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Abstract

Self-enhancement is a pervasive motivation that manifests broadly to promote and protect the positivity of the self. Research suggests that self-enhancement is associated with improved task performance. Untested, however, is whether that association is causal. The present research experimentally manipulated self-enhancement to examine its causal effect on task performance. Participants in five experiments were randomly assigned to self-enhance or not before completing a creativity task (Experiments 1-4) or pain-inducing cold-pressor task (Experiment 5). Results indicate that self-enhancing (but not self-effacing) on a dimension relevant (but not irrelevant) to the task facilitated performance. Furthermore, the data were consistent with the possibility that the performance facilitating effect of self-enhancement was mediated through task-relevant self-efficacy.

Does Self-Enhancement Facilitate Task Performance?

"I'm not the greatest; I'm the double greatest."

Muhammad Ali (BBC Sport, 2007)

Muhammad Ali's aptitude for boxing was closely matched by his impressive flair for self-promotion. When questioned about his golf game, he explained, "I'm the best. I just haven't played yet" (BBC Sport, 2007). Such ennobling sentiment is not unique to Ali and can be heard echoing from most sporting events in chants of "We're number 1" and, more generally, within ourselves. Indeed, though it is typically expressed more subtly than Ali's proclamations, self-enhancement is a pervasive motivation. The purpose of the current work is to experimentally test whether self-enhancement affects task performance. Asked in regard to Ali, for example, was self-promotion part of his arsenal along with talent and training that propelled him to the top? Asked more generally, does self-enhancement facilitate performance?

The Self-Enhancement Motive

Self-enhancement (i.e., concern for promoting and protecting the positivity of the self; Alicke & Sedikides, 2009, 2011) coexists as one of four self-evaluative motives (Sedikides, 1993; Sedikides & Strube, 1995), with the others being self-assessment (i.e., concern for accurately knowing one's self; Festinger, 1954; Trope & Ben-Yair, 1982), self-verification (i.e., concern for confirming what one knows about the self; Swann, Rentfrow, & Guinn, 2003), and self-improvement (i.e., concern for improving known flaws of the self; Lockwood & Kunda, 1997; Taylor, Neter, & Wayment, 1995). Self-enhancement is frequently examined in regard to a positively biased social-comparison of self relative to others (Heck & Krueger, 2015; Kwan, John, Kenny, Bond, & Robbins, 2004; Sedikides et al., 2015). This approach derives from Festinger's (1954) seminal idea that persons are apt to engage in social comparison when

reflecting on domains that lack an objective basis of appraisal. The quintessential example of a self-enhancing social comparison is the tendency for people to deem themselves to be better than the average person (Alicke, 1985; Alicke & Govorun, 2005; Guenther & Alicke, 2010).

Self-enhancement, of course, is not limited to social comparison and manifests broadly in judgment, memory, affect, and behavior (Alicke & Sedikides, 2011; Baumeister, 1998; Kunda, 1990; Tesser, 1988). Persons, for example, have superior memory for positive than negative self-relevant attributes (Sedikides & Green, 2000, 2004; Walker, Skowronski, & Thompson, 2003), experience stronger positive affect when recalling positive events than negative affect when recalling negative events (Ritchie, Sedikides, & Skowronski, 2016), selectively engage in contexts that highlight positive rather than negative self-aspects (Sedikides, 1993), desire social feedback that emphasizes their positivity (Gaertner, Sedikides, & Cai, 2012), expect to receive positive feedback from social interactions (Hepper, Hart, Gregg, & Sedikides, 2011), selectively affiliate with persons and groups who reflect favorably on the self (Cialdini et al., 1976; Tesser, 1988), avoid social comparison following poor performance on self-relevant domains (Gibbons, Persson Benbow, & Gerrard, 1994), make internal attributions for personal success and external attributions for personal failure (Campbell & Sedikides, 1999), take credit for group success and deny blame for group failure (Mullen & Riordan, 1988; Schlenker & Miller, 1977), behave in ways that excuse the self for impending failure (Jones & Berglas, 1978; Tice, 1991), derogate the validity of failure feedback (Shepperd, 1993), and devalue dimensions on which the self fails (Major, Spencer, Schmader, Wolfe, & Crocker, 1998; Tesser, 1988).

The critical component of self-enhancement is engagement of the self as the principal referent. In particular, manipulations of whether persons adopt a self versus an other-person perspective reveal that positively biased processes manifest when the self is the referent. For

example, the tendency to (a) select contexts that reveal positive but not negative aspects of a person occurs when assessing the self but not when assessing other people (Sedikides, 1993), (b) better recall positive than negative events occurs when remembering events about the self but not events about another person (even when the events are held constant; Sedikides, Green, Saunders, Skowronski, & Zengel, 2016), (c) experience stronger positive than negative recall-dependent affect occurs when the past is recalled from a first-person (self) than a third-person (other) perspective (Skowronski, Sedikides, Xie, & Zhou, 2015), and (d) expect positive feedback from social interactions occurs when thinking about the interactions as involving the self but not other persons (Hepper, Hart, Gregg, Sedikides, 2011). Hence, people are not perpetually Pollyanna. They are distinctly *self* Pollyanna. As the name of the motive implies, it is engagement of the self as referent for which self-enhancement functions.

In contrast to its broad manifestation, the expression of self-enhancement is usually subtle and strategic rather than blatant and rampant due to the social costs of being perceived as arrogant, demeaning, and less moral (Colvin, Block, & Funder, 1995; Heck & Krueger, 2016; Kwan, John, Kenny, Bond, Robins, 2004; Leary, Bednarski, Hammon, & Duncan, 1997; Paulhus, 1998; Schlenker & Leary, 1982; Van Damme, Hoorens, & Sedikides, 2016). Hence, self-enhancement is characterized by its tactical nature that is sensitive to contextual pressures (Sedikides & Strube, 1997). Its signature tendency, for example, is to be expressed on dimensions of importance and centrality to the self and to be muted on dimensions of lesser importance and centrality (Alicke, 1985; Dunning, 1995). This tactical quality has spawned debate as to whether the self-enhancement motive is a byproduct of western culture (e.g., Heine Lehman, Markus, & Kitayama, 1999; Henrich, Heine, & Norenzayan, 2010) or a human universal (e.g., Gaertner, Sedikides, Cai, & Brown, 2010; Sedikides, Gaertner, & Cai, 2015).

