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In Praise of Vagueness: Malleability of Vague Information as a Performance Booster

Himanshu Mishra[1], Arul Mishra[1], and Baba Shiv[2]
[1]Department of Marketing, University of Utah, and [2]Graduate School of Business, Stanford University

Abstract

Is the eternal quest for precise information always worthwhile? Our research suggests that, at times, vagueness has its merits. Previous research has demonstrated that people prefer precise information over vague information because it gives them a sense of security and makes their environments more predictable. However, we show that the fuzzy boundaries afforded by vague information can actually help individuals perform better than can precise information. We document these findings across two laboratory studies and one quasi–field study that involved different performance-related contexts (mental acuity, physical strength, and weight loss). We argue that the malleability of vague information allows people to interpret it in the manner they desire, so that they can generate positive response expectancies and, thereby, perform better. The rigidity of precise information discourages desirable interpretations. Hence, on certain occasions, precise information is not as helpful as vague information in boosting performance.

Keywords

vague information, expectancy generation, motivated reasoning, performance, mental acuity, weight loss

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People are increasingly surrounded by devices that provide highly precise information. For instance, technologically advanced bathroom scales can now give measurements of weight, body fat, and hydration levels within two and even three decimal places. People can find out exactly how many calories they are eating, how much weight they can lift, and how many steps they walk in a typical day. The overarching belief exemplified by the use of such technologies could be summed up by the phrase, "If I can measure it, I can manage it." In other words, people seem to believe that precise information increases their likelihood of performing better and meeting personal goals (e.g., improving physical strength or losing weight). People generally prefer precise information over vague information because precise information gives them a greater sense of security and confidence in their ability to predict unknown outcomes in their environment (Camerer & Weber, 1992; Ellsberg, 1961). Despite this preference, we have found that vague information sometimes serves people better than precise information does.

Why might individuals perform better when they receive vague information than when they receive precise information? We posit that vague information allows individuals leeway in interpretation so that they form expectancies in accordance with the outcomes that they desire. Further, we posit that these positive expectancies can give rise to favorable performance-related outcomes. We discuss these propositions, drawing from prior research on motivated reasoning and on the behavioral effects of outcome expectancies.

Past research on motivated reasoning and wishful thinking has alluded to people's tendency to perceive information in a manner that is most beneficial to them. Marks (1951) found that research participants were more likely to predict they would pick a picture card from a pack that contained picture and blank cards when this outcome was desirable (participants expected to gain a point with each picture) than when it was undesirable (participants expected to lose a point with each picture; for similar findings, see Kunda, 1999, and Ross, McFarland, & Fletcher, 1981). The motivation for a desired event to occur influenced the subjective probability assessments of these research participants even though they knew the actual number of picture and blank cards in the pack.

Such motivational distortions become more prominent when available information is vague as opposed to precise. For example, in the field of visual perception, Sanford (1936, 1937) showed that food-deprived participants interpreted ambiguous pictures as representing food. Balcetis and Dunning (2006) found that participants' perceptions of an ambiguous figure

Corresponding Author:
Himanshu Mishra, KDGB 309, David Eccles School of Business, University of Utah, 1645 E Campus Center Dr., Salt Lake City, UT 84112
E-mail: himanshu.mishra@utah.edu

changed according to which interpretation of the figure led to a desired outcome. In the domains of goal setting and self-presentation, research has found that people strategically distort vague information to perceive themselves as at an advantage. For instance, athletes were more likely to exaggerate their abilities on vague dimensions (e.g., mental toughness) than on precise dimensions (e.g., running speed; Felson, 1981); people perceived themselves to be better than average when asked about vague abilities (e.g., driving) rather than precise abilities (e.g., parallel parking; Dunning, Meyerowitz, & Holzberg, 1989); and people indulged in favorable self-deception when they received vague feedback about their behavior (Sloman, Fernbach, & Hagmayer, 2010). In the domain of mental accounting, Cheema and Soman (2006) found that participants were more likely to incur a vague expense that could be assigned to more than one mental account than they were to incur an expense that could be assigned to only one mental account. Thus, vague mental accounts appear to allow people to overcome their self-regulation goals (e.g., saving money) and pursue their desirable spending goals.

