Incremental Beliefs About Ability Ameliorate Self-Doubt Effects

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Abstract
Past research has typically shown negative effects of self-doubt on performance and psychological well-being. We suggest that these self-doubt effects largely may be due to an underlying assumption that ability is innate and fixed. The present research investigated the main hypothesis that incremental beliefs about ability might ameliorate negative effects of self-doubt. We examined our hypotheses using two lab tasks: verbal reasoning and anagram tasks. Participants’ self-doubt was measured and beliefs about ability were measured after participants read articles advocating either for incremental or entity theories of ability. American College Testing (ACT) scores were obtained to index actual ability level. Consistent with our hypothesis, for participants who believed ability was relatively fixed, higher self-doubt was associated with increased negative affect and lower task performance and engagement. In contrast, for participants who believed that ability was malleable, negative self-doubt effects were ameliorated; self-doubt was even associated with better task performance. These effects were further moderated by participants’ academic ability. These findings suggest that mind-sets about ability moderate self-doubt effects. Self-doubt may have negative effects only when it is interpreted as signaling that ability is immutably low.

Keywords
metacognition, self-doubt, belief about ability, performance, psychological well-being

Self-doubt is a metacognition about ability. Specifically, it can be considered the metacognitive representation of uncertainty about one’s abilities. Self-doubt has been shown to have many negative impacts, for example, the negative correlation between self-doubt and self-esteem (e.g., Hermann, Leonardelli, & Arkin, 2002; Wichman & Hermann, 2010) and the link between self-doubt and maladaptive coping strategies such as self-handicapping and subjective over-achievement (e.g., Jones & Berglas, 1978; Oleson, Poehlmann, Yost, Lynch, & Arkin, 2000). We investigated whether people respond to self-doubt differently, depending on yet another metacognition about ability, namely, their metacognition about the malleability of ability. We hypothesized that the belief that ability was malleable, commonly known as implicit incremental beliefs of ability (e.g., Dweck, 1999; Dweck & Leggett, 1988), might ameliorate the negative effects of self-doubt.

Self-Doubt
Most people experience self-doubt at times, but some individuals may experience chronic doubt about their competence and routinely feel distress about upcoming performance. If perception of self-worth is contingent upon competence or ability, self-doubt can become damaging to self-esteem (Wichman & Hermann, 2010). Indeed, self-doubt is negatively correlated with self-esteem, with correlations ranging from −.44 to −.68 (Oleson et al., 2000). Self-doubt is not the same as low self-efficacy. Self-efficacy is a strong personal belief that one can successfully perform in a specific domain (Bandura, 1997). Self-efficacy scales assess how certain people are that they can do a particular task (cannot do at all to highly certain (one) can do; Bandura, 1997). Self-doubt, however, reflects one’s feeling of uncertainty about competence that may reach beyond a specific sense of performance efficacy. The self-doubt scale (Oleson et al., 2000) includes such representative items as “More often than not I feel unsure of my abilities” and “Sometimes I feel that I don’t know why I have succeeded at something.” Thus, people can have high self-efficacy (e.g., I believe I can perform the task) and yet still harbor self-doubt (e.g., but I am not sure my ability is high in this area. My high performance may just be due to high effort).

Research suggests that individuals use different types of coping strategies to deal with chronic self-doubt. Self-handicapping and subjective overachievement (Braslow, Guerrettaz, Arkin, & Oleson, 2012; Jones & Berglas, 1978; Oleson et al., 2000) are two of the most notable

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Beliefs About Ability

Something related to self-doubt that surprisingly has not been heavily researched is incremental beliefs about ability—beliefs as to the extent to which ability is viewed as malleable (Dweck, 1999; Dweck & Leggett, 1988). The self-doubt literature implies that the negative consequences of self-doubt arise when people believe that ability is relatively fixed and stable. For instance, self-handicapping occurs when people believe it is better to withdraw effort and fail to avoid admitting low competence. Overachievement as a negative consequence of self-doubt similarly implies beliefs in ability as a fixed construct. Those who overachieve remain high in self-doubt in spite of their extreme effort investments; logically, if they had incremental beliefs, high effort should eventually translate into reduced self-doubt. What if high self-doubters believed that ability was malleable? Instead of self-handicapping or overachieving, self-doubters who hold incremental beliefs about ability might show both positive performance and psychological well-being outcomes.