Self-Enhancement and Task Performance

In their landmark article, Taylor and Brown (1988) offered several propositions regarding self-enhancement. Most notably, they proposed that positive (not veridical) self-perception is characteristic of and essential to mental health. That proposal generated much controversy (e.g., Colvin & Block, 1994) and subsequent research revealed that self-enhancement indeed has mixed consequences. On the one hand, as we discussed, self-enhancement is associated with detrimental social phenomenon such as garnering negative perceptions in the eyes of others (e.g., arrogance, disagreeable; Bonanno, Field, Kovacevic, & Kaltman, 2002; Bonanno, Rennicke, & Dekel, 2005; Leary et al., 1997; Paulhus, 1998) and poor social skills (Colvin, Block, & Funder, 1995). On the other hand, self-enhancement is associated with a host of positive outcomes, such as better psychological adjustment and wellbeing (Bonanno et al., 2002; Taylor, Lerner, Sherman, Sage, & McDowell, 2003; Zuckerman & O'Loughlin, 2006), less psychological distress after trauma (Gupta & Bonanno, 2010), and higher self-esteem and ego-resiliency (Paulhus, Harms, Bruce, & Lysy, 2003). Such favorable associations have been documented cross-sectionally (Taylor et al., 2003; Gaertner, Sedikides, & Chang, 2008), longitudinally (Bonanno et al., 2002; Zucketman & O'Loughlin, 2006), and experimentally (O'Mara, Gaertner, Sedikides, Zhou, & Liu, 2011).

Most relevant to the current work, Taylor and Brown (1988) additionally proposed that self-enhancement facilitates task performance. Furthermore, they ventured a process through which it might do so: they reasoned that self-enhancement fosters a sense of efficacy, which in turn promotes task success. Research, at least in a piecemeal fashion, is consistent with this possibility. Self-efficacy, for example, is a catalyst of success (e.g., Bandura, 1982; Bandura & Cervone, 1983; Wood & Locke, 1987). Likewise, self-efficacy itself develops from favorable

performance feedback (Bandura & Jourden, 1991) and favorable social comparison feedback (Klein, 1997). Hence, it is plausible that self-enhancing one's abilities might promote a sense of efficacy even in the absence of actual performance or social comparison information. As we subsequently review, a growing literature suggests that there is merit to the basic notion that self-enhancement facilitates performance.

Much of the existing studies examine self-enhancement and performance in an academic context because grade point average (GPA) provides a verifiable outcome to index whether performance has improved. Blanton, Buunk, Gibbons, and Kuyper (1999), for example, tracked students across the academic year and found that to the extent to which students self-enhanced at the start of the study (i.e., rated themselves as better than their classmates in a given course) their subsequent grades improved beyond their earlier grades. Similarly, work on academic exaggeration indicates that self-enhancement in regard to *current* performance (i.e., reporting one's GPA to be higher than it actually is) increases subsequent actual GPA (Gramzow, Elliot, Asher, & McGregor, 2003; Gramzow, Johnson, & Willard, 2014; Willard & Gramzow, 2009).

Exaggeration of a *current* versus *past* performance appears to be an important distinction. Gramzow and Willard (2006), for example, demonstrate that the former is more strongly related to self-enhancement motivation than is the latter: college students' exaggeration of a current performance (i.e., college GPA) correlates with their tendency to rate themselves as above average across a number of important attributes but their exaggeration of a past performance (i.e., Scholastic Achievement Test, SAT) does not. Likewise, Robbins and Beer (2001) estimated collegiate self-enhancement against the standard of a past performance (i.e., high school GPA and SAT) and found no association with subsequent collegiate performance. Hence, estimating self-enhancement in regard to past performance may unwittingly diminish its observed potential

on subsequent performance. Whereas, exaggeration of current performance has been found repeatedly to predict improvement in subsequent performance (Gramzow et al., 2003; Gramzow et al., 2014; Willard & Gramzow, 2009).

Overview of the Present Research

Rather than measuring self-enhancement, which can be fraught with difficulties (Heck & Krueger, 2015; Kwan et al., 2004; Willard & Gramzow, 2009), we manipulate it by randomly assigning participants to engage in self-enhancing thought. That is, we vary whether participants engage in a self-favoring pattern of memory and judgement through which self-enhancement naturally manifests. We do so by adapting a manipulation previously used to experimentally test whether self-enhancement promotes wellbeing (O'Mara et al., 2012). In that study, participants in the United States and China completed measures of wellbeing and a week later listed a personally important trait and self-enhanced or self-effaced in regard to that trait according to the following randomly assigned instructions (with the effacement instructions denoted in brackets; p. 160):

> Think back over the past 7 days – replay in your mind the things you have done and experienced. In as much detail as possible describe how the things that you have done and experienced demonstrate how that most important trait you listed above is [not] descriptive of whom you are as a person. That is, explain, with examples from the past 7 days, how that most important trait is more [less] characteristic of you than it is of other college students.

Participants then completed the wellbeing measures from the previous week. In both countries, self-enhancement increased wellbeing from baseline and self-effacement produced no change.

In five experiments, we adapt that manipulation with three modifications to test experimentally whether self-enhancement promotes performance. One modification is replacing the wellbeing measures with a performance task. We examine performance on a creativity task in Experiments 1 – 4 and, for a conceptual replication, on an endurance cold-pressor task in Experiment 5. To be clear, our interest is not in creativity or endurance, per se. Instead, we use creativity and endurance as platforms on which to test the process of whether and how self-enhancement affects performance. A second modification is replacing the longitudinal assessment, which provides a measure of regressed change, with a between-subjects comparison against a control condition in which randomly assigned participants complete the same performance criteria as do participants in other conditions without experiencing self-enhancement (or other) instructions. A third modification is replacing the procedure of having participants generate an idiosyncratic dimension of self-enhancement (i.e., personally important trait) with a procedure in which participants self-enhance in regard to the dimension of the performance criterion. Indeed, another way to conceptualize Gramzow and colleagues' distinction between exaggeration of a current vs. past performance is whether self-enhancement occurs on a dimension that is relevant or not to the task at hand. Participants in Experiment 1, for example, are randomly assigned to self-enhance, self-efface, or do neither (control) in regard to creativity before completing the creativity task. To test whether self-enhancement must be task relevant we include as a fourth condition of Experiment 2 the idiosyncratic procedure in which participants self-enhance on a self-generated attribute before completing the creativity task.

