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Expressed Likelihood as Motivator: Creating Value through Engaging What's Real

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Abstract

Our research tested two predictions regarding how likelihood can have motivational effects as a function of how a probability is *expressed*. We predicted that describing the probability of a *future* event that could be either A or B using the language of high likelihood (“80% A”) rather than low likelihood (“20% B”), i.e., high rather than low *expressed* likelihood, would make a *present* activity more real and engaging, as long as the future event had properties relevant to the present activity. We also predicted that strengthening engagement from the high (vs. low) expressed likelihood of a future event would intensify the value of present positive and negative objects (in opposite directions). Both predictions were supported. There was also evidence that this intensification effect from expressed likelihood was independent of the actual probability or valence of the future event. What mattered was whether high versus low likelihood language was used to describe the future event.

Keywords

motivation; value; likelihood; probability; engagement

The concept of likelihood, and related concepts such as probability and expectancy, holds a special place in psychology and other disciplines studying judgment and decision-making. But what exactly does ‘likelihood’ mean psychologically, and what is its role in motivation? The purpose of this paper is to address these central questions, propose a new perspective on how likelihood can function as a motivational force, and present some evidence in favor of this new perspective.

In psychology and economics, the concept of likelihood is perhaps best known for its role within the model of *subjective expected utility* (SEU). According to this model, motivational commitment to some action or choice derives from the *subjective value* of the different possible outcomes that could occur from taking that action or making that choice and the *subjective probability* of each possible outcome. The model assumes that the possible outcomes from taking some action are disjunctive; that is, the outcomes are *mutually exclusive* alternatives, joined by “or”. For example, when deciding whether to commit to entering a race, a track star could think about the likelihood of coming in first (gold) or second (silver) or third (bronze) or worse than third (no medal). In addition, the outcomes

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are *exhaustive*, capturing all of the possible outcomes. Given these assumptions, the joint (subjective) probabilities of the possible outcomes sum to 100% (as psychological examples of a subjective expected utility model, see Atkinson 1957; Edwards, 1955; Coombs, 1958; Lewin, Dembo, Festinger, & Sears, 1944; Luce, 1959; Thurstone, 1927). In the simple case of succeeding or failing on a task, success and failure as outcomes are mutually exclusive and exhaustive. There is a subjective probability of success and a subjective probability of failure, summing to 100% (see Atkinson, 1957).

A key feature of the SEU model is that it represents the outcomes from making a particular choice as the discrete, disjunctive, mutually exclusive events that could happen from making that particular choice, which together capture all the possible endings (i.e., exhaustive of all possibilities). But *only one of the possible events will actually happen*. It is like imagining a story with different endings, but only one of the endings actually happens in the story. Moreover, the actual probability of a particular ending is the same regardless of how the likelihood is expressed. For example, if the track star says to herself that there is an 80% likelihood that she will medal in the race (i.e., get either a gold or silver or bronze), this is the same as saying to herself that there is only a 20% likelihood that she will receive no medal. Both expressed likelihoods are referring to the same probable ending.

There is another key feature of the SEU model that is especially germane to the present paper. This is the assumption that value is *the* motivational driving force of commitment. The SEU model proposes that commitment to a choice alternative derives from the subjective value of the outcomes of that choice and the subjective probability that those outcomes will occur, with the relation between these two factors being multiplicative (see, for example, Atkinson, 1957; Edwards, 1955; Lewin, Dembo, Festinger, & Sears, 1944; Vroom, 1964). Even when some version of a SEU model does not formally describe the relation between subjective value and probability as multiplicative, the multiplicative nature of the relation between value and probability is implicit in the general discussion of the model (see, for example, Tolman, 1955; Rotter, 1954. For a discussion of these issues, see Feather, 1959).

What is notable about the proposed multiplicative relation is that it is *about value*. The contribution of subjective probability to this relation is to *moderate* the strength of the value motivational force. Subjective probability is *not* treated as a motivational force in its own right. Instead, the SEU model is all about incentives for doing something; in this case, incentives for making a particular choice or taking a particular action. It is all about wanting desired results. The more valued the desired results, the stronger the commitment to making the choice that will attain them. In the SEU model, subjective probability makes no separate contribution to commitment as a motivational force in its own right. It simply qualifies the impact of subjective value on commitment by taking into account how likely it is that the desired results will actually happen. For example, what matters to the track star is getting a medal in the race. The source of the motivational force on her is the desired (or undesired) results that underlie the alternative medaling outcomes. The probabilities of the alternative outcomes simply strengthen or weaken the motivational force from the value of the outcomes.

But is it true that probability has no motivational force in its own right? Other perspectives, in fact, propose that probability *does* have its own motivational force (for a general discussion of the different ways that probability or likelihood can be motivating, see Higgins, 2012). As one example, consider actions or choices having to do with achievement. On achievement tasks, the probabilities of success or failure can translate into task difficulty, where a high probability of success (or low probability of failure) on a task can translate into the task being 'easy', and a low probability of success (high probability of failure) can

translate into the task being ‘difficult’. Such translations can impact motivation in a number of ways. One way is to influence the motivation to perform the task, such as deciding not to perform an ‘easy’ task because success would have low positive worth but failure would have high negative worth (e.g., Atkinson, 1957, 1964). Another way that probability as task difficulty can have its own motivational force is to influence how much energy is mobilized in preparation for performing the task, such as mobilizing little energy when a task is ‘easy’, even when the anticipated outcomes from task success are quite positive, because a little energy is sufficient to succeed on an easy task (e.g., Brehm & Self, 1989; Wright, 1996). Research by Locke and his colleagues has also shown that effort and performance can be enhanced by setting a difficult goal rather than an easy goal (see Locke & Kristof, 1996; Locke & Latham, 1990; Locke & Latham, 2002).

Probability can have its own motivational force in other ways as well. In his theory of perceived self-efficacy, Bandura (1982; 1986) proposed that our judgments of our capabilities, our thoughts about our ability to manage events in our lives, influence our dealings with the environment: “Perceived self-efficacy is concerned with judgments of how well one can execute courses of action required to deal with prospective situations” (Bandura, 1982, p. 122). People’s choices of which courses of action to pursue, how long to pursue them, how much effort to expend on them, and whether to persist or not when confronting obstacles, are all influenced by their self-efficacy judgments.