Implicit beliefs about ability have been studied in a variety of domains. According to Dweck (e.g., Dweck, 1999; Dweck & Leggett, 1988; Hong, Chiu, Dweck, Lin, & Wan, 1999; Molden & Dweck, 2006), some individuals hold the belief that ability is largely malleable and develops incrementally through effort (incremental belief); whereas others believe that ability is a fixed and stable entity (entity belief). Individuals with incremental beliefs tend to be more willing to take on challenging tasks and persist on them (Dweck, 1999, 2006). In contrast, entity beliefs motivate people defensively to maintain a positive self-view of ability. Students with entity beliefs tend to avoid challenges and to seek tasks that will prove that they are smart (Dweck, 1999, 2006). Moreover, people with incremental beliefs put forth more effort on a task after receiving negative feedback, whereas those with entity beliefs tend to disengage from a task after receiving negative feedback (e.g., Dweck & Leggett, 1988; Hong et al., 1999). A recent review also demonstrates that students with incremental beliefs about ability show higher academic achievement across challenging school transitions and greater completion rates in challenging courses (see Yeager & Dweck, 2012). It is important to note that these beliefs about ability vary on a continuum and change dynamically based on environmental influences (e.g., Kurtz-Costes, McCall, Kinlaw, Wiesen, & Joyner, 2005).

The existing research on self-doubt and beliefs about ability is sparse. Reich and Arkin (2006) found that participants who believed that their evaluators held an entity belief about ability reported greater self-doubt about their upcoming test performance when they expected to do poorly but less self-doubt when they expected to do well, compared with their counterparts who expected incremental evaluators. However, these findings were about what self-doubters thought others believed, not about the self-doubters’ own implicit beliefs. More relevant to the current research, Wichman and Hermann (2010) were able to show a mediating effect of entity beliefs about ability in the relationship between self-doubt and self-handicapping (in a sample of more than 1,000 people). There is also evidence that compared with low self-handicappers, high self-handicappers are more likely to have entity beliefs of ability (Ommundsen, 2001; Rhodewalt, 1994).

Present Research

Any variable can serve multiple roles (e.g., Tormala, Brinol, & Petty, 2007). Although the prior work investigated beliefs about ability as a mediator between self-doubt and maladaptive coping, the focus of the present study was to examine the interaction between beliefs about ability and self-doubt, that is, beliefs about ability as a moderator of the relationship between self-doubt and related outcomes. We hypothesized that incremental beliefs about ability should diminish the negative effects of self-doubt. Specifically, we expected that when people believe that ability was fixed, high self-doubt should yield lower levels of well-being, lower task engagement, and lower performance, compared with low self-doubt. However, when people believe that ability was malleable, the difference between high and low self-doubt individuals should be reduced.

To examine this idea, after collecting self-doubt scores, we exposed the participants to a manipulation of their beliefs about ability and then measured their ability beliefs, followed by our dependent measures. Measured ability beliefs were used to predict the main dependent variables. These included measures of task performance, task engagement, and psychological well-being. American College Testing (ACT) scores (the ACT is a standardized college admission test in the United States) were obtained to represent actual ability level. Research on implicit theories shows that often, the effects of these theories are most pronounced under difficult conditions, such as following a poor performance (Pollack, Burnette, & Hoyt, 2012), ego-depleting task (Job,
Dweck, & Walton, 2010), or, most relevant here, under conditions where people perceive that they have low competence (Ommundsen, 2001). We expected that low-ACT individuals might have greater difficulty with our experimental tasks, and thus show most clearly the effects of implicit theories moderating self-doubt effects.

**Method**

**Participants and Design**

One hundred university students (64 female) enrolled in introductory psychology classes participated in the study for partial fulfillment of their class requirement. Participants’ ages ranged from 18 to 47 years ($M = 19.6$ years). Participants were native English speakers and received partial course credit for their participation. They were randomly assigned to either incremental or entity beliefs conditions.

