



Planning, personality, and prediction: The role of future focus in optimistic time predictions[☆]

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Abstract

The present studies examined cognitive processes underlying the tendency to underestimate project completion times. Two experiments tested the hypothesis that people generate overly optimistic predictions, in part, because they focus narrowly on their future plans for the target task and thus neglect other useful sources of information. Consistent with the hypothesis, instructing participants to adopt a “future focus”—in which they generated concrete, specific plans for the task at hand—led them to make more optimistic predictions about when they would complete their intended Christmas shopping (Study 1) and major school assignments (Study 2). The future focus manipulation did not have a corresponding effect on actual completion times, and thus increased the degree of optimistic bias in prediction. The studies also demonstrated that the optimistic prediction bias generalized across different task domains, relevant individual differences (i.e., trait optimism and procrastination), and other contextual variations.

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Anecdotes, archival records, and surveys all indicate that professionals and lay people are typically overly optimistic in their predictions about when projects will be completed. This optimistic prediction bias is found in everyday projects such as completing major school assignments or personal tax forms (Buehler, Griffin, & Ross, 1994, 1997; Griffin & Buehler, 1999) as well as large-scale industrial and commercial projects such as the completion of hydroelectric dams and public transportation systems (Flyvbjerg, Holme, & Soren, 2002; Hall, 1980; Schnaars, 1989). For example, in 1989 the General Accounting Office (GAO) of the United States government estimated that less than 1% of the Information Technology projects commissioned by the US department of defense met the triple goals of being

completed on time, on budget, and fully operational. A simple summary of a large literature would be that people are characteristically optimistic in their predictions, and that this optimistic bias is multiplied when new and untested technology is involved (Cooke, 1991; Hall, 1980; Schnaars, 1989; Tull, 1967; Tyebjee, 1987).

There are a number of explanations for this optimistic bias. In some cases, there is political or commercial pressure to maintain a public conviction that some optimistic target is attainable (Flyvbjerg et al., 2002; Hall, 1980). In other cases, such as some of those identified by the GAO report on procurement practices by the US department of defense, there are problems with the specifications of a project being upgraded into an unreasonable “wish-list” of features. And in other cases, especially with regard to the software industry, scheduling problems have been tied to the poor monitoring of progress and the lack of management response to falling behind schedule (Abdel-Hamid & Madnick, 1991).

There are a few exceptions to the optimistic rule. In our laboratory, we have found that simple, short tasks do not always elicit optimistic time predictions, and on

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occasion may invoke overly pessimistic predictions (see Byram, 1997, Study 5, for a similar result). We have also found that predictions of time on task—rather than predicted completion dates—are generally unbiased. Although neither of these findings has yet been included in our published work, there is one large-scale, published study of software programming projects that has documented both of these effects (Connolly & Dean, 1997). Importantly, this study of class software projects examined predictions of how long students would take completing sub-tasks that varied in difficulty or complexity as well as in time frame, and found that estimates of time on task could be optimistic *or* pessimistic depending on the relevant task variables. Thus, the optimistic bias in time prediction and the underlying processes that we explore in this article are necessarily limited to specific types of time predictions, notably the prediction of completion times.

Psychological analyses of everyday planning practices implicate two general cognitive processes in the production of overly optimistic task completion estimates (Buehler et al., 1994; Kahneman & Lovallo, 1993; Kahneman & Tversky, 1979). These are (a) an “inside” focus on step by step forward planning and (b) a complementary neglect or avoidance of “outside” or “distribution based” evidence about past prediction failures in similar tasks. For example, in our own past work, students have been asked to “think aloud” while they predict a completion time for an important academic or personal project. Typically, each predictor reports a single, multi-stage plan that links his or her present state to the future goal—but rarely do these plans contain alternate branches that lead to the consideration of possible problems, and even more rarely do these plans contain reference to past experiences with similar tasks. This dissociation of the past from the present may be costly (in terms of accurate predictions) because when the same predictors are directly asked about their past experiences, most respondents acknowledge that their plans and predictions typically err on the side of optimism. Although in retrospect a typical predictor reports completing a typical task just before an externally imposed deadline, in prospect most people expect to complete their future tasks substantially before the deadline. The tendency to ignore the past and focus on a plan-based scenario for the future is magnified when predictors are offered financial incentives for completing the task early (Buehler et al., 1997), and is greatly reduced when a person is asked to make a prediction about someone else’s task completion (Buehler et al., 1994).

On the basis of this previous research and related evidence, it is tempting to conclude that people—at least in western cultures—share a common planning bias that leads to overly optimistic predictions for their own project completion times. However, such a conclusion

would be premature at this stage, for at least two reasons. First, researchers have not demonstrated that focusing on plan-based scenarios (what we call a “future focus”) is a cause of—and not merely diagnostic of—overly optimistic task predictions. Second, research to date has not examined the generalizability of the optimistic bias and associated planning processes across contextual and dispositional factors. The present research was conducted to address both of these concerns. In particular we examine two primary hypotheses:

H1: Increasing the salience of future plans through a “future focus” manipulation will exacerbate the optimistic bias associated with the planning fallacy.