As one more example, Oettingen has investigated how *mentally contrasting* a desired future with aspects of impeding reality can create binding goals (Oettingen, 1996; Oettingen, & Mayer, 2002; Oettingen, Pak, & Schnetter, 2001). Her research demonstrates that strong goal commitment can be induced by having people contrast the enjoyment of fantasizing a desired future self with imagining how to overcome the realistic obstacles that could hinder success. But, notably, this mental contrasting has to result in a high subjective probability of success in order to strengthen commitment. If the subjective probability of success remains low, then mental contrasting, i.e., just imagining high value, is not effective.

As evident from these examples, probability has its own motivational force that can either partner with value, work independently of value, or even help shape value. These different perspectives on the contribution of probability to motivation share one important feature—they concern individuals’ subjective beliefs about the probability that some event (e.g., a successful performance) will occur in the future, beliefs about what will actually happen. Our research considered a different possibility for how probability information could impact motivation. Keeping beliefs about the probability of a future event constant, would motivation on a current task vary depending on *how* that probability of the future event is *expressed*? Taking our achievement example, if people believe that a future task will be difficult, i.e., believe that the probability of success is 20% and the probability of failure is 80%, does it matter whether the likelihood of what will happen on this task was *expressed* as “there is a 20% chance that you will succeed” or as “there is a 80% chance that you will fail”? We propose that differences in expressed likelihood for the same probability *do* matter.

Why would expressed likelihood matter? The psychological literature has demonstrated in various ways that it matters psychologically how the exact same reality is described. When the height of Tom is greater than the height of Bob, for example, it matters whether the difference in height is described as “Tom is taller than Bob” versus “Bob is not as tall as Tom”, where the latter description implies more strongly that Bob is also rather tall (see Huttenlocher & Higgins, 1971). As another example, when a public health program will end up with 200 people saved and 400 people dying, it matters whether the consequences of adopting this program are described as “200 people will be saved” versus “400 people will

die” (Tversky and Kahneman, 1981). As a final example, when the price of a ticket could be \$200 or \$250 and the price you pay for the ticket at the end is \$250, it matters whether this outcome is described as “paying the higher price” versus “not paying the lower price”, because the former is the presence of a loss and the latter is the absence of a gain, which vary in both prevention versus promotion focus, respectively, and in the presence versus absence of features, respectively (see Brendl, Higgins, & Lemm, 1995; Nisbett & Ross, 1980; Wason & Johnson-Laird, 1972).

We know, then, that the same state-of-affairs can, for different reasons, have different psychological effects depending on how it is described. We are proposing that information about the same future probable event can also have different psychological effects depending on *how* the probability is *expressed*. And it matters because probability contributes to establishing *what’s real* versus *what’s imaginary* in the world (see also Higgins, 2012), which in turn is critical for humans and other animals to distinguish for effective self-regulation (see Franks & Higgins, in press; Higgins, 2012).

Failure to distinguish between what is real and what is illusion or imagination can create self-regulatory problems, such as children being frightened by imaginary monsters in their closet or adults having paranoid delusions. More generally, energy and resources must be allocated to what is real rather than what is imaginary. Just as effective self-regulation requires distinguishing between what’s desired and what’s not desired, it also requires distinguishing between what’s real and what’s not real. The psychology of probability and likelihood is concerned with this fundamental self-regulatory factor.

When something is subjectively assigned the status of having high likelihood, it will be treated as real, as true; when assigned low likelihood, it will be treated as less real, less true. Indeed, the connection between likelihood and what’s real is evident in the dictionary meanings that are associated with the word “likelihood” (Webster’s Ninth New Collegiate Dictionary, 1989). “Likelihood” refers to something that is “likely” which means “of such a nature or circumstance as to make something probable” (p.692), and a primary definition of “probable” is “likely to be or become true or real” (937).

If something is real, then it must be dealt with; it must be engaged in. If something is not real, it need not (or should not) be dealt with; it need not (or should not) be engaged in. This is where expressed likelihood comes in. Analogous to the above examples of how the description of the same state-of-affairs matters, we propose that expressing the same probable future event with high likelihood language (e.g., 80% likelihood of failure) will make people experience that event as more real than expressing that same event with low likelihood language (e.g., 20% likelihood of success). We also propose that this difference in experiencing the future event as real will matter because there will be greater preparatory engagement when it is experienced as more real from the high likelihood expression. Finally, we propose that the greater preparatory engagement will matter because stronger engagement can impact value itself. This is because strength of engagement contributes to the intensity of the motivational force experience of attraction toward something or repulsion from something (Higgins, 2006).

Combined, these proposals have implications for value creation. In particular, it means that the subjective likelihood of some event in the future could influence strength of engagement in the present, which in turn could influence the value of something in the present. For example, expressing the probability of a future event in terms of high (vs. low) likelihood language can strengthen (vs. weaken) preparatory strength of engagement in the present. And if a positive object and a negative object are being evaluated in the present, then the positive object will be evaluated more positively *and* the negative object will be evaluated

more negatively when the probability of the future event is expressed using high (vs.) low likelihood language. Moreover, although the future event must have some relevance to the present activity in order to have a preparatory engagement response, the future event and the present activity need not be the same.

A central difference between this perspective on likelihood and how likelihood is treated in the classic SEU model should be highlighted. For the SEU model, what matters is what actual outcome is being referred to and not the language being used to refer to that outcome. For example, if your partner is cooking dinner and is planning to make either roast chicken, which you love, or vegetarian lasagna, which you like only a little, then being told by your partner that there is a 80% probability it will be chicken is the same as being told there is a 20% probability it will be lasagna; they both refer to the same future preferred outcome, making you happy. Similarly, being told by your partner that there is a 20% probability it will be chicken is the same as being told there is an 80% probability it will be lasagna; they both refer to the same future non-preferred outcome, making you disappointed.

From our perspective, however, the language of reference to a probabilistic future event also matters because it relates to preparatory engagement. Being told that a future event has an 80% likelihood of happening is a language that strengthens preparatory engagement—a *language of engagement*. In contrast, being told that a future event has only a 20% likelihood of happening is a language that weakens preparatory engagement. Thus, from our perspective, a reference to the exact same probabilistic future event, such as a 80% likelihood of chicken and a 20% likelihood of lasagna, will have *different* effects on evaluative reactions in the present because they produce differences in preparatory engagement strength; i.e., strong preparatory engagement for chicken versus weak preparatory engagement for lasagna.