**Procedure**

All sessions were conducted on computers using MediaLab 2012 software. After receiving instructions, participants completed the self-doubt scale (Oleson et al., 2000), an eight-item measure ($\alpha = .82$). Some example items are “More often than not I feel unsure of my abilities” and “As I begin an important task, I usually feel confident in my abilities (reverse scored).” Participants rated their level of agreement with each statement from 1 (disagree very much) to 6 (agree very much).

Next, they started a “reading comprehension” task, which was actually the manipulation of incremental or entity interpretations of ability, as used by Miele and Molden (2010). The article was titled “The Origins of Intelligence: Is the Nature-Nurture Controversy Resolved?” The article was fictitious and appeared as a publication in the November 2007 issue of Psychology Today. The incremental and entity versions describe scientific “evidence” that supported the idea that intelligence/ability is environmentally determined and remains stable over time. After the article, participants responded to three open-ended items (Miele & Molden, 2010) to increase the impact of the article. Specifically, they (a) briefly summarized the main point, (b) described the evidence that they found most convincing, and (c) described an example from their own experience that fit with the main point of the article. Participants then completed an eight-item Personalized Measure of Theories of Intelligence (De Castella & Bryne, 2015), which was developed based on the Ideas About Intelligence Questionnaire by Dweck (1999). Instead of general implicit theories about abilities, this personalized measure ($\alpha = .80$) assesses students’ personal theories about their own abilities. Personal beliefs tend to be powerful predictors of motivation and performance (Bandura, 1997). Two example items are: “I believe I can always substantially improve on my intelligence” and “I don’t think I personally can do much to increase my intelligence” (reverse scored). Participants reported their level of agreement with each statement on a 1 (disagree very much) to 6 (agree very much) scale.

Participants then completed three measures of psychological well-being. The first measure was the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS ($\alpha = .84$) consists of a number of words that describe different feelings and emotions such as “distressed” and “proud.” Participants were asked to read each item and indicate to what extent from 1 (not at all) to 5 (extremely) they felt this way right now. The second measure was the Performance Self-Esteem subscale of the State Self-Esteem Questionnaire (also called the Current Thought Scale; Heatherton & Polivy, 1991). This 7-item questionnaire ($\alpha = .89$) consists of statements such as “I feel as smart as others” and “I feel frustrated about my performance.” Participants indicated their level of agreement with each statement from 1 (not at all) to 5 (extremely). The third measure was a 20-item task anxiety questionnaire adapted from the Test Anxiety Inventory (TAI; Spielberger et al., 1980). Before participants responded to this questionnaire, they were given sample items from the reasoning tasks that would be used to measure their objective performance (see Appendix A) and told that they would be completing similar problems. An example item on the questionnaire ($\alpha = .91$) is “I feel very panicky about the upcoming tasks.” Participants rated to what extent they agreed with each statement out of a 4-point scale from 1 (not at all) to 4 (very much so).

Participants then started on the randomly ordered reasoning tasks (see Appendix A). After these tasks, participants completed measures of Task Involvement, Effort, and Enjoyment (Elliot & Harackiewicz, 1996); slightly modified to refer to the reasoning tasks used in this study. The Task Involvement index ($\alpha = .74$) consisted of six items such as “While solving the reasoning problems, I was totally absorbed in the problems.” The Task Effort index ($\alpha = .95$) included two items such as “I put a lot of effort into solving the reasoning problems.” Lastly, the Task Enjoyment index ($\alpha = .80$) had three items, including “I enjoyed solving the reasoning problems.” Ratings were made on 7-point scales ranging from 1 (strongly disagree) to 7 (strongly agree).

Lastly, participants completed a demographics questionnaire that included gender, age, major, ethnicity, and ACT scores. Participants were debriefed before leaving.

