/GCT likely condition performed better on the SPT than on the GCT, $t(16) = 2.57$, $p < .05$, $d = .78$. Further, independent-samples t tests indicated that participants performed better at both the SPT ($M = 6.47$, $SD = 1.56$ vs. $M = 5.23$, $SD = 1.75$), $t(32) = 2.16$, $p < .05$, $d = .76$, and the GCT ($M = 2.65$, $SD = 1.17$ vs. $M = 1.94$, $SD = 0.97$), $t(32) = 1.92$, $p = .06$, $d = .68$, when they believed they would be unlikely as opposed to likely to complete that particular task in the actual experimental session.

In sum, across multiple individual comparisons, participants' visual structuring performance was better on a task they believed they were unlikely to receive in the actual experiment than on the task they believed they were likely to later complete in the experiment. These results are especially intriguing because they show increased performance as a result of decreased probability. Thus, they support the assertion that high-level construals are not a case of superficial, low-effort processing but rather are rooted in abstract conceptualization.

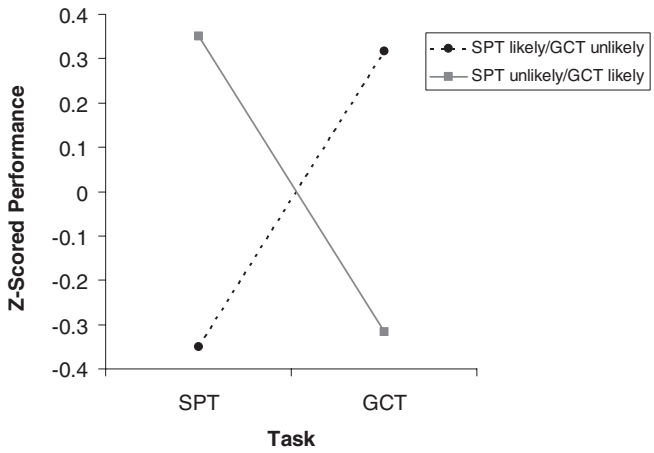

Figure 1. Snowy Pictures Test (SPT) and Gestalt Completion Test (GCT) performance as a function of probability condition.

The above reasoning is based on our expectation that participants should care more about a task they are likely to later encounter. However, there is the possibility that participants saw the "practice version" of the low-likelihood task as their only opportunity to engage in this task and that they therefore exerted more effort and thus performed better on the task described as unlikely. To rule out this possibility, we ran a subsequent study that adapted the paradigm used in Study 5 to look at performance on a task for which we expected visual abstraction (and therefore increased psychological distance) to hinder performance.

Study 6: Seeing the Trees

In Study 6, participants completed the picture completion subtest of the Wechsler Intelligence Scale for Children (WISC; Wechsler, 1991). The test presents participants with a series of pictures in which something is missing. The task of the participant is to identify the missing item in each picture. For example, one item depicts a woman shopping in a grocery store; the labels on a stack of cans near her are missing from the picture. Another item is a picture of a man; the watchband from his watch is missing from the picture. The test captures individuals' ability to observe details and recognize specific features of the environment; of importance, it is associated with whole-to-part discrimination. In this way it is almost the opposite of the GCT task used in Study 5; whereas the GCT involves the ability to see the whole and fill in the missing parts, the picture completion test requires one to not fill in the missing parts—that is, to identify them. Thus, if high-level construals increase the tendency to see the gestalt, despite individual missing elements, then this tendency should lead to reduced performance on the picture completion test. We therefore expect participants to be less successful at this task when they associate it with low probability than when they associate it with high probability.

Method

Participants. Thirty-four individuals (20 women, 10 men, 4 unknown) participated in the study in exchange for either course credit or payment. Participants were randomly assigned to condition.

Materials and procedures. The procedure was the same as that used in Study 5. Upon coming to the lab believing they would complete a computerized study on visual perception, participants were told that they would first have the opportunity to complete a paper-and-pencil practice version of the experimental task. An introductory page to the "practice booklet" first explained the experimental task; it then indicated that a small percentage of people signed up for the experiment would be randomly assigned to complete a different task, supposedly in order to complete a study conducted during the prior semester. The practice session was described as an opportunity for participants to familiarize themselves with the way the tasks worked, and participants were reassured that their performance would not be examined.