To examine issues of moderation and mediation, we simplify Experiments 3 – 5 to a between-subjects comparison of task-relevant self-enhancement versus the no-enhancement control. Experiments 3 and 4 examine the possibility that the effect of self-enhancement on task

performance is moderated by ability. Perhaps self-enhancement is beneficial only for persons who have a capacity for the task. Ennobling himself as "the greatest," for example, might have aided Ali in his boxing pursuit, but would likely have a negligible effect for the current authors. Experiments 3, 4, and 5 assess mediators of self-enhancement. All three of those experiments examine the mediating potential of vitality. That is, self-enhancement might generate feelings of energy or "getting psyched-up" and such ensuing vitality might promote task success. Experiments 4 and 5 additionally examine Taylor and Brown's (1988) proposition that self-enhancement fosters self-efficacy, which in turn promotes task success.

When testing moderation and mediation we employ methods that aid in the interpretation of those effects. When testing moderation we measure the presumed moderator before participants experience the self-enhancement manipulation to ensure that the manipulation does not affect the measured moderator. When testing mediation we counterbalance whether the presumed mediator is measured before or after the performance task to rule out the possibility that it is performance influencing the mediator, rather than vice-versa. In particular, participants could draw inferences about their vitality or efficacy from their in-situ performance on the task, which would yield patterns that appear consistent with mediation but are actually an artifact of measurement order. The latter would emerge as an interaction between self-enhancement and order such that the enhancement manipulation affects the presumed mediator when it is measured after, but not before, the performance task.

Experiment 1

Participants and Procedure

Eighty-six female undergraduates at a Southeastern university participated for partial credit in an introductory psychology course. (All ensuing studies included males and females and

sex did not moderate the patterns). Participants were recruited for a larger study of dyadic interaction and instead completed the current protocol when they were the only person to arrive. We collected data across two academic semesters and determined sample size by the length of the academic year remaining from the start of the study (Simmons, Nelson, & Simonsohn, 2011) We randomly assigned participants to the control condition (n = 29), self-enhancement condition (n = 27), or the self-effacement condition (n = 30).

Upon arrival to the laboratory, participants sat in an individual cubicle, were informed that the study examined creativity, and rated the personal importance of creativity (*1 = not at all important* to *10 = very important*). We introduced the topic of creativity at the start of the session so that it would be salient to all participants and not surprisingly they regarded creativity as highly important (M = 7.58, SD = 1.46, which differed from the scale midpoint of 5.50, $t(84)$ = 13.12, p = .0001). Participants in the control condition then completed the creativity task in which they had 5 min to brainstorm in writing on separate slips of paper as many uses as they could for a brick and they repeated the task for another 5 min brainstorming uses for a candle (Sedikides, Campbell, Reeder, & Elliot, 1998). Participants in the other two conditions completed the same creativity task but they did so after writing a narrative in which they self-enhanced or self-effaced in regard to creativity as specified by the following instructions (with the self-effacement variations noted in brackets):

> Think back over the past 7 days – replay in your mind the things you have done and experienced. In as much detail as possible describe how the things that you have done and experienced demonstrate how being <u>creative</u> is [not] descriptive of whom you are as a person. That is, explain, with examples from the past 7 days how creativity is *more* [*less*] characteristic of you than it is of other college students.

After completing the creativity task, participants were debriefed and thanked.

Results

Two judges independently read the written narratives to ensure that participants self-enhanced or self-effaced as instructed. On that basis, we excluded one participant from the self-enhancement condition yielding an effective sample size of 85.

To assess whether self-enhancement facilitates task performance, we conducted two analyses. One examined the number of solutions participants generated in the creativity task and the other examined the perceived creativity of those solutions as determined by two independent judges who were blind to condition. We transcribed the solutions into an excel file (one row per solution, with one file for brick and one file for candle), hid the participant identifier, and, randomly sorted the rows so that the transcribed solutions were no longer nested within participant (this ensured that judges would not infer creativity from the number of solutions generated by a given participant). Each judge was provided a copy of the brick and candle files and rated the creativity of each solution (*1 = not at all creative* to *5 = extremely creative*). The inter-rater reliability and correlation was high between judges for each object, $\alpha_{brick} = .81$, $r_{brick} = .68$ and $\alpha_{candle} = .82$, $r_{candle} = .71$. We created a subjective creativity score for each participant by averaging the judges' ratings across the solutions. We misplaced solutions from three participants before transcription (one from the control condition and two from the self-effacement condition) yielding an effective sample size of 82 for this outcome.[1]

Number of solutions. Because the outcome is a count, we tested hypotheses using a generalized linear model with a Poisson distribution in Proc Genmod of SAS 9.4 (Aiken, Mistler, Coxe, & West, 2015).[2] There was a condition effect $\chi^2(2; N = 85) = 18.68$, $p = .0001$, such that participants generated more solutions to the creativity task in the self-enhancement condition (*M*

= 25.04, *SD* = 11.14) than in either the control condition (*M* = 20.48, *SD* = 7.99), $\chi^2(1; N = 85) = 12.53$, $p = .0004$, $d = 0.83$, 95% CI (0.3712, 1.2921) or the self-effacement condition (*M* = 20.03, *SD* = 6.66), $\chi^2(1; N = 85) = 15.54$, $p = .0001$, $d = 0.95$, 95% CI (0.4757, 1.4163), and the latter conditions did not differ, $\chi^2(1; N = 85) = 0.15$, $p = .7014$, $d = 0.08$, 95% CI (-0.3415, 0.5096).

