

# Illusionary Progress in Loyalty Programs: Magnitudes, Reward Distances, and Step-Size Ambiguity

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Loyalty programs offer rewards via mediums of different magnitudes (e.g., “\$6 off when you accumulate 1,000 [100] points. Earn 10 [1] points/dollar”). The program medium presents two key pieces of information: reward distance (points required to redeem reward) and step size (points earned per dollar). In higher-magnitude (vs. lower-magnitude) programs, both reward distances (1,000 vs. 100) and step sizes (10 vs. 1 point[s]/dollar) are larger. How do these two pieces of information affect consumers’ postenrollment inferences of progress, store loyalty, and recommendation likelihood? Do consumers always integrate both pieces? We identify a moderator, step-size ambiguity, and show that when ambiguity is high, only reward distance affects inferences. When ambiguity is lower, consumers integrate step size with reward distance, but in a biased manner. Implications arise in goal following and in physical and psychological distance estimation contexts (e.g., weight loss, savings) where distances and step sizes can vary (e.g., as a function of units: kilograms vs. pounds), but especially in loyalty rewards contexts.

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How would consumers interpret the following grocery card programs? “\$6 off when you accumulate 1,000 points. Earn 10 points per dollar,” versus “\$6 off when you accumulate 100 points. Earn 1 point per dollar.” The program medium presents two key pieces of information: reward distance (points required to redeem reward) and step size (points earned per dollar). In higher-magnitude (vs. lower-magnitude) programs, both reward distances (1,000 vs. 100) and step sizes (10 vs. 1 point[s]/dollar) are larger. How do these two pieces of information affect consumers’

postenrollment inferences of progress, store loyalty, and recommendation likelihood? Do consumers always integrate both pieces of information? What role does the program’s magnitude play? These are some questions we investigate in this research.

Imagine that two consumers, Neera and Farah, have enrolled in one of the two grocery loyalty programs described above and are earning points toward the \$6 reward. Neera is near her reward and has earned 80% of the points needed. Farah is still far from the reward and has earned only 20% of the points. If the reward were offered in the higher-magnitude program (1,000 points needed to redeem reward), Neera would have earned 800 points and Farah would have earned 200. The step size would be the same for both Neera and Farah (10 points/dollar). In the program with the smaller magnitude (100 points needed), Neera would have earned 80 points and Farah would have earned 20. The step size would be identical for both but considerably lower (1 point/dollar).

Assume further that Neera and Farah only pay attention to the distance information (points needed). Would Neera’s and Farah’s perceptions, relative to each other (Neera – Farah), differ based on whether they are enrolled in a program with a higher or a lower magnitude? Because reward

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progress (80% vs. 20%) remains unaffected by a change in magnitude, normatively, relative perceptions should not differ. But relative-distance differences (Neera – Farah) may appear larger in the higher (vs. lower) program. Specifically, in the higher program, Neera needs 200 points and Farah needs 800. In the lower program, Neera needs 20 points and Farah needs 80. Relative to Farah, Neera's perceptions may be more positive (higher progress, loyalty, and recommendation likelihood) in the higher program than in the lower program, as she might feel that she has accumulated many more points. Literature on numerosity would support such an argument (Pelham, Sumarta, and Myaskovsky 1994; Wertenbroch, Soman, and Chattopadhyay 2007). Studying currency perceptions, Wertenbroch et al. (2007) show that differences between budget (US\$10) and price of a target item (US\$1) appear larger when expressed in a currency (Singapore dollar, S\$) that is 1.7 times more numerous than the U.S. dollar (S\$15.30 vs. US\$9).

What if Neera and Farah attend to both distance (points needed) and step sizes (points/dollar)? How would their perceptions, relative to each other, change? Would the change depend on the program's magnitude? We believe that it might. We address the current literature's lack of insight on how step sizes would be integrated with distances. We also identify an important moderator, step-size ambiguity, and show that when ambiguity is high (less precise step-size information), consumers ignore step sizes and rely on distances. But when ambiguity is low (more precise information), consumers integrate step sizes with distances, but in a biased manner. Thus, we investigate the role that step-size ambiguity (high vs. low) plays in influencing how program magnitude (high vs. low) affects postenrollment inferences (progress, loyalty, and recommendation likelihood) contingent on reward distance (near vs. far).

We make several important contributions. First, little is known about how different facets of a loyalty program affect postenrollment inferences. Although 1.3 billion loyalty program memberships exist in the United States (Ferguson and Hlavinka 2007), less than one-fourth of enrolled members redeem rewards (Capizzi and Ferguson 2005). Merely joining a loyalty program does not guarantee loyalty. While consumers exert more effort as they approach rewards (Kivetz, Urminsky, and Zheng 2006; Nunes and Drèze 2006), other aspects remain unexplored. Given that the ultimate goal of a loyalty program is to engender loyalty, we investigate effects on postenrollment inferences of progress, store loyalty, and recommendation likelihood.

Second, we extend literature on medium maximization, which suggests that consumers like to maximize points earned in a medium (Hsee et al. 2003). However, in these studies the effects of distances and step sizes were not studied separately. Third, we identify an important moderator, ambiguity of step size, and show how this affects the relative weighting of different facets of a loyalty program (high/low distance and high/low step size). Fourth, the numerosity literature suggests that numbers expressed in a larger (vs. smaller) medium appear farther apart (Wertenbroch et al.

2007) and might predict that reward distance would have a stronger effect on perceptions in the high (vs. low) program medium. We demonstrate that varying step-size ambiguity can attenuate or enhance the influence of reward distance on inferences in both programs.

Fifth, the goal-gradient theory suggests that progress enhances pursuit (Kivetz et al. 2006). We quantify progress using numbers and demonstrate that even when similar amounts of progress have been made (80% vs. 20%), relative perceptions vary depending on the program's magnitude and step-size ambiguity, leading to illusions of progress. Finally, these illusionary progress perceptions affect important marketing variables such as loyalty and recommendation likelihood. We develop our hypotheses next and then report findings from two studies.

## THEORETICAL BACKGROUND

We draw from three streams of research to derive our hypotheses. First, research on medium maximization provides the basis for suggesting that the program medium affects perceptions. Second, research on ambiguity helps us identify when consumers use distances and when they integrate step sizes with distances. Third, research on numerosity suggests how programs with different magnitudes are interpreted when consumers attend to distances alone. We then extend this literature by positing how step sizes would be integrated with distances.

### Medium Maximization

Medium maximization research suggests that consumers overweight the importance of the reward medium because it creates an illusion of advantage (Hsee et al. 2003; Van Osselaer, Alba, and Manchanda 2004). In one study, Hsee et al. (2003) asked participants to choose between a short task (6 minutes) and a long task (7 minutes) and offered them a gallon of either vanilla (short task) or pistachio (long task) ice cream. In the control condition, no points were offered, and the ice cream was simply presented. In the experimental conditions, participants earned either 60 points (short task) or 100 points (long task). With 50–99 points, participants could get the vanilla ice cream, and with 100 or more, the pistachio ice cream. Although the outcomes remained the same (the points had no other value), more participants chose the long task in the experimental condition than in the control condition, overweighting the influence of the medium. Consumers may also overweight the importance of the medium in loyalty rewards contexts. But because consumers make repeated choices in loyalty rewards contexts, a more complicated medium, two informational pieces are available: distance (points needed) and step size (points/dollar). Inferences may differ depending on whether consumers attend to only distances or to both distances and step sizes. We draw from research on ambiguity next to delineate when consumers might attend to distances alone and when they might integrate step sizes with distances.

### Step-Size Ambiguity

One of the broader definitions of ambiguity refers to it as “the subjective experience of missing information relevant to a prediction” (Frisch and Baron 1988, 152; also see Camerer and Weber 1992; Snow 2010). According to this definition, attributes of the stimuli (e.g., precision of step-size information), the decision context (e.g., information overload), and situational and individual difference variables (e.g., memory) can all lead to perceptions of ambiguity (Hoch and Deighton 1989; Hoch and Ha 1986; Muthukrishnan 1995). While studying how ambiguous information is interpreted in decision making, Van Dijk and Zeelenberg (2003) manipulated high ambiguity by providing a range of possible values (\$200,000–\$600,000, less precise) and low ambiguity by providing a precise estimate (either \$200,000 or \$600,000). Similar kinds of strategies are also used in advertising contexts where claims such as “Save 20% to 40%” are often made (Biswas and Burton 1993). These advertisements, referred to as tensile claims, reduce information value and inject ambiguity into the decision-making context (Dhar, Gonzz-Vallejo, and Soman 1999; Mobley, Bearden, and Teel 1988). We use a similar method to manipulate step-size ambiguity. We provide either a range (less precise, high ambiguity) or the mean of the range (more precise, low ambiguity).

