Journal of Personality and Social Psychology

So Near and Yet So Far: The Mental Representation of Goal Progress

Szu-chi Huang, Ying Zhang, and Susan M. Broniarczyk

Online First Publication, May 14, 2012. doi: 10.1037/a0028443

Journal of Personality and Social Psychology

0022-3514/12/$12.00 DOI: 10.1037/a0028443

So Near and Yet So Far: The Mental Representation of Goal Progress

Szu-chi Huang, Ying Zhang, and Susan M. Broniarczyk
University of Texas at Austin

In the present article, we explore whether people's mental representation of progress level can function as a self-regulation mechanism that helps motivate continued effort in the pursuit. We propose that when individuals have just started pursuing a goal and have accumulated only limited progress, they exaggerate the achieved progress level in their mental representation to signal a higher chance of eventual goal attainment and thus elicit greater effort. In contrast, when people have made substantial progress and are approaching the goal attainment, they downplay the achieved progress in their mental representation to create greater perceived discrepancy, hence eliciting greater effort. Empirical evidence from 4 studies supported the hypothesis.

Keywords: progress, mental representation, motivation, self-regulation, goals

In the course of goal pursuit, people often actively monitor their levels of progress, and these assessments can have a profound influence on their subsequent motivation (e.g., Carver & Scheier, 1998; Fishbach, Dhar, & Zhang, 2006; Louro, Pieters, & Zeelenberg, 2007). For example, motivation increases as people are getting close to the end point of goal pursuit (Förster, Higgins, & Chen Idson, 1998; Hull, 1932; Liberman & Förster, 2008), and they may also feel liberated to pursue other goals if they perceive that a sufficient level of progress has been made on the focal pursuit (Fishbach & Dhar, 2005). However, what determines people's assessment of their progress? Is it always the case that people form accurate mental representations of their progress level and then act based on these assessments?

In the present research, we propose a self-regulatory analysis of people's mental representation of goal progress and explore the possibility that the mental representation of progress level, instead of being a faithful reflection of one's actual pursuit level, can function as a self-regulation mechanism that helps to ensure subsequent motivation in the pursuit of important goals. We suggest that when individuals have just started pursuing a goal and have accumulated limited progress, they are primarily concerned about the attainability of the goal and derive their motivation from the sense that the goal is attainable. Therefore, they are likely to exaggerate the level of progress in their mental representation to signal a higher chance of eventual goal attainment, which in turn helps to elicit greater motivation. However, when people have made substantial progress and are approaching the end point of the pursuit, the attainment of the goal is relatively secured, and they derive their motivation from the sense that discrepancy still exists between their current and desired states. At these times, individuals are likely to downplay the achieved progress to signal a greater need for effort in their mind, which consequently helps elicit greater effort in the pursuit.

Szu-chi Huang, Ying Zhang, and Susan M. Broniarczyk, McCombs School of Business, University of Texas at Austin.

Correspondence concerning this article should be addressed to Szu-chi Huang, McCombs School of Business, University of Texas at Austin, B6700, 1 University Station, Austin, TX 78702. E-mail: szu-chi.huang@phd.mccombs.utexas.edu

Mental Representation of Progress

Prior research has shown that people's level of progress on a goal can have a profound impact on their motivation. For example, in the pursuit of goals with specific endpoints, people are motivated by the progress that needs to be made to achieve goal attainment (Carver & Scheier, 1998; Higgins, 1987; Locke & Latham, 2002). Relatedly, the Goal Gradient Hypothesis documents the phenomenon that people's motivation increases as they move closer to the endpoint of the pursuit (Lewin, 1935, 1951; Liberman & Förster, 2008).

One common assumption in the extant research on how goal progress influences motivation is that there should be no systematic biases in people's mental representation of their level of progress, so that the perceived progress would be a generally faithful reflection of the actual levels. For example, a typical paradigm in these studies involve providing people with feedback on their level of progress before assessing their motivation, or monitoring the changes in people's motivation as they progress from the first step to the last one in the task (see, e.g., Förster et al., 1998; Louro et al., 2007). While these findings did not explicitly assume that people hold veridical representations of their progress level, the study treatments and the interpretation of results were based on the assumption that people's mental representation of their progress level would not be systematically different from the objective feedback received, so that the experimenter could reliably attribute motivational consequences to the progress level feedback.

While it is plausible to assume that people's mental representations of goal progress are reasonably accurate, oftentimes they could be susceptible to various influences. First, in many situations, one's precise progress on attaining a goal can be difficult to gauge. For instance, a weight watcher will need meticulous calculation to know exactly how well he or she is doing in controlling his or her daily calorie intake. Similarly, a political candidate can

rely only on various mixed feedback during a campaign to infer the progress on obtaining the necessary votes but cannot know the exact outcome until the moment of truth. Even for progress that we can easily measure, such as one's current weight or bank account balance, it is often the case that people maintain only a rough representation of their general position in relation to the desirable goal state, rather than representing the progress level using the most precise measurement.

The fact that goal progress can impact motivation and that the precise mental representation of progress may be difficult to gauge or even entirely absent raises the possibility that individuals may employ such representations as a mechanism to help motivate greater effort. From an instrumental perspective, the ambiguity in mental representations of goal progress allows people to systematically and strategically alter them, so that the modified representations can function to help maintain high levels of motivation. Specifically, we posit that while a dieter who hopes to lose 25 pounds and has made some progress will have a general sense of where he or she is regarding this goal (i.e., the initial stage of having lost a few pounds vs. the more advanced stage of having lost a significant amount of pounds), this person will strategically bias how much progress he or she believes he or she has made toward attaining this goal, so that he or she can remain motivated throughout the pursuit.

Prior research has found ample support for the notion that perceptions and judgments are influenced by motivation (Balcetis & Dunning, 2006; Dunning, 2001; Dunning, Brewer, & Hewstone, 2004; Festinger, 1957; Gilbert, Brown, Pinel, & Wilson, 2000; Kunda, 1990). For instance, distance perception is influenced by factors such as ease of reaching a tool only when the actor intends to use that tool (Witt, Proffitt, & Epstein, 2005), suggesting that how people perceive their surroundings greatly depends on their intention and motivation to act within it. Similarly, whether people believe that they have seen a letter ("B") or a number ("13") on a computer screen before it crashes is influenced by the outcome of such visual perception; the symbol that leads to a desirable freshly squeezed orange juice is believed to be seen by the majority of people, whereas the symbol that leads to a less desirable, chunky veggie smoothie is reported as less seen (Balcetis & Dunning, 2006).

In the context of goal pursuit, research has found that people modify their mental representation of the available options so that it is easier for them to resolve self-control conflicts in favor of the higher level goal (see, e.g., Mischel & Ayduk, 2004; Trope & Fishbach, 2000). For example, when encountering temptations that may undermine their pursuit of a long-term goal, people form psychologically distant representations of temptations so that they are likely to avoid these items (Fujita, Trope, Liberman, & Levin-Sagi, 2006). Similarly, individuals exaggerate the extent to which they believe such temptations can undermine their goal, so that the temptations appear more costly to pursue and are more likely to be avoided (Zhang, Huang, & Broniarczyk, 2010).

If indeed people systematically alter their mental representations of progress levels as an instrumental mechanism to help maintain high levels of motivation, what are the determinants of these alterations? Do people consistently exaggerate their progress, or downplay it? On the basis of the dynamics of self-regulation (Fishbach, Zhang, & Koo, 2009; Koo & Fishbach, 2008), we theorize that the direction of bias in mental representation depends on a person's stage of goal pursuit. That is, depending on whether people have just started to pursue a goal or have made substantial progress and are approaching the end point, they either exaggerate or downplay, respectively, their specific progress level in their mental representations, such that their motivation for subsequent pursuit remains high.

Attainability-Based Motivation

Based on the findings in the dynamics of self-regulation, people can construe their goal pursuit in two different ways: They can construe it either as commitment toward the desirable end state or as making progress toward this desirable state. These two construals of goal pursuit, in turn, constitute two different sources of motivation: the commitment to the goal and the lack of progress on a goal (Fishbach et al., 2009; Koo & Fishbach, 2008). For instance, if a person has lost three pounds and interprets this progress as an indicator of his or her commitment to the goal of being healthy, this person is likely to continue working out to lose more weight; on the other hand, this person can also focus on the discrepancy between having lost three pounds and the end goal of losing 10 pounds—this lack of progress signals that more efforts will be necessary and will also be a motivator for continued effort.

It is unlikely, however, that individuals are concerned about both goal commitment and the lack of progress to the same extent at all times. Instead, when people first start to pursue a goal, they are less certain about their commitment to the goal and will question whether they should continue to work toward goal attainment; hence, their commitment level would be the main source of motivation at this stage. What, then, determines individuals' commitment level?

One important component of goal commitment refers to the belief that the goal is attainable (Atkinson, 1957; Bandura, 1997; Bandura & Pervin, 1989; Liberman & Förster, 2008; Lewin, 1951; Mischel, Cantor, & Feldman, 1996). For example, the expectancy-value models emphasize the cognitive assessment of one's chances of attaining the goal as an important factor for the motivation in the pursuit (Atkinson, 1957; Tolman, 1955; Vroom, 1964). Similarly, the social–cognitive model (Bandura, 1997) also suggests that a person's self-efficacious beliefs of whether the goal can be attained through effort will determine one's willingness to pursue the goal. Furthermore, goal-setting theory proposes that the assessment of attainability is an important factor in individuals' decisions to adopt a goal (Locke & Latham, 1990).

At the initial stages of goal pursuit, when one has only made limited progress and is still questioning whether the goal is attainable, the perception that greater progress has been made on this goal signals that one is moving steadily toward the desirable end state and that eventual attainment is more likely. It follows, therefore, that people may exaggerate how much progress they have made on the goal in their mental representations, so that the goal seems more attainable, and they could remain motivated to continue the pursuit. For example, a couple who have just started to save for the down payment of a new house may exaggerate the amount of money they have saved in the first few months so that the needed amount does not seem so out of reach. By doing so, they become more committed to this goal, despite being only at the initial stage of the pursuit, and can stay motivated to push forward on this goal.

Discrepancy-Based Motivation

Individuals, however, do not always question the attainability of the goal or observe their achieved progress for assurance of goal attainability. When people have accumulated sufficient progress and are approaching the end point, they feel relatively confident about its attainment and thus are highly committed to this goal. At these stages, people focus instead on reducing the remaining discrepancy to the desirable end point (Higgins, 1987; Koo & Fishbach, 2008; Locke & Latham, 2002). For instance, once the couple who are saving for the new house have achieved sufficient progress and are approaching the needed amount, they should be less concerned about whether they can ultimately save enough for the down payment. The priority at this point will be to eliminate the remaining distance to finally reach the end point. In these situations, the remaining discrepancy becomes the main determinant of motivation.

Prior research has suggested that people mobilize their efforts on the basis of how much is left to be done in order to succeed (Brehm & Self, 1989; Brehm, Wright, Solomon, Silka, & Greenberg, 1983; Wright & Kirby, 2001). When people feel that more efforts are necessary to eliminate the remaining discrepancy on the goal, they become more motivated and increase effort accordingly. Conversely, if the remaining discrepancy seems trivial and requires little effort to overcome, motivation tends to drop and relaxation becomes more likely. Therefore, motivation at this advanced stage of goal pursuit should be impacted by the size of discrepancy: As long as the goal is perceived to be attainable, the greater the discrepancy, the greater people's motivation should be.