We conducted two studies to test these implications of our perspective regarding the importance of *expressed* likelihoods. In Study 1, undergraduates believed that they were participating in a marketing study for a new dairy company that was trying to decide what would become their newest flavor of yogurt. They were told that in the first part of the study they would taste two yogurt flavors that each represented a general flavor category (labeled A or B), and then, in the second part of the study, they would try more concentrations within just one of these general flavor categories. In the *expressed high likelihood* conditions, participants were told either that they had an 80% chance of later trying more yogurt concentrations from A or that they had an 80% chance of later trying more yogurt concentrations from B. In the *expressed low likelihood* conditions, participants were told either that they had a 20% chance of later trying more yogurt concentrations from B or that they had a 20% chance of later trying more yogurt concentrations from A. Unbeknownst to participants, one yogurt category was pre-tested to be good-tasting (flavored with sugar & nutmeg) and the other yogurt category was pre-tested to be bad-tasting (flavored with clove).

In two experimental conditions, then, there was a high probability for later trying various concentrations of the *good* yogurt flavor—the 80% sugar & nutmeg condition and the 20% clove (and thus 80% sugar & nutmeg) condition. From a SEU perspective, these two conditions are equivalent. In the two other experimental conditions, there was a high probability for later trying various concentrations of the *bad* yogurt flavor—the 80% clove condition and the 20% sugar & nutmeg (and thus 80% clove) condition. From a SEU perspective, these two conditions are also equivalent. According to the SEU model, the high likelihood of later tasting sugar & nutmeg concentrations (and low likelihood of later tasting clove concentrations) would intensify positive anticipations of later trying more yogurt concentrations of the good yogurt, and the high likelihood of later tasting clove

concentrations (and low likelihood of tasting sugar & nutmeg concentrations) would intensify negative anticipations of later trying more yogurt concentrations of the bad yogurt.

Strictly speaking from a SEU perspective, these anticipations of later tasting in the second part of the study either different concentrations of the good yogurt or different concentrations of the bad yogurt are irrelevant to evaluating now, in the first part of the study, one concentration of each of the two yogurts. But perhaps looking forward to tasting more of the good yogurt later would make people feel good now, and being upset about tasting more of the bad yogurt later would make people feel bad now, and these good or bad moods could affect evaluations of the two yogurts now. Possibly, but note that if there were such an effect of mood in the present from anticipating tasting future concentrations of either the good yogurt or the bad yogurt, this mood effect would be *opposite* for a high probability of the *good* yogurt versus a high probability of the *bad* yogurt. In addition, any such mood effect would be the same in the 80% sugar & nutmeg condition and the 20% clove condition because they are equivalent in anticipating the good yogurt, and it would be the same in the 80% clove condition and the 20% sugar & nutmeg condition because they are equivalent in anticipating the bad yogurt.

Our perspective on likelihood makes different predictions. It predicts that participants in *both* high expressed likelihood conditions (80% likelihood of the good yogurt later; 80% likelihood of the bad yogurt later) would be more strongly engaged in the present tasting activity than participants in the low expressed likelihood conditions (20% likelihood of the good yogurt later; 20% likelihood of the bad yogurt later). Furthermore, stronger engagement in the present tasting activity would intensify evaluative reactions, such that the good yogurt would taste better and the bad yogurt would taste worse in the high than the low expressed likelihood conditions. This means that participants expecting the *same* later event, such as those in the 80% probability of the good yogurt later and those in the 20% probability of the bad yogurt later, would have *different* evaluative reactions to the yogurts they are currently tasting as a function of how the likelihood of that future event is expressed (i.e., 80% of good yogurt later versus 20% of bad yogurt later).

The purpose of Study 2 was to test our proposal that high (vs. low) expressed likelihoods for a future event can make individuals experience the present activity as real and engaging. Study 2 also investigated a limiting condition for this to happen. From our perspective, when a future event is believed to have high likelihood, it is experienced as real and strong preparatory engagement occurs in the present. But for this experience of a future event as real and engaging to transfer to some other event in the present, the future event must be *relevant* in some way to the present event (see Eitam & Higgins, 2010). For example, we would not expect that thinking about the high likelihood of seeing a particular colleague at work later in the morning would make you experience your morning coffee at home as more real and engaging; but it might if you and this colleague regularly take a morning coffee break together at work.

There was such relevance in Study 1 because the future event of tasting different concentrations of one of the yogurts was clearly related to tasting yogurts in the present, even though the future and present activities were not exactly the same. Study 2 had a present activity of forming impressions of different photos and a future activity that was either a word puzzle or a photo puzzle, with the expressed likelihood of working on either kind of puzzle being manipulated as in Study 1. Although neither future puzzle was the same activity as the present activity of forming impressions from photos, the photo puzzle had relevance as an activity involving photos whereas the word puzzle did not. According to our proposal, engagement in the present ‘photo impressions’ task would be stronger and reality heightened when the expressed likelihood of doing the photo puzzle later was high

versus low, but not when the expressed likelihood of doing the word puzzle later was high versus low.

Study 1

Method

Overview—Participants were told that they were participating in a marketing study for a new dairy company that was conducting an investigation to determine their newest flavor of yogurt (their new feature product). Before they even tried the yogurts, the full study was explained because the expressed likelihood manipulation needed to be introduced. Through a two-part study set-up, participants were told different likelihoods that they would try more concentrations of one of the two yogurt flavors in the second part: either high or low expressed likelihood for one yogurt flavor. They then tasted one concentration of each of the two flavors. After tasting each flavor, participants answered a questionnaire in which they evaluated each flavor. The purpose of the study was to test whether the expressed likelihood manipulations for trying more concentrations of one of the yogurt flavors in Part 2 of the study would influence the participants' evaluations of each flavor in Part 1 of the study.

Participants and Design—Sixty-one Columbia University students (28 males and 33 females: average age of 20.49 years old) were paid for participation in this experiment. (There were no effects of gender.) They were recruited through fliers and advertisements placed throughout campus.