But how does the malleability of vague information help people perform better? We propose that people are able to distort vague information in a manner they desire, which in turn influences performance by affecting outcome expectancies. Recent findings support this notion by showing that individuals who are committed to an action display higher outcome expectancies when their decision is based on vague information than when their decision is based on precise information (Mishra, Shiv, & Nayakankuppam, 2008). Research has also documented the positive influence of expectancies on performance. For instance, Crum and Langer (2007) found that people who undertook activities they expected would be helpful in reducing weight lost more weight than people who undertook the same activities but were not given information that linked their activity to weight loss. Shiv, Carmon, and Ariely (2005) showed that people's performance after purchasing and using a supposed performance aid can be affected by their belief in the price-quality relationship: Individuals who paid a discounted price for and drank an energy drink that they were told increased mental acuity solved fewer puzzles than those who purchased and consumed the same energy drink but paid its regular price.

In sum, we suggest that when people are motivated to pursue a desired goal (e.g., performing well on a mental acuity task), vague information (as opposed to precise information) allows them the flexibility to distort the given information and generate positive outcome expectancies. This distortion of vague information helps people to act in line with those expectancies (a response akin to the placebo effect), which in turn leads to a boost in performance and results in outcomes that confirm the positive expectancies.

In the studies reported here, we demonstrated the effect of vague information[1] on performance and tested the hypothesized underlying process. Our tests involved different types of performance: mental acuity (Study 1), physical strength (Study 2), and weight loss (Study 3).

Study 1: Influence of Vague Versus Precise Information on Mental Acuity

This study compared how vague information and precise information influenced performance on a mental acuity task. Prior to the task, participants were given chocolate with an ingredient (flavanol) that they were told would improve mental acuity. Depending on condition, the quantity of flavanol in the sample was presented to participants in vague or precise terms.

We conducted a pretest to determine whether participants given vague information about the quantity of flavanol they consumed generated greater positive expectancies regarding its ability to enhance their mental acuity than did participants given precise information. We measured expectancies in the pretest rather than in the main study because we did not want participants to see the link between their generated expectancies and subsequent performance.

Pretest

Thirty-eight participants were asked to sample a piece of chocolate and were informed that they would be expected to complete mental acuity tasks after sampling it. The chocolate was said to contain flavanol, which participants were told has the potential to improve mental performance. The instructions informed participants that approximately 1 g of cocoa has enough flavanol to improve mental acuity. Participants in the precise-information condition were told that the chocolate they sampled contained 1 g of cocoa; participants in the vague-information condition were told that the chocolate they sampled contained between 0.5 and 1.5 g of cocoa (for a complete description, see Study 1 Materials in the Supplemental Material available online). Participants in the two conditions sampled the same chocolate. After sampling the chocolate, they completed an expectancy measure, rating how much they expected the chocolate to be effective in improving their mental performance (scale from −3, *very low*, to 3, *very high*). After completing this measure, participants were told that because of a technical glitch, they would not have to perform the mental acuity tasks and that the study was being terminated.

The results indicated that participants in the vague-information condition generated higher expectancies that the chocolate would positively affect their performance (M = 0.75) than did participants in the precise-information condition (M = −0.27), $F(1, 36) = 5.87$, $p < .02$.

Main study

One hundred six participants took part in the main study in return for partial course credit. Participants completed a set of mental acuity tasks on a Nintendo DS system that was preloaded with a game called Brain Age (see Study 1 Materials in the Supplemental Material for a description of the tasks in the game). Lower Brain Age scores connote higher mental acuity; higher scores connote lower mental acuity. To familiarize participants with the Brain Age game, we asked them to complete a game in a purported practice session. This session provided us with a baseline score for each participant.

After the practice session, participants were randomly assigned to a condition (vague information or precise information) and offered a chocolate sample. Participants in this study were given the same information as were participants in the pretest. After participants had voluntarily sampled the chocolate, they were asked again to complete a Brain Age game. After completing the game, they rated how competent they believed they were "in solving mental acuity tasks," using a 7-point scale from 1, *not at all*, to 7, *a lot*.

A difference score was calculated by subtracting participants' practice score from their final score. Because a lower score is better than a higher score, a negative difference score indicated improvement. We used a one-way ANOVA to analyze the influence of information type (vague vs. precise) on the difference score. The analysis revealed a significant difference between the vague- and precise-information conditions, $F(1, 104) = 4.78$, $p < .03$, $\eta^2 = .04$. The Brain Age scores of participants in the vague-information condition improved more ($M = -13.7$) than did the scores of participants in the precise-information condition ($M = -10.3$).[2] Therefore, Study 1 demonstrated the proposed effect of vague information on performance in the domain of mental acuity.