In all cases, two tasks were described: the picture completion subtest of the WISC and the SPT, previously used in Study 5. The likelihood of receiving each task was varied across participants. Half of the participants were told that the picture completion task was the likely task and the SPT was the unlikely one, and the other half were told that the SPT was the likely task and the picture completion task was the unlikely one. After reading the introductory page, all participants completed the picture completion test. (The SPT was described in the introduction as part of the cover story but was not actually completed.) Before beginning, they read a brief introduction to the task and were provided with a sample item. Further, a note was included on top of this instruction sheet; the high-probability version of this (with the low-probability version in parentheses) said, "Note: 95% (5%) of participants will receive this task for the actual experiment." Participants were given 3 min to complete the 30 picture completion items. After completing the test, participants indicated on 9-point scales how they felt at the time (1 = *very bad*, 9 = *very good*) and how much they were looking forward to the experimental task (1 = *very little*, 9 = *very much*). They were then debriefed, thanked, and given appropriate course credit or payment.

Results and Discussion

Performance on the picture completion test was calculated by summing the number of correctly identified items. A *t* test conducted on these scores indicated that the performance of those in the high-likelihood condition ($M = 19.63$, $SD = 3.01$) was better than the performance of those in the low-likelihood condition ($M = 17.17$, $SD = 2.98$), $t(32) = 2.39$, $p < .05$, $d = .84$.

Further results suggest that these findings are not due to effects of mood. Analysis of the mood ratings indicated no differences between likelihood conditions in participants' mood or the degree to which they looked forward to the experimental task ($ps > .69$). In addition, although there was a tendency for increased positive mood and increased picture completion scores to be associated ($r = .30$, $p = .10$), adjusting for both mood and the degree to which participants looked forward to the experimental task as covariates did not change the results of the analyses reported above, suggesting that the effect of likelihood on picture completion scores is not mediated by either of these two items.

The current finding that participants performed less well on the picture completion task when they believed that they were unlikely to receive the task in the experimental session than when they believed that they were likely to do so supports the contention that the effect of likelihood on task performance is dependent on the nature of the task. When the task was one that required abstracting visual information, as in Study 5, low likelihood was associated with increased performance; in contrast, when the task was one for which visual abstraction should have hindered performance, as in the current study, low likelihood was associated with decreased performance.

In our final study, we adopt a somewhat different approach. In Studies 1–6 we manipulated the probability of an event occurring and then measured differences in construal of that same event. In fact, our findings from Study 5, showing that the same participants were better able to structure visual information when it was associated with a low-likelihood event than when it was associated with a high-likelihood event, highlight the specificity of the obtained effects. However, in that study, as in all studies presented up to this point, this specificity was obtained when an object itself was associated with the probability statement. In Study 7, we consider the activation of the general concepts of low and high likelihood, in the absence of a link between the probability statements and a set of specific objects. When activated as a general concept, we believe that likelihood will cue a general processing orientation that will transfer to unrelated tasks. To examine this prediction, in Study 7 we implicitly activate the concept of either low or high probability and look at resulting changes on an unrelated measure of end-versus-means action identification.

Study 7: Primed Probabilities and Action Identification

In Study 7, we primed participants with either low- or high-likelihood phrases in order to activate an abstract or concrete processing orientation. This approach is in line with work by Frietas and colleagues (Frietas, Gollwitzer, & Trope, 2005), who have shown that procedurally inducing either an abstract or a concrete processing orientation influences construal of subsequent unrelated tasks. Further, similar transfer effects have been obtained through inducing a distant or proximal temporal mindset (Förster et al., 2004; Y. Kivetz & Tyler, in press) or a distant or proximal social mindset (Smith & Trope, 2006). Thus, we expected that activating the concept of low likelihood would lead participants to adopt an abstract processing orientation and therefore to represent subsequently described actions in terms of their high-level construals (end terms). In contrast, activating the concept of high likelihood should lead participants to adopt a concrete processing orientation and therefore to represent subsequent actions in terms of their low-level construals (means terms).

Method

Participants. Twenty-six participants (17 women, 9 men) completed the study in response to a posted advertisement. Participants received $10 for completing this and other unrelated experiments and were randomly assigned to condition.

Materials and procedures. Participants were given a questionnaire booklet titled "Behavior Identification." An introductory page provided the following instructions:

> In this study you will complete a paper and pencil task in which you will be asked to identify a set of behaviors. Because we want to get a clear picture of the way people identify behaviors, we would like all participants to complete a mind clearing exercise before beginning the identification task. This mind clearing exercise is located on the following page and involves creating meaningful phrases from clusters of words. When you are done with the exercise, you may turn the page to complete the behavior identification task.