H2: The optimistic bias will be robust across relevant individual differences, notably procrastination and dispositional optimism, although these differences may moderate the level of the optimistic bias.

Assessing the impact of a future focus

We have proposed that people generate overly confident and optimistic predictions, at least in part, because they focus their attention on a concrete, plan-based future scenario for the upcoming task. However, research to date has not provided direct experimental evidence for this causal hypothesis. In the current studies, we experimentally manipulate the degree of future focus by having some participants make detailed, step-by-step plans about a current project while other participants merely report their predictions about project completions. Our anticipation is that inducing a strong future focus will anchor participants’ predictions even more firmly on their plan-based scenarios, leading to a greater disregard of past experiences and consequently to more optimistic predictions. Furthermore, we expect that the future focus induced at the time of prediction will have less impact on participants’ actual completion times than on their predictions, and thus will contribute to an optimistic bias in prediction.

The hypothesis may seem surprising in light of research indicating that specific plans can have facilitating effects on behavior. For example, Gollwitzer and his colleagues have demonstrated that developing a concrete plan of action helps people to achieve their goals (Gollwitzer, 1996, 1999; Gollwitzer & Brandstatter, 1997; see also Armor & Taylor, 2003 and Koole & Spijker, 2000). Participants who share a common goal intention (e.g., a desire to finish a project during an upcoming vacation) are more likely to succeed if they are prompted to generate implementation intentions that specify precisely when, where, and how they will act to achieve the goal. The implementation intention is effective because it links anticipated opportunities with effective goal directed behaviors. When the opportunity is later encountered people are more likely to initiate

and carry out the actions required to meet their goals, even in the face of tempting distractions, bad habits, and competing demands. Gollwitzer (1999) reviewed a number of related studies in the area of health promotion showing that making vivid, detailed plans can increase the likelihood of self-protective behaviors such as breast self-examination.

Along similar lines, research on process simulations (Pham & Taylor, 1999; Taylor, Pham, Rivkin, & Armor, 1998) suggests that envisioning the process needed for reaching a goal is an effective technique for regulating behavior. Constructing a process simulation involves setting a goal and then mentally rehearsing the specific steps required to achieve it. One highly pertinent study assessed the effectiveness of process simulations in attenuating the planning fallacy (Taylor et al., 1998). All participants first predicted when they would complete a school assignment that was due the following week. Participants in the process simulation condition were then trained to envision themselves going through the steps needed to complete the assignment (e.g., gathering the required materials, getting organized, and beginning work on the project) and were instructed to rehearse this process simulation for five minutes each day during the week that the project was carried out. In comparison to control participants who did not perform this daily cognitive exercise, more of these participants managed to finish their projects by the predicted time (14 vs. 41%, respectively), although most people were still overly optimistic.

Although implementation intentions and process simulations are distinct mental processes, they both appear to facilitate task completion; and they both involve the kind of future focus that has been identified as a root cause of the planning fallacy. Research in other domains also indicates that predictions sometimes affect subsequent behavior (Johnson & Sherman, 1990; Sherman, Skov, Hervitz, & Stock, 1981; Sherman, 1980) although not always (Hoch, 1985; Wilson & LaFleur, 1995). Thus, the critical question involves the *relative* impact of a future focus on predictions and behavior. When a future focus exerts a stronger impact on actual completion times than on predicted completion times, the optimistic bias will be attenuated. When a future focus exerts a stronger impact on people's predictions than on their behavior the optimistic bias will be exaggerated. Thus, it would be most useful to identify those contexts in which future focus primarily affects behavior, prediction, or when it has balanced effects.

A key variable controlling the impact of a future focus on actual completion times, we suggest, is the nature of the *barriers* to project completion. When the barriers to completion consist primarily of internal (and therefore more controllable) factors such as forgetfulness, lack of motivation, and weakness of will, we expect the effect on behavior to be substantial. However, when the

barriers to completion consist primarily of external (and therefore less controllable) factors such as competing projects, unexpected problems in the task itself, or missing resources, we expect that the effect on behavior will be minimal.

We believe that the kind of projects we have been studying—the completion of income tax forms, major school assignments, and long-term personal projects—may fit the latter pattern. These are long-term projects that require sustained effort over several days or weeks. In the present research, we again targeted long-term tasks with external deadlines that we anticipated (on the basis of our previous research) would almost always be met, and we assessed how promptly participants finished these tasks. Students were highly motivated to complete these tasks, and the tasks were highly salient to them. Delayed completion for such tasks is often caused by competing projects (a source of delay usually neglected in the planning phase), shifting priorities, and unforeseeable interruptions to the task.