Creativity of the solutions. An ANOVA revealed a condition effect, $F(2, 79) = 3.41$, $p = .0379$, such that solutions were more creative in the self-enhancement condition (*M* = 2.22, *SD* = 0.26) than in the control condition (*M* = 2.03, *SD* = 0.25), $F(1, 79) = 6.64$, $p = .0118$, $d = 0.75$, 95% CI (0.1985, 1.2919), and the control condition did not differ from the self-effacement condition (*M* = 2.15, *SD* = 0.31), $F(1, 79) = 2.68$, $p = .1057$, $d = 0.43$, 95% CI (-0.1077, 0.9616). Although the means were in the expected direction, the creativity of the solutions in the self-enhancement condition did not differ from the self-effacement condition, $F(1, 79) = 0.94$, $p = .3345$, $d = 0.24$, 95% CI (-0.7801, 0.2908).

Discussion

This results are consistent with the possibility that self-enhancement facilitates task performance. Participants randomly assigned to self-enhance in regard to creativity generated more solutions to a creativity task than did control participants and blind judges deemed the solutions of self-enhancing participants as more creative than those of control participants. The only inconsistency is that the creativity of the solutions generated by participants in the self-enhancement condition did not differ from those of participants in the self-effacement condition.

In Experiment 2 we replicate Experiment 1 and add a fourth condition. As we reviewed, work on academic exaggeration suggests that exaggeration of current (but not past) performance is associated with self-enhancement motivation and academic improvement. Another way to think about the current vs. past distinction is in terms of whether enhancement occurs on a

dimension that is relevant vs. irrelevant to the task. Self-enhancing on a dimension relevant to the performance task might facilitate performance more so than does self-enhancing on an irrelevant dimension. For example, engaging in self-favoring thoughts about one's ability to endure pain might boost performance on an endurance race but have negligible effect on a driving test. To test this possibility, we included a fourth condition in which participants self-enhance on a dimension other than creativity before completing the creativity task.

Experiment 2

Participants and Procedure

One hundred and fifty undergraduates (71 females, 76 males, 3 unspecified) at a Southeastern university participated for partial credit in an introductory psychology course. We decided a priori to collect data from the beginning until the end of the semester. We randomly assigned participants to the control condition (n = 34), creativity self-enhancement condition (n = 40), creativity self-effacement condition (n = 38), or task-irrelevant self-enhancement condition (n = 38). The procedure for the first three conditions was identical to that of Experiment 1. Participants in the task-irrelevant self-enhancement condition began the session by generating a personally important trait, wrote a narrative in which they self-enhanced in regard to that trait using the instructions from O'Mara et al. (2012; the exact wording is quoted in "The Current Work" section above), and then completed the creativity task (participants did not generate "creativity" as their important trait). Participants were then thanked and debriefed.

Results

Two judges independently read the narratives to ensure that participants self-enhanced or self-effaced as instructed. On that basis, we excluded 15 participants (nine, five, and one, respectively, from the creativity self-enhancement, creativity self-effacement, and task-irrelevant

self-enhancement conditions) bringing the effective sample size to 135. We computed a subjective creativity score for each participant as we did in Experiment 1 and the inter-rater reliability and correlation between judges was high for each object, $\alpha_{brick} = .80$, $r_{brick} = .68$ and $\alpha_{candle} = .77$, $r_{candle} = .62$. We misplaced solutions from five participants before transcription (one, two, and two, respectively from the task-irrelevant self-enhancement, creativity self-enhancement, and creativity self-effacement conditions) yielding an effective sample size of 130 for this outcome.

Number of solutions. The generalized linear model with a Poisson distribution revealed a condition effect, $\chi^2(3; N = 135) = 30.75$, $p = .0001$, such that only task-relevant self-enhancement facilitated performance beyond the control. In particular, participants generated more solutions in the self-enhancement condition (M =26.48, SD = 10.56) than in the control condition (M = 22.71, SD = 7.88), $\chi^2(1; N = 135) = 9.43$, $p = .0021$, $d = 0.55$, 95% CI (0.1983, 0.8979). Participants in the control condition generated as many solutions as did participants in the task-irrelevant self-enhancement condition (M = 21.43, SD = 6.83), $\chi^2(1; N = 135) = 1.30$, $p = .2536$, $d = 0.20$, 95% CI (-0.1418, 0.5362), and more solutions than did participants in the creativity self-effacement condition (M = 20.18, SD = 7.43), $\chi^2(1; N = 135) = 4.97$, $p = .0259$, $d = 0.39$, 95% CI (0.0472, 0.7348).

Creativity of the solutions. An ANOVA revealed no condition effect, $F(3,126) = 0.55$, $p = .6470$, such that the creativity of the solutions did not vary among the creativity self-enhancement (M = 1.84, SD = 0.23), control (M = 1.85, SD =0.27), creativity self-effacement (M = 1.83, SD = 0.29), and task-irrelevant self-enhancement (M = 1.77, SD = 0.22) conditions.

Discussion

The results for the number of generated solutions replicates that of Experiment 1 such that participants who were randomly assigned to self-enhance in regard to creativity subsequently generated more solutions to the creativity task than did control participants. Furthermore, the addition of the task-irrelevant self-enhancement condition reveals that the facilitative effect of self-enhancement occurs only if self-enhancement is task-relevant. Indeed, participants who self-enhanced on an important but creativity-irrelevant dimension generated no more solutions to the creativity task than did control participants. These patterns are conceptually similar to the findings in the academic exaggeration literature indicating that exaggeration of a current (but not a past) performance improves subsequent performance and suggests that it is the relevance of the exaggerated dimension that matters.

Inclusion of the task-irrelevant self-enhancement condition also helps distinguish self-enhancement, per se, from self-affirmation. As Taylor and Sherman (2008) indicate, the major distinction by which self-enhancement and self-affirmation maintain self-worth is that self-enhancing processes operate on the dimension on which the self is being assessed whereas self-affirming processes operate on a dimension other than that on which the self is being assessed. The self-affirmation literature, for example, indicates that persons are more accepting of threatening health information (Sherman, Nelson, Steele, 2000) and more tolerant of threating outgroups (Fein & Spencer, 1997) if they initially affirm a value or attribute that is self-important but irrelevant to the threat (also see Liu & Steele, 1986; Steele & Liu, 1983). That task performance was facilitated in the current study by self-enhancing on a task-relevant but not a task-irrelevant dimension suggests that the facilitative effect was a product of self-enhancement more so than self-affirmation.