If a more sizeable discrepancy to the end point induces greater motivation, it follows that people at the advanced stage of goal pursuit would downplay the level of progress they have achieved and, in turn, exaggerate the remaining distance to the end point, so that they remain motivated to eventually complete the goal. An exaggerated discrepancy in these situations, while not threatening the attainability of the goal, signals that one needs to invest more effort to eliminate the remaining gap, and thus should elicit greater motivation. Applying to the earlier example, for the couple who have accumulated sufficient progress toward the goal of saving for a new house, mentally downplaying the amount of their total savings (and hence exaggerating the remaining gap) signals that although they are well on track of reaching their goal, additional efforts and actions are still necessary. This systematic alteration of mental representation, in turn, should motivate more continued effort in saving.

Taken together, the present theorizing suggests that while being aware of their general stages of goal pursuit, individuals also strategically alter the mental representations of their specific progress levels as a self-regulatory instrument to motivate further effort. The direction of the alterations, furthermore, depends on one's stage of goal pursuit: While people exaggerate their progress levels at the initial stage of goal pursuit to signal higher goal attainability, they downplay their specific progress level to signal the need for further effort when they are relatively close to the end point.

This theorizing goes beyond the extant paradigm in studying the impact of goal progress on motivation by challenging the assumptions that people always desire accuracy with their representations of goal progress and that the way people see their own progress should not be systematically different from the reality. In the present framework, the mental representation of goal progress is more than a faithful reproduction of the actual situation; instead, it reflects one's desire to complete the important goals, sometimes at the cost of accuracy. This conceptualization is also consistent with the Action-Based Model of cognitive dissonance (Harmon-Jones, Amodio, & Harmon-Jones, 2009; Harmon-Jones & Harmon-Jones, 2002), which builds on the assumption that perceptions and cognitions are action-oriented, and posits that dissonance motivates effort to bring cognitions in line with one's behavioral commitment, resulting in effective actions such as goal-directed behaviors; that is, dissonance is only aroused when effective action may be taken. Similarly, in the present theorizing, because the systematic alteration of mental representation is an instrumental mechanism to boost effort and to ensure the successful attainment of valuable goals, it should occur only when efforts are necessary and effective in helping one secure goal attainment and when the accuracy in mental representation is relatively unimportant. In other situations, such as when the goal is of little value, when efforts are ineffective in helping goal attainment, or when the costs of errors in mental representations are high, such alterations should not occur.

We tested our hypothesis in four studies. Across all studies, participants were asked to estimate their achieved progress at different stages of goal pursuit, and we measured their perceived specific progress level as well as their subsequent motivation in the pursuit. We started with a field study using a collective donation goal and examined whether individuals who perceived the collective goal to be of high (vs. low) value altered their mental representation of specific progress level and, in turn, became more motivated to donate. Study 2 further tested if such alteration of mental representation could occur even when specific number-based feedbacks were provided. In Studies 3 and 4, we directly tested the self-regulatory nature of the observed phenomenon; we manipulated the effectiveness of effort in goal pursuit (Study 3) and the importance of accuracy in mental representations (Study 4) and tested whether the systematic alterations would still occur.

Study 1: T-Shirt Donation Drive

In the first study, we aimed to examine our hypothesis in the real world with a field experiment. We simulated what people would normally encounter in their daily lives and used visual stimuli to provide vague feedback on progress. In addition, we included a control group to capture participants' baseline mental representation of progress, which served as the comparison benchmark to shed light on whether participants exaggerated or downplayed specific progress levels, as hypothesized. We also included process measures to examine whether people indeed had different concerns at different stages of pursuit. If people alter their perceived specific progress level to remain motivated in an important goal pursuit, they should exaggerate their specific progress level at early stages of pursuit to increase the perceived goal attainability when the goal value is high (vs. low) but conversely downplay the achieved specific progress level at more advanced stages of pursuit of the same high- (vs. low-) value goal, to signal a greater need for subsequent effort. Both of these alterations of specific progress level would lead to greater motivation in the pursuit.

The context of the field experiment was a t-shirt donation drive for a charitable cause. We manipulated the importance of the goal by changing the cause of donation and manipulated the stage in the pursuit by showing participants different visual stimuli: a high or low number of boxes full of donated used t-shirts to-date. We measured participants' mental representations of specific progress level by asking them to estimate the number of t-shirts in these boxes, and we recorded the number of t-shirts they donated as the indicator of their motivation to attain this collective goal.

Method

Participants. A total of 305 American undergraduate students (124 men, 181 women) at the University of Texas at Austin participated in this study. The gender of the participants did not yield any effects here or in subsequent studies and was therefore omitted from further consideration.

Procedure. This study used a 2 (stage in the pursuit: initial vs. advanced) × 3 (goal value: low vs. high vs. control) between-subjects design. Participants first signed up for a regular session of extra-credit study, and the content of the study was not disclosed. Four days before the scheduled experiment date, these participants received an e-mail about a used t-shirt donation drive on campus with a link to an online survey. In the high-value conditions, participants were first reminded of the recent January 2010 earthquake in Haiti (the experiment was conducted 4 weeks after the earthquake). Then they read a paragraph about how most refugees in Haiti were still in desperate need of living essentials, such as shelter and clothing, and that without things as simple as basic clothing, many of them could not go back to school or to work. A picture of a refugee in Haiti was also included to raise attention to the issue. In the low-value conditions, participants read a paragraph about the economic situation in Honduras and that half of the population still remained below the poverty line; a picture of the flag of Honduras was included in these conditions. A pretest using 7-point scales (1 = *Not at all* and 7 = *Very important/Very much*) showed that participants perceived the issue of refugees in Haiti to be more important ($M = 5.10$, $SD = 1.46$) than that of poor people in Honduras ($M = 4.00$, $SD = 1.41$), $t(50) = 7.25$, $p < .01$. Furthermore, they cared about the refugees in Haiti more ($M = 5.12$, $SD = 1.29$) than they did for poor people in Honduras ($M = 4.18$, $SD = 1.38$), $t(50) = 6.95$, $p < .01$.

After reading about the issues, participants were informed that we were organizing a used t-shirt donation event on campus, and they were invited to donate some of their used t-shirts either to the refugees in Haiti or to the poor people in Honduras, depending on the condition. Specifically, we told participants that the campaign aimed to collect 1,000 t-shirts to send to refugees in Haiti (or to poor people in Honduras) and that the t-shirts could be of any size or color. To mimic individual goal pursuit situation, we led participants to believe that if the total donation amount was less than 1,000 t-shirts, the campaign would fail and the t-shirts collected may not be shipped to the designated countries. Participants then saw a picture of the used t-shirts we had collected so far for the campaign. In the initial-stage conditions, there were two full boxes (size 24 in. × 18 in. × 24 in. [60.96 cm × 45.72 cm × 60.96 cm]) of t-shirts in the picture, whereas in the advanced-stage conditions, there were 10 full boxes of t-shirts in the picture (see Appendix for stimuli). In both conditions we emphasized that we still needed t-shirt donations so that participants believed that their donation was critical for the campaign's success.

After viewing the picture of used t-shirts that we had collected for the campaign, participants were urged to participate in the donation event and were told that to better manage this campaign, we would like to first get some feedback on the organization and communications of this campaign from potential donors such as them. The first question asked participants to estimate the specific progress of the campaign: they were asked to estimate how many used t-shirts they thought we had collected so far on the basis of the picture they saw on the previous page; participants typed a number between 0 and 1,000 in a textbox. In addition, participants were asked to indicate how likely they thought we could successfully reach the goal of collecting 1,000 t-shirts (7-point scale; 1 = *Not at all* and 7 = *Very likely*), as well as how hard they thought we needed to work to collect the remaining t-shirts to reach the goal of getting 1,000 t-shirts (1 = *No need to work at all* and 7 = *Work very hard*). The former question gauged participants' perceived goal attainability, whereas the latter question measured their concern for discrepancy reduction. These questions were embedded among other filler questions about the campaign.

Participants were then told that donation boxes would be set up when they came to the lab to participate in the extra-credit study a few days later. If they were willing to donate their t-shirts, they could simply bring their t-shirts with them and drop them off at the lab. Participants were assured that this donation drive was not part of the requirement for extra credit and that it was completely voluntary whether to donate. Participants were also offered an alternative drop-off time and location in case they could not bring the t-shirts to the lab. When participants came to the lab for an extra-credit study 4 days later, we set up a small donation site at the corner of the lab, and a campaign assistant accepted and recorded all of the donations. We used the last four digits of participants' phone numbers to match their actual donations with the information they provided in the online survey while maintaining the anonymity of the donation process. We then used the number of t-shirts that the participants donated as an indicator of participants' motivation to help attain this collective goal.

In control conditions, participants did not read any information about the t-shirt donation drive and were instead asked to take an evaluation task to evaluate stimuli such as words and pictures. During the task, they viewed the same pictures of two or 10 boxes of t-shirts and were asked to estimate the number of t-shirts in these pictures; their estimates served as the baseline numbers in our analyses.

Results and Discussion

Mental representation of specific progress level. Our first dependent variable was the progress that participants estimated—the number of used t-shirts in the boxes. Because the answers to this question were not normally distributed, we log-transformed the measure to reduce the skewness, then submitted it to a 2 (stage in the pursuit: initial vs. advanced) × 3 (goal value: low vs. high vs. control) factoral ANOVA. The analysis first yielded a main effect of perceived stage in the pursuit, $F(1, 299) = 103.93$, $p < .01$: Participants who saw two boxes of donated t-shirts reported less progress ($M = 142.83$, $SD = 143.96$) than those who saw 10 boxes ($M = 575.47$, $SD = 535.81$). More important, this main

effect was qualified by a Stage in the Pursuit × Goal Value interaction, $F(1, 299) = 8.18$, $p < .01$. To examine the interaction term and explore how the treatments differed among three levels of goal value, we assigned orthogonal planned contrast codes based on the goal value conditions. Of primary interest was the contrast code of (2, –1, –1) for the high-value condition, the low-value condition, and control condition, respectively. This code allowed us to contrast the high-value condition that we believed would induce the alteration of mental representation with the other two conditions. The other contrast code was (0, –1, 1), to test the difference between the low-value and control conditions. The planned contrast analyses at each stage in the pursuit revealed that among participants who saw two boxes of t-shirts in the picture, those who thought the campaign was for earthquake refugees in Haiti estimated more t-shirts in these boxes ($M = 220.84$, $SD = 194.89$) than those who thought the campaign was for poor people in Honduras ($M = 109.36$, $SD = 82.96$) and those in the control group ($M = 91.51$, $SD = 77.36$), $F(1, 153) = 29.39$, $p < .01$; there was no significant difference between the latter two groups, $F(1, 153) = 0.46$, *ns*. In contrast, among participants who saw 10 boxes of t-shirts in the picture, those who thought the campaign was for refugees in Haiti estimated fewer t-shirts in the boxes ($M = 424.00$, $SD = 326.39$) than those who thought the campaign was for poor people in Honduras ($M = 711.06$, $SD = 758.70$) and those in the control group ($M = 617.13$, $SD = 418.35$), $F(1, 146) = 7.25$, $p < .01$; there was no significant difference between the latter two groups, $F(1, 146) = 0.75$, *ns* (see Figure 1).