**Results**

**Article Version Effects**

We first investigated the impact of the “intelligence” article (incremental vs. entity) on participants’ ability beliefs. We reverse coded all entity items on the eight-item intelligence questionnaire and then averaged across items so that higher
scores indicated stronger incremental beliefs. Exposure to the incremental (vs. entity) article caused higher incremental scores, \( t(98) = 4.74, p < .001; M_{\text{Incremental}} = 38.7, SD = 5.06; M_{\text{Entity}} = 33.2, SD = 7.02. \) This finding is consistent with that of previous research in which the same articles were used to prime participants’ ability beliefs (e.g., Miele & Molden, 2010; Zhao, Zhang, & Vance, 2013). Compared with Zhao et al. (2013), the present study showed a smaller magnitude of the manipulation effect. In Zhao et al. (2013), the article version produced a greater difference between the incremental and entity groups: \( M_{\text{Incremental}} = 39.3 \) versus \( M_{\text{Entity}} = 22.6. \) In particular, the entity group in Zhao et al. (2013) reported lower incremental scores than the entity group in the current study.

### Analytic Strategy and Data Preparation

We next examined the data for outliers and missing entries. One case was identified as multivariate outlier, and thus excluded from analysis. The identified case had an outlying Cook’s \( d \) value associated with verbal reasoning performance (larger than 1.20; next largest Cook’s \( d \) value was 0.18). This case also had a Mahalanobis \( D^2 \) (Mahalanobis, 1936; Schinka, Velicer, & Weiner, 2003) with a probability less than .001 (\( D^2 = 40.05, p = .00001 \)). Another seven participants did not report ACT scores, resulting in a final sample of 92 for analysis.

To test our hypothesis that incremental beliefs of ability might reduce the threat of self-doubt and yield positive outcomes, we performed multiple regressions predicting each of the following: performance on each of the two tasks, measures of task engagement, and well-being measures. We predicted these outcomes using dummy-coded article version (incremental vs. entity), standardized self-doubt scores, standardized ACT scores, and all interactions. Regression results showed that article version did not interact with self-doubt or ACT scores to predict any of the dependent variables, \( p > .05. \) Although article version affected beliefs about intelligence, it was not directly related to our hypothesized effects on the DVs. One possible explanation for this finding is that the belief manipulation in the present study did not impact participants’ beliefs as strongly as it could have. As indicated earlier, our manipulation produced a smaller magnitude of effect, compared with Zhao et al. (2013) where the same articles were used to manipulate beliefs.

We subsequently collapsed across the article version factor and replaced it with the standardized continuous measure of (post-article) incremental belief scores. This change altered our approach from an experimental to correlational one. We present our results organized into three sections below: “Task Performance,” “Measures of Task Engagement,” and “Measures of Well-Being.” We predicted these outcomes using standardized incremental beliefs, standardized self-doubt scores, standardized ACT scores, and all interactions. The ACT variable was included in our regression model to increase power by controlling for what would otherwise be error variance, and to allow us to investigate whether our theoretically expected effects would be particularly strong among low-ACT individuals for whom actual ability did not already suggest high levels of performance and engagement. Table 1 presents the descriptive statistics of our predictor and outcome variables, as well as correlations between them.

### Task Performance

Participants’ performance on the two experimental tasks was first analyzed. Results for both tasks’ regression models with standardized self-doubt, implicit theories, and ACT, including all interactions, showed \( F \) statistics significant at \( p < .001 \) levels. For verbal reasoning and anagram performance, adjusted \( R^2 \)’s were .34 and .32, respectively.