Our primary hypothesis was that a focus on plan-based scenarios (a future focus) contributes to the optimistic bias in these kinds of task completion predictions because it tends to exert a stronger impact on predicted than actual completion times. To test this hypothesis, in two studies we induced a future focus in some participants by asking them to generate and describe a specific plan for carrying out the target task; participants in the control conditions did not receive these instructions. We then assessed the impact of this future focus on predicted completion times relative to its impact on actual completion times. In addition to the theoretical benefits of specifying the role of future focus in the planning fallacy, the results of these studies may have considerable applied value. Planners in organizational environments are often called upon to justify their predictions on the basis of detailed step-by-step plans—because the barriers to such tasks are likely to be outside the planner's control, the requirement for detailed plan-based justification may actually accentuate the tendency towards an optimistic bias.

Assessing dispositional moderators

Are optimistic time predictions limited to a distinct sub-group of individuals? It seems at least plausible that optimistic time predictions are part of a more general tendency towards dispositional optimism (Scheier & Carver, 1985). Dispositional optimists are identified by their agreement with such items as “every cloud has a silver lining” or “I'm optimistic about my future.” Clearly, such beliefs are consistent with an inclination to focus on plans for success and to assume that the future will be different from, and better than, the past. Dispositional pessimists, in contrast, may be more prone to

focus on possible problems and to adjust their task completion predictions accordingly.

In contrast to these intuitive assumptions, previous research (summarized in Armor & Taylor, 1998, 2002) indicates that generalized, dispositional optimism is often related only modestly to domain-specific expectations and performance. In addition, the research suggests that dispositional optimism may be most pertinent to optimistic biases that function in the service of self-related motives. Our account of the planning fallacy, in contrast, is heavily cognitive, implying that the misprediction is a natural byproduct of cognitive processes by which goals are set, plans formed, and timetables established. Accordingly, we anticipated that the optimism of participants' predictions would not be strongly related to individual differences in dispositional optimism.

Another individual difference that might moderate people's tendency to make overly optimistic completion predictions is the tendency to procrastinate. Procrastination, by definition, involves the behavior of postponing task initiation (Ferrari, Johnson, & McGown, 1995). Research examining the antecedents and consequences of procrastination offers several reasons to expect that dispositional procrastinators may be more inclined than their counterparts to underestimate how long it will take them to complete tasks. Procrastinators are characterized by particularly weak links between intentions and behavior, and consequently have difficulty beginning (or completing) a task at the time they intend (Ferrari & Emmons, 1995; Lay & Burns, 1991). Before beginning a task, procrastinators appear to overestimate the degree of control they exert over its completion (Lay, Edwards, Parker, & Endler, 1989). Finally, procrastinators predict that they will require less working time to complete a task than non-procrastinators (Lay, 1988; McCown, Petzel, & Rupert, 1987), implying that their completion time predictions may be markedly optimistically biased.

On the other hand, there are also reasons to believe that procrastinators may be less inclined to be optimistic. Many procrastinators dwell on their past problems with task completion (Lay, 1995), and because they are more likely to attribute their past problems to factors within themselves, procrastinators may be particularly likely to use their past experiences or "personal base rates" (Osberg & Shrauger, 1986) to guide their predictions, making them less susceptible to the optimistic prediction bias. In a recent study (Pychyl, Morin, & Salmon, 2000) students scoring high on procrastination were just as accurate in forecasting their study times for midterm exams as those scoring low on procrastination. The procrastinators began studying later and studied less than their counterparts, but they were also able to predict this pattern of behavior in advance. Thus, although procrastinators are expected to finish tasks

relatively late, it remains an open question as to whether their completion-time predictions will be more or less optimistically biased than those of their peers.

Study 1

In our initial study we targeted a real-world task (buying Christmas presents during the winter holiday season) that many anecdotes and some previous research (e.g., Ferrari, 1993) indicate is often completed much later than expected or desired. Thus we anticipated that there would be a strong optimistic bias for this task, allowing a fairly stringent test of our hypothesis that inducing a higher level of future focus would increase the degree of optimistic bias.

Participants

The initial prediction questionnaire was completed by 85 undergraduates at a Canadian university and 78 (92%) of these participants (61 females and 17 males) were contacted for the follow-up interview.

Procedure

In small group sessions conducted 3–4 weeks before Christmas day, participants completed a questionnaire concerning their upcoming Christmas shopping. Participants were first asked to compose a "shopping list" that contained the three most important parts of their intended shopping for the current year. Next they reported whether they had started working on this part of their shopping yet and, if so, indicated how much of it they had completed using a percentage scale.