Different concerns in goal pursuit. We further performed a 2 (stage in the pursuit: initial vs. advanced) × 2 (goal value: low vs. high) factoral ANOVA on participants' perceived attainability of the goal as well as on their concern for discrepancy reduction, excluding those participants in the control group. The analysis on the likelihood of attaining the goal showed a main effect of stage, $F(1, 203) = 31.33$, $p < .01$, such that participants who saw two boxes of donated t-shirts perceived the goal to be less attainable ($M = 5.46$, $SD = 1.34$) than those who saw 10 boxes ($M = 6.32$, $SD = 0.90$). The main effect was qualified by the hypothesized Stage in the Pursuit × Goal Value interaction, $F(1, 203) = 4.59$, $p < .05$. For the participants who saw two boxes of donated t-shirts, those in the Haiti campaign condition thought that the goal of collecting 1,000 t-shirts was more likely to be attained ($M = 5.75$, $SD = 1.30$) than those in the Honduras campaign condition ($M = 5.14$, $SD = 1.32$), $t(103) = – 2.35$, $p < .05$, and the estimated progress level predicted their perceived likelihood of goal attainment, $B = 0.003$, $t(103) = 3.98$, $p < .01$. However, consistent with our theorizing, neither the difference in the likelihood of goal attainment, nor the correlation, existed among participants who saw 10 boxes of donated t-shirts ($M_{\text{Haiti}} = 6.29$, $SD = 0.90$ vs. $M_{\text{Honduras}} = 6.36$, $SD = 0.92$, *ns*).

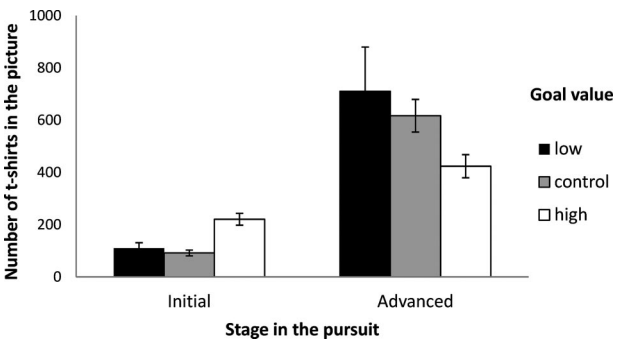

Figure 1. Number of donated t-shirts as a function of stage in the pursuit and goal value (Study 1). Error bars represent 1 *SE* for the respective conditions.

We conducted the same analyses on people's concern on the reduction of discrepancy. The 2 (stage in the pursuit: initial vs. advanced) × 2 (goal value: low vs. high) factoral ANOVA first showed a main effect of stage, $F(1, 203) = 4.44$, $p < .05$; participants who saw two boxes of donated t-shirts thought that we should put in more effort to collect remaining t-shirts ($M = 5.80$, $SD = 1.24$) than those who saw 10 boxes ($M = 5.41$, $SD = 1.61$). The main effect was qualified by the hypothesized Stage in the Pursuit × Goal Value interaction, $F(1, 203) = 4.06$, $p < .05$. Subsequent contrast analyses showed that for participants who saw 10 boxes of donated t-shirts, those in the Haiti campaign condition thought that we should put in more effort to collect the remaining t-shirts ($M = 5.71$, $SD = 1.36$) than those in the Honduras campaign condition ($M = 5.06$, $SD = 1.81$), $t(100) = –2.05$, $p < .05$, and the estimated progress level negatively predicted how much effort they thought was needed to reach the goal, $B = –0.001$, $t(100) = –4.55$, $p < .01$. However, as expected, there was no significant difference among participants who saw two boxes of donated t-shirts regarding how much more effort was required to reduce the remaining discrepancy ($M_{\text{Haiti}} = 5.73$, $SD = 1.22$ vs. $M_{\text{Honduras}} = 5.88$, $SD = 1.27$, *ns*), nor a correlation between the progress level and the expectation of additional effort.

Motivation. We then examined how the factors of stage in the pursuit, goal value, and people's estimated specific progress levels, together, influenced their actual donation behaviors. Since only 46.4% of participants chose to donate in this study (with a total of 307 t-shirts collected), we analyzed the data using a Tobit model with zero (no donation) as the lower limit. Specifically, we conducted Tobit analyses on the number of t-shirts that participants donated, using goal value, the stage in the pursuit, estimated progress, and all the interaction terms as predictors. The analysis yielded a Goal Value × Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = –0.01$, $t(198) = –2.75$, $p < .01$, with no other effects. To further examine this three-way interaction, we then conducted Tobit analyses on the number of donated t-shirts using the stage in the pursuit, mental representation of specific progress level, and their interaction term as predictors for each of the goal value conditions, respectively. The results showed that, when the goal value was high (to help refugees in Haiti), there was a main effect of stage in the pursuit, $B = 2.33$, $t(105) = 2.17$, $p < .05$, and more important, a significant Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = –0.01$, $t(105) = –3.22$, $p < .01$, suggesting that the effect of estimated progress on people's motivation depended on their current stage in the pursuit. Further analyses showed that, consistent with our prediction, participants who saw two boxes of t-shirts collected for refugees in Haiti donated more t-shirts after reporting that more progress had been made on attaining the goal; specifically, these participants' estimated specific progress level positively predicted how many t-shirts they donated, $B = 0.10$, $t(52) = 2.58$, $p < .01$. In contrast, for participants who saw 10 boxes of t-shirts collected for refugees

in Haiti, they donated more t-shirts after reporting that we had made less progress on the goal; that is, these participants' estimated specific progress level negatively predicted how many t-shirts they donated, B = –0.10, $t(52) = -1.92$, $p = .05$. However, supporting our prediction that biased progress estimates were less likely when the goal was of low value, the Stage in the Pursuit × Mental Representation of Specific Progress Level interaction term was not significant when the campaign was for poor people in Honduras, $B = 0.002$, $t(92) = 0.68$, *ns*, and participants' estimated progress did not predict their actual donation at either stage of the pursuit: two boxes of t-shirts, $B = -0.03$, $t(47) = -.65$, *ns*; 10 boxes of t-shirts, $B = 0.001$, $t(44) = 0.28$, *ns*.

Moderated mediation model. Last, we fully tested the relationships among various factors through a moderated mediation analysis. We followed Preacher, Rucker, and Hayes (2007, Model 5) and used a bootstrapping procedure that generated a sample size of 5,000 to assess the regression models. The first part of this model regressed participants' mental representation of specific progress level on goal value, stage in the pursuit, and their interaction term. The result was consistent with the earlier ANOVA and showed a main effect of stage, $B = 0.39$, $t(207) = 5.33$, $p < .01$, such that people in the advanced stages of pursuit estimated greater progress than those in the initial stages, qualified by the Stage in the Pursuit × Goal Value interaction, $B = -0.17$, $t(207) = -2.36$, $p < .05$, suggesting that the impact of goal value on mental representation of specific progress level indeed depended on people's current stage in the pursuit (see Figure 2). The second part of the model, which regressed participants' motivation to donate on their mental representation of specific progress level, stage in the pursuit, goal value, the interaction between stage in the pursuit and goal value, and the interaction between stage in the pursuit and mental representation of specific progress level, yielded a main effect of stage, $B = -0.18$, $t(207) = -1.94$, $p = .05$, a main effect of mental representation of specific progress level, $B = 0.42$, $t(207) = 2.40$, $p < .05$, and more important, a significant Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = -0.44$, $t(207) = -2.56$, $p = .01$; the result suggested that it is people's mental representation of specific progress level that determined their motivation, and this relationship is moderated by their current stage in the pursuit (see Figure 2).

These results provided initial support for our hypothesis that people alter their mental representations of the achieved specific progress level to elicit greater motivation in the pursuit of valuable goals. In addition, by including a control condition and the measures for participants' concerns at different stages of goal pursuit, we were able to derive that it is indeed the case that people at the initial stages of pursuit exaggerate the specific progress level to increase the perceived goal attainability, and those at the advanced stages downplay their specific progress level to highlight the need for extra effort. In the next study, we tested our hypothesis in an individual goal pursuit context; in addition, we tested whether the alteration of mental representation of specific progress level would still occur when clear, number-based progress feedback was provided.

Study 2: Number-Based Feedback and Willingness to Pay

In Study 2, participants completed a word identification task and were offered a limited-edition school magnet as a reward for reaching the required number of points. We manipulated their perceived stage in the pursuit by providing feedback on their current points. We then measured participants' mental representations of progress and their subsequent task efforts.

Method

Participants. A total of 143 undergraduate students (67 men, 76 women) at the University of Texas at Austin participated in the study on computers in exchange for partial course credit.

Procedure. In Study 2, we used a Stage in the Pursuit (initial vs. advanced) × Goal Value design, in which the stage in the pursuit was manipulated as a between-subjects factor, and the value of the goal was measured as an individual difference factor. All participants were told that the researchers were interested in how people identify different words and that they needed to correctly identify and type down the strings of letters they saw on the screen. Participants were further told that the more letters they could correctly identify in the letter string, the more points they could earn. Shorter letter strings offered less points per question, longer letter strings would offer more points per question; the maximum points participants could potentially earn in a letter string was set at 800 points. Participants were then told that they would receive an additional prize—a limited-edition school magnet—if they could earn a total of 21,500 points or more by the end of the task. A picture of the prize was shown to participants, and we measured participants' perceived value of the goal by asking

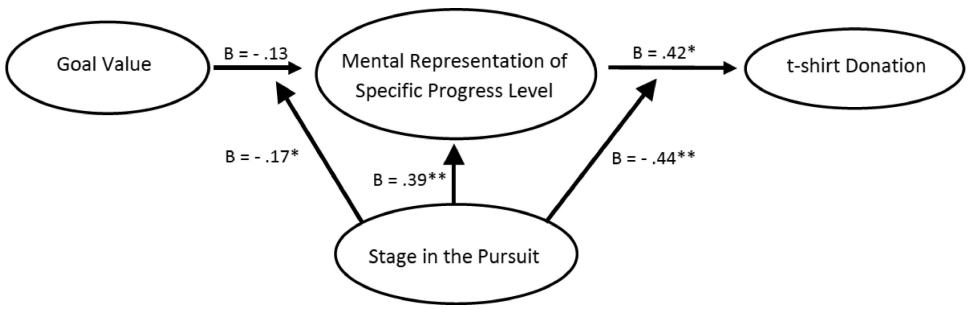

Figure 2. Moderated mediation model of the influence of mental representation of progress level on t-shirt donation (Study 1). * $p \leq .05$. ** $p \leq .01$.

them to write down how much they would be willing to pay for the magnet if they were to buy this magnet in a store. We assumed that the more people were willing to pay for the magnet, the more valuable it was for them to reach 21,500 points in the task to obtain the prize.