On verbal reasoning performance (\( M = 11.78 \) of 15 = 78.5% correct, \( SD = 2.32 \)), there was a three-way interaction among self-doubt, incremental belief, and ACT scores, \( B = -1.07 \) (\( SE = .32 \)), \( p = .001 \). The three-way interaction qualifies the lower order effects, including a two-way interaction between self-doubt and incremental belief, \( p = .006 \), and a two-way interaction between ACT scores and incremental belief, \( p = .03 \). Simple slopes tests (Aiken & West, 1991) were used to analyze the three-way interaction (Figure 1). The results showed that for those with relatively higher ACT scores (+1 \( SD \)), the self-doubt \( \times \) incremental belief interaction was not significant, \( B = -0.35 \) (\( SE = .35 \)), \( p = .32 \). However, for individuals with relatively low ACT scores (-1 \( SD \)), their performance was affected by a significant two-way interaction between self-doubt and incremental belief, \( B = 1.78 \) (\( SE = .46 \)), \( p < .001 \). The two-way interaction was such that for participants relatively low in incremental beliefs (-1 \( SD \)), higher self-doubt was associated with lower performance, \( B = -2.36 \) (\( SE = .69 \)), \( p = .001 \), as expected. However, for individuals higher in incremental beliefs (+1 \( SD \)), the self-doubt effect was reversed. Self-doubt was positively associated with performance, \( B = 1.20 \) (\( SE = .44 \)), \( p = .007 \). This finding supports the hypothesis that incremental beliefs can change the nature of self-doubt effects, particularly for those with lower ACT scores, who may feel less competent (cf. Ommundsen, 2001).

On anagram performance (\( M = 8.65 \) of 15 = 57.7% correct, \( SD = 4.16 \)), there was a two-way interaction between self-doubt and incremental belief (Figure 2), \( B = 1.16 \) (\( SE = .46 \)), \( p = .01 \), in addition to an effect of ACT scores, \( p < .001 \). No other effects were significant, \( p > .10. \) Simple slope tests of the interaction showed a significant positive relationship between self-doubt and performance for individuals with relatively high incremental beliefs (+1 \( SD \)), \( B = 1.35 \) (\( SE = .49 \)), \( p = .007 \). In contrast, for those with relatively low incremental beliefs (-1 \( SD \)), self-doubt was negatively related to performance \( (B = -0.98, SE = .71, p = .17) \), although the association did not reach significance. This pattern echoes the findings for verbal reasoning, although without ACT moderation.
To summarize, incremental beliefs about ability ameliorated the negative impact of self-doubt on task performance. On the verbal reasoning task, this was particularly true for individuals with low (ACT-assessed) actual ability. Consistent across tasks (verbal reasoning and anagram), for people with strong incremental beliefs, a sense of self-doubt was positively associated with performance. In contrast, for people with strong entity beliefs, the overall pattern was that self-doubt impaired performance, with the proviso that ACT scores moderated this effect on the verbal reasoning task.

Measures of Task Engagement

We next analyzed measures of task involvement, effort, and enjoyment with the same standardized predictor variables and interaction terms. Regression results showed that model $F$ statistics were significant for task involvement ($p < .001$; adjusted $R^2 = .20$) and task enjoyment ($p = .01$; adjusted $R^2 = .12$), but not for task effort, $p > .10$.

On task involvement, there was a marginal three-way interaction among self-doubt, incremental belief, and ACT scores, $B = -1.4$ ($SE = .74$), $p = .06$, in addition to a marginal two-way interaction between self-doubt and incremental belief, $p = .06$, a two-way interaction between ACT scores and self-doubt, $p = .02$, and effects of self-doubt, $p < .001$, and ACT scores, $p = .03$. The three-way interaction (Figure 3) was again analyzed with simple slopes
SAGE Open
tests. The results mirrored the performance results on the verbal reasoning task. The self-doubt × incremental belief interaction was not significant for individuals with relatively high ACT scores (+1 SD), $B = -0.31$ ($SE = .80$), $p = .71$. However, individuals with relatively low ACT scores ($-1$ SD) showed a significant two-way interaction between self-doubt and incremental belief, $B = 2.49$ ($SE = 1.07$), $p = .02$. Specifically, for low-ACT individuals relatively high in incremental beliefs (+1 SD), self-doubt was not significantly associated with task involvement, $B = -0.89$ ($SE = 1.00$), $p = .38$. However, for low-ACT individuals who also were relatively low in incremental beliefs ($-1$ SD), higher self-doubt was associated with lower task involvement, $B = -5.88$ ($SE = 1.60$), $p < .001$. These results further support the idea that the negative effects of self-doubt can be ameliorated by incremental beliefs.