Future focus manipulation. As participants considered when they would complete the designated shopping they encountered a manipulation designed to vary the focus of their thoughts as they generated the predictions. Immediately before generating their predictions, the participants randomly assigned to the *future focus* condition ($n = 36$) were asked to spend a few minutes considering their plans for completing their shopping and then to describe the plans in detail, according to the following instructions:

Please take a few minutes to consider your plans for completing the parts of your Christmas shopping you have listed. Now, please describe your plans for completing this shopping. Tell us the main steps involved, including details such as when, where, and how you will go about this shopping and will complete it. Try to provide a complete scenario, from beginning to end, of how this shopping is likely to unfold.

Participants assigned to the *control* condition ($n = 42$) were not asked about their shopping plans. All participants were then asked to "predict as accurately as possible" the date and time that they would complete

their designated shopping, and an accompanying thought listing measure asked them to report all of their thoughts as they were generating their predictions.

Measures of dispositional optimism and procrastination. Following the assignment prediction questionnaire, all participants were asked to complete a personality survey that contained the measures of dispositional optimism and procrastination. The measure of optimism used in the present research was the Life Orientation Test (LOT) (Scheier & Carver, 1985). This scale includes eight items assessing the favorability of people's general outlook on the future, four that are worded in a positive direction (e.g., I always look on the bright side of things; I'm optimistic about my future) and four worded in the negative direction (e.g., If something can go wrong for me it will; Things never work out the way I want them to). Respondents indicated their agreement with each item on a scale ranging from 0 (strongly disagree) to 4 (strongly agree).

The measure of dispositional procrastination used in the present research was the general form of a procrastination scale (Form G) developed by Lay (1986). This 20-item true-false inventory assesses individual differences in the tendency to postpone actions needed to attain a goal. It contains 10 true-keyed items (e.g., In preparing for some deadline, I often waste time by doing other things; I am continually saying I'll do it tomorrow) and 10 false-keyed items (e.g., I usually start an assignment shortly after it is assigned; I often have a task finished sooner than necessary). Participants were contacted between 1 and 3 weeks after Christmas for a short telephone interview in which they were asked to report the date and time they had actually finished the shopping.

Results

Each participant's predicted and actual completion time was converted into the number of days (and fraction of days) before the arrival of Christmas day. Prediction bias was indexed by the difference between predicted and actual completion times. Questionnaire Items were summed to create composite scores for the measures of dispositional optimism (LOT: Cronbach's $\alpha = .87$) and procrastination (FORM G: Cronbach's $\alpha = .83$) and median splits were also performed to classify participants as low or high in optimism (median = 21) and procrastination (median = 11).

An initial comparison of predicted and actual completion times revealed a substantial optimistic bias. In general, participants expected to finish their designated shopping list further before Christmas ($M = 5.97$ days) than they actually did ($M = 3.40$ days), $F(1, 76) = 15.52, p < .001$. The optimistic bias was magnified in the future focus condition (mean predictions of 7.49 days matched with actual completion times of 3.49 days)

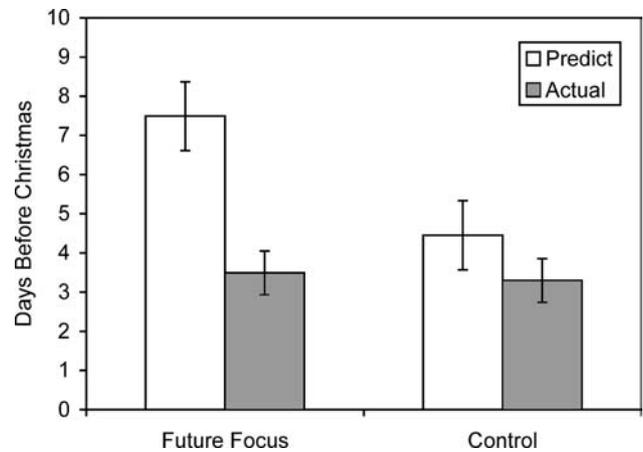


Fig. 1. Predicted and actual days before Christmas as a function of the future focus manipulation (Study 1). Bars represent one standard error above and below the mean.

relative to the control condition (mean predictions of 4.45 days matched with actual completion times of 3.30 days), $F(1, 76) = 4.74, p < .04$. Expressed differently, the future focus manipulation strongly affected the expressed predictions ($p < .02$) while leaving behavior largely unaffected ($p > .80$). These results are displayed in Fig. 1.¹

We next conducted a series of hierarchical regression analyses to examine whether the individual difference variables of optimism and procrastination were also related to the degree of optimistic bias. Note that the bias scores are difference scores (estimated-actual completion times) and so effects on the bias scores are simply weighted combinations of the effects on the estimated and actual completion times separately (e.g., Cohen & Cohen, 1983; Griffin, Murray, & Gonzalez, 1999). Thus we report the regression for the components separately as well as for their difference. The future focus manipulation was entered in a first step, followed by the two individual difference variables, and then the interaction variables were entered in a third step. There were no significant relations between dispositional optimism and the predicted completion times ($B = -.14, p < .25$), the actual completion times ($B = .00$), or the degree of prediction bias ($B = -.13, p < .25$). There was a non-significant relation between procrastination and the predicted completion times ($B = -.15, p < .2$), a significant relation between procrastination and the actual completion times ($B = -.26, p < .03$), and a non-significant relation between procrastination and the degree of prediction bias ($B = .01, p > .9$). Thus, although procrastinators actually finished significantly closer to the deadline than non-procrastinators ($M_s = 3.03$ vs. 3.72 days before Christmas, when defined by a median