The "mind clearing exercise" was in fact a scrambled sentence task. Participants were presented with 13 scrambled five-word clusters and instructed to form meaningful four-word phrases from the clusters by

crossing out the word that did not fit and writing the four-word phrase on the blank line next to each cluster. Five of the 13 phrases were related to probability. The high-probability versions of these phrases (with low-probability versions in parentheses) were "it's likely (unlikely) to happen," "his arrival is expected (unexpected)," "can (can't) bet on it," "the odds are high (low)," and "a 95 (5) percent chance."

After completing the scrambled sentence task, participants completed the Behavior Identification Form (Vallacher & Wegner, 1989), a questionnaire designed to measure individual differences in action identification. Each item presented a target behavior (e.g., "locking a door") and asked participants to choose between two alternative descriptions for that action: one describing it in terms of its means (how an action is performed; e.g., "turning a key") and one describing it in terms of its ends (why an action is performed; e.g., "securing a house"). Preference for the low-level identification for an item was coded as a 0, whereas preference for the high-level identification was coded as a 1. These values were then summed to create an index of level of action identification ranging from 0 to 25, with higher scores indicating stronger preferences for high-level action identifications.

Participants were then asked several questions, including how much they enjoyed participating in the study (1 = *very little*, 9 = *very much*) and how they currently felt (1 = *very bad*, 9 = *very good*). In addition, they were asked what they thought the study was about and whether they could guess the experimenters' hypothesis. Finally, they were thanked and paid for their participation.

Results and Discussion

As predicted, participants primed with low-probability phrases had stronger preferences for high-level action identifications ($M = 17.00$, $SD = 5.02$) than did those primed with high-probability phrases ($M = 12.83$, $SD = 4.63$), $t(24) = 2.19$, $p < .05$, $d = .89$.[3] This effect was not explained by participants' mood or enjoyment of participating in the study; there were no differences in these items based on probability condition ($ps > .47$), and they did not predict action identification ($ps > .29$). Moreover, adjusting for each of these as covariates did not change the pattern of results reported above.

These findings are in line with the link between likelihood and construal that we have shown in our earlier studies. Beyond this, the current results suggest that whereas probability statements referring to a particular object can specifically influence construal of that object, when the concept of high or low likelihood is activated without referring to a specific object or outcome, this can have more general transfer effects. Indeed, in this experiment we primed high- or low-likelihood concepts and found that this influenced the subsequent construal of an unrelated task. Further, these results are hard to explain with an effortful processing argument. It is difficult to see how activation of likelihood in the priming task would influence involvement in a later task that was not made self-relevant in any way (i.e., respondents were asked to identify the behaviors listed in the action identification task but were at no point instructed to imagine engaging in the listed behaviors).

General Discussion

In seven experiments, we tested the hypothesis that low-likelihood events are represented at a higher level of construal than high-likelihood events. In Study 1, participants who imagined a series of events depicted as unlikely to occur categorized sets of objects related to the events into fewer groups than those who imagined a series of likely events. In Study 2, participants who believed they were unlikely to receive vouchers for a set of items were more inclusive in their categorization of atypical category exemplars than participants who believed they were likely to receive vouchers for the items. In Study 3, a research assistantship was depicted in more general terms by participants who believed they were unlikely to get the position than by participants who believed they were likely to get the position. In Study 4, a behavioral sequence was segmented into fewer units by participants who believed they were unlikely to engage in the depicted behaviors than by participants who believed they were likely to do so. In Study 5, participants' performance on two tasks requiring visual abstraction was improved when they believed they were unlikely, as opposed to likely, to encounter the task in a later experimental session. In Study 6, participants' performance on a task requiring identification of elements missing within a coherent whole was improved when they believed they were likely, as opposed to unlikely, to encounter the task in a later experimental session. Finally, in Study 7, participants primed with low-likelihood phrases showed a greater preference for identifying actions in terms of ends rather than means. Thus, using a variety of operationalizations of construal level, as well as multiple methods of manipulating probability, we found consistent evidence that decreasing likelihood leads individuals to represent events in a more abstract, high-level manner.

Alternative Explanations

Mood. One possible alternative explanation of our findings involves mood. Given that positive mood has been linked to more broad and global processing (e.g., Gasper & Clore, 2002; Isen & Daubman, 1984) and that our probability manipulations might affect mood, mood rather than probability might be driving the observed changes in construal. We believe this possibility is not plausible for several reasons. First, the objects under consideration in our experiments were generally positive, and therefore one might expect those individuals in the high-likelihood conditions to exhibit more positive mood than those in the low-likelihood conditions. If this was in fact the case, mood theorists would expect individuals in the low-likelihood conditions to show *less* global processing than individuals in the high-likelihood conditions (e.g., Gasper & Clore, 2002). Further, in the majority of our experiments we measured participants' mood to see whether it could account for our results. We did not find evidence that our manipulations influenced mood, and in most cases mood was not related to subsequent measures of construal. Further, controlling for mood as a covariate did not change the pattern of the reported results.