On task enjoyment, there was also a marginal three-way interaction among self-doubt, incremental belief, and ACT scores, $B = -0.96$ ($SE = .50$), $p = .06$, in addition to effects of incremental beliefs, $p = .03$ and ACT scores, $p = .02$. Considering the three-way interaction on task enjoyment (Figure 4), the results were again consistent with our hypothesis. For individuals with relatively low ACT scores ($-1$ SD), self-doubt × incremental belief interaction was significant, $B = -1.12$ ($SE = .54$), $p = .04$. Further analysis showed that for low-ACT individuals relatively high in incremental beliefs (+1 SD), self-doubt was not significantly associated with task enjoyment, $B = 0.29$ ($SE = .68$), $p = .67$. For low-ACT individuals also relatively low in incremental beliefs ($-1$ SD), though, higher self-doubt was associated with lower task enjoyment, $B = -2.53$ ($SE = 1.09$), $p = .02$. Consistent with previous research showing that implicit theories are most important under conditions of low ability or perceived adversity, the self-doubt × incremental belief interaction was not significant, $B = 0.05$ ($SE = .51$), $p = .93$, for those with higher ACT scores.

These results are consistent with the findings for our task performance measures. Incremental beliefs about ability ameliorated the negative impact of self-doubt on task involvement and enjoyment, particularly for individuals with low actual ability. For low-ability individuals with strong incremental beliefs, self-doubt was unrelated to task involvement or enjoyment. However, for low-ability individuals with entity beliefs, self-doubt predicted less task involvement and enjoyment.

**Measures of Well-Being**

We also analyzed measures of affect, performance self-esteem, and task anxiety. Results showed that the $F$ statistic was significant for each of the models, $ps ≤ .04$. The
adjusted $R^2$s were .08, .26, .55, and .46 for positive and negative affect, performance self-esteem, and task anxiety, respectively.

On positive affect, there was an effect of self-doubt, $B = -1.75$ ($SE = .81$), $p = .03$. Higher self-doubt was associated with lower positive affect. No other effects were significant, $ps > .05$. On negative affect, there was also an effect of self-doubt, $B = 3.10$ ($SE = .59$), $p < .001$, and, consistent with our findings for other measures, this effect was qualified by a two-way interaction between self-doubt and incremental beliefs, $B = -1.766$ ($SE = .67$), $p = .01$. This interaction was plotted (Figure 5) and investigated with simple slopes tests. The results showed that higher self-doubt was associated with greater negative affect for participants with low incremental scores ($−1 SD$), $B = 4.86$ ($SE = 1.04$), $p < .001$; this negative effect of self-doubt was only marginally significant for those with high incremental scores ($+1 SD$), $B = 1.33$ ($SE = .72$), $p = .07$. Self-doubt did not interact with incremental beliefs to predict either performance self-esteem or task anxiety. However, ACT scores (actual ability) moderated self-doubt effects on these variables (see Appendix B for these results).

**Discussion**

Previous research shows negative relationships between self-doubt and a variety of outcome measures. We hypothesized that incremental beliefs could change these relationships. Although the article version (incremental or entity) did not interact with self-doubt or ACT score on our outcome variables, we were able to collapse across this factor and test our hypothesis with the post-article incremental belief scores. Keeping this in mind, our data are consistent with our main hypotheses. For all performance and task engagement measures (except the effort measure), incremental beliefs moderated self-doubt effects. Interestingly, these theoretically expected effects were further moderated by ACT for verbal reasoning performance, task involvement, and enjoyment. Incremental beliefs ameliorated self-doubt effects on these outcome measures, particularly for low-ACT individuals.

Beliefs about ability affect responses in performance situations (see Dweck, 2012, for a review). Here, we show that these beliefs also can moderate the effects of self-doubt. These findings suggest that those who are particularly vulnerable to the threat of self-doubt are individuals who have low academic ability and believe that ability cannot be changed. Presumably, having a sense of self-doubt is less damaging if individuals believe that ability can be improved through effort. This moderation effect indicates that self-doubt matters most on an academic performance task when it is perceived to index stable, low ability (cf. Seligman, Abramson, Semmel, & von Baeyer, 1979). Although this is a novel way to think about self-doubt, it is consistent with the consequences of an explanatory style that attributes negative outcomes to stable, internal, and global causes (Peterson, Seligman, & Vaillant, 1988). Self-doubt matters most when it is seen as stable. Self-doubt is by definition about an internal factor, ability. Only globality remains unspecified for high self-doubt, entity theory holders.