¹ Preliminary analyses in both studies indicated that gender was not significantly related to any of the outcome variables, and did not qualify the effects of the future focus manipulation on predicted vs. actual completion times. This factor is not discussed further.

split), the procrastinators also predicted that they would finish with less time to spare ($M_s = 5.48$ vs. 6.21 days), yielding no significant difference in bias.²

We next examined the effect of the future focus manipulation on participants' open-ended thought-listing responses. A research assistant first identified discrete thought units, and these thoughts were coded into five mutually exclusive categories identified in our prior research: future plans (e.g., I will complete this shopping on December 19 because that is when I have a couple of hours to spare. After my exams, I will shop all day for the next three days and find everything.), future problems (e.g., My brother is lazy so it will take me a while to get him out with me. I won't know what to get my Dad), past experiences (e.g., I'm usually done shopping a few days before Christmas. I never leave shopping until the last minute), past problems (e.g., It will be completed on Christmas Eve because I have a track record of doing so. I have always left everything, including Christmas shopping, until the last minute), and the predictor's own personality (e.g., I am indecisive and will wait as long as possible to get her gift. Knowing that I'm an eternal procrastinator, I can't see myself rushing right out and finishing.) and transformed into proportions for each individual. A second research assistant coded the full set of responses to establish inter-rater reliability (percent agreement = 93%; Cohen's $\kappa = .88$)

Unfortunately, the thought-listing responses were of limited use for two reasons: First, there was an overwhelming tendency to report plans and little else (overall, fully 73% of discrete thoughts reported referred to future plans, 11% to future problems, 8% to past experiences, 6% to past problems, 3% to personality). Second, the experimental design itself limited the meaning of the thought-listing responses in the future focus condition. The defining manipulation in this condition required participants to list their future plans in detail before reporting what they thought about—it is not clear how participants construed the repeated request to report their thoughts. Should they report only non-redundant thoughts or all thoughts? Perhaps because of this aspect of the design, there were no significant differences between the future focus and control conditions in any thought category ($ps > .15$; e.g., for future plans, $M_s = .76$ vs. $.70$ and for thoughts about past experiences $M_s = .06$ vs. $.09$). Procrastination level correlated only with reports of past problems ($r(74) = .27$, $p < .02$; all other $ps > .40$) and dispositional optimism was not correlated with any thought-listing category (all $ps > .7$).

Discussion

Study 1 provided strong support for Hypothesis 1 as the manipulation of future focus significantly increased the degree of optimistic bias found in predicted completion times. Furthermore, the degree of optimistic bias was not moderated by either individual difference variable, consistent with Hypothesis 2, nor was the effect of future focus moderated by the individual difference variables.

Study 2

In Study 2 we extended the results from the domain of winter holiday shopping (which, after all, comes only once a year) to the more common domain of completing university class assignments. We also extended the basic design in two ways to test whether the observed optimistic bias was robust to measurement methodology. We varied the "temporal framing" of the prediction question, such that participants either predicted their completion times in terms of the numbers of days *until* completion or the number of days *before* the final deadline. We also included a measure of past experience that was counterbalanced with predictions in the control condition, yielding a past reminder control condition as well as a standard control condition. We anticipated that these manipulations would not moderate the optimistic bias, yielding further evidence of its robustness. As in Study 1, we included measures of dispositional optimism and procrastination. We also recruited a supplementary control group to yield a larger sample for our analyses of individual differences.

Method

Participants

The participants in the main study were 125 undergraduates (82 females and 43 males) at a Canadian university recruited for a study of student activities. They participated individually and received either course credit or a payment of \$5. A supplementary sample was collected in a different semester to provide a large sample within the control conditions for examining the effects of the continuous individual difference variables. The supplementary participants were 86 undergraduates (56 females and 30 males) at a Canadian University who were recruited for a study of student activities. They participated in individual sessions and received either course credit or a payment of \$5.

Procedure

Participants first identified a target academic assignment, reported its deadline, and rated its importance on a scale ranging from 1 (not at all important) to 9

² In both studies, the results based on median splits are reported solely for descriptive purposes. All tests of significance are based on the regression analyses using continuous variables.