Our hypothesis involves two factors that influence performance: ability to distort information and motivation to distort information. In Study 2, we constrained the ability to distort information for some participants but kept the motivation to do well the same across all participants.

Study 2: Constraining the Ability to Distort Information

Research on motivated reasoning has shown that people who are constrained to arrive at an accurate assessment (e.g., primed with an accuracy goal) find it difficult to distort information in a desired manner (Kunda, 1999; Mishra et al., 2008). Therefore, we expected that participants who were given vague information but primed with an accuracy goal would find it difficult to distort information. Hence, we predicted that the difference in performance between participants given vague and precise information would decrease among participants given this prime.

Study 2 compared the influence of vague information with that of precise information on participants' performance on a physical task. Participants were asked to sample a fruit juice that purportedly contained a natural nutrient called kaempferol, which they were told could enhance abilities on physical performance tasks. The study used a 2 (information: vague vs. precise) × 2 (prime: accuracy vs. control) between-participants design.

Method

One hundred thirty-seven participants took part in this study in return for partial course credit. First, participants were randomly assigned to the accuracy-prime or control condition. Participants in the accuracy-prime condition were asked to "describe a situation in which you took great care to collect information and made a very careful, unbiased and accurate decision." Those in the control condition were asked to "describe some events that occurred recently." Participants were then taken to a different room for what was purportedly a separate study.

In this second phase, participants were asked to sample a glass of fruit juice containing kaempferol after being told that kaempferol supplies essential energy to the muscles and has the potential to enhance muscular strength. They were further told that they would be asked to complete physical performance tasks later in the study. Participants were randomly assigned to the vague-information condition ("this juice sample has somewhere between 0.5 to 1.5 grams of kaempferol") or to the precise-information condition ("this juice sample has 1 gram of kaempferol"; for the full experimental instructions, see Study 2 Materials in the Supplemental Material).[3] Participants in the two conditions were served the same fruit juice. They were then given a hand grip and asked to exert as much force as they could. The hand grip was connected to a computer that remotely recorded the magnitude and duration of the exerted force.

Results and discussion

Because participants differed in the amount and the duration of force they exerted, we calculated the dependent variable by dividing the total force exerted by the total time a participant held the hand grip. A two-way ANOVA with force per second as the dependent variable yielded a significant Prime × Information interaction, $F(1, 133) = 5.42$, $p < .02$, $\eta^2 = .03$. Planned contrasts revealed that in the control condition, participants who had been given vague information exerted more force per second ($M = 217.22$) than did those who had been given precise information ($M = 168.3$), $F(1, 133) = 7.83$, $p < .005$. In the accuracy-prime condition, there was no difference in performance between participants who were given vague information ($M = 166.8$) and those who were given precise information ($M = 175.9$), $F < 0.5$, $p > .6$. The moderation by the accuracy prime supports the notion that it was the facility with which vague information could be distorted that boosted performance.

Study 3: Influence of Vague Health Information on Weight Loss

In both Studies 1 and 2, the information that was manipulated pertained to an external factor (food) that could influence performance. In Study 3, our first objective was to test whether vague information would have the same effect on performance when the information concerned factors that were internal rather than external. We met this objective by providing participants with either vague or precise feedback about their progress at meeting health-related goals. Past research has found that both motivation to do well and feedback are necessary for the attainment of positive outcomes (Locke & Latham, 2002). In Study 2, motivation to distort information was kept constant across participants, but in Study 3, we wanted to investigate the effect of this factor. Thus, our second objective was to examine the influence of vague information on performance when the motivation to distort information varied in magnitude.

Forty-one participants took part in this study in return for partial course credit. The study lasted for 3 weeks; participants attended one session per week. A unique respondent number was assigned to each participant to maintain anonymity and track responses. In the first session, participants were told that the study was designed to test the validity of a new health index called the Holistic Health Index (HHI); participants were informed that the HHI had recently been proposed as an alternative to the body mass index and that the HHI reflected the healthfulness of the lifestyle an individual was maintaining (for a full description of the HHI, see Study 3 Materials in the Supplemental Material). In the first session, participants were informed that an ideal HHI score was in the range from 45 to 55. This helped them assess their scores and progress over the 3-week study period. We created this fictitious health index so that participants could not check the values themselves and would have to rely on our feedback to track their progress.