One plausible mechanism for our moderation effects is that incremental beliefs may have made self-doubters more motivated (or even "fired up") to do well on the tasks and hence eliminated the performance difference between high and low self-doubt groups. With entity beliefs, high self-doubt likely yields lower motivation relative to low self-doubt. Consistent with this idea, we found that incremental beliefs moderated self-doubt effects for performance measures and the task engagement measures of involvement and enjoyment. We found no incremental belief effects on the effort measure, consistent with past evidence that self-doubters with entity beliefs can adopt either self-handicapping (effort withdrawing) or subjective overachievement (effort enhancing) coping strategies. These strategies may have combined to eliminate consistent self-doubt effects on the effort measure. Another possible mechanism for consideration is that instead of focusing on how incremental theories boost motivation among high self-doubt individuals, one could consider how in the presence of perceived low competence, or after failure feedback, incremental theories have been shown to be more influential (Job et al., 2010; Pollack et al., 2012). That is, rather than incremental theories moderating self-doubt effects, perhaps it is self-doubt that moderates incremental theories effects. Although experimental research would be required to adequately test this idea, it would be consistent with previous research showing that incremental theories matter under conditions of relative adversity. This said, the evidence here suggests that incremental beliefs made self-doubters more deeply involved in the tasks and enjoyed the tasks more, which in turn, improved their actual performance.

Further considering the specific results we found, in the case of verbal reasoning, task involvement, and task enjoyment, the effects of self-doubt and incremental beliefs were moderated by participant ability (ACT score). This effect suggests that self-doubt matters when it is considered diagnostic for performance (i.e., in the absence of a strong basis...
for expecting success due to high ability), and that only under conditions where self-doubt matters do incremental beliefs moderate its effect. To be more specific, self-doubt reflects doubts about ability. ACT is an objective measure of academic competence and can be understood as a proxy for performance efficacy. To the degree that competence is high, self-doubt might be expected to be less influential for performance, by such mechanisms as higher competence being associated with more ability-relevant knowledge and greater personal experience with the ability-related domain. In other words, subjective doubt effects on performance may simply be out-weighed by superior competence.

The absence of ACT moderation for anagram performance probably reflects the fact that the ACT does not assess the kind of combinatory processes required to solve anagrams. It may also be the case that participants found the anagram task to be much more difficult than the verbal reasoning task, so that their efficacy to successfully complete each task was poor regardless of ACT-assessed ability level. This is consistent with the fact that mean performance on the anagram tasks (57.7%) was lower than performance on the verbal reasoning task (78.5%). Under conditions where ACT-assessed abilities were not clearly relevant to performance, self-doubt was likely considered more diagnostic, opening the door for the moderation of self-doubt by incremental beliefs.

Considering the measures of well-being, incremental beliefs moderated the impact of self-doubt on general negative affect, but not on performance self-esteem or task anxiety. For these variables, ACT scores (not beliefs about ability) moderated self-doubt effects, such that self-doubt predicted lower self-esteem and higher anxiety when ACT were lower (see Appendix B). This suggests that in terms of negative emotion relating to specific task performance, performance efficacy may be more effective than incremental beliefs at pre-emptively buffering people prior to performance execution. We need to further investigate these ideas, but the fact remains that on nearly all our performance and task engagement measures, we found support for the hypothesis that implicit beliefs moderate self-doubt effects.