(extremely important). Participants were then asked to predict when the assignment would be finished and an accompanying thought listing measure asked them to report all of their thoughts as they were generating their predictions. We varied the temporal framing of the prediction question by asking participants either to predict the date and time the assignment would be finished or to predict how far in advance of the deadline it would be finished. We also varied the focus of participants' thoughts at the time of prediction. Participants in the Reminder Control condition ($n = 43$) recalled their typical completion times immediately before generating their prediction for the target task, whereas participants in the Standard Control condition ($n = 44$) and Future Focus conditions ($n = 38$) did so only after providing their predictions. In the Future Focus condition participants were asked, immediately before generating their predictions, to consider and describe in detail their plans for completing the target assignment. As in Study 1, the thought-listing task closely followed the future focus manipulation (presented below):

We would like you to take a few minutes to consider your thoughts and plans for completing the assignment that you listed for this study. Try to form a picture in your mind of the future course of this assignment: Imagine the sequence of events that will be involved in completing it. Now, please describe your plans for completing this particular assignment, including details such as when, where, and how you will complete it. Try to provide a complete picture, from beginning to end, of how this assignment will be completed.

After completing the assignment prediction questionnaire, participants completed the personality survey containing the measures of trait optimism and procrastination. All participants were telephoned for follow-up interviews as soon as possible after the deadline for their assignment, usually within two or three days. They were asked to report the date and time that they had actually completed the assignment. Participants in the supplemental sample received the same set of contextual manipulations (Reminder vs. Control crossed by Prediction vs. Deadline framing) but did not participate in the Future Focus condition. Results including the supplementary sample are described under "Individual Difference Results" below.

Results and discussion

Each participant's predicted and actual completion times were converted into the number of days (and fraction of days) before or after the deadline. Items were summed to create composite scores for the measures of dispositional optimism (Cronbach's $\alpha = .84$) and procrastination (Cronbach's $\alpha = .85$) and median splits were also performed to classify participants as low or high in optimism (median = 20) and procrastination (median = 11). One participant failed to complete the

measure of procrastination and one failed to complete the measure of optimism, and due to a copying error 19 participants in the Control condition did not receive the measure of previous experiences, resulting in lower degrees of freedom for analyses including these factors.

An initial comparison of predicted and actual completion times again revealed a substantial optimistic bias. Participants expected to finish their assignments further before the deadline than they actually did ($M_s = 2.21$ vs. $.56$ days), $t(124) = 4.50$, $p < .001$; they also expected to finish further before the deadline than they had typically finished such assignments in the past ($M_s = 2.15$ vs. 1.28 days), $t(104) = 4.80$, $p < .001$. Thus we next performed analyses parallel to those in Study 1 to assess potential moderators of participants' overly optimistic forecasts.

Effects of future focus

We hypothesized that the degree of optimistic bias would be magnified by the future focus manipulation but not affected by either the temporal framing manipulation (whether participants reported their expected days to completion or expected days before deadline) or the reminder manipulation (whether participants in the control condition reported their typical completion times before or after they made their predictions). To test these two hypotheses, we conducted a mixed model factorial ANOVA with one within-subject variable (a measure of bias contrasting predicted versus actual completion times) and two between-subject variables: temporal framing (expected days versus days before deadline) crossed with three levels of future focus (control, past-reminder control, and future focus). The three-level future focus variable was coded by two orthogonal contrasts, one comparing the future focus condition with the two control conditions, and a second comparing the past-reminder control and the control condition. We also conducted follow-up, between-subject ANOVAs separately for the predicted and actual completion times.

As expected, significant effects were found only for the contrast highlighting the future focus manipulation (all other $p_s > .15$). As seen in Fig. 2, the optimistic bias was greater in the future focus condition ($M = 2.43$ days) than in the two control conditions combined ($M = 1.19$), $t(121) = 2.07$, $p < .05$. Analyses performed separately on the predicted and actual completion times revealed that participants expected to finish their assignment further before the deadline in the future focus condition ($M = 3.31$ days) than in the control conditions ($M = 1.71$), $t(121) = 2.34$, $p = .02$. However, participants finished equally close to the deadline in the future focus and control conditions ($M_s = .88$ and $.52$ days, $p > .8$). In summary, the future focus instructions produced more optimistic predictions without affecting actual completion times and, as a result, exacerbated the

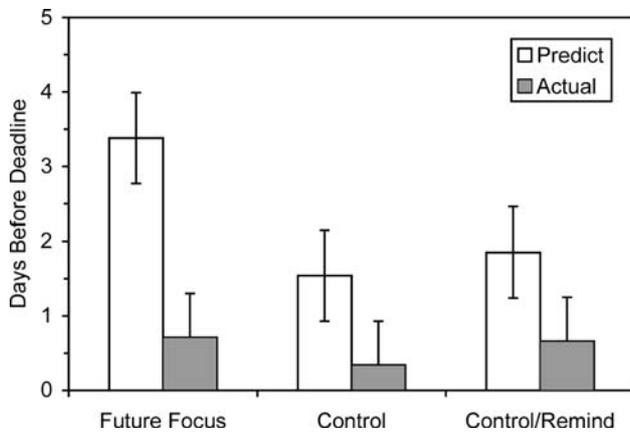


Fig. 2. Predicted and actual days before deadline as a function of the future focus manipulation (Study 2). Bars represent one standard error above and below the mean.

optimistic bias in prediction.³ We did not analyze the thought protocols as a function of the experimental manipulation, due to the interpretational ambiguity described in Study 1.