After the instruction, participants commenced the task and answered the first 15 letter-identification questions. The letters were heavily distorted and barely legible so that participants would be uncertain about the actual number of points they earned, making it possible for us to convincingly manipulate their perceived stage in goal pursuit. The time that participants spent on these 15 questions was recorded as a comparison benchmark. At the end of the first 15 questions, a pop-up box informed participants that the computer would now calculate their current scores. Participants in the initial-stage condition were told that they had earned 3,157 points thus far, whereas those in the advanced-stage condition were told that they had earned 11,813 points, suggesting that the attainability of the reward was relatively more secured. It is crucial to note that because participants were not informed of the total number of questions in the task and that the total points available for each question could vary based on the length of the letter strings, the feedback on current scores merely indicated their current progress on the goal of reaching 21,500 points, rather than providing information on the difficulty of the task, accuracy rate, or their relative ability to succeed. The questions inserted at the end of the study provided additional assurance for the validity of this manipulation: There was no significant difference in participants' perceived difficulty of the task between the initial-stage and the advanced-stage conditions, $B = -0.15$, $t(139) = -1.46$, *ns*, nor was there a difference in their perceived ability to succeed in this task, $B = 0.06$, $t(139) = 0.68$, *ns*.

Upon receiving their current scores, participants were reminded that they had a limited number of questions left and that they needed to earn 21,500 points (or more) to win the reward. A few questions then appeared to ask participants to indicate their feelings and evaluations about the task before continuing. Among filler questions (e.g., mood scales), we asked participants to estimate their current progress: "Without calculating, what percentage of points have you earned so far toward the points required for the reward (please enter an estimate between 0% and 100%)?" After participants answered these questions, they were directed to answer more word-identification questions. For the ease of comparison, this section contained 15 questions that were similar in nature to those in the first section, and we measured the amount of time that participants spent on these questions as the indicator of their motivation to win the prize. After completing the task, participants were debriefed and dismissed.

Results and Discussion

Mental representation of specific progress level. We regressed participants' estimated specific progress level (in percentages) on their stage in the pursuit, perceived goal value (mean-centered and standardized), and the interaction between the two factors. The analysis first yielded a main effect of stage in the pursuit, $B = 0.44$, $t(139) = 5.94$, $p < .01$, suggesting that participants who thought they had earned more points reported greater progress. More important, we found the predicted Stage in the Pursuit $\times$ Goal Value interaction, $B = -0.25$, $t(139) = -2.83$, $p < .01$. We further explored the effect of goal value on the represented specific progress level at different stages in the pursuit by comparing the slopes of goal value at each stage. For participants who were at the initial stage of the pursuit and were thus highly uncertain about goal attainment, their perceived goal value positively predicted their reported specific level of progress, $B = 0.20$, $t(73) = 2.19$, $p < .05$; those who were willing to pay more for the prize reported having made greater progress on the goal. In contrast, for participants who were relatively close to the end point and thus were relatively certain about goal attainment, their perceived goal value negatively predicted their reported specific progress level, $B = -0.31$, $t(66) = -2.14$, $p < .05$; those who were willing to pay more for the prize reported having made less progress. For the ease of interpretation, we graphed Figure 3 using goal value at one standard deviation above and below the mean (see Figure 3).

Motivation. How did the mental representation of progress influence our participants' subsequent motivation? In this experiment, participants were allowed to spend as much time as they wanted on the first 15 questions as well as the remaining 15 questions after receiving progress feedback; therefore, we could assess the change in the amount of time they spent on the questions after receiving progress feedback as a measure of the impact of their mental representations of progress. There was no significant difference in the time that participants spent on the first 15 questions (pre-feedback motivation) across conditions: stage in the pursuit, $B = -0.09$, $t(139) = -1.11$, *ns*; goal value, $B = -0.10$, $t(139) = -1.00$, *ns*; Stage in the Pursuit $\times$ Goal Value interaction, $B = -0.08$, $t(139) = -0.76$, *ns*. To assess the change in their motivation after feedback, we deducted the time that participants spent on the first 15 questions (pre-feedback motivation) from the time that they spent on the second set of 15 questions (post-feedback motivation) to obtain a "time difference" and standardized the variable. We regressed this variable on people's stage in the pursuit, perceived goal value, mental representation of specific progress level, and all the interaction terms. The analysis yielded a main effect of stage in the pursuit, $B = 0.21$, $t(135) = 2.19$, $p < .05$, and a hypothesized Stage in the Pursuit $\times$ Mental Representation of Specific Progress Level interaction, $B = -0.36$, $t(135) = -3.60$, $p < .01$. We further examined the interaction term by comparing the slopes of reported progress at each stage of pursuit, and we found that for participants at the initial stage of pursuit,

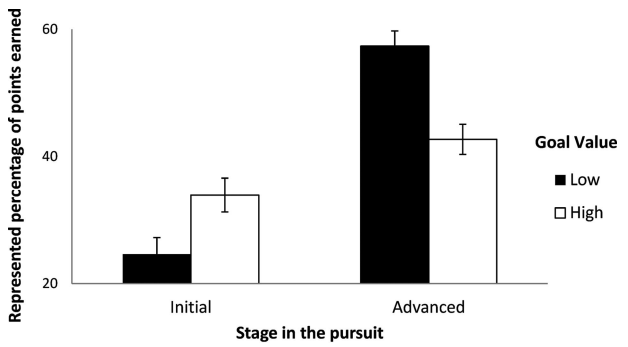

Figure 3. Represented progress as a function of the stage in the pursuit and goal value (Study 2). Error bars represent 1 *SE* for the respective conditions.

their mentally represented progress level positively predicted the change of their subsequent effort in attaining the goal, $B = 0.35$, $t(73) = 3.20$, $p < .01$; those who reported greater progress tended to increase their effort to a greater extent in the latter 15 questions. In contrast, for those who were at advanced stage of pursuit, their mentally represented progress level negatively predicted the change of their subsequent effort, $B = -0.64$, $t(66) = -6.81$, $p < .01$; those who reported less progress tended to increase their effort to a greater extent in latter questions.

Although we did not obtain the Goal Value × Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, on the basis of our a priori theorizing, we also followed the procedures in Study 1 and explored the Stage in the Pursuit × Mental Representation of Specific Progress Level interaction when the goal value was one standard deviation above and below the mean, respectively. The results showed a pattern consistent with Study 1: When the goal value was high, we observed a significant Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = -0.08$, $t(135) = -2.48$, $p = .01$, suggesting that the estimated progress influenced motivation based on people's current stage; however, when the goal value was low, the Stage in the Pursuit × Mental Representation of Specific Progress Level interaction term was less/not significant, $B = -0.06$, $t(135) = -1.63$, $p = .11$.

Moderated mediation model. Following the procedures in Study 1, we tested the relationships among all factors together through a moderated mediation analysis (Preacher et al., 2007, Model 5) with a bootstrapping procedure that generated a sample size of 5,000. The first part of this model regressed participants' mental representation of specific progress level on goal value, stage in the pursuit, and their interaction term. The result again showed a main effect of stage, $B = 0.44$, $t(143) = 5.94$, $p < .01$, such that people in the advanced stages of pursuit estimated greater progress than those in the initial stages, qualified by the Stage in the Pursuit × Goal Value interaction, $B = -0.25$, $t(143) = -2.83$, $p < .01$, confirming that the impact of goal value on mental representation of specific progress level depended on people's current stage in the pursuit (see Figure 4). The second part of the model, which regressed participants' change of effort on their mental representation of specific progress level, stage in the pursuit, goal value, the interaction between stage in the pursuit and goal value, and the interaction between stage in the pursuit and mental representation of specific progress level, yielded a main effect of stage, $B = 0.22$, $t(143) = 2.44$, $p < .05$, and a significant Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = -0.36$, $t(143) = -3.77$, $p < .01$; the result again confirmed that it is people's mental representation of specific progress level that determined their motivation, and this relationship is moderated by their current stage in the pursuit (see Figure 4).

These results provided further evidence for our hypothesis that people who value their goals will represent their achieved, specific level of progress in distinctive ways to maintain their motivation in the pursuit, even when the progress feedback was number-based. These altered mental representations of specific progress level, although biased, further determine individuals' subsequent motivation and effort in the pursuit.

If indeed the mental representation of specific goal progress is a self-regulatory mechanism that individuals use to ensure successful goal attainment, it should occur only when people believe that self-regulation is effective in helping them attain the goal. Whenever self-regulation is perceived to be ineffective in attaining the goal, such bias in mental representations should not occur. In Study 3, we tested this hypothesis.

Study 3: Self-Regulation Effectiveness

In Study 3, participants worked on a pitch differentiation task and were offered a reward for reaching the required number of points in the task. We informed participants either that pitch identification is an innate ability and cannot be improved through practices, or that it can be improved through effort. We also manipulated their perceived stage in the pursuit by providing feedback on their accumulated points. We measured participants' mental representations of their specific progress level in percentages, as well as their subsequent effort in the task.

Method

Participants. A total of 123 undergraduate students (60 men, 63 women) at the University of Texas at Austin participated in the study in exchange for partial course credit.

Procedure. The study used a 2 (stage in the pursuit: initial vs. advanced) × 2 (self-regulation effectiveness: effective vs. ineffective) between-subjects design. Upon arriving at the lab, participants were told that researchers were studying how people differentiate pitches of sound. Participants were asked to complete a few separate pitch-identification tasks. Each task asked them to first

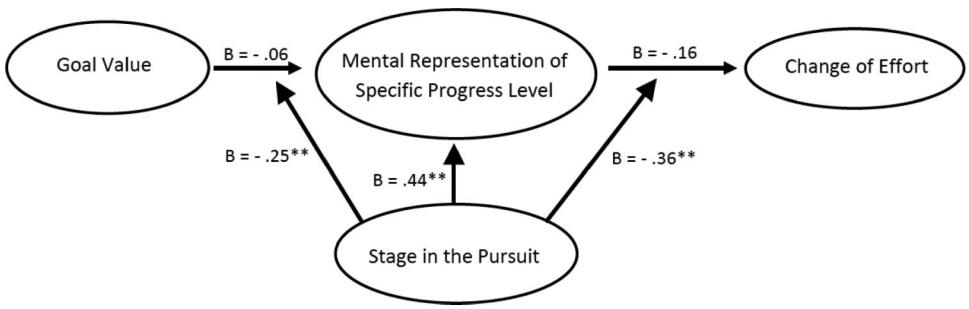

Figure 4. Moderated mediation model of the influence of mental representation of progress level on change of effort (Study 2). ** $p \leq .01$.

listen to 10 different pitches, ranging from Level 1 (lowest) to Level 10 (highest), and then to correctly identify the level of pitches in the question section. We also offered a performance bonus and told participants that they would earn points based on how close their answers were to the correct ones. If they could reach more than 23,900 points at the end of two pitch-identification tasks, they would receive an additional $20 for their performance.

After the instruction, participants commenced the task and were first shown an information page that explained the nature of the pitch-identification task. The information indicated that "Our ears have thousands of ciliated cells with different sensitivities. These cells identify the frequencies that make up a particular pitch, as well as the spectrum of different frequencies that blend together." In the self-regulation effective conditions, participants then read that they could improve their abilities in identifying a specific pitch through learning and familiarizing the ears with that pitch; that is, they could prepare their ears to "capture" certain pitches through repeatedly exposing their ears to that pitch. In the self-regulation ineffective conditions, participants read that the sensitivity of the ciliated cells is genetically determined and that some people are better at identifying higher pitches, whereas others are better at lower pitches. It was further emphasized that the genetic nature meant that one's sensitivity to given pitches does not change, nor will it be influenced by learning or effort.