Inconsistent with the results of Experiment 1 was the lack of an effect of self-enhancement (task-relevant or not) on the judged creativity of the solutions. One possibility for this inconsistency, which we examine in Experiment 3, is the presence of an unmeasured moderator. Perhaps task-relevant self-enhancement yields the persistence necessary to generate more solutions, but the quality of those solutions might further depend on the person's creative ability. In other words, self-enhancement might boost creative quality only for persons who are predisposed to be creative. Because creativity involves an ability to "form numerous and unusual associations" (Barron & Harrington, 1981, p. 12) we suspect that a predisposition to think abstractly would aid the creative process and moderate the effect of self-enhancement. Self-enhancement might increase the creative quality of persons high (but not low) in abstractness.

Experiment 3

Following Insko et al. (2001), we assess a predisposition to think abstractly with a combination of the Openness-Intellect scale of the Big Five and the Intuition subscale of the Keirsey Temperament Sorter (Keirsey & Bates, 1984).[3] We also examine a potential mediator. In particular, we examine whether self-enhancement fosters a feeling of vitality (i.e., or colloquially, "get's people psyched") that facilitates performance.

Participants and Procedure

Two hundred and twenty six undergraduates (100 females, 125 males, 1 unspecified) at a private Midwestern university participated for partial credit in an introductory psychology course. We decided a priori to collect data from the beginning until the end of the semester and randomly assigned participants to the control condition (n = 108) or creativity self-enhancement condition (n = 118).

Participants sat in individual cubicles and completed the Big-Five Personality Inventory (John, Donahue, & Kentle, 1991; John, Naumann, & Soto, 2008) and the Keirsey Temperament Sorter (Keirsey & Bates, 1984). Participants self-enhanced in regard to creativity or not (control condition) as in Experiments 1 and 2 before completing a state version of the Subjective Vitality Scale (Ryan & Frederick, 1997; $\alpha = .89$; e.g., "*I feel energized right now*") and the creativity task, with the order of the latter two counterbalanced. Participants were debriefed and thanked.

Results

Two judges independently read the narratives to ensure that participants self-enhanced as instructed. On that basis, we excluded nine participants. We further excluded 14 additional participants: one in the control condition who informed the experimenter that a previous participant shared the purpose of the study, four in the self-enhancement condition who provided unusable responses to the creativity task, and nine non-native English speakers who informed the experimenter that they were confused by various aspects of the study (three in the self-enhancement condition and six in the control condition). The effective sample size was 203.

We computed a subjective creativity score for each participant as we did previously and the inter-rater reliability and correlation between judges was reasonable for each object, $\alpha_{brick} = .65$, $r_{brick} = .51$ and $\alpha_{candle} = .80$, $r_{candle} = .67$. We misplaced solutions from 11 participants before transcription (five from the self-enhancement condition and six from the control condition) yielding an effective sample size of 192 for this outcome. We formed an index of abstract thinking by standardizing the scores to the Openness subscale ($\alpha = .76$) of the Big Five and the Intuition subscale ($\alpha = .76$) of the Kiersey Temperament Sorter and averaging the two standardized scores – the scales correlated at $r(201) = .52$, $p = .0001$. Results of analyses using

either openness or intuition yield the same conclusions based on *p*-values and direction of effects as what we report subsequently with the combined index.

Subjective vitality. A Condition (self-enhance, control) x Order (vitality-then-creativity, creativity-then-vitality) factorial ANOVA revealed no effects, *F*'s(1, 202) < 0.37. The lack of a condition effect eliminates subjective vitality as a mediator of self-enhancement.

Number of solutions. The generalized linear model with a Poisson distribution revealed that participants who were randomly assigned to self-enhance in regard to creativity generated more solutions to the creativity task (*M* = 24.26 *SD* = 7.89) than did the control participants (*M* = 22.65, *SD* = 8.43), $\chi^2(1; N = 203) = 5.61$, *p* = .0178, *d* = 0.34, 95% CI (0.0582, 0.6162). Adding to the model mean-centered abstractness and Abstractness x Condition revealed that abstractness positively predicted the number of solutions generated, *B* = 0.09, *SE* = 0.02, 95% CI (0.0623, 0.1282), $\chi^2(1; N = 203) = 32.16$, *p* = .0001. That is, more abstract minded participants generated more solutions than did less abstract minded participants. However, the interaction was not significant, *B* = -0.02, *SE* = 0.02, 95% CI (-0.0525, 0.0133), $\chi^2(1; N = 203) = 1.36$, *p* = .2438, indicating that abstractness did not moderate the effect of self-enhancement.

Creativity of the solutions. An ANOVA for condition revealed that the solutions generated by participants in the self-enhancement condition were deemed to be more creative (*M* = 2.73, *SD* = 0.39) than the solutions generated by participants in the control condition (*M* = 2.61, *SD* = 0.36), *F*(1, 190) = 5.07, *p* = .0255, *d* = 0.32, 95% CI (0.0428, 0.5966). Adding to the model mean-centered abstractness and Abstractness x Condition revealed that abstractness positively predicted the creativity of the solutions, *B* = 0.13, *SE* = 0.03, 95% CI (0.0668, 0.1865), *F*(1, 188) = 17.45, *p* = .0001, such that the solutions of more abstract minded participants were deemed to be more creative than the solutions of less abstract minded participants. However, the

interaction was not significant, $B = 0.02$ $SE = 0.03$, 95% CI (-0.0426, 0.0770), $F(1, 188) = 0.32$, $p = .5713$, indicating that abstractness did not moderate the effect of self-enhancement.