Individual difference results

The analyses relating dispositional optimism and procrastination to the outcome variables, including thought listings, were performed for the 173 participants in the two control conditions in both sub-samples. The future focus condition was not included in these analyses because the manipulation was designed to affect participants' thought focus, and thus would potentially obscure naturally occurring relationships between participants' personalities and their judgments or behaviors. In all analyses, sample was represented by a binary, dummy-coded variable to capture between-sample differences. To examine the potential moderating effects of dispositional optimism and procrastination on the difference between predicted and actual completion times, we performed regression analyses parallel to those in Study 1. As in the previous study, the analyses revealed no significant effects of dispositional optimism for the predicted completion times ($B = .02, ns$), the actual completion times ($B = .06, ns$), or the predicted-actual difference scores ($B = -.05, ns$); thus participants expected to finish and actually did

finish equally far before the deadline regardless of their characteristic levels of optimism.

The effects of procrastination obtained in Study 1 were also replicated, but this time both main effect relations were significant. There was a main effect of procrastination on the predicted completion times ($B = -.31, p < .001$) and the actual completion times, ($B = -.21, p < .01$). Participants classified as low in procrastination, on the basis of a median split, predicted they would finish further before the deadline than the procrastinators ($M_s = 2.40$ vs. 1.29 days) and did indeed finish further before the deadline than procrastinators ($M_s = .99$ days early versus $.16$ days late). Thus, as in Study 1, the degree of optimistic bias did not differ for participants low or high in procrastination ($M_s = 1.41$ vs. 1.45), $B = .01, ns$.

Thought-listing responses for the two control conditions were coded by a research assistant into six mutually exclusive categories based on those used in Study 1—a new category (thoughts about the project deadline) was added to the five original categories (future plans, future problems, past experiences, past problems, and predictor's personality). A second research assistant coded the responses from a subset of 86 participants to establish inter-rater reliability (percent agreement = 86%; Cohen's $\kappa = .81$).

Again, thoughts were dominated by future plans (58%) with some attention paid to future problems (7%), past experiences (17%), past problems (8%), predictor's personality (3%), and the task deadline (7%). A regression analysis performed on the thought listing responses revealed that higher scores on the procrastination scale were associated with fewer thoughts about the future ($B = -.20, p < .01$) and more thoughts about past problems ($B = .32, p < .001$), but were unrelated to thoughts about future problems ($p > .50$), general past experiences ($p > .90$), personality ($p > .2$), or deadlines ($p > .7$). There were no significant associations between dispositional optimism and the thought categories.

In summary, the two main hypotheses were supported. First, the study provided further evidence of the robustness of the optimistic prediction bias to relevant individual differences and contextual variations. Second, and more importantly, the study provided confirmatory experimental evidence of the causal impact of a future focus on the optimistic bias in prediction. Developing concrete plans describing when, where, and how they would complete the target assignment resulted in more optimistic predicted completion times without a corresponding impact on the actual completion times, and thus increased the degree of optimistic bias.

General discussion

Results across two separate "real-world" prediction tasks were consistent with our hypotheses. People

³ In both studies, the distribution of the predicted and actual days before deadline showed a mild positive skew because of the floor effect caused by the deadline. As a result, we analyzed the time data using original units and using square-root transformed data; results were substantially the same and so we present the original units for clarity of exposition. In addition, a visual examination of the distributions of bias scores indicated that the effects described here do not result from a few extreme scores. It is also worth noting that, parallel to the comparisons of means that we report, the proportion of participants who finished by the predicted time was lower in the future focus condition than in the control conditions in both Study 1 (21 vs. 36%) and Study 2 (25 vs. 43%).

predicted they would finish an upcoming task both earlier than they had typically finished such tasks in the past, and earlier than they actually did finish the task. Both studies confirmed that the planning fallacy is a robust phenomenon, not limited to certain types of people, or certain methods of elicitation. The optimistic prediction bias generalized across two very different task domains, and was not moderated by variations in the framing of the prediction question (designed to vary the salience of deadlines) or by variations in the order of questions (designed to vary the salience of past experiences).