The study employed a basic 2×2 experimental design with two levels of expressed likelihood for the yogurt flavor concentrations they would taste in Part 2 of the study (high expressed likelihood; low expressed likelihood), which was a randomly assigned between-participants variable, and two different yogurt flavors that all participants tasted in Part 1 (good flavor; bad flavor), which was a within-participants variable.

Yogurt Flavors—Two yogurt flavors were used in the study—a good flavor and a bad flavor. Unusual flavors had to be created for the study in order to eliminate any value biases from prior experience. Flavors were chosen from a study that evaluated people's opinions of unusual yogurt flavors (Botti and Iyengar, 2004). The Botti and Iyengar study found that their participants rated their liking of nutmeg yogurt as 4.13 and clove yogurt as 2.73 (on a 9-point scale ranging from "1" not at all like to "9" extremely like). Based on this data, a nutmeg and sugar yogurt was chosen to represent the good flavor and a clove yogurt was chosen to represent the bad flavor. The good flavor was created with a ratio of $\frac{1}{2}$ cup of plain yogurt to 1 tablespoon of nutmeg and 1 tablespoon of sugar. The bad flavor was created with a ratio of $\frac{1}{2}$ -cup plain yogurt to $\frac{1}{2}$ -tablespoon cloves. Participants were not told what was in the yogurt and they were not told that one was intentionally made to be good and one was intentionally made to be bad. The yogurts were labeled as Yogurt A and Yogurt B and referred to as such by the experimenter and in the questionnaire.

Procedure—After signing-in and filling out a consent form, participants were given a list of potential ingredients that could be contained in the yogurt. If participants did not have an allergy to any of the possible ingredients, they signed this form and were eligible to participate.

The two yogurt flavors were placed in front of the participants. They were labeled as A and B, with these labels alternating across participants for the two flavors. The participants were informed that there were two parts to the study. They were told that in Part 1 of the study, they would taste two yogurt flavors, with each one representing a general flavor category.

They were then told that in Part 2 of the study they would taste more concentrations within one of the two general flavor categories they tasted in Part 1.

In describing what would happen in Part 2 of the study, the expressed likelihood manipulation was introduced. In the high expressed likelihood conditions, participants were told that they had an 80% chance of trying more yogurts from the flavor category that they would later experience as good (simply labeled as A or B) or that they had an 80% chance of trying more yogurts from the flavor category that they would later experience as bad (simply labeled as A or B). The experimenter only referred to a yogurt as A or B and said, for example, “80% chance of the sample that the yogurt company gave us for Part 2 is from category A, so there is an 80% that you will try more yogurt from flavor A.” In the low expressed likelihood conditions, participants were given a 20% expressed likelihood for trying more of the good flavor or the bad flavor and were told, for example, “20% of the sample that the yogurt company gave us for Part 2 is from category B, so there is only a 20% chance that you will try more yogurt from flavor B.” Only one expressed likelihood was randomly presented to each participant: either high expressed likelihood for the good flavor, high expressed likelihood for the bad flavor, low expressed likelihood for the good flavor, or low expressed likelihood for the bad flavor. Thus, the expressed likelihood independent variable consisted of a level of likelihood (80%; 20%) X type of Part 2 yogurt concentrations (good flavor concentrations; bad flavor concentrations) between-participants manipulation, with the yogurts always referred to as simply flavor A or flavor B.

After receiving all of these instructions, the participants actually tried the two yogurt flavors in Part 1 and then filled out a questionnaire that measured their evaluations of each flavor. The participants were asked, “How would you rate the overall taste of Yogurt A (or B)?” on a scale from -7 (*extremely bad*) to $+7$ (*extremely good*). The participants were also asked, “How much would you be willing to pay for an individual-sized one cup container of Yogurt A (or B)?” and they were given a blank space to provide their own response.

Once the participants indicated that they had completed the questionnaire, they were informed that there was no actual second part of the study. They were then thanked, fully debriefed, and paid.

Results

Effect of Expressed Likelihood For Part 2 on Yogurt Taste Ratings in Part 1—

ANOVAs were conducted separately for the Part 1 good yogurt and the Part 1 bad yogurt to test the effect on the Part 1 taste ratings from varying the Level of Expressed Likelihood for Part 2 (80%; 20%) X Type of Yogurt Concentrations in Part 2 (good flavor concentrations; bad flavor concentrations). For the good yogurt in Part 1, there was just a significant effect of level of expressed likelihood, $F(1,57) = 11.87$, $p = .001$; the effect of type of yogurt concentration (good flavor; bad flavor) and the interaction term were both insignificant, $F(1, 57) = .17$, $p > .6$, and $F(1, 57) = .49$, $p > .4$, respectively. Thus, regardless of whether the expressed likelihood for Part 2 concerned concentrations for the good yogurt or concentrations for the bad yogurt, the good yogurt in Part 1, as predicted, was rated much more positively when the expressed likelihood for Part 2 was high (collapsing across type: $M = 3.6$, $SD = 2.5$) than low (collapsing across type: $M = 1.2$, $SD = 2.7$; see Table 1 for means by condition). For the bad yogurt in Part 1, there was just a significant effect of level of expressed likelihood, $F(1,57) = 3.90$, $p = .05$; the effect of type of yogurt concentration (good flavor; bad flavor) and the interaction term were both insignificant, $F(1, 57) = .10$, $p > .7$, and $F(1, 57) = .01$, $p > .8$, respectively. Thus, once again, regardless of whether the expressed likelihood for Part 2 concerned concentrations for the good yogurt or concentrations for the bad yogurt, the bad yogurt in Part 1, as predicted, was rated more negatively when the expressed likelihood for Part 2 was high (collapsing across type: $M =$

−4.5, $SD=2.0$) than low (collapsing across type: $M = -3.3$, $SD = 2.7$; see Table 1 for means by condition). (See Figure 1).