Furthermore, Van Dijk and Zeelenberg (2003) show that when information is more ambiguous, it is discounted. In study 1, the researchers find that when sunk-cost information is provided in a precise format (either \$200,000 or \$600,000), the effect on decision making is much higher than when a range is provided (\$200,000–\$600,000). These researchers contend that “ambiguous, inexact, incomplete, or vague information” is deemed insufficient and is therefore discounted in decision making (342). We expect ambiguity (and precision) to have a similar effect on postenrollment inferences in loyalty rewards contexts. With less precise information, consumers will ignore the step sizes. They will instead use distances, as this is the only other cue available. We draw from the numerosity literature next to derive how this would affect inferences.

### Numerosity and Program Medium

An emerging literature (Burson, Larrick, and Lynch 2009; Gourville 1998; Wertenbroch et al. 2007) suggests how medium magnitudes influence perceptions. Gourville (1998) finds that consumers are more likely to donate \$1 per day than when the same amount is presented on a yearly basis, that is, \$350 per year. Burson et al. (2009) also demonstrate similar effects. In one study, Burson et al. (2009) asked consumers to choose between two movie rental options that either indicated the number of new movies available on a weekly basis (plan A: seven movies/week for \$10/week; plan B: nine movies/week for \$12/week) or on a yearly basis (plan A: 364 movies/year for \$10/week; plan B: 468 movies/year for \$12/week). Although the number of new movies in each of the two plans remained unchanged, plan A was

preferred over plan B when the lower-magnitude medium (week) was used, but when the higher-magnitude medium (year) was used, plan B was preferred. Thus, changing the medium’s magnitude affected inferences.

Similarly, Wertenbroch et al. (2007) find that consumers overspend with a currency of higher magnitude. This is because a difference, of say 9 units, between budget (US\$10) and price (US\$1) appears larger in a currency (\$) that is 1.7 times more numerous (\$15.30 vs. US\$9).

The numerosity literature provides a possible explanation of why this might be so (Josephs, Giesler, and Silvera 1994; Pelham et al. 1994). Pelham et al. (1994) suggest that larger numbers are often associated with larger sizes. More often than not, a 10-bedroom house is likely to be of a larger size than a three-bedroom home. Repeated exposure to such joint stimuli strengthens these associations. Consequently, individuals learn to use largeness of a number to infer size, ignoring other cues. Others suggest that these associations are not learned, but that the brain is wired to use numerosity to infer quantity (Gallistel and Gelman 1991). In the context of loyalty rewards, a program’s magnitude (numerosity) is likely to also affect inferences.

As discussed previously, when ambiguity of step size is higher, consumers will ignore step sizes (Van Dijk and Zeelenberg 2003) and use distances to make inferences. Because more points are needed to redeem rewards in the high-magnitude (vs. low-magnitude) programs, participants’ relative judgments as a function of reward distance will be more pronounced in the higher (vs. lower) program (Wertenbroch et al. 2007). Thus, in the high-magnitude program (1,000 points needed), distances appear larger, and so Neera (80% progress, earned 800 points) will feel that she is closer to the reward (needs 200 points) relative to Farah (20% progress, earned 200 and needs 800 points). These perceptions will be attenuated in the low program, and Neera (earned 80 of the 100 points) will not feel that she has earned that many more points relative to Farah (20 points).

But what happens when step-size ambiguity is lower (i.e., when points earned per dollar is evident)? Research suggests that costs associated with earning a reward play an important role in influencing perceptions (Dowling and Uncles 1997; O’Brien and Jones 1995; Ramasubramani 2007). Thus, consumers are likely to focus on the redemption costs. But as cognitive misers, rather than actually calculating costs, consumers are expected to make cost inferences from the different available cues. Step size provides an immediately accessible measure of return in the medium (points earned per dollar). When step sizes are large, the influence of distance will be attenuated. This is because a large step size will give the impression that the reward is easily attainable; hence, distance will play a smaller role in affecting inferences. However, when step sizes are smaller, consumers will realize that the progress rate is very low and, in order to ascertain attainability, will pay attention to distances. Thus, in the high-magnitude program, Neera will not feel that she has made that much more progress relative to Farah, because they both feel they are earning points at a fast rate (10 points/dollar). In contrast, in the low-magnitude conditions, Neera

will feel that she has made a lot of progress (80 points) given the small steps (1 point/dollar), while Farah will not feel so (20 points). If consumers calculate costs by assessing the step sizes and the distances and then dividing distance by step size, we would expect similar patterns of differences between the near and far conditions in both the high- and low-magnitude programs. Given the complexity involved, we do not expect consumers to calculate the costs incurred and posit the following (see H1A and H1B in fig. A1 in the appendix):

**H1:** Step-size ambiguity will moderate how reward distance influences consumers' postenrollment inferences in programs of different magnitudes.

**H1a:** Step-size ambiguity high: When program magnitude is *high*, those near the reward relative to those far from it will (*a*) judge progress to be higher, (*b*) be more loyal, and (*c*) be more likely to recommend the program. When program magnitude is *low*, the differences between those near the reward relative to those far from it will be attenuated.

**H1b:** Step-size ambiguity low: When program magnitude is *low*, those near the reward relative to those far from it will (*a*) judge progress to be higher, (*b*) be more loyal, and (*c*) be more likely to recommend the program. When program magnitude is *high*, the differences between those near the reward relative to those far from it will be attenuated.

As hypothesis 1a suggests, in the high-magnitude (vs. low-magnitude) program, distances are larger and so have a stronger influence on perceptions when ambiguity is high. Neera will feel that she has made more progress relative to Farah (800 vs. 200 points). When ambiguity is reduced, even though relative progress remains the same (80% vs. 20%), Neera and Farah will incorporate the step sizes and realize that they are large (10 points/dollar); thus, the distance differences will not seem as large relative to when ambiguity is higher. In the low-magnitude program, the distance differences are smaller (80 vs. 20 points), and so the influence of distance on perceptions is lower when ambiguity is higher, as individuals rely on only distances. When ambiguity is reduced, the small difference between 80 points and 20 points will seem larger because Neera and Farah realize how small the step size is (1 point/dollar). Neera will thus feel that she has made more progress relative to Farah (see H2 in fig. A1 in the appendix). Formally:

**H2:** Program magnitude will moderate how reward distance influences consumers' postenrollment inferences in programs with different step-size ambiguities.

**H2a:** High-magnitude program: When step-size ambiguity is *high*, those near the reward relative to

those far from it will (*a*) judge progress to be higher, (*b*) be more loyal, and (*c*) be more likely to recommend the program. When step-size ambiguity is *low*, the differences between those near the reward relative to those far from it will be attenuated.

**H2b:** Low-magnitude program: When step-size ambiguity is *low*, those near the reward relative to those far from it will (*a*) judge progress to be higher, (*b*) be more loyal, and (*c*) be more likely to recommend the program. When step-size ambiguity is *high*, the differences between those near the reward relative to those far from it will be attenuated.

Extant research suggests that nearer goals elicit greater commitment and effort (Bandura and Schunk 1981; Kivetz et al. 2006; Naylor and Ilgen 1984). In the context of loyalty programs, rewards that are perceived as being nearer are also likely to elicit more favorable evaluations. Thus, progress perceptions are likely to influence consumers' loyalty as well as recommendation likelihoods. Progress may be measured by eliciting perceptions of time required to earn the reward or amount of progress made per dollar. These perceptions will mediate the contingent effects of the independent variables on loyalty and recommendation likelihood. More formally:

**H3:** Progress perceptions will mediate the relationship between step-size ambiguity, program magnitude, and reward distance on loyalty and likelihood of recommending the program.

We report findings from two studies. In study 1 we use a grocery-card context to investigate effects on store loyalty and on recommendation likelihood. We provide process support by demonstrating the mediating role of time required. Study 2 uses a restaurant context and simulates the point-accrual process. Participants make repeated purchases and earn points that could be redeemed for a free dinner. We examine effects on recommendation likelihood and on progress per dollar. Study 2 allows us to demonstrate the robustness of the phenomenon by replicating findings from study 1 in a different context. It also provides for a more realistic test where participants engage in the process of earning points and experience the effects of both distances and step sizes. Additionally, in study 2 we are able to replicate the pattern of results using progress per dollar, a measure of perceived step size, as a dependent measure and provide process support by investigating its role as a mediator. We discuss study 1 next.