Task involvement. Another potential explanation of our findings revolves around task involvement and effort. Is it possible that participants in our studies perceived likely events as more important and self-relevant and were therefore more involved in construing likely than unlikely events? One could argue that the greater breadth and generality we found for low-likelihood events is indicative of low-effort processing, or mere indifference, as

[3] One participant received a score of 25 on the Behavior Identification Form and was dropped from the analysis for being an outlier (more than 1.5 times the interquartile range above the third quartile). The pattern of the results was similar when this participant was included.

opposed to the abstract processing we claim. However, not all aspects of our results are consistent with this reasoning. Some evidence suggests participants were similarly involved in the high- and low-likelihood events. For example, in Study 1, participants reported equal degrees of attentiveness in the high- and low-likelihood conditions. Similarly, in Study 3, participants were equally likely to sign up for the research assistantship in the likely and unlikely conditions. Further, the measures of high-level construal we used in a number of studies are hard to associate with low effort. For example, in Study 2, there is no a priori reason to expect low effort to be associated with uncommonly inclusive ratings of atypical category members. Further, in Study 5, we found increased performance on a low, as opposed to high, likelihood task, a finding one would not expect if decreased likelihood affected performance by decreasing motivation. Another result that is difficult to reconcile with the probability-as-involvement view is the finding of Study 7 that level of construal was affected when probability was manipulated by priming. In this study, participants first engaged in thinking about either a likely or an unlikely event and then chose between high-level and low-level action identifications. Because the actions themselves were not made likely or unlikely, it is difficult to argue that the experimental manipulation affected self-relevance. In addition, the actions in this study did not refer to anything that the participant was asked to do, and in that way they were not self-relevant. It is therefore unclear how a motivational account could have predicted the obtained results.

Implications and Future Directions

The relationship we observed between probability and construal bears a striking resemblance to the relationship that has been previously found to exist between level of construal and temporal distance. Furthermore, recent evidence suggests that other dimensions of psychological distance, including spatial distance (Fujita, Henderson, Eng, Trope, & Liberman, 2006) and social distance (Liviatan, Trope, & Liberman, 2006), have a similar influence on mental construal. The parallel between the current findings and these prior findings thus supports the broader notion of psychological distance, according to which different dimensions are interrelated and similarly affect mental representation (Liberman, Trope, & Stephan, in press; Trope & Liberman, 2003; see Bar-Anan, Liberman, & Trope, 2006, for recent evidence for this proposition involving the Implicit Association Test). Further, the current findings have direct implications for two areas of key interest to decision scientists: the manner in which probabilities are assessed and the manner in which probabilities influence preference and choice.

Probability Judgments

Recent research suggests that the relationship between distance and construal is bidirectional. In other words, much as distant events are represented in a high-level manner, forming a high-level construal of an event fosters greater psychological distance from the event. For example, in one study Liberman, Trope, Macrae, and Sherman (in press) manipulated participants' level of construal of an activity by asking the participants to either explain the reasons behind the activity (i.e., use high construal level) or describe how the activity is performed (i.e., use low construal level). When the participants were asked to estimate the amount of time from the present point at which the activity would be enacted, those in the high-level construal condition estimated the enactment time as more distant from the present than those who used low-level construal to describe the same activity.

According to this logic, thinking about an event in a high-level manner should make it seem less probable; thinking about it in a low-level manner should make it seem more probable. Some evidence for this proposition can be found in studies examining vividness of descriptions and probability estimates. For instance, Sherman, Zehner, Johnson, and Hirt (1983) found that reading a detailed, as opposed to more general, description of a future event increased the estimated probability that the event would actually occur. Similarly, Sherman, Cialdini, Schwartzman, and Reynolds (1985) described symptoms of a disease in either a more concrete (e.g., low energy level, muscle aches, severe headaches) or abstract (e.g., disorientation, malfunctioning nervous system) manner and asked participants to imagine contracting the disease. Results indicated that participants who imagined concrete symptoms estimated the likelihood of actually contracting the disease to be higher than those who imagined abstract symptoms. A construal level account of these findings would suggest that a similar pattern of results would be obtained with a variety of manipulations of construal, rather than only vividness-related issues. For example, asking participants to describe an activity in terms of the reasons behind an event versus the actions involved, instructing participants to chunk a behavioral sequence into broad units versus fine units, or creating a construal mind-set through an unrelated task (see Fujita, Trope, Liberman, & Levin-Sagi, 2006, for an example) should similarly affect probability assessments.