Thus, as predicted, the positivity of the good yogurt and the negativity of the bad yogurt in Part 1 intensified when the expressed likelihood for Part 2 was high versus low, and this was true regardless of whether the expressed likelihood for Part 2 was about concentrations of the good yogurt or the bad yogurt. Importantly, whether the actual probability of receiving the good (vs. bad) yogurt concentrations in Part 2 was high (i.e., being told that there was either a 80% chance of receiving the good yogurt concentrations or a 20% chance of receiving the bad yogurt concentration) or was low (i.e., being told that there was either a 20% chance of receiving the good yogurt concentrations or a 80% chance of receiving the bad yogurt concentration) had no effect on how the good or bad yogurts in Part 1 were rated (for rating the good yogurt in Part 1: $F < 1$; for rating the bad yogurt in Part 1: $F < 1$). It was not the actual probabilities of receiving good or bad yogurt concentrations in Part 2 that mattered in participants' evaluations of the yogurts in Part 1. What mattered was using a high versus a low likelihood *expression*.

Effect of Expressed Likelihood For Part 2 on Amount Willing to Pay for

Yogurts in Part 1—The measure of how much a participant was willing to pay for the yogurts showed a similar pattern to the yogurt taste rating results, though by experimenter error the payment data was only collected in the second half of the study ($N=29$), which reduced power for this measure compared to the yogurt taste rating measure. For the good yogurt in Part 1, there was just a significant effect of level of likelihood, $F(1,25)=11.87$, $p < .002$; the effect of type of yogurt concentration (good flavor; bad flavor) and the interaction term were both insignificant, $F(1, 25) = 2.49$, $p > .12$, and $F(1, 25) = .91$, $p > .3$, respectively. As predicted, participants were willing to pay more money for the good yogurt when the expressed likelihood for Part 2 was high (collapsing by type: $M = \$1.97$, $SD = 0.92$) than low (collapsing by type: $M = \$1.04$, $SD = 0.45$), regardless of whether the expressed likelihood for Part 2 concerned concentrations for the good yogurt or concentrations for the bad yogurt. For the bad yogurt in Part 1, there was a marginal effect of level of likelihood, $F(1,25)=2.72$, $p = .11$; the effect of type of yogurt concentration (good flavor; bad flavor) and the interaction term were both insignificant, $F(1, 25) = .01$, $p > .9$, and $F(1, 25) = .33$, $p > .5$, respectively. In line with our prediction, participants were willing to pay *less* money for the bad yogurt when the expressed likelihood for Part 2 was high ($M = \$0.15$, $SD = .29$) than low ($M = \$0.38$, $SD = .43$), regardless of whether the expressed likelihood for Part 2 concerned concentrations for the good yogurt or concentrations for the bad yogurt. (See Figure 2).

Study 2

The results of Study 1 supported our predictions regarding value intensification from high versus low *expressed* likelihood. The good tasting yogurt in Part 1 increased in value when the likelihood of tasting concentrations of *either* the good yogurt or the bad yogurt in Part 2 was expressed as “high” rather than “low”, independent of the actual probability of tasting good versus bad yogurt concentrations in Part 2. And the bad tasting yogurt in Part 1 decreased in value when the likelihood of tasting concentrations of *either* the good yogurt or the bad yogurt in Part 2 was expressed as “high” rather than “low”, again independent of the actual probability of tasting good versus bad yogurt concentrations in Part 2. We propose that this value intensification effect, i.e., the intensification of the value of the good and bad yogurts in Part 1, happens because a present value object is experienced as more real and engaging when the occurrence of a future (and relevant) event is experienced as more real from being described as having a high (vs. low) likelihood. The purpose of Study 2 was to test for this ‘real and engaging’ experience in Part 1 from a Part 2 event being described as

having a high (vs. low) likelihood. Study 2 also tested for the importance of the Part 2 event being relevant to the Part 1 event.

Method

Participants and Design—101 Columbia University students (35 males and 66 females) were paid for participation in this experiment. There was a marginal effect of gender, with females experiencing the pictured events in the focal Part 1 task as being marginally more real and engaging, $t(99) = 1.66$, $p = 0.10$. Because of this effect, all analyses reported below controlled for gender. Importantly, the significance and direction of the results remained the same whether or not gender was included. Participants signed up through a business school student recruitment pool, and all participants came in-person to a computer lab. The participants were randomly assigned to one of four conditions of expressed likelihood regarding which puzzle activity they would perform in Part 2 of the study: a level of likelihood (80%; 20%) X type of puzzle activity (photo puzzle; verbal puzzle) expressed likelihood in Part 2 that functioned as the independent variable. In Part 1, prior to doing one of the puzzle activities, they were asked to participate in a ‘pilot study’ of forming impressions of photo pictures. The dependent measure was participants’ experience of the pictured events during the Part 1 impression task as being real and engaging.

Procedure—Participants were first asked to do one sample of each of two types of puzzles: ‘Spot the Difference’ (a photo puzzle) and ‘Puzzle Boxes’ (a verbal puzzle). For the ‘Spot the Difference’ puzzles, the participants were presented with two nearly identical photos side-by-side and were asked to find and list the differences in the photos. For the ‘Puzzle Boxes,’ the participants were presented with a graphical display of a common verbal phrase and were asked to list the verbal phrase that was displayed. After they completed the sample puzzles, the screen read, “That was a sample to give you an idea of what you might be asked to do towards the end of this study. Later on, the computer will randomly assign you to a condition. You will be asked to complete several iterations of one kind of activity, **either** ‘Spot the Difference’ **or** ‘Puzzle Boxes.’” We then manipulated the expressed likelihood that they would complete one of the two types of puzzles at the end of the study, as follows:

High likelihood photo puzzle: “Four of our five conditions involve ‘Spot the difference’ puzzles, so it is very likely (80% chance), that you will be assigned to the ‘Spot the difference’ puzzles.”

Low likelihood photo puzzle: “One of our five conditions involves ‘Spot the difference’ puzzles, so it is very unlikely (20% chance), that you will be assigned to the ‘Spot the difference’.”

High likelihood verbal puzzle: “Four of our five conditions involve ‘Puzzle Boxes’, so it is very likely (80% chance), that you will be assigned to the ‘Puzzle Boxes’.”

Low likelihood verbal puzzle: “One of our five conditions involve ‘Puzzle Boxes’, so it is very unlikely (20% chance), that you will be assigned to the ‘Puzzle Boxes’.”