## STUDY 1: GROCERY STUDY

### Participants, Method, and Design

We recruited 246 undergraduates to take part in a study for course credit ( $M_{\text{age}} = 20$  years, 47% female). We ex-

cluded six participants whose responses were 3 or more SDs away from the mean. The analyses reported below use the remaining 240 responses.

The study scenario indicated that participants had enrolled in a grocery store membership program. We manipulated program magnitude between subjects. In the high-magnitude program, members enrolled in this program could earn \$6 off from the store's gas station after accruing 1,000 points, while in the low-magnitude program only 100 points were needed. We then manipulated step-size ambiguity by varying the precision with which it was presented. All participants learned that the number of points earned depended on the products purchased and could vary. In the high-ambiguity condition, participants earned between 7 and 13 points per dollar if they were in the high-magnitude condition and between 0.7 and 1.3 points per dollar if they were in the low-magnitude condition. In contrast, in the low-ambiguity conditions, we did not provide a range but told participants that on average they earned 10 points per dollar if they were in the high-magnitude condition and 1 point per dollar if they were in the low-magnitude condition. Thus, in the high-ambiguity condition we provided a range (less precise step-size information), while in the low-ambiguity condition participants were given the mean values (more precise information).

We then manipulated reward distance between subjects. In the reward-near condition, we told participants that they had accumulated either 800 points (high-magnitude program) or 80 points (low-magnitude program), whereas in the reward-far condition, we told participants that they had accumulated 200 points (high-magnitude program) or 20 points (low-magnitude program). Thus, irrespective of program magnitude, those in the near condition had spent \$80, while those in the far condition spent only \$20. These manipulations are shown in table A1 in the appendix.

This study was designed as a 2 (ambiguity: high, low)  $\times$  2 (magnitude: high, low)  $\times$  2 (reward distance: near, far) full-factorial, between-subjects study. We asked participants to indicate whether such a program would increase store loyalty (1 = not much at all, 7 = a lot) and whether they would recommend this program to others (1 = not likely at all, 7 = very likely). We asked participants to indicate how much time would be required to earn the reward (1 = not long at all, 7 = very long). We also asked participants several manipulation-check questions, such as how difficult it was to estimate the number of points earned per dollar spent (1 = not difficult at all, 7 = very difficult), the number of points earned per dollar spent (1 = not many at all, 7 = a lot), and the number of points earned so far (1 = not many at all, 7 = a lot).

## Results

*Manipulation Checks.* An ANOVA with difficulty of estimating the number of points earned per dollar as the dependent measure and ambiguity, magnitude, and reward distance as the independent measures elicited only a main

effect of ambiguity ( $F(1, 232) = 51.66, p < .0001$ ), indicating that it was harder to estimate points earned in the high-ambiguity condition than in the low-ambiguity condition ( $M_{\text{high-amb}} = 4.28$  vs.  $M_{\text{low-amb}} = 2.72$ ). Similarly, an ANOVA with points earned per dollar elicited only a main effect of program magnitude ( $F(1, 232) = 4.45, p < .04$ ). Participants in the high-magnitude program were aware that they were earning a higher number of points per dollar relative to those in the low-magnitude program ( $M_{\text{high-mag}} = 3.72$  vs.  $M_{\text{low-mag}} = 3.33$ ). An ANOVA with points earned so far elicited a main effect of reward distance ( $F(1, 232) = 181.53, p < .0001$ ), confirming that participants were aware that they had earned more points when they were near versus far from the reward ( $M_{\text{reward-near}} = 4.94$  vs.  $M_{\text{reward-far}} = 2.90$ ). No other effects emerged, suggesting that our manipulations worked.

*Store Loyalty.* An ANOVA with loyalty as the dependent measure elicited a main effect of reward distance ( $F(1, 232) = 4.81, p < .03$ ). Loyalty perceptions of those near the reward were more positive than were perceptions of those farther away ( $M_{\text{reward-near}} = 4.59$  vs.  $M_{\text{reward-far}} = 4.08$ ).

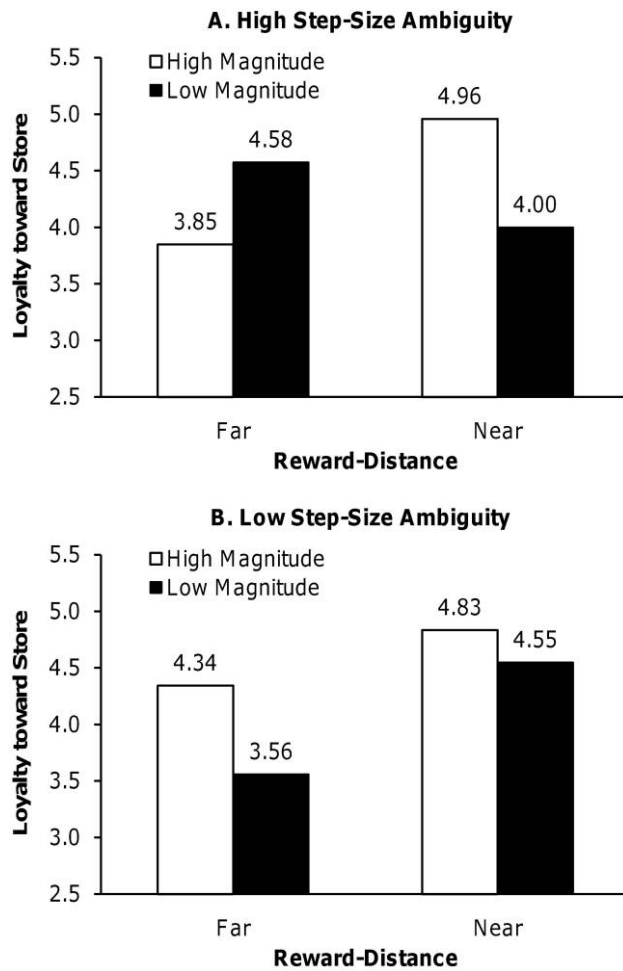
A significant ambiguity  $\times$  magnitude  $\times$  reward distance interaction also emerged ( $F(1, 232) = 5.66, p < .02$ ), as shown in figure 1. The three-way interaction was driven by differences in the magnitude  $\times$  reward distance interactions in the high- and low-ambiguity conditions ( $F(1, 232) = 6.68, p = .01$  and  $F(1, 232) = .59, p > .40$ , respectively). Similarly, the ambiguity  $\times$  reward distance interaction also differed across the high- and low-magnitude programs ( $F(1, 232) = .92, p > .30$  and  $F(1, 232) = 5.74, p < .02$ , respectively).

Our hypotheses, however, relate to comparisons of several contrasts. Specifically, hypothesis 1 suggests that the difference between the reward-near and reward-far conditions in the high-ambiguity condition will be significant when program magnitude is high but will be attenuated when magnitude is low. We expect a reversal in the low-ambiguity conditions. Specifically, the differences between the reward-near and reward-far conditions will be attenuated when program magnitude is higher but will be significant when magnitude is lower. As predicted, in the high-ambiguity condition, reward distance had a significant effect on loyalty when magnitude was high ( $M_{\text{reward-near}} = 4.96$  vs.  $M_{\text{reward-far}} = 3.85; p < .02$ ) but not when it was low ( $M_{\text{reward-near}} = 4.00$  vs.  $M_{\text{reward-far}} = 4.58; p > .20$ ). In contrast, in the low-ambiguity condition, reward distance did not have a significant effect on loyalty when magnitude was high ( $M_{\text{reward-near}} = 4.83$  vs.  $M_{\text{reward-far}} = 4.34; p > .25$ ) but did when it was low ( $M_{\text{reward-near}} = 4.55$  vs.  $M_{\text{reward-far}} = 3.56; p < .04$ ).