Each week, the participants' weight and hydration levels were measured. After measurements were taken, participants entered their height, weight, hydration level, gender, and age into a computer. Participants were informed that two algorithms would be used to calculate their HHI score and that the algorithms might initially give different readings but would calibrate themselves to converge to a single value over the course of the study. Participants were also told that if the two algorithms gave different values, then their HHI score lay between the two values. When participants hit the "enter" button after entering their information, the computer screen displayed the message, "Calculating your health index." After 30 s, the computer displayed the HHI score from each algorithm. Participants were asked to write their scores on a piece of paper with the week's number printed on it so that they could refer to this information later.

Participants were randomly assigned to the vague- or precise-information condition. For participants in the precise-information condition, the two algorithms always gave the same HHI score. For participants in the vague-information condition, one algorithm added 3% to the computed value, and the other subtracted 3% from the computed value; thus, participants were given two different values that appeared in the form of a range.

Predictions

We predicted that participants whose HHI score was within the ideal range (i.e., they were already in a desired state of health) would not have high motivation to improve their score by losing weight and hence that their weight loss would be the same whether they were given vague or precise feedback on their HHI scores. However, participants whose HHI score was higher than the ideal would be more motivated to attain an HHI score within the ideal range.[4] For such participants, vague feedback would provide an illusion of proximity to the ideal range, making the goal of being in the ideal HHI range appear more achievable. This would translate to positive expectancies, which in turn would encourage participants to lead a healthy lifestyle and result in subsequent weight loss (movement toward the ideal). Moreover, participants had a definite goal (the ideal HHI score) toward which they could progress. Past research has shown that the motivation to work toward a goal increases with proximity to the goal (Hull, 1932; Kivetz, Urminsky, & Zheng, 2006). Vague information provided an illusion of proximity to the ideal score and thus would be expected to help participants feel that they could bring their scores within the ideal range. We predicted that participants provided with precise feedback would be less influenced by feedback (i.e., would show less weight loss) than would participants provided with vague feedback because they would be unable to selectively focus on favorable pieces of information (e.g., the lower score in a range).

Results and discussion

Two participants dropped out after 2 weeks, leaving a final sample of 39 participants. We used a regression analysis to explore the influence of the initial HHI score, the format in which the HHI score was provided (vague vs. precise), and their interactive effect on the change in weight in the subsequent 2 weeks. The analysis revealed a significant interaction, $F(1, 35) = 4.94$, $p < .03$, $\eta^2 = .11$ (see Fig. 1). We then ran a spotlight analysis and compared the change in participants' weights across the vague- and precise-information conditions at 1 standard deviation above and below the initial mean HHI score. At 1 standard deviation below the mean (HHI = 46.17, i.e., within the ideal range; less motivated participants),

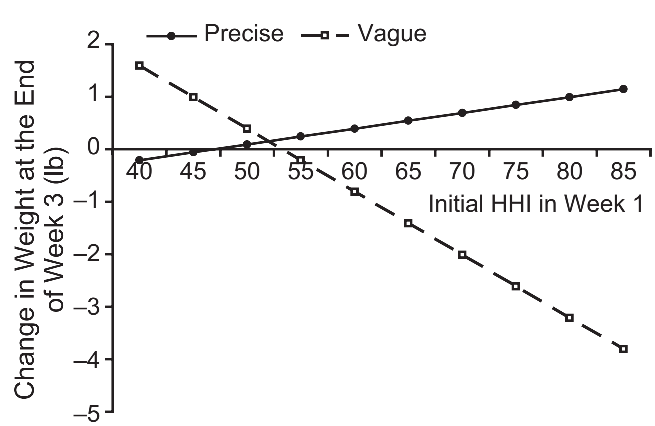

Fig. 1. Results from Study 3: change in weight as a function of feedback type (vague vs. precise information) and initial Holistic Health Index (HHI) score.

the weight loss of participants in the vague- and precise-information conditions did not differ, $p > .58$. However, at 1 standard deviation above the mean (HHI score = 69.55, i.e., above the ideal range; more motivated participants), the weight loss of participants differed significantly between the vague- and precise-information conditions; participants in the vague-information condition lost more weight than participants in the precise-information condition, $F(1, 35) = 6.52$, $p < .01$, $\eta^2 = .15$. Thus, the results of this study demonstrate the role of motivation in the influence of vague information on performance.