Next, participants were asked to participate in a ‘pilot study’ related to forming impressions of photo pictures. For the impression task, participants were asked to express how various photos made them feel. The photos were selected to vary in their capacity to project a real and engaged experience, from a photo of burning buildings or of kids playing at the beach during sunset to a photo of empty barrels or a man with an emotionless expression. The ‘pilot’ required participants to assess 12 photos that were selected from the International Affective Picture System based on their having equivalent arousal ratings (Lang, Bradley & Cuthbert, 2008). After the participants finished assessing the photos, they were asked to

complete a questionnaire that measured their experiences while observing the photos—how real and engaging were the depicted events. The questionnaire items for these ‘real-engaging’ experiences were as follows: “For at least some of the photographs, I could easily imagine the events depicted taking place”; “I could picture myself in the scene of the events depicted in the photographs”; “I was mentally involved in assessing the photographs while viewing them”; “The events depicted in these photographs are relevant to my everyday life”. Each item was answered on a scale of -3 (*not at all*) to $+3$ (*very much*). The Cronbach’s Alpha for these four ‘engagement-real’ questionnaire items was 0.70.

At the end of the study, the participants were thanked, fully debriefed, and paid.

Results and Discussion

We used ANOVA to test the effect of expressed likelihood for Part 2 puzzles on ‘realengaging’ experiences while forming impressions of the photo pictures in Part 1. There was a significant interaction between level of expressed likelihood (high 80%; low 20%) and relevance of Part 2 puzzle for Part 1 photo impression task (high relevance of Part 2 photo puzzles; low relevance of Part 2 word puzzles), interaction term, $F(1, 96) = 4.65$, $p = 0.03$. As predicted, for the high relevance Part 2 photo puzzles, ‘real-engaging’ experiences while forming impressions of the photo pictures in Part 1 were significantly stronger when the expressed likelihood of doing the Part 2 photo puzzles was high ($M = 1.11$, $SD = .74$) than when it was low ($M = 0.36$, $SD = 1.1$), planned contrast, $F(1, 48) = 8.72$, $p = 0.005$. In contrast, there was no expressed likelihood effect for the low relevance Part 2 verbal puzzles (high expressed likelihood, $M = .94$, $SD = 1.2$; low expressed likelihood, $M = 1.01$, $SD = .83$; planned contrast, $F(1, 47) < 1$). Thus, as predicted, high expressed likelihood for a future Part 2 activity made the present activity in Part 1 more real and engaging, but only when the Part 2 activity had some property that was relevant to the Part 1 activity (in this case, both involving looking at photos). (See Figure 3).

General Discussion and Conclusions

Study 2 presents evidence that describing the probability of a future event using the language of high likelihood, i.e., high expressed likelihood, can make a present object or activity more real and engaging than using the language of low likelihood, i.e., low expressed likelihood, as long as the future event also has properties that are relevant to the present object or activity. Moreover, the results of Study 1 suggest that making a present object or activity more real and engaging can intensify evaluative reactions to it, such that its positivity will increase or its negativity will increase when the expressed likelihood of the future event is high versus low. In addition, as shown in Study 1, this intensification will occur independent of the actual probability or valence of the future event.

What these studies demonstrate is that *how* probabilities are *expressed* matters because it impacts what is experienced as real and worthy of engaging strongly, which in turn influences the motivational force of value intensity. In contrast to SEU models, the impact of likelihood is not restricted to its role in signaling the probability that some future outcome will actually occur. Rather, *expressed* likelihood of some future event affects preparatory responses in the present that can increase or decrease value in the present.

Importantly, the effect on present value is not restricted to the case where the likely future value object (or activity) is exactly the same as the present value object. This is the standard case considered in SEU models, as when making a decision about some object involves considering the probabilities of the future outcomes from choosing *that* object. In such cases, the future object is completely relevant to the present object that is being currently considered because it is the identical object. However, our findings demonstrate that the

engagement and intensification effects from high expressed likelihood are not restricted to the case where a future object or activity is identical to the present object or activity being evaluated. Relevance that is less than total is sufficient for the expressed likelihood of the future event to affect the real and engaged experience (Study 2), and the experienced value (Study 1), of a current object or activity.

The important implication of expressed likelihood not functioning as a simple probability is that the same probable event in the future can have different effects on current engagement and value depending on how that probability is expressed. In Study 1, for example, when category A was the good tasting yogurt and category B was the bad tasting yogurt, the 80% probability that participants would taste concentrations of the good tasting yogurt in Part 2 of the session could be expressed as: (a) “80% of the sample that the yogurt company gave us for Part 2 is from category A, so there is an 80% that you will try more yogurt from flavor A.”; or (b) “20% of the sample that the yogurt company gave us for Part 2 is from category B, so there is only a 20% chance that you will try more yogurt from flavor B.” Both expressed likelihoods refer to the exact same probability of tasting concentrations of the good tasting yogurt in Part 2, but they differ in *expressed* reality—high vs. low. Importantly, even though the probability of the future event was held constant, expressed likelihood mattered. In the present, participants liked the good yogurt more and disliked the bad yogurt more when the *same* probable future event was *expressed* as high likelihood than as low likelihood.

Importantly, Study 1 also shows that it does not matter whether the high likelihood expression refers to a probable future event of tasting concentrations of the *good* tasting yogurt in Part 2 of the session or refers to a probable future event of tasting concentrations of the *bad* tasting yogurt in Part 2, as long as the expressed likelihood was *high*. The *valence* of the future event did not matter. That is, the intensification effects on the good and bad tasting yogurts in the present were the same for the expressed likelihood “80% of the sample that the yogurt company gave us for Part 2 is from category A, so there is an 80% that you will try more yogurt from flavor A.”, which refers to a probable future event of tasting good yogurt concentrations, and for the expressed likelihood “80% of the sample that the yogurt company gave us for Part 2 is from category B, so there is an 80% that you will try more yogurt from flavor B.”, which refers to a probable future event of tasting bad yogurt concentrations. It was not the valence of the actual probable future event that mattered. What mattered was whether the expressed likelihood for a probable future event was expressed as high or low. This is another implication of our proposal that is quite different from SEU models.