The contextual manipulations introduced in Study 2 are important, because in many previous demonstrations of the planning fallacy, completion-time predictions were elicited using a common methodology in which judges were asked first to give their prediction about a future project, and only later asked to specify deadlines and to report on relevant past experiences (Buehler, Griffin, & Ross, 2002). Faced with a request to give a prediction about the future, respondents may have (a) actively inferred that only their plans for the future were relevant to the judgment and/or (b) implicitly focused on their plans about the future as the most salient source of data for their prediction, and thus underweighted the role of past experiences and project deadlines. The present findings alleviate these concerns because the predictors' past experiences and the project deadlines were clearly made relevant to the judgment task and salient to the planners' perceptual field, and yet an equally strong optimistic bias was found. Thus we can be more confident in the generality and robustness of the optimistic prediction bias.

The present studies also indicated that the planning fallacy was not moderated by individual differences in dispositional optimism or procrastination. The optimism findings provide another example in which domain-specific or behavioral optimism is not determined by individuals' more generalized outcome expectancies. This finding is also generally consistent with our view that people's optimistic time estimates reflect general cognitive processes involved in planning for tasks rather than self-related motivational factors such as the desire to maintain a positive view of oneself and the future.

Intriguingly, although procrastinators in both domains finished later than their non-procrastinating counterparts, they anticipated this outcome. Thought listing measures indicated that procrastinators were somewhat more inclined than their counterparts to incorporate relevant past experiences into their predictions. This pattern of effects is consistent with the findings of a recent study examining the study plans of procrastinators (Pychyl et al., 2000), and extends the previous findings to the phenomenon of overly optimistic task predictions. The planning fallacy cannot be attributed simply to a subset of individuals who tend to delay working at their tasks.

The results of the future focus manipulation constitute the major contribution of the present studies. These findings provide the first direct, experimental support for cognitive accounts of the planning fallacy proposed previously (Buehler et al., 1994; Kahneman & Tversky, 1979). We have hypothesized that people generate overly optimistic predictions, in part, because they overweight their specific plans for a given future project and underweight more general distributional information. Because planning processes are more directly tied to stated predictions than to actual behavior (which occurs much later and is prone to unforeseeable complications) they will often exert a greater impact on predicted than actual completion times, and thus produce an optimistic prediction bias. Previous research (Buehler et al., 1994, 1997) provided correlational evidence that a future focus at the time of prediction is linked to the optimistic bias in prediction. By providing experimental evidence, we can be more confident about the causal role of these cognitive processes in producing overly optimistic forecasts. These findings also provide the first evidence we know of that inducing people to focus on specific future plans—a focus that often facilitates goal attainment—may have costs in terms of judgmental accuracy. We are currently seeking more direct evidence for our “overweighting” hypothesis by examining the effects of varying the evidence available to an observer predictor.

In addition to their theoretical contribution, the present findings also have clear practical implications. As noted previously, planners in organizational contexts are often expected to justify their forecasts with a concrete, step-by-step plan for implementation. The present findings suggest that requiring a detailed plan-based justification may actually accentuate the tendency to make overly optimistic forecasts and projections. Individuals and organizations seeking more realistic forecasts may be advised to adopt an alternative approach to prediction that gives less weight to plans and more weight to other potentially useful sources of information, such as distributions of completion times for related projects or the views of neutral, outside observers.

Is planning bad? Although we have demonstrated that plans can sometimes exert a greater impact on predicted than actual completion times, this does not mean, of course, that planning processes are usually unrelated to behavior—in the limit, the complete absence of plans would make project completion impossible. Plans are useful, even necessary, in guiding behavior but under some circumstances, at least, they seem to be overweighted relative to other sources of information that could be used to generate more realistic task completion predictions.

The problem of identifying conditions under which optimistic expectations to complete a project determine completion times is reminiscent of the classic social psychological problem of identifying when attitudes and

associated behavioral intentions guide behavior (Ajzen, 1991; Eagly & Chaiken, 1993; Fishbein & Ajzen, 1975). Two points of contact between research on attitudes and our analysis of the planning fallacy are especially noteworthy. First, an active but still controversial question in attitude research is when and how past behavior predicts future behavior independent of attitudes and intentions (Ouellette & Wood, 1998; Sheeran, Orbell, & Trafimow, 1999). Second, both the actual and perceived controllability of the task have been identified as determinants of intention-behavior consistency (Ajzen, 1991; Ajzen & Madden, 1986; Schifter & Ajzen, 1985). Thus, for some kinds of personal projects, lessons from attitude research may help to distinguish those situations in which optimistic biases are “self-correcting”—that is, when strong intentions to finish early actually lead to early completions—from situations in which past experiences are the best predictors of completion times. However, for large-scale organizational projects, such as the mega-projects we began with, a forecaster cannot control the outcome, unless she can fully dictate the resources available to the project. Similarly, many personal projects are subject to factors that are beyond the control of a person’s best intentions and efforts. For such projects, bias reduction techniques (“de-biasing”) must target the optimistic predictions themselves. These techniques have the potential to yield substantial benefits to individuals and organizations whose fate relies on the accuracy of their predictions.

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