General Discussion

Across three studies, we demonstrated that when people are motivated to pursue a desired goal (e.g., losing weight or performing well on mental acuity or physical performance tasks), vague information allows them latitude in interpretation so that they can distort the information. This distortion, in turn, allows them to generate and act in line with positive expectancies. In this way, vague information, compared with precise information, yields better performance and thus results in outcomes that confirm positive expectancies. Along with demonstrating this effect, we demonstrated the role of motivation and positive expectancies in the documented effect of vague information on performance.

Our findings have significant practical implications. Market data indicate that people spend around $70 billion annually on weight-loss programs. However, people frequently discontinue their participation in these programs or switch programs because they are unable to observe any positive results. Our research suggests that vague, and thus malleable, information would allow individuals to perceive their progress more favorably and thus would help them stick to a plan, enabling them to lead a healthy lifestyle.

Past work on ambiguity aversion suggests that people prefer to have precise information rather than vague information prior to making a decision (Ellsberg, 1961). In this research, however, we demonstrated that vague information helps in the pursuit of goals. Our findings extend prior research on motivated reasoning by suggesting that vague information is more susceptible to distortion than is precise information and that vague information thus provides people with an impetus to persevere. Our findings also contribute to prior research on fuzzy trace theory. According to fuzzy trace theory, the precision with which information is encoded varies along a continuum; at one end of this continuum, information is represented by fuzzy traces (vague representations that have only a sense of the recently encountered information), and at the other end, information is defined by verbatim traces (well-articulated representations that preserve the information exactly; Brainerd & Reyna, 1990; Reyna & Brainerd, 1995). This theory also suggests that people have a greater inclination to use fuzzy traces than to use verbatim traces because the former seem more malleable. Our findings suggest that the prominence of fuzzy traces in vague information encourages the distortion of such information and thus enhances performance.

We should note that there may be situations in which vague information has weaker effects than demonstrated in our studies. Indeed, vague information may even have detrimental effects. For instance, if caloric information is given in the form of a range, people might focus on the lower value to justify their overindulgence. Further, the positive effects of vague information might be limited when people are anxious, because vagueness can aggravate anxiety.

Conclusion

Is the eternal quest for precise information always worthwhile? Our research suggests that, at times, vagueness has its merits. Not knowing precisely how they are progressing lets people generate positive expectancies that allow them to perform better. The fuzzy boundaries afforded by vague information allow people to distort that information in a favorable manner. This latitude positively influences behavior by affecting outcome expectancies. Conversely, the very nature of precise information prevents people from distorting it and forces them to be objective about their expectancies, which in turn may have a less positive influence on performance.

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Supplemental Material

Additional supporting information may be found at http://pss.sagepub.com/content/by/supplemental-data

Notes

1. We would like to emphasize that vague information is not the same thing as false information. In the studies we report here, vague information was accurate information presented in the form of a range. People can easily convert such vague information into a precise form (e.g., a range of 1.5 to 2.5 lb can be converted to a more precise "average" of 2 lb).

2. An alternate explanation could be that the participants' performance depended on their prior expertise at tasks similar to the Brain Age game. We compared the mean self-reported competence in the two conditions and found that participants in the vague-information condition ($M = 5.71$) and the precise-information condition ($M = 5.52$) perceived themselves to be equally competent, $p > .32$. We ran an additional analysis to assess the influence of information type (vague vs. precise) on the final Brain Age score while statistically controlling for the effects of practice on Brain Age score and competence score.

This analysis also yielded a significant influence of information type on final Brain Age score (vague-information condition: $M = 44.96$; precise-information condition: $M = 48.4$), $F(1, 102) = 5.36$, $p < .02$.

3. As in Study 1, a separate pretest showed that participants in the vague-information condition generated higher expectancies that the juice would positively influence their performance ($M = 0.19$) than did participants in the precise-information condition ($M = -0.9$), $F(1, 40) = 5.41$, $p < .02$.

4. A separate test was conducted to assess whether people whose HHI score was above the ideal range were more motivated to adopt healthful practices than were those whose HHI score was in the ideal range. One hundred twenty-four participants inputted their height, weight, hydration level, age, and gender and received their HHI score. Subsequently, they responded to three items that measured their motivation to pursue a healthy lifestyle: how hard they would try to maintain their score or bring it within the ideal range, how motivated they felt to maintain a healthy lifestyle, and whether maintaining a healthy lifestyle was worth the time and effort ($\alpha = .74$). The results indicated that as participants' HHI score increased, their motivation increased, $F(1, 122) = 5.88$, $p < .01$.

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