After the information page, participants put on their headsets and started the first task. They listened to the 10 pitches (from Level 1 to Level 10) as paced by the program and then answered 20 pitch-identification questions by indicating the level of the pitch played in each question on a 10-point scale. After completing this task, a pop-up box informed participants that the computer would now calculate their current scores and provide some feedback. We manipulated the stage in goal pursuit by changing the amount of progress that participants had achieved on the task: Participants in the initial-stage conditions were told that they had earned 7,966 points thus far (about one third of the total points needed for the reward), whereas participants in the advanced-stage conditions were told that they had earned 15,932 points (about two thirds of the total points needed for the reward). Similar to the previous study, because participants were not given information on the total number of questions in the task or the point structure of each question, the feedback on their current scores merely indicated their current progress level rather than providing information on the difficulty of the task or on their relative ability/performance. In addition, the questions inserted at the end of the study showed that there was no significant difference between the initial-stage and the advanced-stage conditions in participants' perceived difficulty of the task, $F(1, 119) = 1.52$, *ns*, and their perceived ability to succeed, $F(1, 119) = 2.23$, *ns*.

After receiving the feedback, participants proceeded to the second pitch-identification task. For this task, we told participants that they could rewind the sound clip as many times as they wished and that they could spend as much time as they wanted listening to the 10 pitches before moving on to the question section. We also reminded participants that they would need 23,900 points for the $20 prize.

Right before this second task began, a few questions appeared in a pop-up box and asked participants to "evaluate the design of the experiment" before moving on. Among a number of filler questions, we asked participants to report their progress so far: "Without calculating, what percentage of points do you think you have earned so far toward the points required for the reward (please enter an estimate between 0% and 100%)?" After participants answered these questions, they started the second pitch-identification task. We recorded the amount of time that participants spent on listening to these pitches before clicking "Continue" to load the question section as the indicator of their motivation for achieving better performance in this task. Upon finishing this task, participants were told that they had completed the study and were thanked and debriefed. No participant raised any suspicions about the task or about the feedback they had received during the task.

Results and Discussion

Mental representation of specific progress level. We submitted participants' reported progress to a 2 (stage in the pursuit: initial vs. advanced) × 2 (self-regulation effectiveness: effective vs. ineffective) factoral ANOVA. Consistent with prior findings, the analysis first yielded a main effect of the stage in the pursuit, $F(1, 119) = 231.68$, $p < .01$, indicating that participants who were told that they had earned 15,932 points felt that they had made more progress ($M = 60.59$, $SD = 11.43$) than those who had earned 7,966 points ($M = 31.03$, $SD = 10.76$). More important, the analysis yielded the predicted Stage in the Pursuit × Self-Regulation Effectiveness interaction, $F(1, 119) = 9.00$, $p < .01$. Subsequent contrast analyses revealed that among the participants at initial stages of pursuit, those who believed that the performance in the task depended on their effort felt that they had made more progress ($M = 33.97$, $SD = 10.17$), compared with those who thought that the ability of pitch identification was genetically determined and could not be improved by effort ($M = 28.00$, $SD = 10.67$), $t(57) = -2.20$, $p < .05$. In contrast, among the participants who thought that they had made substantial progress on the goal, those who believed that the performance depended on their effort reported less progress ($M = 57.81$, $SD = 10.41$) than those who thought the ability of pitch identification could not be improved by effort ($M = 63.55$, $SD = 11.88$), $t(62) = 2.06$, $p < .05$ (see Figure 5).

Motivation. We then examined how the factors of self-regulation effectiveness, stage in the pursuit, and people's estimated specific progress levels, together, influenced participants'

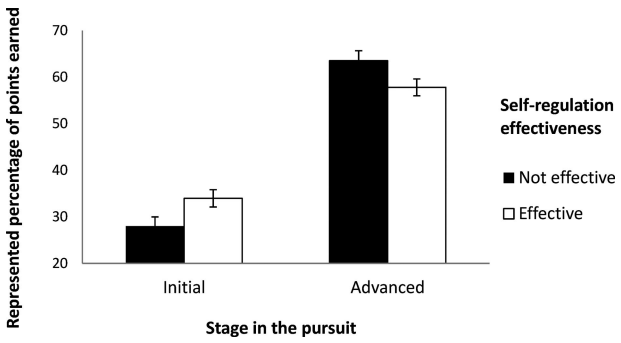

Figure 5. Represented progress as a function of the stage in the pursuit and self-regulation effectiveness (Study 3). Error bars represent 1 *SE* for the respective conditions.

subsequent effort in the pursuit (i.e., the time that participants spent on listening to the pitches in the second task before entering the question section). Specifically, we regressed this motivation measure on the self-regulation effectiveness, stage in the pursuit, estimated progress, and all the interaction terms. The analysis yielded a main effect of self-regulation effectiveness, $B = 0.85$, $t(115) = 6.90$, $p < .01$; a Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = -0.59$, $t(115) = -4.72$, $p < .01$; and more important, a significant Self-Regulation Effectiveness × Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = -0.73$, $t(115) = -5.85$, $p < .01$. To further examine this three-way interaction, we then regressed the motivation measure on the stage in the pursuit, mental representation of specific progress level, and their interaction term, for self-regulation effective and self-regulation ineffective conditions, respectively. The results showed that when effort was perceived to be effective, there was a significant Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = -1.31$, $t(59) = -6.38$, $p < .01$, suggesting that the effect of estimated progress on people's motivation depended on their current stage in the pursuit. Further analyses showed that, when participants thought that they were at initial stages of pursuit and that effort was effective in improving their performance, the reported progress positively predicted their subsequent effort in repeatedly listening to pitches, $B = 0.70$, $t(28) = 5.24$, $p < .01$; those who reported greater progress tended to invest more effort. Conversely, for those who thought that they were approaching the end point and that effort was effective in improving their performance, the reported progress negatively predicted their subsequent effort in practicing, $B = -0.57$, $t(31) = -3.81$, $p < .01$; those who reported less progress invested more effort. In contrast, for participants who were led to believe that their performance in pitch identification could not be improved through effort, the stage in the pursuit × mental representation of specific progress level interaction term was not significant, $B = 0.14$, $t(56) = 0.99$, *ns*, and participants' reported progress did not predict their subsequent effort in practicing, regardless of whether they were at initial, $B = -0.07$, $t(27) = -0.36$, *ns*, or advanced, $B = 0.21$, $t(29) = 1.17$, *ns*, stage of the pursuit.

Moderated mediation model. We then tested the relationships among all factors through a moderated mediation analysis (Preacher et al., 2007, Model 5) with a bootstrapping procedure that generated a sample size of 5,000. The first part of this model regressed participants' mental representation of specific progress level on self-regulation effectiveness, stage in the pursuit, and their interaction term. The result showed a main effect of stage, $B = 0.80$, $t(123) = 15.22$, $p < .01$, such that people in the advanced stages of pursuit estimated greater progress than those in the initial stages, qualified by the Stage in the Pursuit × Self-Regulation Effectiveness interaction, $B = -0.16$, $t(123) = -3.00$, $p < .01$, suggesting that the impact of self-regulation effectiveness on mental representation of specific progress level depended on people's current stage in the pursuit (see Figure 6). The second part of the model, which regressed participants' effort investment on their mental representation of specific progress level, stage in the pursuit, self-regulation effectiveness, the interaction between stage in the pursuit and self-regulation effectiveness, and the interaction between stage in the pursuit and mental representation of specific progress level, yielded a main effect of self-regulation effectiveness, $B = 0.27$, $t(123) = 3.29$, $p < .01$, and more important, a significant Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = -0.54$, $t(123) = -3.87$, $p < .01$; the result suggested that it is people's mental representation of specific progress level that determined their motivation, and this relationship is moderated by their current stage in the pursuit (see Figure 6).

These results further support the proposition that people use their mental representation of specific progress level strategically as a self-regulatory mechanism to motivate themselves and that they do so only when they believe that effort would be effective in helping them attain the goal. These results help to rule out the possibility that the mental representation of progress was a consequence of pure cognitive biases. By demonstrating that the phenomenon occurs only when efforts are perceived to be effective in goal attainment, we offer evidence for the self-regulatory nature of this operation.

Based on our proposed mechanism, people strategically alter their mental representations of goal progress to maintain high levels of motivation. One unresolved issue is whether the motivation to accurately assess goal progress would help or hinder one's subseuqent motivation in goal pursuit. We expect that self-regulation biases in progress assessment will be more likely to occur when accuracy motivation is low; when the accuracy motivation for the representation is high, people would be less likely to systematically bias their progress estimates. Ironically, this absence of bias among high accuracy individuals is expected to dampen their subsequent motivation, as it removes an important

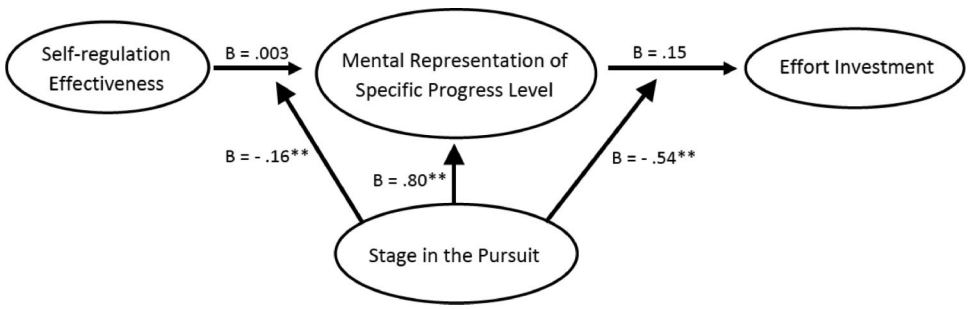

Figure 6. Moderated mediation model of the influence of mental representation of progress level on effort investment (Study 3). ** $p \leq .01$.

self-regulation instrument. We tested this hypothesis in the next study.

Study 4: Accuracy Goal

In this final study, we tested the moderating effect of accuracy motivation on biased mental representation of goal progress level. We expect that individuals who have lower accuracy motivations will be more likely to exhibit self-regulation driven biases in their representations of specific progress level and, as a result, become more motivated in pursing the goal than those who aim to be accurate in their goal progress mental representations.

Method

Participants. A total of 173 undergraduate students (95 men, 78 women) at the University of Texas at Austin participated in the study in exchange for compensation of $5.

Procedure. The study used a 2 (stage in the pursuit: initial vs. advanced) × 2 (importance of accuracy: low vs. high) between-subjects design. When participants arrived at the lab, they were informed that researchers were interested in people's cognitive processes—how people identify and differentiate objects. Participants were told that they would view five sets of pictures and identify the differences within each set. Specifically, they would view Picture A in the set first, for as long as they would like to. When they clicked "Continue" to move on, Picture A would disappear, and Picture B, which was slightly different from Picture A, would appear. They would then be asked to identify the differences between the two pictures by clicking on the different parts in Picture B. When they correctly identified the differences, they would earn points, and the points they earned would be reflected in the progress bar on the screen (anchored from 0 to 500 points). Participants further read that, if they reached 500 points at the end of five sets of pictures, they would win a bonus cash prize of $30 on top of their $5 compensation. We set the reward at $30 to ensure that the goal was valuable to all participants in the study.