Hypothesis 2 suggests that the difference between the reward-near and reward-far conditions in the high-magnitude programs will be significant when ambiguity of step size is higher but will be attenuated when ambiguity is lower. Furthermore, the differences between the two distance conditions in the low-magnitude programs will be significant when ambiguity is lower but will be attenuated when am-

FIGURE 1

EFFECT OF AMBIGUITY, MAGNITUDE, AND REWARD DISTANCE ON LOYALTY: STUDY 1



ambiguity is higher. As expected, in the higher-magnitude program, reward distance elicited a significant difference when ambiguity of step size was higher ( $M_{\text{reward-near}} = 4.96$  vs.  $M_{\text{reward-far}} = 3.85$ ;  $p < .02$ ) but not when ambiguity was lower ( $M_{\text{reward-near}} = 4.83$  vs.  $M_{\text{reward-far}} = 4.34$ ;  $p > .25$ ). In contrast, in the low-magnitude program, reward distance did not influence loyalty when ambiguity of step size was higher ( $M_{\text{reward-near}} = 4.00$  vs.  $M_{\text{reward-far}} = 4.58$ ;  $p > .20$ ) but did when ambiguity was lower ( $M_{\text{reward-near}} = 4.55$  vs.  $M_{\text{reward-far}} = 3.56$ ;  $p < .04$ ).

**Recommendation Likelihood.** When we conducted an ANOVA with recommendation likelihood as the dependent measure, a main effect of reward distance emerged ( $F(1, 232) = 9.14$ ,  $p < .005$ ). Those closer to earning the reward were more likely to recommend the program relative to those farther away ( $M_{\text{reward-near}} = 4.26$  vs.  $M_{\text{reward-far}} = 3.55$ ).

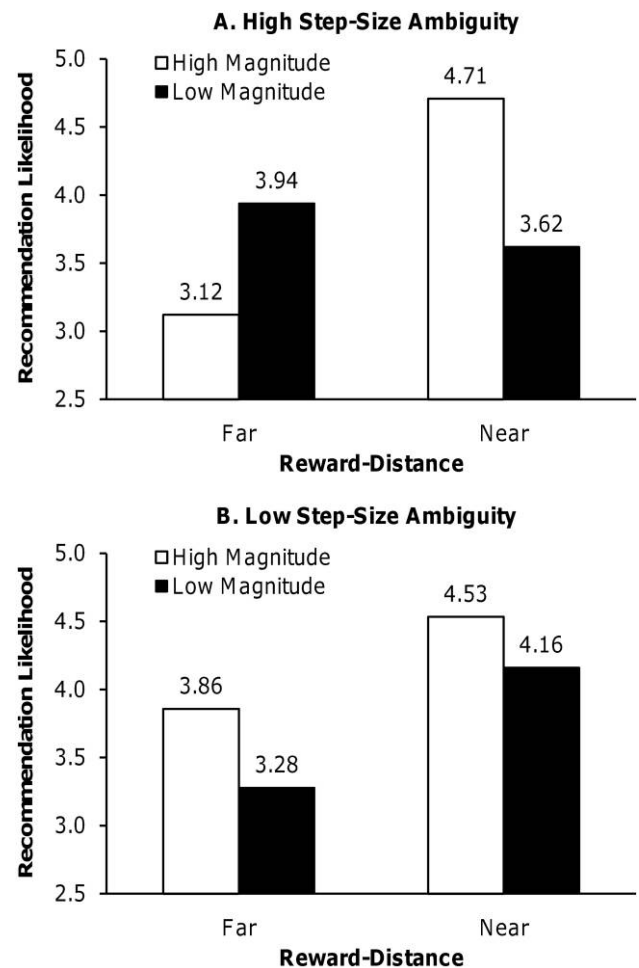
A significant ambiguity  $\times$  magnitude  $\times$  reward distance

interaction also emerged ( $F(1, 232) = 5.10$ ,  $p < .03$ ), as shown in figure 2. Follow-up contrasts revealed that the magnitude  $\times$  reward distance interactions were different in the high- and low-ambiguity conditions ( $F(1, 232) = 8.24$ ,  $p < .005$  and  $F(1, 232) = .10$ ,  $p > .75$ , respectively). The patterns were also different for the ambiguity  $\times$  reward distance interaction within levels of the high- and low-magnitude programs ( $F(1, 232) = 1.92$ ,  $p > .15$  and  $F(1, 232) = 3.26$ ,  $p > .07$ , respectively).

Consistent with hypothesis 1, when step-size ambiguity was higher, reward distance had a significant effect on recommendation likelihood in the high-magnitude program ( $M_{\text{reward-near}} = 4.71$  vs.  $M_{\text{reward-far}} = 3.12$ ;  $p < .005$ ) but not in the low-magnitude program ( $M_{\text{reward-near}} = 3.62$  vs.  $M_{\text{reward-far}} = 3.94$ ;  $p > .45$ ). In contrast, in the low-ambiguity condition, reward distance did not have a significant influence on recommendation likelihood when magnitude was

FIGURE 2

EFFECT OF AMBIGUITY, MAGNITUDE, AND REWARD DISTANCE ON RECOMMENDATION LIKELIHOOD: STUDY 1



high ( $M_{\text{reward-near}} = 4.53$  vs.  $M_{\text{reward-far}} = 3.86$ ;  $p > .10$ ) but had a marginal effect when it was low ( $M_{\text{reward-near}} = 4.16$  vs.  $M_{\text{reward-far}} = 3.28$ ;  $p < .07$ ).

Consistent with hypothesis 2, in the higher-magnitude program, reward distance elicited a significant difference when step-size ambiguity was high ( $M_{\text{reward-near}} = 4.71$  vs.  $M_{\text{reward-far}} = 3.12$ ;  $p < .005$ ) but not when it was low ( $M_{\text{reward-near}} = 4.53$  vs.  $M_{\text{reward-far}} = 3.86$ ;  $p > .10$ ). In contrast, in the low-magnitude program, reward distance did not influence recommendation likelihood when ambiguity of step size was higher ( $M_{\text{reward-near}} = 3.62$  vs.  $M_{\text{reward-far}} = 3.94$ ;  $p > .45$ ) but elicited a marginal effect when ambiguity was lower ( $M_{\text{reward-near}} = 4.16$  vs.  $M_{\text{reward-far}} = 3.28$ ;  $p < .07$ ).

**Time Required.** A similar pattern of results also emerged when we ran an ANOVA with time required as our dependent measure. The main effect of reward distance was significant ( $F(1, 232) = 6.66$ ,  $p < .02$ ), suggesting that participants in the reward-near condition expected the reward to be quickly attainable relative to those in the reward-far condition ( $M_{\text{reward-near}} = 3.94$  vs.  $M_{\text{reward-far}} = 4.40$ ).

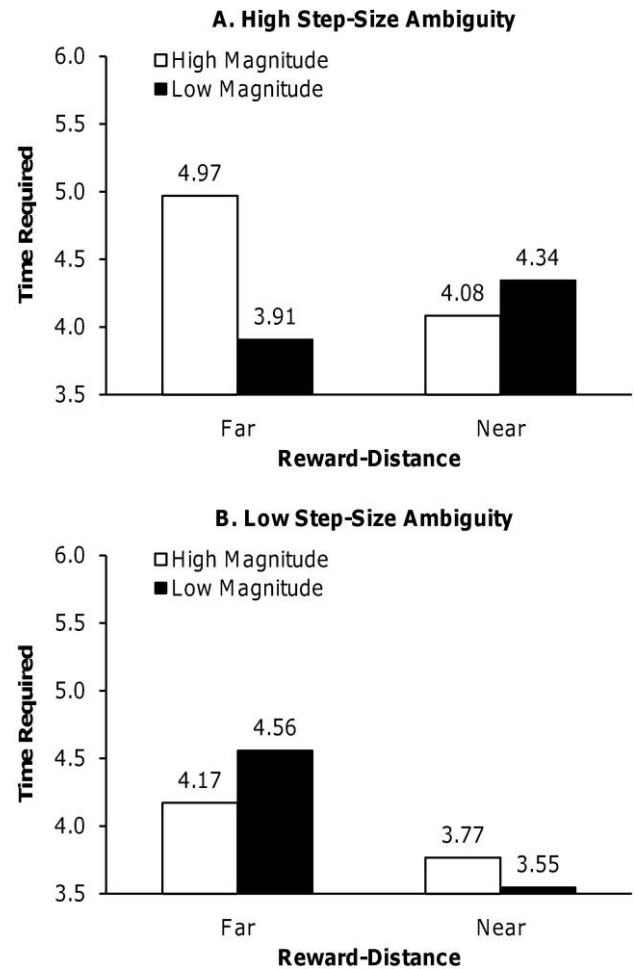
A significant ambiguity  $\times$  magnitude  $\times$  reward distance interaction also emerged ( $F(1, 232) = 7.11$ ,  $p < .01$ ), as shown in figure 3. Planned contrasts also revealed that the magnitude  $\times$  reward distance interactions were different in the high- and low-ambiguity conditions ( $F(1, 232) = 6.62$ ,  $p = .01$  and  $F(1, 232) = 1.42$ ,  $p > .20$ , respectively). Similarly, the ambiguity  $\times$  reward distance interaction was different in the high- and low-magnitude programs ( $F(1, 232) = .90$ ,  $p > .30$  and  $F(1, 232) = 7.91$ ,  $p = .005$ , respectively).