Discussion

The results were consistent with the possibility that self-enhancement facilitates performance. Participants who were randomly assigned to self-enhance in regard to creativity generated more solutions and more creative solutions (as rated by judges) to the creativity task than did control participants. Our supposition that such an effect is mediated by feeling energized appears incorrect. Self-enhancement had no effect on subjective vitality. Also, our supposition that self-enhancement would most benefit the creative performance of persons predisposed to creativity appears incorrect. Although more abstract-minded persons generated more solutions and more creative solutions than did less abstract minded persons, abstractness did not moderate the effect of self-enhancement. Self-enhancement facilitated performance regardless of the participant's abstractness. In Experiment 4 we replicate the current procedure to again test the moderating effect of abstractness and the mediating potential of vitality. In addition, we examine another potential mediator: self-efficacy (Taylor & Brown, 1988).

Experiment 4

Participants and Procedure

Two hundred and twenty undergraduates (126 females, 93 males, 1 unspecified) at a private Midwestern university participated for partial credit in an introductory psychology course. We determined sample size based on Experiment 3, with the goal of obtaining 200 participants which required two academic semesters. We randomly assigned participants to the control condition (n = 112) or creativity self-enhancement condition (n = 108). The procedure and materials were identical to Experiment 3 with the exception that participants additionally

completed a general self-efficacy scale and a task-specific self-efficacy scale. We randomized the order in which participants completed the vitality, general self-efficacy, and task-specific self-efficacy scales and counterbalanced whether they were all completed before or after the creativity task. The general self-efficacy scale (Generalized Self-Efficacy Scale; Schwarzer & Jerusalem, 1995) consisted of 10 items in which participants rated (*1 = not at all* to *4 = exactly true*) their general belief in accomplishing goals (e.g., *"I can always manage to solve difficult problems if I try hard enough"*). Following Bandura's (1982) conceptualization of self-efficacy as domain specific, we created a 6-item creativity self-efficacy scale. Participants rated their confidence (*0 = not at all confident* to *100 = completely confident*) in their creative ability (e.g., How confident are you that you are able to: "*generate creative responses...successfully complete the creativity test*"). We subsequently debriefed and thanked participants.

Results

Two judges independently read the narratives to ensure that participants self-enhanced as instructed. On that basis, we excluded nine participants. We further excluded 10 additional participants: one in the self-enhancement condition who provided unusable responses to the creativity task, three who informed the experimenter that a previous participant shared the purpose of the study (one in the self-enhancement condition and two in the control condition), and six non-native English speakers who informed the experimenter that they were confused by various aspects of the study (four in the self-enhancement condition and two in the control condition). The effective sample size was 201, with the exception of analyses involving vitality ($\alpha = .88$), general self-efficacy ($\alpha = .78$), and task-specific self-efficacy ($\alpha = .92$) for which the effective sample size was 200 because one participant did not complete those measures.

We computed a subjective creativity score for each participant as we did previously – however, we had four rather than two judges because the first pair of judges finished their RA assignment before rating all solutions. So, we obtained a second pair of judges to rate the remaining solutions. To ensure that the four judges agreed in their ratings we had the second pair of judges additionally rate a subset of the solutions (n = 400) rated by the first pair. For that subset, the four judges evidenced high reliability: α_{brick} = .87, α_{candle} = .86 (and the two pairs of judges yielded similar creativity means, r = .74). For the items rated separately by each pair of judges, the inter-rater reliability and correlation was high for each object for pair 1 (α_{brick} = .81, r_{brick} = .72, and α_{candle} = .86, r_{candle} = .76) and for pair 2 (α_{brick} = .81, r_{brick} = .69, and α_{candle} = .85, r_{candle} = .74). We formed an index of abstract thinking as we did in the previous study by averaging the standardized responses to the Openness subscale (α = .80) of the Big Five and the Intuition subscale (α = .71) of the Kieresy Temperament Sorter – the scales correlated at $r(199)$ = .56. Results of analyses using either openness or intuition yield the same conclusions based on p-values and direction of effects as what we report subsequently with the combined index.

Possible mediators. We submitted vitality, general self-efficacy, and task-specific self-efficacy to a Condition (self-enhance, control) x Order (measured-mediator-then-creativity, creativity-then-measured-mediator) factorial ANOVAs to examine their potential as mediators.

Subjective-vitality. A condition effect, $F(1, 196) = 4.23$, p = .041, d = 0.29, 95% CI (0.0067, 0.5644), indicates that participants who were randomly assigned to self-enhance reported greater vitality (M = 4.71, SD = 0.96) than did control participants (M = 4.39, SD = 1.24). This effect was not moderated by order (i.e., Condition x Order), $F(1, 196) = 2.05$, p = .1542. Based on these patterns subjective-vitality stands as a possible mediator of self-enhancement (a formal test is below).

General self-efficacy. There were no effects on general self-efficacy, *F*'s(1, 196) < 0.71. The lack of a condition effect eliminates general self-efficacy as a mediator of self-enhancement.

Task-specific self-efficacy. A condition effect, $F(1, 196) = 4.33$, $p = .0388$, $d = 0.29$, 95% CI (0.0088, 0.5661), indicates that participants who were randomly assigned to self-enhance reported greater creativity-specific self-efficacy ($M = 64.30$, $SD = 18.12$) than did control participants (M = 59.02, SD = 18.58). This effect was not moderated by order (i.e., Condition x Order), $F(1, 196) = 2.49$, $p = .1159$. Based on these patterns task-specific self-efficacy stands as a possible mediator of self-enhancement (a formal test is below).[4]

Number of solutions. A generalized linear model with a Poisson distribution revealed that participants who were randomly assigned to self-enhance in regard to creativity generated more solutions to the creativity task ($M = 23.26$, $SD = 6.99$) than did the control participants ($M = 21.78$, $SD = 6.67$), $\chi^2(1; N = 201) = 4.87$, $p = .0273$, $d = 0.32$, 95% CI (0.0353, 0.5951). Furthermore, adding to the model mean-centered abstractness and Abstractness x Condition revealed that abstractness positively predicted the number of solutions generated, $B = 0.07$, $SE = 0.02$, 95% CI (0.0409, 0.1085), $\chi^2(1; N = 201) = 18.73$, $p < .0001$, such that more abstract participants generated more solutions than did less abstract participants. The interaction was not significant, $B = -0.02$, $SE = 0.02$, 95% CI (-0.0563, 0.0114) $\chi^2(1; N = 201) = 1.69$, $p = .1933$, indicating that abstractness did not moderate the effect of self-enhancement.