Participants then commenced the task. In the initial-stage conditions, participants completed one set of pictures and about one fifth of the progress bar was filled. In the advanced-stage conditions, participants completed four sets of pictures, and the red filling in the progress bar increased as they moved on in the task; four fifths of the progress bar was filled after participants completed the fourth set. In both conditions, the difficulty of the task and participants' ability/performance should be perceived as the same; the only thing that differed was their current stage in the pursuit.

Participants then encountered an instruction page, either after the first set or the fourth set of pictures, depending on condition. Specifically, the instruction informed participants that, before they moved on to the next set, we would like to ask them to answer a few questions about the task they were completing. Here we manipulated the importance of accuracy: While those in the low-accuracy conditions read that the researchers were planning to have a large number of participants for the study, and therefore a rough estimate from each of them would be sufficient, those in the high-accuracy conditions read that as a result of budget constraints, the researchers could run only a limited number of participants for the study, and thus they should try to be as accurate as possible in their responses, avoiding both overestimation and underestimation (Neuberg, 1989; Zhang & Fishbach, 2010).

Participants then entered the question section and were asked to make estimates about the task. Among filler questions, we asked participants to estimate (based on the progress bar they saw earlier) how many points they thought they had earned so far out of the total of 500 points; participants typed a number between 0 and 500 in a textbox. Following the estimates, we also asked participants to indicate how likely they thought they would win the $30 bonus cash in the task (7-point scale; 1 = *Not at all* and 7 = *Very likely*), as well as how hard they thought they needed to work to earn the remaining points for the $30 prize (1 = *No need to work at all* and 7 = *Work very hard*).

After completing these questions, participants continued with the task and were again reminded that they could look at Picture A for as long as they wanted to. We recorded how much time participants spent observing Picture A in this new set (after they provided estimates for their current progress) as a proxy for their motivation. All participants completed the task, were debriefed, and were entered in the drawing for the cash rewards.

Results and Discussion

Mental representation of specific progress level. We submitted the points participants estimated that they had earned in the task to a 2 (stage in the pursuit: initial vs. advanced) × 2 (importance of accuracy: low vs. high) factoral ANOVA. The analysis first showed a main effect of stage in the pursuit, $F(1, 169) = 283.11$, $p < .01$, such that those in the advanced stages reported to have received more points in the task ($M = 395.87$, $SD = 60.50$) than those in the initial stages ($M = 161.13$, $SD = 119.26$). There was also a main effect of accuracy, $F(1, 169) = 4.82$, $p < .05$, such that those in the low-accuracy conditions estimated more points ($M = 305.34$, $SD = 137.38$) than those in the high-accuracy conditions ($M = 253.02$, $SD = 158.84$). More important, these main effects were qualified by the expected Stage in the Pursuit × Accuracy interaction, $F(1, 169) = 20.78$, $p < .01$. Among the participants who completed one set of pictures and were at the initial stage of pursuit, those who were not asked to be accurate in their estimations reported to have earned more points ($M = 213.86$, $SD = 149.26$), compared with those who were trying to be accurate ($M = 122.10$, $SD = 70.28$), $t(85) = 3.82$, $p < .01$. In contrast, among the participants who have completed four sets of pictures and were at the advanced stage of pursuit, those who were not asked to be accurate reported having earned less points ($M = 380.56$, $SD = 60.77$), compared with those trying to be accurate ($M = 412.68$, $SD = 56.23$), $t(84) = –2.54$, $p < .05$ (see Figure 7).

Different concerns in goal pursuit. We further performed a 2 (stage in the pursuit: initial vs. advanced) × 2 (importance of accuracy: low vs. high) factoral ANOVA on participants' perceived attainability of the goal as well as on their concern for discrepancy reduction. The analysis on the likelihood of attaining the goal showed a main effect of stage, $F(1, 169) = 58.90$, $p < .01$, such that those in the advanced stages thought they were more likely to attain the goal ($M = 5.13$, $SD = 1.18$) than those in the initial stages ($M = 3.47$, $SD = 1.57$). The main effect was qualified by the hypothesized Stage in the Pursuit × Accuracy interaction, $F(1, 169) = 6.97$, $p < .01$. For the participants who had just started the pursuit, those in the low-accuracy condition

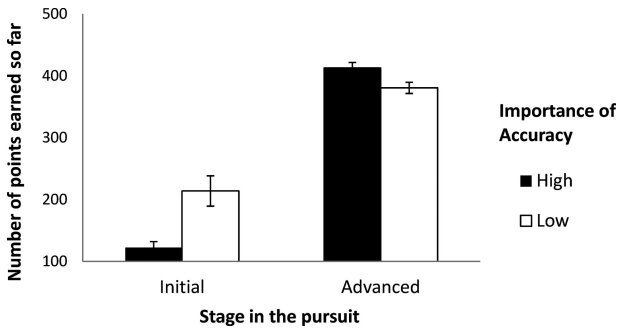

Figure 7. Number of points earned so far as a function of stage in the pursuit and importance of accuracy (Study 4). Error bars represent 1 *SE* for the respective conditions.

thought that the bonus cash was more likely to be attained (M = 4.00, SD = 1.76) than those in the high-accuracy condition (M = 3.08, SD = 1.29), $t(85) = 2.81$, $p < .01$, and the estimated progress level predicted their perceived chance of attaining the goal in the end, $B = 0.007$, $t(85) = 5.48$, $p < .01$. In contrast, neither the difference in the chance of attaining the goal, nor the correlation, existed among participants who were approaching the end point of the pursuit ($M_{\text{low-accuracy}} = 5.04$, $SD = 1.02$ vs. $M_{\text{high-accuracy}} = 5.22$, $SD = 1.33$, *ns*). These results provided evidence that people who were not concerned about the accuracy in estimates exaggerated their progress level at the initial stages to signal higher goal attainability, and they did not do so in more advanced stages in which the goal attainability was relatively secured.

We conducted the same analyses on people's concern about additional effort investment to reduce the remaining discrepancy. The 2 (stage in the pursuit: initial vs. advanced) × 2 (importance of accuracy: low vs. high) factoral ANOVA showed the hypothesized Stage in the Pursuit × Accuracy interaction, $F(1, 169) = 7.72$, $p < .01$. There was no main effect in this analysis. Subsequent analyses showed that among participants who were approaching the end point of the pursuit, those in the low-accuracy condition reported a greater need for extra effort to earn the remaining points ($M = 6.16$, $SD = 1.02$) than those in the high-accuracy condition ($M = 5.46$, $SD = 1.29$), $t(84) = 2.78$, $p < .01$, and the estimated progress level negatively predicted how much effort they thought they would need to reach the goal, $B = -0.005$, $t(84) = -2.57$, $p = .01$. In contrast, among the participants in the initial stage of the pursuit, this variable did not differ between the two accuracy conditions ($M_{\text{low-accuracy}} = 5.46$, $SD = 1.02$ vs. $M_{\text{High-accuracy}} = 5.76$, $SD = 1.29$, *ns*), nor did we find the correlation between the progress level and the expectation of additional effort.

Motivation. What happens to individuals' motivation when they try to be accurate in estimates? We performed a regression analysis on the time participants spent on trying to memorize Picture A after estimating their progress, using accuracy, stage in the pursuit, estimated progress, and all the interaction terms as predictors. The analysis yielded a main effect of accuracy, $B = -0.19$, $t(165) = -2.59$, $p = .01$, a Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = -0.27$, $t(165) = -3.37$, $p < .01$, and the hypothesized Accuracy × Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = 0.21$, $t(165) = 2.60$, $p = .01$. To further examine the three-way interaction, we regressed the motivation measure on the stage in the pursuit, mental representation of specific progress level, and their interaction term, for low-accuracy and high-accuracy conditions, respectively. The results showed that when accuracy was not important, there was a significant Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = -0.48$, $t(78) = -4.46$, $p < .01$, suggesting that the effect of estimated progress on people's motivation depended on their current stage in the pursuit. Further analyses showed that among participants who were not instructed to be accurate with their estimates, the reported progress positively predicted their subsequent effort in observing Picture A at the initial stage of the pursuit, $B = 0.43$, $t(35) = 2.80$, $p < .01$, but negatively predicted their subsequent effort at the advanced stage, $B = -0.47$, $t(43) = -3.49$, $p < .01$. This relationship, again, was not observed among participants who were asked to provide accurate estimates: the Stage in the Pursuit × Mental Representation of Specific Progress Level interaction term was not a significant predictor, $B = -0.06$, $t(87) = -0.59$, *ns*, and the reported progress did not predict participants' subsequent effort, regardless of whether they were at the initial, $B = 0.21$, $t(48) = 1.45$, *ns*, or advanced, $B = 0.16$, $t(39) = 1.01$, *ns*, stage of the pursuit.

Moderated mediation model. We then tested the relationships among all factors through a moderated mediation analysis (Preacher et al., 2007, Model 5) with a bootstrapping procedure that generated a sample size of 5,000. The first part of this model regressed participants' mental representation of specific progress level on the importance of accuracy, stage in the pursuit, and their interaction term. The result showed the hypothesized Stage in the Pursuit × Accuracy interaction, $B = 0.33$, $t(173) = 4.48$, $p < .01$, suggesting that the impact of the importance of accuracy on mental representation of specific progress level depended on people's current stage in the pursuit (see Figure 8). The second part of the model, which regressed participants' effort investment on their mental representation of specific progress level, stage in the pursuit, importance of accuracy, the interaction between stage in the pursuit and accuracy, and the interaction between stage in the pursuit and mental representation of specific progress level, yielded the hypothesized Stage in the Pursuit × Mental Representation of Specific Progress Level interaction, $B = -0.31$, $t(173) = -4.20$, $p < .01$; the result suggested that it is people's mental representation of specific progress level that determined their motivation, and this relationship is moderated by their current stage in the pursuit (see Figure 8).

Results in Study 4 provided critical support for our hypothesis that people alter their mental representations of goal progress as a self-regulation mechanism to elicit greater effort in the pursuit. When accuracy in estimates is important, this operation ceases and people's mental representations do not show systematic biases, which, ironically, had a negative impact on their subsequent effort. In addition, we explored the mechanism through which the distortions influence motivation: While the inflated progress level at the initial stages increases motivation by enhancing the perceived goal attainability, the downplayed progress level at the advanced stages increases motivation by highlighting the need for extra effort. Importantly, by showing that a desire to be accurate can eliminate the systematic biases in the representations, we were able to further

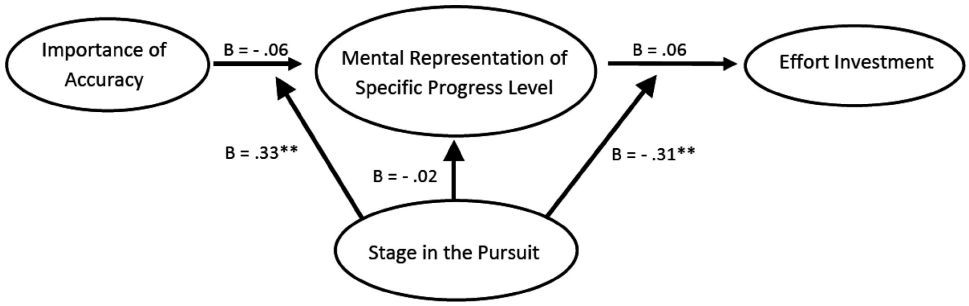

Figure 8. Moderated mediation model of the influence of mental representation of progress level on effort investment (Study 4). ** $p \leq .01$.

confirm that these alterations, instead of being attention-based biases, are indeed self-regulatory instruments designed to help ensure successful goal attainment.