Consistent with hypothesis 1, in the high-ambiguity condition, reward distance had a significant effect on time required when magnitude was high ( $M_{\text{reward-near}} = 4.08$  vs.  $M_{\text{reward-far}} = 4.97$ ;  $p < .02$ ) but not when it was low ( $M_{\text{reward-near}} = 4.34$  vs.  $M_{\text{reward-far}} = 3.91$ ;  $p > .20$ ). Moreover, in the low-ambiguity condition, reward distance did not have a significant influence on time required when magnitude was high ( $M_{\text{reward-near}} = 3.77$  vs.  $M_{\text{reward-far}} = 4.17$ ;  $p > .20$ ) but did when it was low ( $M_{\text{reward-near}} = 3.55$  vs.  $M_{\text{reward-far}} = 4.56$ ;  $p < .01$ ).

We also find support for hypothesis 2. In the higher-magnitude program, reward distance elicited a difference in time perceptions when step-size ambiguity was high ( $M_{\text{reward-near}} = 4.08$  vs.  $M_{\text{reward-far}} = 4.97$ ;  $p < .02$ ) but not when it was low ( $M_{\text{reward-near}} = 3.77$  vs.  $M_{\text{reward-far}} = 4.17$ ;  $p > .20$ ). In the low-magnitude program, reward distance did not influence perceived duration when ambiguity of step size was higher ( $M_{\text{reward-near}} = 4.34$  vs.  $M_{\text{reward-far}} = 3.91$ ;  $p > .20$ ) but did when ambiguity was lower ( $M_{\text{reward-near}} = 3.55$  vs.  $M_{\text{reward-far}} = 4.56$ ;  $p < .01$ ).

**Mediation.** Hypothesis 3 posited that progress perceptions would mediate the effects of the ambiguity  $\times$  magnitude  $\times$  reward distance interaction on store loyalty and on recommendation likelihood. As discussed earlier, individual ANOVAs with loyalty, recommendation likelihood, and time perceptions as dependent measures elicited sig-

**FIGURE 3**  
EFFECT OF AMBIGUITY, MAGNITUDE, AND REWARD DISTANCE ON TIME REQUIRED: STUDY 1



nificant three-way interactions of ambiguity  $\times$  magnitude  $\times$  reward distance ( $F(1, 232) = 5.66$ ,  $p < .02$ ;  $F(1, 232) = 5.10$ ,  $p < .03$ ; and  $F(1, 232) = 7.11$ ,  $p < .01$ , respectively). To test for mediated moderation (Muller, Judd, and Yzerbyt 2005), we included time required along with the interaction of time required and ambiguity in the models with loyalty and recommendation likelihood as the dependent measures. The main effect of time required remained significant in both models ( $F(1, 230) = 7.53$ ,  $p < .01$  and  $F(1, 230) = 12.44$ ,  $p = .0005$ , respectively), but the three-way interactions were no longer significant ( $F(1, 230) = 3.72$ ,  $p > .05$  and  $F(1, 230) = 2.86$ ,  $p > .09$ , respectively). Thus, progress inferences fully mediated the effects of the independent variables on loyalty and on recommendation likelihood.

## Discussion

These findings support all our hypotheses. As posited in hypothesis 1a, when step-size ambiguity is high, consumers use distances to make inferences. Distances appear larger in the high-magnitude (vs. low-magnitude) program; therefore, the difference in perceptions between those in the near and far conditions is more pronounced in the high (vs. low) program. We also find support for hypothesis 1b when step-size ambiguity is low. In the high-magnitude (vs. low-magnitude) program, step sizes are larger, and so the effect of reward distance on inferences is attenuated. But the difference in perceptions between those in the near and far conditions is more pronounced in the low (vs. high) program. This is because those near the reward feel that they have traversed a long distance given the small step size, while those far from the reward feel that they need to traverse a much longer distance. If respondents calculated the costs incurred in the low-ambiguity conditions, differences between the near and far conditions would be the same in both the high- and low-magnitude conditions. Given the complexity involved in calculation, we did not expect to see such a pattern and found results consistent with hypothesis 1b.

Furthermore, consistent with hypothesis 2a, the step size is larger in the high-magnitude program; therefore, reducing ambiguity of step size attenuates the influence of reward distance. In contrast, distances in the low-magnitude program appear smaller when step size is ambiguous. When ambiguity is reduced, consumers realize how small the step size is. Because the steps are smaller, the distances now appear more imposing. Consistent with hypothesis 2b, relative to the high-ambiguity condition, differences in perceptions between those in the near and far conditions are enhanced when ambiguity is reduced. We also find that progress perceptions (time to redeem reward) mediate the effects of ambiguity, magnitude, and reward distance on loyalty and on recommendation likelihood. We describe study 2 next.

## STUDY 2: RESTAURANT BEHAVIORAL STUDY

### Participants, Method, and Design

We recruited 310 participants from an online panel (Amazon Mechanical Turk, <https://www.mTurk.com>;  $M_{\text{age}} = 33$  years, 61% female) and 75 undergraduates ( $M_{\text{age}} = 21$  years, 47% female) for this study. The panelists were paid a token amount, while the undergraduates earned course credit. We excluded responses from 10 participants whose responses were 3 or more SDs away from the mean. The analyses reported below use the remaining 375 responses. Although the patterns of results are the same across both data sets, we control for the source (panelists, undergraduates) in our analyses. Not controlling for the source does not change the pattern of our results.

The scenario indicated that participants had enrolled in a

loyalty program introduced by a restaurant. We manipulated program magnitude between subjects. In the high-magnitude conditions, members could earn a free dinner after accruing 1,000 points, while in the low-magnitude conditions, only 100 points were needed.

We also manipulated the ambiguity of step size. In the high-ambiguity condition, participants learned that the dinner menu as well as entrée prices changed every day. The prices typically varied from about \$7.25 to \$12.75. The number of points earned per dinner also varied and could range from about 60 to 140 points (6 to 14 points) in the high-magnitude (low-magnitude) conditions. Thus, it would be hard for consumers to precisely assess the step size, that is, points earned per dollar, in the high-ambiguity conditions. In contrast, in the low-ambiguity conditions, participants were given more precise step-size information. That is, even though the menu changed every day, the price generally remained fixed (about \$10). The number of points per dinner was also fixed (100 and 10 points in the high- and low-magnitude programs, respectively).

We also manipulated progress between subjects. We designed an interactive platform to simulate the process by which participants earned points. On the first screen, participants learned that they had enrolled in a loyalty program and would be using their loyalty card to dine at a restaurant several times. On the next screen, we asked participants to imagine that they were at the restaurant and were choosing an entrée. A menu consisting of 10 items was presented, and participants were asked to choose an entrée. On the following screen, the price of the entrée, along with the number of points earned, was displayed. Although participants were allowed to choose any entrée from the list, the points and prices for all the entrées in a specific dinner menu were preprogrammed to be the same (we carefully included entrées that were similar in price). Thus, irrespective of entrée choice, consumers in a specific condition saw the same price information and earned the same number of points for the same dinner. However, points earned and price paid varied from one dinner to the other in the high-ambiguity conditions but remained fixed in the low-ambiguity conditions (see table A2 in the appendix).

The price and number of points earned for the selection was shown after participants picked an entrée. A summary table displaying the number of points earned so far and the number of points required to redeem the reward was also displayed after each dinner. In the reward-near conditions, participants were allowed to dine out eight times before we interrupted them and asked them to respond to a few questions. In contrast, in the reward-far conditions, participants dined out two times before we asked them to respond to the questionnaire.

As discussed earlier, the number of points participants earned per dinner varied as a function of ambiguity and magnitude. However, in the reward-near conditions, irrespective of the ambiguity of step size, participants earned 80% of the points required to redeem the reward (equivalent to eight dinners) after spending \$80, while in the reward-

far conditions, participants earned 20% of the points (equivalent to two dinners) after spending \$20. We carefully varied the points for each dinner so that after participants finished their dinners they would earn points that added up to exactly 800 (80) points in the high-magnitude (low-magnitude) programs when the reward was near and 200 (20) points when the reward was far.