The results of Study 2 are also important in showing that not all future events expressed as a high likelihood will strengthen engagement in a current activity. The future event needs to have some *relevance* to the current activity. From the results of Study 2, we can draw two conclusions regarding relevance. First, the future event need not be exactly the same event as the present event; that is, the Part 2 task of finding and listing the differences in two nearly identical photos was not the same as the Part 1 task of expressing how various photos made you feel, but both tasks involved examining photos. Second, there is a limiting condition where too little relevance will eliminate the high expressed likelihood effect; that is, the Part 2 task of listing the common verbal phrase that matched a graphic display had very little if any relevance to the Part 1 task of expressing how various photos made you feel. What we do not know from Study 2, however, is exactly how much relevance there needs to be for a future event expressed as a high likelihood to impact a present event. Indeed, we do not yet know precisely what makes a future event relevant to a present event. However, given that we are proposing that a future relevant event produces a preparatory response in the present that strengthens engagement, we suggest that relevance constitutes

the extent to which performing or managing the present task (or activity) functions to prepare for the future task. Future research needs to examine this factor through both task analysis and direct manipulations of the preparatory relation between the present and future tasks (or activities).

There is another limiting condition that should also be highlighted. Our proposal is that a future event expressed as a high likelihood strengthens engagement in a present activity because, when it has relevance for the present activity, it induces a preparatory response for that kind of activity; i.e., a preparatory response regarding what the future and present events have in common, such as tasting yogurts in Study 1 and examining photos in Study 2. However, not all expressed likelihoods regarding some future event are represented as some event or activity to prepare for. They could instead be referring to just the pleasure or pain that will be experienced in the future—a future hedonic experience.

In this case, people might just imagine the desired or undesired experience that will happen rather than preparing to deal with some event that will happen. This is the case where a high probability (80%) of a pleasant ending would be the same as the low probability (20%) of an unpleasant ending because in both cases you would imagine a pleasant future experience. There was no such valence effect found in Study 1 because, we believe, the participants instead prepared for a kind of activity rather than imagining a future hedonic experience. But there can be cases where expressed likelihoods *do* translate into imagining future hedonic experiences and here it would be the *actual probabilities* of particular desired or undesired endings that would matter in the present—a high probability (80%) of a future pleasant ending would no longer have the same effect in the present as the high probability (80%) of a future unpleasant ending. For example, different feelings would be produced in the present. And, of course, such differences have major effects on choices in the present because people prefer options for which they imagine pleasant endings over options for which they imagine unpleasant endings. Notably, our studies were not about people making these kinds of choices.

A third limiting condition of our findings needs to be noted as well. In Study 1, the two yogurts were simply labelled as A or B in the instructions. Before tasting each of the two yogurts, the participants knew from the expressed likelihood information which of the two yogurts they would probably be tasting more concentrations of during the second part of the study. Until they actually tasted the yogurts, however, they did not know whether the yogurt they would be tasting in the second part of the study was a good tasting or a bad tasting yogurt. Of course, they did know this by the time they were asked to evaluate the two yogurts, but they did not know before they tasted the yogurts. It remains an open question, therefore, what would happen if before they tasted the two yogurts they knew, for example, that yogurt A was good tasting and yogurt B was bad tasting (based, say, on the strong majority opinion of prior participants) and that they would probably be tasting more concentrations of the bad tasting yogurt B in the second part of the study. If this probability was presented as a high expressed likelihood, i.e., 80% likelihood of yogurt B, would participants still be strongly engaged in the first part of the study or would they disengage from feeling disappointed or discouraged? Our model suggests that being told there is a high likelihood of a future negative event would not necessarily weaken present engagement because people often prepare themselves in the present for a future negative event, such as preparing now in the doctor's waiting room for a flu shot to be received in an hour, which could make an interesting medical story you are reading in the waiting room even more interesting.

In addition to noting the limiting conditions of our expressed likelihood effects, we also need to note the limitations of our studies. One limitation is that one study tested whether

high (*vs.* low) expressed likelihood of a future event makes a present object or activity more real and engaging (Study 2) and another study tested whether high (*vs.* low) expressed likelihood of a future event intensifies evaluative reactions to a present object (Study 1). We did not test both of these predictions in the same study, and thus we were unable to test whether the former effect of high (*vs.* low) expressed likelihood mediates the latter effect, as our overall perspective suggests. This needs to be done in future research. Another limitation of the design of our studies is that we don't know where the action is; do our effects derive from high expressed likelihood making a present object or activity more real and engaging or from low expressed likelihood making a present object or activity less real and engaging or both? To answer this question, future research needs to include additional, comparison or control conditions.

Future research also needs to examine other possible mechanisms underlying the effect from the high (*vs.* low) expressed likelihood of a future event in addition to its making a present object or activity more real and engaging. For example, perhaps fluency also plays a role in impacting evaluative reactions (see, for example, Freitas, Azizian, Travers, & Berry, 2005; Reber, Winkielman, & Schwarz, 1998). It should be noted, however, that if fluency is associated with the effect it could be because stronger engagement increases fluency. In the literature on regulatory fit, for example, where both engagement and fluency have been associated with fit effects, there is recent evidence that the fit effects occur because fit enhances engagement that then both increases processing fluency and intensifies reactions (Lee, Keller, & Terndal, 2010).

We also need to address the issue of what our 'expressed language' manipulation is doing. We believe that the difference between the high versus the low likelihood expressions concerns differences in preparing for a future reality. A high expression says that the future event will *really* happen and thus should be prepared for now, thus strengthening present engagement. In contrast, a low expression says that the future event is *not* really going to happen and thus need not be prepared for now, thus weakening present engagement. One might argue that something else is being manipulated, such as expressed high likelihood being "the presence of something" or being an unmarked (more natural) expression and expressed low likelihood being "the absence of something" or being a marked (less natural) expression. There is a family resemblance to these distinctions, but strictly speaking our manipulations of high and low expressed likelihood are, in *both* cases, "the presence of something" and unmarked expressions. The manipulations express an 80% or 20% likelihood of the presence of something in the future; there is no condition which talks about an 80% or 20% likelihood of something *not* happening in the future (i.e., the absence of something). And *both* expressions use the term 'likelihood', which being the name of the dimension as a whole is unmarked (see Huttenlocher & Higgins, 1971). Given this, we believe that the best characterization of our manipulation is that it concerns differences in what will really happen in the future that should be prepared for now.