General Discussion

Past research has emphasized the impact of progress feedback on people's subsequent motivation in goal pursuit (Förster et al., 1998; Hull, 1932; Liberman & Förster, 2008; Louro et al., 2007). The present investigation extends the previous findings and focuses on one's mental representation of specific progress levels as a determinant of motivation. By taking a motivational approach, we find that mental representations of goal progress can function as a self-regulation mechanism that helps people maintain high levels of motivation in goal pursuit. While people exaggerate their specific progress level to increase perceived goal attainability at initial stages of pursuit to elicit greater motivation, they downplay the specific progress level to highlight the need for greater effort at advanced stages of goal pursuit to elicit greater motivation.

The results of four studies provided convergent support for the proposed mechanism. Study 1 tested our hypothesis in the context of a collective donation goal pursuit. We found that when the donation cause was highly (vs. less) valuable, people exaggerated the progress that had been made on the goal above the baseline condition to signal higher goal attainability in initial stages of the pursuit, but conversely downplayed the level of progress below the baseline condition to signal a higher need for additional effort in advanced stages of the pursuit. Such alterations in mental representations, in turn, impacted people's subsequent motivation in contributing to the collective goal. In an individual goal context, Study 2 found that participants who were starting to accumulate points for a reward reported greater achieved progress when the reward was of high (vs. low) value to them, which subsequently led to greater effort in the task. Conversely, participants who were approaching the total points required for the reward reported less progress when the reward was of high (vs. low) value to them, which also resulted in increased effort in further pursuit.

In Study 3, we found that such alteration of progress occurred only when self-regulation was perceived to be effective and necessary in helping one attain the goal; participants who thought they could (vs. could not) improve their performance through practice in a pitch-identification task estimated greater achieved progress when they had just started accumulating points but reported less progress when they were approaching the total points required for reward. Their altered mental representations of specific progress levels, in turn, predicted their subsequent motivation. Lastly, Study 4 provided further evidence for the self-regulatory nature of the observed phenomenon by showing that participants who were trying to be accurate with their estimates did not alter their mental representations, and their motivation, in turn, suffered compared with those who were less concerned about the accuracy and hence altered their mental representations as a motivational instrument. Importantly, because the participants who were concerned about accuracy would monitor their progress as (if not more) intensely and closely as those who were not concerned about accuracy, this study also ruled out the possibility that the observed alteration of mental representation was a result of more intense monitoring of one's progress.

Implications for Other Research

If we view the process of goal pursuit as moving along a straight line anchored by the starting point on one end and the ideal state on the other, progress and the remaining discrepancy to attainment would represent two opposing sides of the same construct: While progress represents how much one has accomplished from the starting point, discrepancy represents the distance one still needs to cover to reach the end point. Prior research has found evidence that both accomplished and unaccomplished goal progress can be motivating. On one hand, people are motivated by negative feedback that is based on the discrepancies to goal attainment (Carver & Scheier, 1998; Higgins, 1987; Locke & Latham, 2002); on the other hand, one's achieved progress also motivates effort by signaling greater chance of goal attainment (Liberman & Förster, 2008). The present framework unites the two streams of literature by adding a temporal dimension and suggests that people derive motivation from different sources at different stages of goal pursuit. While they are mostly concerned about goal attainability and are more motivated by the achieved progress in the initial stages of goal pursuit, they become mostly concerned about reducing the discrepancy and are more motivated by the unachieved progress in advanced stages of goal pursuit.

At the center of this dual-source view is the level of progress on a goal, which addresses both concerns in goal pursuit. The present research analyzes people's tendencies to use the mental representation of their progress level as a self-regulatory instrument. By strategically biasing the representations of their progress levels on the goal, they either enhance the goal commitment or highlight the

magnitude of discrepancy, so that their motivation remains high throughout the entire pursuit.

Past research has documented various instruments that people employ to prevent obstacles from undermining their goal attainment. They can modulate the choice situations (Ainslie, 1975; Becker, 1960; Green & Rachlin, 1996; Rachlin & Green, 1972; Schelling, 1978, 1984; Thaler, 1991; Thaler & Shefrin, 1981), change the value of different options in conflicts (Fishbach, Zhang, & Trope, 2010; Kuhl, 1986; Myrseth, Fishbach, & Trope, 2009) or shift the level of abstraction of the available options (Fujita et al., 2006; Mischel & Ayduk, 2004). The present investigation extends this research stream from single-choice situations to goal pursuit that requires continued efforts and demonstrates that people in these contexts modify the mental representation of their achievement as an instrument to ensure goal attainment. These strategic alterations, as we demonstrate in the present research, are in operation whenever the attainment of an important goal is at stake and, unlike in previous studies, do not require the presence of an immediate self-control conflict to be triggered.

The finding that people strategically modify their mental representations of achieved progress to elicit greater motivation further contributes to the discussion on the interaction between motivation and cognition. Rather than always representing the world accurately in their minds, people's cognitions—including evaluations of other people, estimated likelihood of an event, and interpretations of ambiguous stimuli—are often influenced by their momentary motivations (Balcetis & Dunning, 2006; Dunning, 2001; Kunda, 1990). Extending these findings, we have demonstrated a productive motivation-cognition cycle of reinforcement in goal pursuit: Individuals' motivation to ensure the completion of important goals initiates the operation that biases their cognition (exaggerating or downplaying achieved progress), which, in turn, comes back to exert further positive influence on their motivation to attain the goal. This cycle of reinforcement further highlights the intertwined relationship between motivation and cognition and sheds important light on our understanding of the interaction between the two.

Related Conceptualizations

We posit that the biases in mental representation reflect a motivational, self-regulatory mechanism that individuals use to elicit greater motivation. Alternatively, they might also reflect other cognitive biases that are nonmotivational in nature. For example, the optimism bias (Taylor & Brown, 1988) represents one's unrealistic expectation of greater success in the future than what a person actually achieved during a comparable period in the past. Optimism bias suggests that holding optimistic expectations about the future can enhance one's feelings of self-efficacy and can increase one's motivation to attain the goal by functioning as more challenging performance standards to elicit greater efforts (Ajzen, 1985; Armor & Taylor, 2002; Bandura, 1997; Buehler, Griffin, & Ross, 1994; Gollwitzer, 1990; Oettingen & Mayer, 2002). Similarly, defensive pessimism (e.g., Norem & Cantor, 1986; Norem & Illingworth, 1993; Showers, 1992) suggests that when anticipating difficulties in goal pursuit, people sometimes set unrealistically low expectations in order to help manage their emotional experiences in case of failure, and to motivate greater effort. According to this account, it is possible that people might have been downplaying their progress so that they could better prepare themselves for the potential failures and the emotional consequences. Notably, both the optimism and defensive pessimism would predict that such biases should occur for goals that are both within and outside their control; for instance, people exercising defensive pessimism would think through various possible outcomes (usually worse-case scenarios) of an event, whether it is a performance (within their control) or a situation (outside their control), to help manage their anxiety level (Norem & Illingworth, 1993). That is, people display optimism and defensive pessimism regardless of their perceived level of control in the pursuit of the goal.

Our empirical evidence, however, supports the self-regulatory nature of the biases in the mental representation of goal progress by showing that this phenomenon occurs only when people feel that efforts are instrumental in helping them attain the goal. Whenever the outcome of a goal pursuit is found to be outside of people's personal control (e.g., genetically determined in Study 3), their mental representations of specific progress level do not display the same systematic bias, nor do these representations predict people's subsequent efforts in the pursuit. Therefore, mere optimism or pessimism cannot account for our findings. Instead, this pattern is more consistent with a counteractive self-regulation conceptualization, which emphasizes the instrumental nature of such representations. Because efforts are not instrumental in helping the attainment of goals that are beyond people's control, people do not engage in self-regulation, and hence, the systematic biases in mental representations do not occur.

A Word on Accuracy and Motivation

Biases in perceptions and judgments are generally regarded as undesirable, and much research from decision making as well as from clinical psychology suggest that an accurate perception about one's circumstance is often desirable and provides better directions for people's important decisions (Ambady & Gray, 2002; Fletcher & Kerr, 2010; Funder, 1987; Rule, Ambady, Adams, & Macrae, 2008). Indeed, in many situations, people benefit from an accurate representation of the outside world, because it allows them to make decisions that are more in line with reality and facilitates human behaviors such as planning and coordination.

Despite all the benefits associated with accuracy in perceptions, it is also important to take notice of the situations in which biases, within reasonable scope, may be instrumental and beneficial. As we demonstrated in the present research (e.g., Study 4), a desire to be accurate in estimates brought about the unintended costs of decreased motivation in goal pursuit; a biased representation, on the other hand, proved to be effective in eliciting greater motivation to ensure the attainment of an important goal. These findings add to the growing evidence that a healthy amount of bias, particularly when it is motivational in nature, can be of positive value (e.g., Taylor & Brown, 1988; Zhang & Fishbach, 2010). Besides an appropriate amount of bias, the timing and direction of the bias are also crucial. For instance, prior research (e.g., Taylor & Gollwitzer, 1995) has found that, while people are motivated to be accurate in their evaluations at the deliberation stage of the pursuit to carefully evaluate the pros and cons of competing goals as well as their own capabilities, people become more biased in their evaluations at the implementation stage, which helps them to better

allocate effort and resources to facilitate the attainment of the chosen goal. Our research sheds light on the direction of beneficial biases after one initiates the pursuit. By altering the mental representation of specific progress levels in distinctive directions at different stages of goal pursuit, people can effectively motivate themselves and increase the likelihood of eventual goal attainment.

Moreover, this benefit of biases can have important implications for social agents who try to motivate other people. Because the use of biased mental representation requires a certain degree of freedom in the representation, frequent feedback could limit the effectiveness of such operations. On the basis of our findings, one should be aware of both the benefits and costs of frequent progress feedback, and the question of how frequent the feedback should be depends on the relative value of the goal and the initial motivation level of the individual. For example, instead of providing frequent progress feedback to all individuals, our findings would suggest that for people who are motivated to pursue the goal, a certain level of ambiguity in progress feedback would facilitate their own self-regulation efforts and allow them to proactively use mental representations to help them attain the goal. In a similar vein, an interesting question is how people strategically balance between the use of precise information and self-regulatory instruments that require a certain degree of ambiguity. When precise feedback on goal progress is easily accessible, would people strategically forgo, avoid, or suppress such feedback so that they could employ their own self-regulatory tactics? How often, for example, would an everyday runner seek information on the distance covered or calories burned from monitoring gadgets/devices and would this frequency change as this person gets closer to the end point of the pursuit? Further investigations on these questions would be an interesting avenue for future research.

References

Ainslie, G. (1975). Specious reward: A behavioral theory of impulsiveness and impulse control. *Psychological Bulletin, 82,* 463–496. doi:10.1037/h0076860

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action-control: From cognition to behavior* (pp. 11–39). Heidelberg, Germany: Springer.