The study was thus designed as a 2 (ambiguity: high, low)  $\times$  2 (magnitude: high, low)  $\times$  2 (reward distance: near, far) full-factorial, between-subjects study. We asked participants to indicate recommendation likelihood (1 = not likely at all, 7 = very likely) and how much progress they made per dollar spent (1 = not much at all, 7 = a lot). Participants also provided responses to several manipulation-check questions, such as whether it was difficult to estimate the number of points earned per dollar (1 = not difficult at all, 7 = very difficult), the total number of points needed (text entry), and the number of points earned thus far (text entry).

## Results

**Manipulation Checks.** An ANOVA with difficulty of estimating number of points earned per dollar spent as the dependent measure and ambiguity, magnitude, and reward distance as the independent measures elicited only a main effect of ambiguity ( $F(1, 366) = 327.56, p < .0001$ ), indicating that it was harder to precisely estimate points earned in the high-ambiguity condition than in the low-ambiguity condition ( $M_{\text{high-amb}} = 4.91$  vs.  $M_{\text{low-amb}} = 2.06$ ). Similarly, an ANOVA with the total number of points needed elicited only a main effect of program magnitude ( $M_{\text{high-mag}} = 909.39$  vs.  $M_{\text{low-mag}} = 94.73; F(1, 363) = 1,447.85, p < .0001$ ; three participants did not respond to this measure). Thus, participants in the high-magnitude conditions were aware that they needed to earn more points than those in the low-magnitude condition.

An ANOVA with points earned elicited a main effect of magnitude ( $F(1, 362) = 1,973.71, p < .0001$ ; four participants did not respond to this measure), reward distance ( $F(1, 362) = 997.61, p < .0001$ ), and a magnitude  $\times$  reward distance interaction ( $F(1, 362) = 683.47, p < .0001$ ). The main effects confirmed that participants were aware that they had earned more points in the high-magnitude program relative to the low-magnitude program ( $M_{\text{high-mag}} = 476.02$  vs.  $M_{\text{low-mag}} = 49.43$ ) and when they were near the reward relative to when they were far from it ( $M_{\text{reward-near}} = 414.29$  vs.  $M_{\text{reward-far}} = 111.16$ ). The interaction confirmed that differences in points earned between the near and far conditions were larger in the high-magnitude program ( $M = 553.93$ ) than in the low-magnitude program ( $M = 55.32$ ). Source was not significant in any of the models ( $p > .20$ ). No other effects emerged, suggesting that our manipulations worked.

**Recommendation Likelihood.** An ANOVA with recommendation likelihood as the dependent measure revealed a significant main effect of program magnitude ( $F(1, 366) = 4.55, p < .04$ ). The higher-magnitude program elicited a

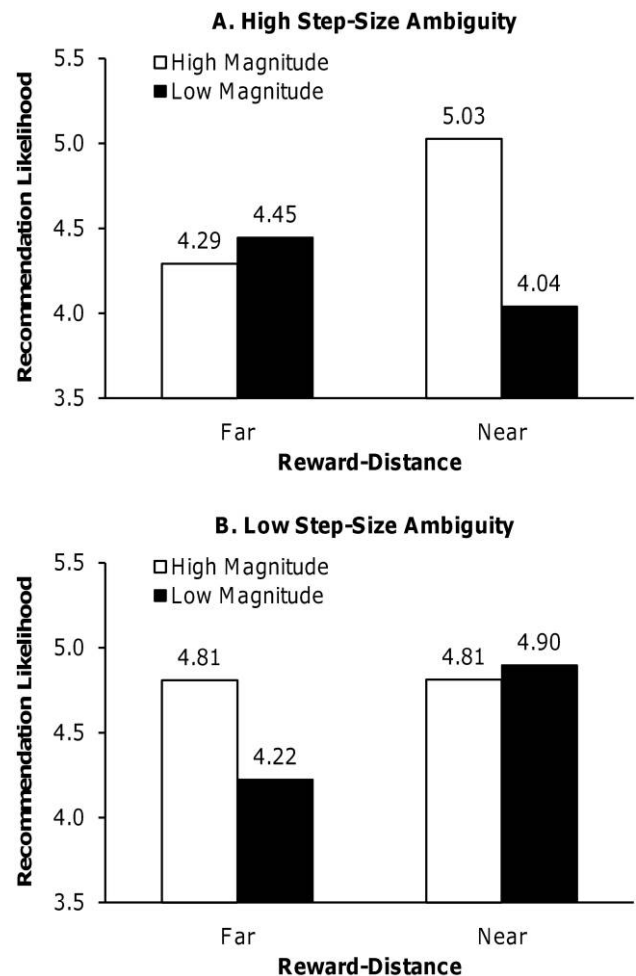
higher recommendation likelihood relative to the lower-magnitude program ( $M_{\text{high-mag}} = 4.73$  vs.  $M_{\text{low-mag}} = 4.40$ ).

As predicted, a significant ambiguity  $\times$  magnitude  $\times$  reward distance interaction also emerged ( $F(1, 366) = 6.01, p < .02$ ), as shown in figure 4. Planned contrasts elicited different patterns of magnitude  $\times$  reward distance interactions in the high- and low-ambiguity conditions ( $F(1, 366) = 4.11, p < .05$  and  $F(1, 366) = 2.04, p > .15$ , respectively). Similarly, the ambiguity  $\times$  reward distance interaction also differed in the high- and low-magnitude programs ( $F(1, 366) = 2.05, p > .15$  and  $F(1, 366) = 4.19, p < .05$ , respectively).

As discussed, our hypotheses are based on comparisons of several contrasts. Specifically, hypothesis 1 suggests that when ambiguity is high, recommendation likelihood will be higher in the reward-near condition relative to the reward-far condition in the high-magnitude program, but this difference will be attenuated in the low-magnitude program.

FIGURE 4

EFFECT OF AMBIGUITY, MAGNITUDE, AND REWARD DISTANCE ON RECOMMENDATION LIKELIHOOD: STUDY 2



In contrast, when ambiguity is low, reward distance will not affect recommendation likelihood in the high-magnitude program but will do so in the low-magnitude program. As expected, when ambiguity was high, reward distance had a significant effect in the high-magnitude condition ( $M_{\text{reward-near}} = 5.03$  vs.  $M_{\text{reward-far}} = 4.29$ ;  $p < .05$ ) but not in the low-magnitude condition ( $M_{\text{reward-near}} = 4.04$  vs.  $M_{\text{reward-far}} = 4.45$ ;  $p > .20$ ). Moreover, in the low-ambiguity condition, reward distance did not influence recommendation likelihood when magnitude was high ( $M_{\text{reward-near}} = 4.81$  vs.  $M_{\text{reward-far}} = 4.81$ ;  $p > .95$ ) but did when it was low ( $M_{\text{reward-near}} = 4.90$  vs.  $M_{\text{reward-far}} = 4.22$ ;  $p < .04$ ).

Hypothesis 2 suggests that, in the higher-magnitude program, reward distance will have a significant effect on recommendation likelihood when ambiguity is high but that this effect will be attenuated when ambiguity is low. In contrast, in the lower-magnitude program, the effects of reward distance on recommendation likelihood will be stronger in the lower-ambiguity relative to the higher-ambiguity conditions. Consistent with our expectations, in the high-magnitude program, reward distance had a significant effect on recommendation likelihood when the ambiguity of step size was high ( $M_{\text{reward-near}} = 5.03$  vs.  $M_{\text{reward-far}} = 4.29$ ;  $p < .05$ ) but not when it was low ( $M_{\text{reward-near}} = 4.81$  vs.  $M_{\text{reward-far}} = 4.81$ ;  $p > .95$ ). In contrast, in the low-magnitude program, reward distance did not influence recommendation likelihood when ambiguity of step size was high ( $M_{\text{reward-near}} = 4.04$  vs.  $M_{\text{reward-far}} = 4.45$ ;  $p > .20$ ) but did when ambiguity of step size was low ( $M_{\text{reward-near}} = 4.90$  vs.  $M_{\text{reward-far}} = 4.22$ ;  $p < .04$ ). Source was significant in this model ( $F(1, 366) = 19.27$ ,  $p < .0001$ ). When source was not included in the model, the main effect of reward distance was not significant ( $F(1, 367) = 3.25$ ,  $p > .07$ ). However, the three-way interaction remained significant ( $F(1, 367) = 6.02$ ,  $p < .02$ ).