Let us now consider two implications of our proposal that should be examined in future research. One classic SEU model is Atkinson's (1964) theory of achievement motivation. Like other SEU models, this model is concerned with the probability of some future outcome, in this case, the probability of succeeding on a future achievement task. Because the probability of success and the probability of failure must sum to 100%, the probable future event can be expressed either in terms of the likelihood of success, such as "the likelihood of success is 80%", or the likelihood of failure, such as "the likelihood of failure is 20%". According to Atkinson's theory, *both* the (subjective) likelihood of success and the likelihood of failure contribute to overall achievement motivation by combining with the (subjective) value of success and the value of failure.

Because the likelihoods of success and failure necessarily move in opposite directions, when one likelihood is high the other is low. From our perspective, then, the motivational forces from the expressed likelihoods of success and failure would work in opposite directions and cancel each other out. But the expressed likelihoods could instead be manipulated, such that the same probable future event could be expressed as “there is an 80% likelihood of success on the future task” versus “there is a 20% likelihood of failure on the future task”. The former likelihood expression should induce a stronger experience of what’s real and engagement than the latter, which should in turn affect mobilization of resources for the upcoming event (i.e., preparation) and, in turn, performance on a current practice item, for example. Note that this is not the same as predicting greater energy mobilization prior to task engagement when the future task is perceived as difficult (see, for example, Brehm & Self, 1989; Brehm, Wright, Solomon, Silka, & Greenberg, 1983) because the *same* probable difficult future task could be expressed in terms of either the likelihood of success being low or the likelihood of failure being high, with the prediction that the latter (vs. former) expression will produce a stronger experience of reality and engagement in the present.

Our perspective also has implications for considering the motivational force of *certainty*. Perhaps the best-known example of the motivational impact of certainty is Tversky and Kahneman’s (1981) classic framing study on choosing between options for combating disease framed in terms of how many people will be saved versus how many people will die. When the option is framed in terms of people being saved (out of 600 people), individuals strongly prefer the certain option that 200 people will be saved over the option of 1/3 probability that 600 will be saved and a 2/3 probability that no people will be saved. However, when the option is framed in terms of people dying, individuals strongly prefer the option where there is a 1/3 probability that nobody will die and a 2/3 probability that 600 people will die over the certain option that 400 people will die.

The classic interpretation of this striking phenomenon is that it reveals a general tendency for risk aversion in the positively framed version of the problem (people being saved) and for risk seeking in the negatively framed version (people dying). In addition to that mechanism, our perspective suggests that motivational force from expressed likelihood may play a role as well. The certainty option within both framing conditions is expressing a 100% likely outcome (i.e., 200 people will be saved; 400 people will die). In contrast, the alternative option combines a high and a low expressed likelihood, which as motivational forces work in opposite directions. Thus, the options with a certain future would induce the strongest real and engaged experience, which in the present would intensify the evaluative reaction to the certain option—make the certain positive outcome of saving 200 people an even more attractive choice in the present and make the certain negative outcome of 400 people dying an even more repulsive choice in the present. This reasoning predicts greater acceptance of the positive certain option and greater rejection of the negative certain option—which is what happens.

But note that a certain probable outcome can also be expressed with different likelihoods. For example, the same certain desert weather tomorrow can be expressed as “100% likelihood of a cloudless sunny day” or as “0% likelihood of a cloudy rainy day”. Although these expressions refer to the same actual probable event, we would predict that the real and engaged experience would be greater for the former than the latter expression. Future research should test this unique prediction from our perspective on expressed likelihood.

Let us end by illustrating how our findings could have implications for an everyday issue in economics—saving for retirement. Imagine there is a target category of people who are known to be setting aside too little of their income for their retirement accounts (e.g., blue-collar workers under 30 years-of-age). You know that within this category of people there

are those who believe that their current contribution is fine and those who recognize that it is a problem but believe it is not a big problem. Both of these evaluations need to be changed to convince them to increase their contributions to retirement savings. For those who believe that their current contribution is fine, this positive evaluation can be weakened by telling them the likelihood that they will succeed in having the money they need upon retirement is low. This low expressed likelihood will deintensify their present positive response to their savings behavior. For those who believe that their current contribution is a problem, this negative evaluation can be transformed from a small to a big problem by telling them the likelihood that they will fail to have the money they need upon retirement is high. This high expressed likelihood will intensify their present negative response to their savings behavior.

Everyone is told that if they continue with their current retirement savings plan they will probably not have the money they need upon retirement. But by understanding the force of expressed likelihood, this probability information can be tailored to each audience to maximize its persuasive impact. Such tailoring to fit is the benefit of using the expressed likelihood tool.

HIGHLIGHTS

>While doing a present task, there was high or low likelihood of doing a future task > High (vs. low) likelihood of the future task strengthened engagement in the present task > High likelihood of the future task intensified positive and negative reactions to present objects > These effects depend on the future task having properties relevant to the present task

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Figure 1.

Average taste ratings for bad and good yogurt flavors as a function of low or high expressed likelihood in Study 1. Taste rating = -7 (*extremely bad*) to +7 (*extremely good*). The error bars attached to each column in the figure reflect standard errors. $n=61$. * $p < .05$ ** $p < .01$

Figure 2.

Average price paid (in dollars) for bad and good yogurt flavors as a function of low or high expressed likelihood in Study 1. The error bars attached to each column in the figure reflect standard errors. $n=29$. ** $p < .01$

Figure 3.

The real-engaging experience of low and high relevance tasks as a function of low and high expressed likelihood in Study 2. Real-engage = the extent to which the participant viewed the experience as real and engaging on a scale of -3 (*not at all*) to +3 (*very much*). The error bars attached to each column in the figure reflect standard errors. $n=101$. ** $p < .01$

Table 1

Means of yogurt ratings by condition

Taste Ratings:	<i>Bad flavor (SD)</i>	<i>Good Flavor (SD)</i>
Conditions:		
<i>High Likelihood (of good flavor)</i>	−4.6 (1.6)	3.7 (2.3)
<i>High Likelihood (of bad flavor)</i>	−4.3 (2.5)	3.5 (2.9)
<i>Low likelihood (of good flavor)</i>	−3.3 (3.2)	0.8 (3.4)
<i>Low likelihood (of bad flavor)</i>	−3.2 (1.9)	1.6 (2.3)