The present study is not without its weaknesses. For instance, our sample is relatively small, and these data ultimately are correlational. Although measurement of both self-doubt and incremental beliefs came before exposure to the dependent measures, there could be a third variable associated with one or more of our individual difference predictors that might be truly causal. Although the nature of our interaction effects makes it difficult to identify a possible third variable that could account for these results, it remains a possibility. We caution readers that although our correlational study resulted in the outcomes we expected from experimental manipulation of implicit theories, that the conclusions we draw do not have the same certainty as those that would be derived from experimental evidence. Furthermore, we have presented a single study, which would benefit from replication and extension.

Going forward, it will be useful to achieve greater clarity on the factors that caused our effects. Future research will hopefully demonstrate that these findings are robust when subjected to experimental testing. Also going forward, these results have significant implications for some cross-cultural research. Research suggests that students from Confucian Asian countries (e.g., Hong Kong-China, South Korea, Japan, and Singapore) have high academic achievement, but also higher levels of self-doubt, compared with students from European countries (e.g., Lee, 2009; Wilkins, 2004). There may be cultural differences in people’s beliefs about ability and interpretations of self-doubt. For example, ability is commonly believed to be innate and relatively stable in Western society (Weiner, 1986), and it is considered more important to succeed because of high ability than because of high effort (Covington & Omelich, 1979; Jones, 1990). However, in Confucian culture, ability is believed to be malleable through hard work (Hau & Salili, 1991, 1996) and people may harness self-doubt as motivation to work harder (Hau & Ho, 2010). If the causal role of incremental theories of intelligence moderating self-doubt effects can be experimentally established, it may eventually be extended to provide an explanation for some cultural differences.

We have known for some time that metacognitions can influence each other (e.g., Wichman et al., 2010). However, this example of self-doubt and implicit beliefs, as uncertainty and malleability metacognitions targeting ability, is the first application of this idea to better understand academic achievement. Our findings suggest that the most vulnerable group to the threat of self-doubt is the one with low academic achievement and entity beliefs about ability. Shifting mindsets to believe in the malleability of ability ameliorates self-doubt effects, not only in terms of enhancing task performance and engagement, but also in improving general affect/well-being. We look forward to seeing additional tests of this idea, and to developing it to achieve better performance and well-being outcomes.

Appendix A

Examples of the Reasoning Tasks

1. One of the tasks involves solving a set of 15 verbal reasoning problems. Each verbal reasoning problem involves analogies and you must choose the one alternative that best completes the statement or answers the question.

Here is an example:
Elated is to despondent as enlightened is to ______B____
A. aware B. ignorant C. miserable D. tolerant

2. Another task involves solving a set of 15 everyday vocabulary anagrams. An anagram is a word made by using letters of another word in a different order. You must enter the anagram at the end of each word.
Here is an example:

Tale: (Late)

Note. Please contact either of the authors if you would like a copy of these tasks.

Appendix B

Additional Results on Performance Self-Esteem and Task Anxiety

On performance self-esteem, the regression coefficients revealed a two-way interaction between self-doubt and ACT scores, $B = 0.88$ ($SE = .44$), $p = .05$, in addition to effects of self-doubt ($p < .001$) and ACT scores ($p < .001$). No other effects were significant, $ps > .05$. The same pattern of results was observed for task anxiety: Effects of self-doubt ($p < .001$) and ACT scores ($p = .02$) were qualified by a two-way interaction between self-doubt and ACT scores, $B = −2.55$ ($SE = .99$), $p = .01$. The nature of these interactions was such that self-doubt significantly predicted lower self-esteem and higher anxiety, particularly for people with relatively lower ACT scores. For participants with low ACT scores ($−1 SD$), higher self-doubt was associated with lower performance self-esteem, $B = −4.241$ ($SE = .51$), $p < .001$, and greater task anxiety, $B = 9.404$ ($SE = 1.36$), $p < .001$; but for those with relatively high ACT scores ($+1 SD$), the magnitude of the self-doubt effect was reduced on performance self-esteem, $B = −2.568$ ($SE = .51$), $p < .001$, or task anxiety, $B = 4.305$ ($SE = 1.27$), $p = .001$. Conceptually supporting our reasoning with incremental beliefs about ability, these results show that for performance self-esteem and task anxiety, actual ability (not beliefs about ability) moderated self-doubt effects.

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