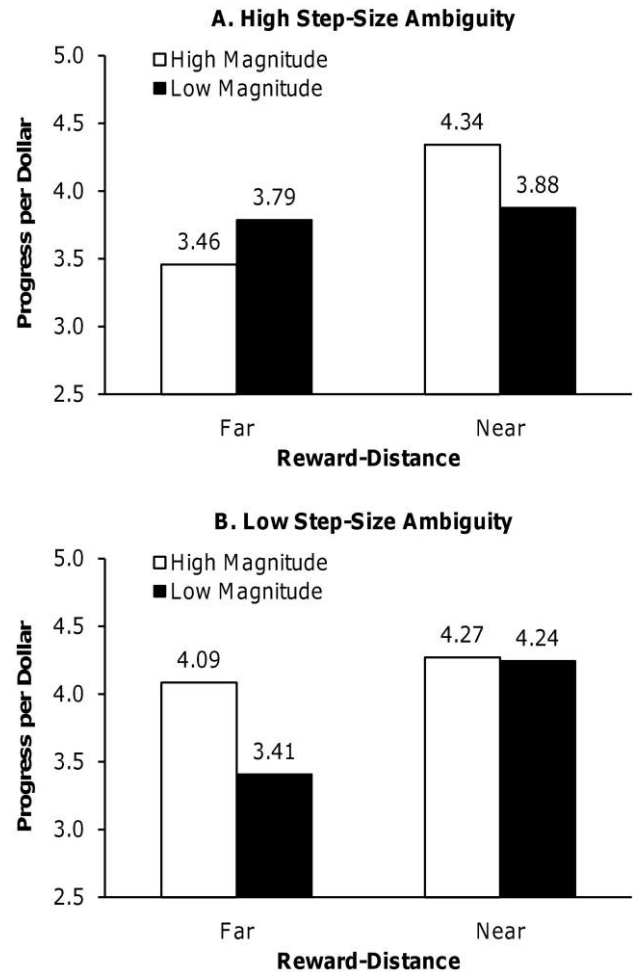
**Progress per Dollar.** An ANOVA with progress per dollar elicited a significant main effect of reward distance ( $M_{\text{reward-near}} = 4.18$  vs.  $M_{\text{reward-far}} = 3.68$ ;  $F(1, 366) = 13.29$ ,  $p < .0005$ ). Those nearer to the reward felt that they were making greater progress per dollar relative to those farther away.

A significant ambiguity  $\times$  magnitude  $\times$  reward distance interaction also emerged ( $F(1, 366) = 6.45$ ,  $p < .02$ ), as shown in figure 5. Follow-up contrasts elicited the following patterns of magnitude  $\times$  reward distance interactions in the high- and low-ambiguity conditions ( $F(1, 366) = 3.58$ ,  $p < .06$  and  $F(1, 366) = 2.87$ ,  $p > .09$ , respectively). Similarly, the following patterns of ambiguity  $\times$  reward distance interactions emerged in the high- and low-magnitude programs ( $F(1, 366) = 2.98$ ,  $p > .08$  and  $F(1, 366) = 3.49$ ,  $p > .06$ , respectively).

Consistent with hypothesis 1, in the high-ambiguity condition, reward distance had a significant effect on progress perceptions when magnitude was high ( $M_{\text{reward-near}} = 4.34$  vs.  $M_{\text{reward-far}} = 3.46$ ;  $p < .005$ ) but not when it was low ( $M_{\text{reward-near}} = 3.88$  vs.  $M_{\text{reward-far}} = 3.79$ ;  $p > .65$ ). However, in the low-ambiguity condition, reward distance did not in-

FIGURE 5

EFFECT OF AMBIGUITY, MAGNITUDE, AND REWARD DISTANCE ON PROGRESS PER DOLLAR: STUDY 2



fluence progress perceptions when magnitude was high ( $M_{\text{reward-near}} = 4.27$  vs.  $M_{\text{reward-far}} = 4.09$ ;  $p > .45$ ) but did when it was low ( $M_{\text{reward-near}} = 4.24$  vs.  $M_{\text{reward-far}} = 3.41$ ;  $p < .005$ ).

Similarly, consistent with hypothesis 2, in the high-magnitude program, reward distance had a significant effect on progress perceptions when the ambiguity of step size was high ( $M_{\text{reward-near}} = 4.34$  vs.  $M_{\text{reward-far}} = 3.46$ ;  $p < .005$ ) but not when ambiguity was low ( $M_{\text{reward-near}} = 4.27$  vs.  $M_{\text{reward-far}} = 4.09$ ;  $p > .45$ ). In contrast, in the low-magnitude program, reward distance did not influence progress perceptions when ambiguity of step size was high ( $M_{\text{reward-near}} = 3.88$  vs.  $M_{\text{reward-far}} = 3.79$ ;  $p > .65$ ) but did when ambiguity was low ( $M_{\text{reward-near}} = 4.24$  vs.  $M_{\text{reward-far}} = 3.41$ ;  $p < .005$ ). Source was not significant in this model ( $p > .10$ ). Not including source in the model did not change the significance of the reward-distance main effect ( $F(1, 367) = 12.50$ ,  $p =$

.0005) or the three-way interaction ( $F(1, 367) = 6.54, p = .01$ ).

*Mediation.* Hypothesis 3 posited that progress perceptions would mediate the effects of the ambiguity  $\times$  magnitude  $\times$  reward distance interaction on recommendation likelihood. As discussed earlier, when we ran individual ANOVAs with recommendation likelihood and progress per dollar as the dependent measures, significant three-way interactions of ambiguity  $\times$  magnitude  $\times$  reward distance emerged ( $F(1, 366) = 6.01, p < .02$  and  $F(1, 366) = 6.45, p < .02$ , respectively). To test for mediated moderation (Muller et al. 2005), we included progress per dollar along with the interaction of progress per dollar and ambiguity in the model with recommendation likelihood as the dependent measure. The main effect of progress per dollar remained significant ( $F(1, 364) = 65.90, p < .0001$ ), while the three-way interaction was not significant ( $F(1, 364) = 2.37, p > .10$ ). Thus, progress per dollar fully mediated the effects of the ambiguity  $\times$  magnitude  $\times$  reward distance interaction on recommendation likelihood. Source was significant in the first and third models ( $p < .0001$ ) but not in the second model ( $p > .10$ ).

## Discussion

In this study we simulated the process of point accrual. As in study 1, the three-way interaction was significant, and all our hypotheses were supported. As posited in hypothesis 1a, we find that when ambiguity of step size is high, the difference in perceptions between the reward-near and reward-far conditions is higher in the high-magnitude program. These differences are attenuated in the low-magnitude program. Consistent with hypothesis 1b, when ambiguity of step size is low, the effect of reward distance on inferences is attenuated in the high (vs. low) program because step sizes are larger. But the smaller step size in the low program enhances the difference in perceptions between those in the near and far conditions relative to the high program. If consumers calculated the costs incurred in the low-ambiguity conditions, we would have found similar differences between the near and far conditions in both the high- and low-magnitude conditions. Because the computations are complex, we did not expect this to happen, and our results were consistent with hypothesis 1b.

Furthermore, consistent with hypothesis 2a, we find that because step size is larger in the high-magnitude program, reducing ambiguity attenuates the differences in perceptions between those in the near and far conditions relative to when ambiguity is higher. In contrast, when ambiguity is higher in the low-magnitude program, distances appear smaller. When ambiguity is reduced, consumers realize that the step size is small. Therefore, consistent with hypothesis 2b, relative to the high-ambiguity condition, differences in perceptions between those in the near and far conditions are enhanced in the low-magnitude program.

We also find that, consistent with hypothesis 3, progress perceptions (progress per dollar) mediate the effects of am-

biguity, magnitude, and reward distance on recommendation likelihood. While in study 1 we used time as a proxy for progress, in this study we were able to replicate results using progress per dollar, a measure of perceived step size. Together, these studies demonstrate the robustness of our effects.

## GENERAL DISCUSSION

Loyalty programs have gained popularity since American Airlines pioneered its frequent flyer program 28 years ago. In spite of its importance, little is known about how these programs influence postenrollment perceptions. We study how ambiguity of step size influences the role that program magnitude plays in affecting judgments as consumers approach loyalty rewards.