Preference and Choice

According to the current account, individuals form higher level construals of low-likelihood events than high-likelihood events. It follows, then, that decisions made about low-likelihood events should be influenced by higher level aspects of those events. When an outcome has multiple features, we would expect that the lower the probability of receiving the outcome is, the greater will be the weight of central, defining features of the outcome relative to the weight of its peripheral, nonessential features (see Todorov et al., in press). For example, in choosing a course, students would assign greater weight to the quality of the instructor (a high-level feature) and less weight to the location of the course (a low-level feature) when the likelihood that the course will be offered is low rather than high. Thus, a course given by a good instructor in an inconvenient location would be more attractive when the course is unlikely to be offered than when it is likely to be offered, whereas the reverse should hold for a course given by a mediocre instructor in a convenient location.

This analysis has interesting implications for the role of personal values in guiding individuals' choice. Values are abstract, schematic mental constructs and, hence, should be more readily applied to psychologically distant than proximal situations, as research by Sagristano, Eyal, Trope, Liberman, and Chaiken (2005) has recently found. We would expect, therefore, that individuals' values are more likely to be expressed in choices they make for situations that are unlikely to occur. For example, individuals' achievement values might better predict signing up for a challenging course that

is unlikely to be offered than a course that is likely to be offered. Further, it is possible to distinguish between values that are superordinate and central to an individual and more subordinate, secondary values (Eyal, Liberman, Sagristano, & Trope, 2005). When a situation involves a conflict between two different values, we would expect people to be more likely to solve the conflict in terms of their personally more central, superordinate value when the event is unlikely to occur than when it is likely to occur. In other words, superordinate values should have greater influence on decisions about unlikely (rather than likely) events, whereas subordinate values should have greater influence on decisions about likely (rather than unlikely) events.

Conclusions

In a set of seven studies we provide evidence that the probability of an event occurring influences the manner in which that event is mentally represented. Whereas low-likelihood events are represented in an abstract, structured manner, high-likelihood events are represented in a more concrete, unstructured manner. These findings suggest that the role of probability is even more fundamental than has been previously assumed; instead of acting only to weight the values associated with various outcomes, the findings suggest that probability influences our perception of the outcomes' very nature. Further, insofar as this perception is integral to a determination of value, the current approach leads to systematic predictions about the way in which probability will influence decisions. We believe, therefore, that conceptualizing probability as a dimension of psychological distance provides a useful framework for more fully considering a range of probability-related phenomena.

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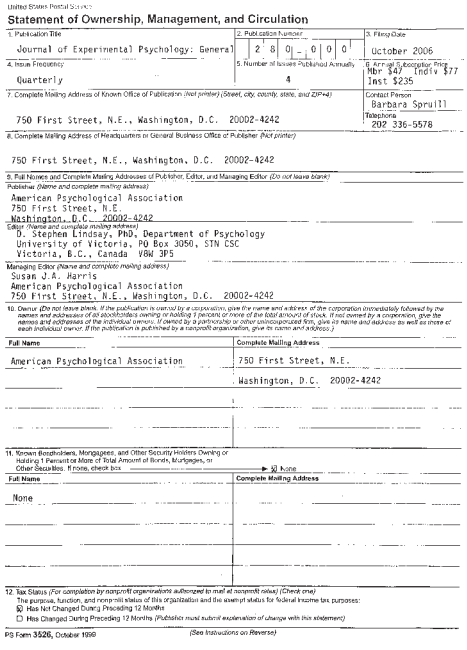

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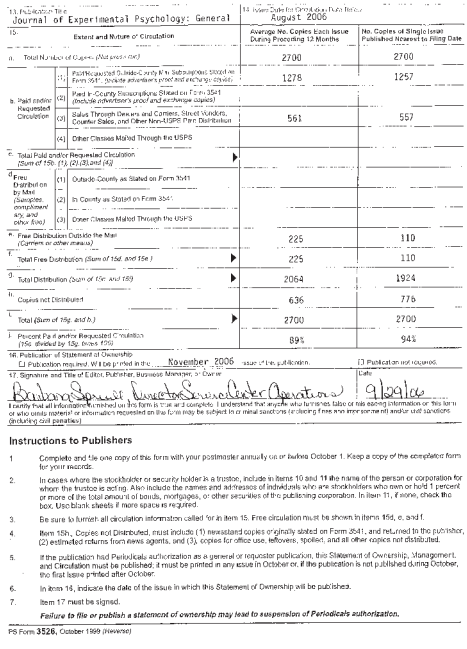

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