Next, we examined whether vitality or task-specific self-efficacy mediated the effect of self-enhancement on the number of solutions generated. As we previously reported, self-enhancement increased both reported vitality and creativity self-efficacy. Adding vitality and task-specific self-efficacy to separate Poisson distributed general linear models that included the enhance vs. control manipulation yielded results consistent with their potential as mediators in

that the number of solutions generated by participants was positively related to their vitality, *B* = 0.03, *SE* = 0.01, 95% CI (0.0084, 0.0611), $\chi^2(1; N = 200) = 6.66$, *p* = .0098, and task-specific self-efficacy, *B* = 0.004, *SE* = 0.001, 95% CI (0.0021, 0.0053), $\chi^2(1; N = 201) = 20.25$, p = .0001. To formally test the indirect (i.e., mediated) effect we used Valeri and VanderWeele's (2013) bootstrapping approach that is appropriate for the count-based dependent measure (i.e., number of uses). The approach scales the indirect effect as a risk ratio because it is estimating an effect, in part, from a generalized linear model with a Poisson distribution. Consequently, an indirect effect with a 95% percentile-based confidence interval that overlaps 1.0 (rather than 0) is inconsistent with mediation. This analysis produced a confidence interval consistent with mediation for the indirect effect via task-specific self-efficacy (1.00090 to 1.04849), but not vitality (0.99785 to 1.03283). That is, the data are consistent with the possibility that self-enhancement increased the participants' self-efficacy at creativity, which, in turn, enabled them to generate more solutions.

Creativity of the solutions. The solutions generated by participants randomly assigned to self-enhance were deemed to be no more or less creative (*M* = 2.05, *SD* = 0.29) than of control participants (*M* = 2.05, *SD* =0.30), *F*(1, 199) = 0.02, *p* = .8923, *d* = 0.00, 95% CI (-0.2773, 0.2773). To test whether the effect of self-enhancement varied by abstractness we regressed the creativity rating on condition, mean-centered abstractness, and Abstractness x Condition. Abstractness positively predicted creativity, *B* = 0.08, *SE* = 0.02, 95% CI (0.0386, 0.1321), *F*(1, 197) = 12.96, *p* = .0004, such that the solutions generated by more abstract participants were deemed to be more creative than those generated by less abstract participants. The interaction, however, was not significant, *B* = 0.01, *SE* = 0.02, 95% CI (-0.0321, 0.0611), *F*(1,197) = 0.38 *p* = .5368, indicating that abstractness did not moderate the effect of self-enhancement.

Because it is possible for an independent variable to have an indirect (i.e., mediated) effect on an outcome despite no apparent total effect on that outcome (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002), we examined whether self-enhancement indirectly affected the creativity of the solutions via subjective-vitality or task-specific self-efficacy. We first conducted separate regression models in which the creativity rating was regressed on either vitality or task-specific self-efficacy along with the enhance-vs.-control manipulation. Those analyses were consistent with the possibility that task-specific self-efficacy, but not vitality, was a mediator in that the rated creativity of the solutions was positively related to task-specific self-efficacy, B = 0.0041, SE = 0.0011, 95% CI (0.0019, 0.0063), $F(1, 197) = 13.33$, $p = .0003$, but not vitality, B = 0.0002, SE = 0.0188, 95% CI (-0.0369, 0.0374), $F(1, 197) = 0.00$, $p = .9899$. We formally tested mediation using the bootstrapping procedure of the PROCESS macro for SAS (Hayes, 2013). The 95% percentile-based confidence interval was consistent with mediation (i.e., excluded 0) for the indirect effect via task-specific self-efficacy (0.0003 to 0.0584), but not vitality (-0.0164, 0.0155). That is, the data are consistent with the possibility that self-enhancement increased participants' self-efficacy at creativity, which, in turn, enabled them to generate particularly creative solutions.

Discussion

The results were again consistent with the possibility that self-enhancement facilitates task performance. Participants who were randomly assigned to self-enhance in regard to creativity subsequently generated more solutions to a creativity task than did control participants. Furthermore, tests of mediation were consistent with the possibility that task-specific self-efficacy (but not general self-efficacy) mediates self-enhancement on the number of generated solutions and the creativity of those solutions. As in Experiment 3, subjective vitality did not

yield evidence consistent with mediation. Likewise, level of abstractness facilitated performance on the creativity task but did not moderate the effect of self-enhancement. We consider in the General Discussion why abstractness did not serve as a moderator and what it might (and might not) imply more generally for the facilitative effect of self-enhancement on task performance.

Before doing so, however, we sought to ensure that our observed effect of self-enhancement on task performance is not unique to the creativity task and is a more basic property of self-enhancement that can generalize to other domains. We address this issue in Experiment 5 in which we again test the facilitative effect of self-enhancement on task performance and the possibility of mediation through task-specific self-efficacy but we do so on a different performance domain.

Experiment 5

To assess whether the performance facilitating effect of self-enhancement extends beyond the domain of creativity, we replicated the previous study using a cold-pressor task, which is typically used to study pain (Edens & Gill, 1995; Mitchel, MacDonald, & Brodie, 2004). In the cold-pressor task, participants immerse an arm in an ice bath to provide measures of pain threshold (i.e., duration until first felt pain) and pain tolerance (i.e., duration until pain is intolerable). We randomly assigned participants to self-enhance or not in regard to their ability to endure discomfort before they engaged in the cold-pressor task. We had no prediction as to whether self-enhancement would affect pain threshold. We did, however, expect it to increase pain tolerance such that participants who self-enhance in regard to discomfort endurance should persist in the ice bath longer than do control participants.