We find that when ambiguity of step size is high, consumers only use reward distance to make inferences. In the high-magnitude program, all the distances are magnified, and so perceptions are influenced by reward distance. In contrast, in the low-magnitude program, distances appear smaller, and so the influence of reward distance on perceptions is attenuated. When step size is less ambiguous, consumers use both distance and step-size information but in a biased manner. In the high-magnitude program, the step size is large, and so the influence of reward distance is attenuated. However, the smaller step size in the low-magnitude program makes the influence of reward distance stronger relative to the high-magnitude program.

We also compare how reducing ambiguity affects perceptions within a program of a certain magnitude. In the high-magnitude programs, step sizes are larger, and so the reward-distance effects are attenuated in the low-ambiguity conditions but not in the high-ambiguity condition where individuals base their judgments on distances alone. In contrast, in the low-magnitude conditions, reducing ambiguity makes consumers cognizant of the small step size and increases the influence of reward distance. These progress perceptions mediate the effects of the independent variables on store loyalty and on recommendation likelihood.

We also find an interesting directional effect. In the high-ambiguity conditions when program magnitude is low, being far from a reward leads to directionally higher evaluations than being near (all  $p > .20$ ). As posited in hypothesis 1a, when ambiguity is high, consumers use distances to make inferences. The distances are small in the low program and may lead to the inference that the reward is near. However, as consumers approach the reward, they become aware of the small step size, and the realization begins to set in that the reward is not as close as previously believed. This is especially true in study 2, where participants experienced progress. This could have led to directionally more negative evaluations in the near (vs. far) conditions.

## Boundary Conditions

We compare differences in perceptions of those near a reward and those far from it within a program (Neera –

Farah), across different conditions. This comparison forms the basic building block of our theory and is conceptually similar to other work in this area (e.g., Wertenbroch et al. 2007). These authors compared the difference between budget and a target item's price in one medium with that in another (but not budget or item price independently across mediums). We find this approach reasonable because the numbers themselves (e.g., 1,000 or 100) do not carry much meaning unless information about the number system is provided, such as currency (dollars or pesos), unit (meters or kilometers), or, as in our case, program magnitude (need 1,000 points or 100 points). Thus, we compare number systems (relative difference between numbers in one system with another), not the numbers themselves.

Although we use a between-subjects design, Neera and Farah can also be construed as representing two different mind-sets of the same consumer (one when near the reward and the other when farther away). Given that loyalty reward points are accumulated over a period of time, it is possible that our results may replicate in such a setting.

### Implications and Future Research

We provide insights about how different aspects of a medium (e.g., high/low distance, high/low step size) affect inferences. We also show how step sizes and distances are integrated. While numerosity predictions hold when ambiguity of step size is high, reducing ambiguity changes the patterns of results contingent on the program's magnitude. We manipulate ambiguity by varying the precision of step-size information (by either providing a range or the mean). Other contextual factors (information overload) or individ-

ual differences (memory) that influence consumers' ability to assess step sizes may also elicit similar results.

Our findings can be used to design loyalty programs effectively. We find that progress perceptions influence loyalty and recommendation likelihood. It may be beneficial to design loyalty programs to influence consumers' progress perceptions favorably. Varying program magnitude and step-size ambiguity is also likely to affect inferences. The effectiveness of existing programs can also be improved by customizing ambiguity based on progress.

In the context of goals, progress perceptions influence goal pursuit (Bandura and Schunk 1981; Kivetz et al. 2006; Naylor and Ilgen 1984). We use numbers to quantify progress and show that a medium's magnitude and step-size ambiguity can lead to differential progress perceptions even though the actual distance is the same. These findings may also be applicable to the general area of goals where information displays can be changed to vary the perceived medium magnitudes (e.g., exam out of 1,000 vs. 100 points or sales target of \$1,000,000 vs. \$1 million). Individuals' perceptions may vary with goal distance and step size.

Our findings are also likely to be important in distance estimation (e.g., spatial, temporal). In the realm of physical distances, smaller step sizes may lead to the inference that the goal is far. In other contexts, such as in weight-loss or savings contexts, different number systems (e.g., kilograms vs. pounds) with different step sizes (1 kilogram = 2.2 pounds) are likely to lead to different patterns of interpretations depending on whether the step sizes are ambiguous or not. Thus, this research makes important theoretical and managerial contributions and provides fertile avenues for future research.

# APPENDIX

FIGURE A1

FLOW CHART

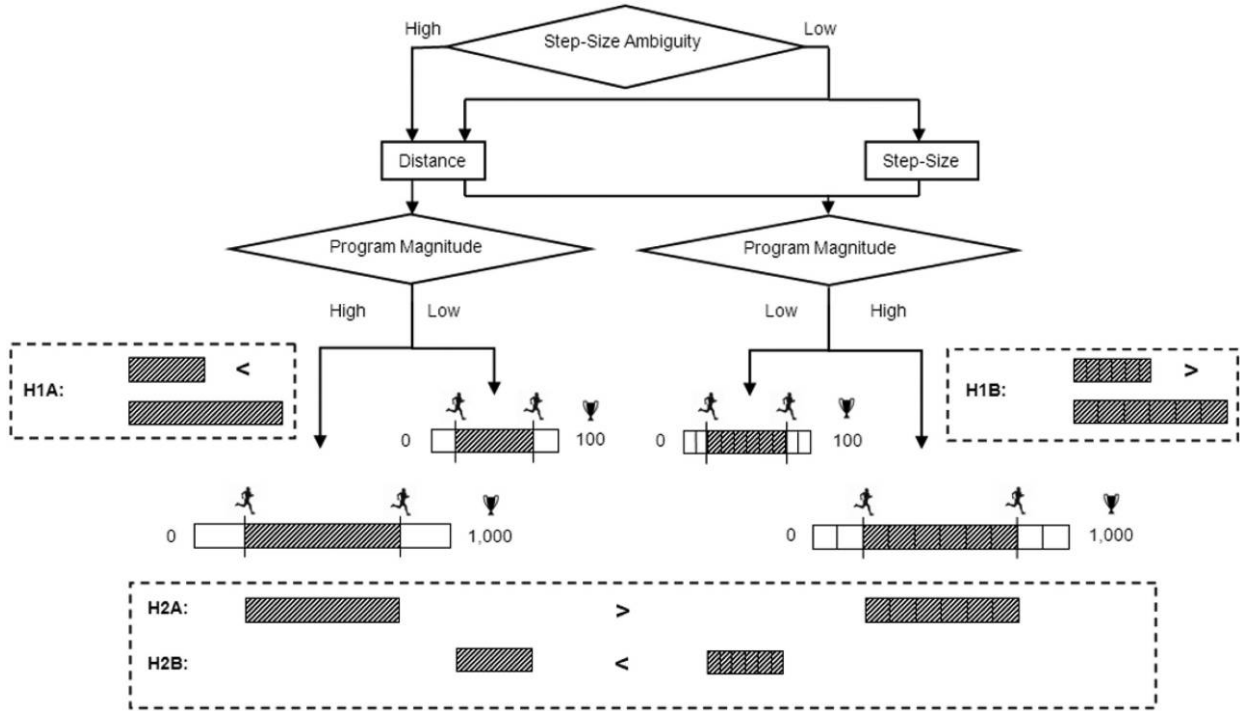


TABLE A1

STUDY 1 MANIPULATIONS

Ambiguity	Magnitude	Points earned per \$	Points accumulated	
			Reward-far	Reward-near
High	High	7-13	200	800
Low	High	10	200	800
High	Low	.7-1.3	20	80
Low	Low	1	20	80

TABLE A2

STUDY 2 MANIPULATIONS

Ambiguity	Magnitude	Price and points information	Dinner number		Price paid and points accumulated: reward-far	Dinner number						Price paid and points accumulated: reward-near
			1	2		3	4	5	6	7	8	
High	High	Price (\$)	8.5	11.5	20	9	12	9	11	10	9	80
		Points earned	130	70	200	105	95	110	90	80	120	800
Low	High	Price (\$)	10	10	20	10	10	10	10	10	10	80
		Points earned	100	100	200	100	100	100	100	100	100	800
High	Low	Price (\$)	8.5	11.5	20	9	12	9	11	10	9	80
		Points earned	13	7	20	10.5	9.5	11	9	8	12	80
Low	Low	Price (\$)	10	10	20	10	10	10	10	10	10	80
		Points earned	10	10	20	10	10	10	10	10	10	80

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