Ambady, N., & Gray, H. M. (2002). On being sad and mistaken: Mood effects on the accuracy of thin-slice judgments. *Journal of Personality and Social Psychology, 83,* 947–961. doi:10.1037/0022-3514.83.4.947

Armor, D. A., & Taylor, S. E. (2002). When predictions fail: The dilemma of unrealistic optimism. In T. D. Gilovich, D. W. Griffin, & D. Kahneman (Eds.), *Heuristics and biases: The psychology of intuitive judgment* (pp. 334–347). New York, NY: Cambridge University Press.

Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review, 64,* 359–372. doi:10.1037/h0043445

Balcetis, E., & Dunning, D. (2006). See what you want to see: Motivational influences on visual perception. *Journal of Personality and Social Psychology, 91,* 612–625. doi:10.1037/0022-3514.91.4.612

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: Freeman/Times Books/Holt.

Bandura, A., & Pervin, L. A. (1989). Self-regulation of motivation and action through internal standards and goal systems. In L. A. Pervin (Ed.), *Goal concepts in personality and social psychology* (pp. 19–85). Hillsdale, NJ: Erlbaum.

Becker, H. S. (1960). Notes on the concept of commitment. *American Journal of Sociology, 66,* 32–40. doi:10.1086/222820

Brehm, J. W., & Self, E. A. (1989). The intensity of motivation. *Annual Review of Psychology, 40,* 109. doi:10.1146/annurev.ps.40.020189.000545

Brehm, J. W., Wright, R. A., Solomon, S., Silka, L., & Greenberg, J. (1983). Perceived difficulty, energization, and the magnitude of goal valence. *Journal of Experimental Social Psychology, 19,* 21–48. doi:10.1016/0022-1031(83)90003-3

Buehler, R., Griffin, D., & Ross, M. (1994). Exploring the "planning fallacy": Why people underestimate their task completion times. *Journal of Personality and Social Psychology, 67,* 366–381. doi:10.1037/0022-3514.67.3.366

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior.* New York, NY: Cambridge University Press.

Dunning, D. (2001). On the motives underlying social cognition. In N. Schwarz & A. Tesser (Eds.), *Blackwell handbook of social psychology: Vol. 1. Intraindividual processes* (pp. 348–374). New York, NY: Blackwell.

Dunning, D. (2004). On the motives underlying social cognition. In M. B. Brewer & M. Hewstone (Eds.), *Emotion and motivation* (pp. 137–164). Malden, MA: Blackwell.

Festinger, L. (1957). *A theory of cognitive dissonance.* Oxford, England: Row, Peterson.

Fishbach, A., & Dhar, R. (2005). Goals as excuses or guides: The liberating effect of perceived goal progress on choice. *Journal of Consumer Research, 32,* 370–377. doi:10.1086/497548

Fishbach, A., Dhar, R., & Zhang, Y. (2006). Subgoals as substitutes or complements: The role of goal accessibility. *Journal of Personality and Social Psychology, 91,* 232–242. doi:10.1037/0022-3514.91.2.232

Fishbach, A., Zhang, Y., & Koo, M. (2009). The dynamics of self-regulation. *European Review of Social Psychology, 20,* 315–344. doi:10.1080/10463280903275375

Fishbach, A., Zhang, Y., & Trope, Y. (2010). Counteractive evaluation: Asymmetric shifts in the implicit value of conflicting motivations. *Journal of Experimental Social Psychology, 46,* 29–38. doi:10.1016/j.jesp.2009.09.008

Fletcher, G. J. O., & Kerr, P. S. G. (2010). Through the eyes of love: Reality and illusion in Intimate relationships. *Psychological Bulletin, 136,* 627–658. doi:10.1037/a0019792

Förster, J., Higgins, E. T., & Chen Idson, L. (1998). Approach and avoidance strength during goal attainment: Regulatory focus and the "goal looms larger" effect. *Journal of Personality and Social Psychology, 75,* 1115–1131. doi:10.1037/0022-3514.75.5.1115

Fujita, K., Trope, Y., Liberman, N., & Levin-Sagi, M. (2006). Construal levels and self-control. *Journal of Personality and Social Psychology, 90,* 351–367. doi:10.1037/0022-3514.90.3.351

Funder, D. C. (1987). Errors and mistakes: Evaluating the accuracy of social judgment. *Psychological Bulletin, 101,* 75–90. doi:10.1037/0033-2909.101.1.75

Gilbert, D. T., Brown, R. P., Pinel, E. C., & Wilson, T. D. (2000). The illusion of external agency. *Journal of Personality and Social Psychology, 79,* 690–700. doi:10.1037/0022-3514.79.5.690

Gollwitzer, P. M. (1990). Action phases and mind-sets. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (Vol. 2, pp. 53–92). New York, NY: Guilford Press.

Green, L., & Rachlin, H. (1996). Commitment using punishment. *Journal of the Experimental Analysis of Behavior, 65,* 593–601. doi:10.1901/jeab.1996.65-593

Harmon-Jones, E., Amodio, D. M., & Harmon-Jones, C. (2009). Action-based model of dissonance: A review, integration, and expansion of conceptions of cognitive conflict. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 41, pp. 119–166). New York, NY: Academic Press.

Harmon-Jones, E., & Harmon-Jones, C. (2002). Testing the action-based model of cognitive dissonance: The effect of action orientation on

postdecisional attitudes. *Personality and Social Psychology Bulletin, 28,* 711–723. doi:10.1177/0146167202289001

Higgins, E. T. (1987). Self-discrepancy: A theory relating self and affect. *Psychological Review, 94,* 319–340. doi:10.1037/0033-295X.94.3.319

Hull, C. L. (1932). The goal-gradient hypothesis and maze learning. *Psychological Review, 39,* 25–43. doi:10.1037/h0072640

Koo, M., & Fishbach, A. (2008). Dynamics of self-regulation: How (un-)accomplished goal actions affect motivation. *Journal of Personality and Social Psychology, 94,* 183–195. doi:10.1037/0022-3514.94.2.183

Kuhl, J. (1986). Motivation and information processing: A new look at decision making, dynamic change, and action control. In R. M. Sorrentino & E. T. Higgins (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (pp. 404–434). New York, NY: Guilford Press.

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin, 108,* 480–498. doi:10.1037/0033-2909.108.3.480

Lewin, K. (1935). *A dynamic theory of personality.* New York, NY: McGraw-Hill.

Lewin, K. (1951). Intention, will and need. In D. Rapaport (Ed.), *Organization and pathology of thought: Selected sources* (pp. 95–153). New York, NY: Columbia University Press. doi:10.1037/10584-005

Liberman, N., & Förster, J. (2008). Expectancy, value and psychological distance: A new look at goal gradients. *Social Cognition, 26,* 515–533. doi:10.1521/soco.2008.26.5.515

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting & task performance.* Englewood Cliffs, NJ: Prentice-Hall.

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist, 57,* 705–717. doi:10.1037/0003-066X.57.9.705

Louro, M. J., Pieters, R., & Zeelenberg, M. (2007). Dynamics of multiple-goal pursuit. *Journal of Personality and Social Psychology, 93,* 174–193. doi:10.1037/0022-3514.93.2.174

Mischel, W., & Ayduk, O. (2004). Willpower in a cognitive–affective processing system: The dynamics of delay of gratification. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 99–129). New York, NY: Guilford Press.

Mischel, W., Cantor, N., & Feldman, S. (1996). Principles of self-regulation: The nature of willpower and self-control. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 329–360). New York, NY: Guilford Press.

Myrseth, K. O. R., Fishbach, A., & Trope, Y. (2009). Counteractive self-control. *Psychological Science, 20,* 159–163. doi:10.1111/j.1467-9280.2009.02268.x

Neuberg, S. L. (1989). The goal of forming accurate impressions during social interactions: Attenuating the impact of negative expectancies. *Journal of Personality and Social Psychology, 56,* 374–386. doi:10.1037/0022-3514.56.3.374

Norem, J. K., & Cantor, N. (1986). Defensive pessimism: Harnessing anxiety as motivation. *Journal of Personality and Social Psychology, 51,* 1208–1217. doi:10.1037/0022-3514.51.6.1208

Norem, J. K., & Illingworth, K. S. S. (1993). Strategy-dependent effects of reflecting on self and tasks: Some implications of optimism and defensive pessimism. *Journal of Personality and Social Psychology, 65,* 822–835. doi:10.1037/0022-3514.65.4.822

Oettingen, G., & Mayer, D. (2002). The motivating function of thinking about the future: Expectations versus fantasies. *Journal of Personality and Social Psychology, 83,* 1198–1212. doi:10.1037/0022-3514.83.5.1198

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research, 42,* 185–227. doi:10.1080/00273170701341316

Rachlin, H., & Green, L. (1972). Commitment, choice and self-control. *Journal of the Experimental Analysis of Behavior, 17,* 15–22. doi:10.1901/jeab.1972.17-15

Rule, N. O., Ambady, N., Adams, R. B., Jr., & Macrae, C. N. (2008). Accuracy and awareness in the perception and categorization of male sexual orientation. *Journal of Personality and Social Psychology, 95,* 1019–1028. doi:10.1037/a0013194

Schelling, T. C. (1978). Egonomics, or the art of self-management. *American Economic Review, 68,* 290–294.

Schelling, T. C. (1984). Self-command in practice, in policy, and in a theory of rational choice. *American Economic Review, 74,* 1–11.

Showers, C. (1992). The motivational and emotional consequences of considering positive or negative possibilities for an upcoming event. *Journal of Personality and Social Psychology, 63,* 474–484. doi:10.1037/0022-3514.63.3.474

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin, 103,* 193–210. doi:10.1037/0033-2909.103.2.193

Taylor, S. E., & Gollwitzer, P. M. (1995). Effects of mindset on positive illusions. *Journal of Personality and Social Psychology, 69,* 213–226. doi:10.1037/0022-3514.69.2.213

Thaler, R. H. (1991). *Quasi rational economics.* New York, NY: Russell Sage Foundation.

Thaler, R. H., & Shefrin, H. M. (1981). An economic theory of self-control. *The Journal of Political Economy, 89,* 392–406. doi:10.1086/260971

Tolman, E. C. (1955). Principles of performance. *Psychological Review, 62,* 315–326. doi:10.1037/h0049079

Trope, Y., & Fishbach, A. (2000). Counteractive self-control in overcoming temptation. *Journal of Personality and Social Psychology, 79,* 493–506. doi:10.1037/0022-3514.79.4.493

Vroom, V. H. (1964). *Work and motivation.* Oxford England: Wiley.

Witt, J. K., Proffitt, D. R., & Epstein, W. (2005). Tool use affects perceived distance, but only when you intend to use it. *Journal of Experimental Psychology: Human Perception and Performance, 31,* 880–888. doi:10.1037/0096-1523.31.5.880

Wright, R. A., & Kirby, L. D. (2001). Effort determination of cardiovascular response: In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 33, pp. 255–307). San Diego, CA: Academic Press.

Zhang, Y., & Fishbach, A. (2010). Counteracting obstacles with optimistic predictions. *Journal of Experimental Psychology: General, 139,* 16–31. doi:10.1037/a0018143

Zhang, Y., Huang, S., & Broniarczyk, S. M. (2010). Counteractive construal in consumer goal pursuit. *Journal of Consumer Research, 37,* 129–142. doi:10.1086/649912

(*Appendix follows*)

Appendix

Picture Stimuli Used in the T-Shirt Donation Drive (Study 1)

Received December 6, 2011
Revision received March 12, 2012
Accepted March 14, 2012 ■