Participants and Procedure

We restricted participation to persons without vascular or circulatory problems and without cuts, scrapes, open wounds, or joint diseases in their arms or hands. Two hundred and twenty five undergraduates (137 females, 88 males) at a private Midwestern university participated for partial credit in an introductory psychology course. We determined sample size with the goal of at least 200 observations, which required two academic semesters. We based our estimated sample size on a power analysis for at least 80% power assuming a small effect size of d = .20 – given the new performance domain we were uncertain of the effect size and erred on the side of it being small. We randomly assigned participants to the control condition (n = 109) or self-enhancement condition (n = 116).

Upon arrival to the lab, the experimenter explained that the study involved endurance and recorded the participant's height, weight, and body temperature. Participants in the control condition subsequently engaged in the cold-pressure task, in which they submerged their non-dominant hand (up to the forearm) in a cooler filled with ice water maintained at approximately 2 °C. Participants were instructed to announce when they first felt pain (pain threshold) and to keep their arm submerged for as long as possible (pain tolerance). The experimenter surreptitiously recorded with a concealed stopwatch pain threshold and pain tolerance. In accordance with the local Institutional Review Board, the experimenter terminated the task if the participant persisted in the ice bath for 15 min.

Participants in the self-enhancement condition also completed the cold-pressor task, but they did so after writing a narrative in which they self-enhanced in regard to enduring discomfort as specified by the following instructions:

> Think back over the past two weeks – replay in your mind the things you have done and experienced. In as much detail as possible describe how the things you have done and

experienced demonstrate that you have the ability to endure discomfort. That is, explain with examples from the past two-weeks, how enduring discomfort is more characteristic of you than it is of other college students.

As in Experiment 4, all participants completed measures of subjective vitality, general self-efficacy, and task-specific self-efficacy. We randomized the order in which they completed those measures and counterbalanced whether they completed all of the measures before or after the cold-pressor task. We assessed vitality and general self-efficacy using the same scales as in the previous experiment. For task-specific self-efficacy, participants rated on 5-items their confidence (*0 = not at all confident* to *100 = completely confident*) in their ability to endure discomfort (e.g., How confident are you that you are able to: "*endure the discomfort presented in the task...show that you are a determined and tenacious person*").

Results

Two judges independently read the narratives to ensure that participants self-enhanced as instructed. On that basis, we excluded three participants. We further excluded 27 additional participants: one in the control condition who was timing the cold-pressor task, three non-native English speakers who informed the experimenter that they were confused by various aspects of the study (two in the self-enhancement condition and one in the control condition), eight who informed the experimenter that they regularly take ice baths for sports rehabilitation (four in each condition), and 15 who informed the experimenter that a previous participant shared the purpose of the study (nine in the self-enhancement condition and six in the control condition). The effective sample size was 195, with the exception of analyses involving (a) task-specific self-efficacy because two participants (one from each condition) did not complete that measure yielding an effective samples size of 193 and (b) pain threshold because 11 participants (nine

from the self-enhancement condition and two from the control condition) did not announce when they first felt pain yielding an effective sample size of 184.

The latency scores (measured in seconds) for pain tolerance and pain threshold were positively skewed and heteroskedastic. A natural log transformation corrected both the skew and heteroskedasticity. We report inferential tests based on the transformed scores and, to facilitate interpretation, we report descriptive statistics based on the raw scores.[5]

Possible mediators. We submitted vitality (α = .84), general self-efficacy (α = .78), and task-specific self-efficacy (α = .92) to Condition (self-enhance, control) x Order (measured-mediator-then-cold-pressor, cold-pressor-then-measured-mediator) factorial ANOVAs.

Subjective-vitality. There were no effects on subjective vitality, *F*'s(1, 191) < 1.01. The lack of a condition effect excludes subjective vitality as a mediator of self-enhancement.

General self-efficacy. There were no effects on general self-efficacy, *F*'s(1, 191) < 1. The lack of a condition effect excludes general self-efficacy as a mediator of self-enhancement.

Task-specific self-efficacy. A condition effect, $F(1, 189) = 4.03$, $p = .046$, $d = 0.29$, 95% CI (0.0054, 0.5726), indicates that participants who were randomly assigned to self-enhance reported greater discomfort-endurance self-efficacy ($M = 75.54$, $SD = 17.59$) than did control participants (M = 70.11, SD = 19.39). That effect was not moderated by order (i.e., Condition x Order), $F(1, 189) = 0.47$, $p = .4959$. These patterns suggest that task-specific self-efficacy is as a possible mediator of self-enhancement (a formal test is below).

Pain threshold. Participants who were randomly assigned to self-enhance in regard to enduring discomfort waited non-significantly longer to announce when they first felt pain (M = 43.23s, SD = 52.01) than did control participants (M = 32.48s, SD = 36.09), $F(1, 182) = 3.31$, p = .0705, $d = 0.26$, 95% CI (-0.0213, 0.5425). We examined the mediating potential of task-specific

self-efficacy by simultaneously regressing pain threshold on self-efficacy and enhance-vs.-control. The results were inconsistent with mediation in that self-efficacy did not predict pain threshold, $B = 0.0034$, $SE = 0.004$, 95% CI (-0.0045, 0.0114), $F(1, 180) = 0.74$, $p = .3907$. Indeed, a formal test of mediation using the bootstrapping procedure of the PROCESS macro for SAS (Hayes, 2013) yielded a 95% percentile-based confidence interval that was inconsistent with mediation for the indirect effect of task-specific self-efficacy (log transformed pain-threshold: -0.0148 to 0.0388; raw pain-threshold: -0.8378 to 1.4708).

Pain tolerance. Participants who were randomly assigned to self-enhance in regard to enduring discomfort persisted longer in the ice bath ($M = 236.57$s, $SD = 281.91$) than did control participants ($M = 152.22$s, $SD = 197.55$), $F(1, 193) = 5.72$, $p = .0177$, $d = 0.34$, 95% CI (0.0598, 0.6253). The same conclusion is reached when comparing the self-enhancement versus control condition in regard to the duration between which participants announced that they first felt pain and subsequently removed their arm from the water by performing either a between-condition test of (a) the difference score (i.e., pain tolerance minus pain threshold) or (b) a regressed difference (i.e., simultaneously regressing pain tolerance on pain threshold and condition, i.e., enhance vs. control). Indeed, participants randomly assigned to self-enhance persisted longer in the ice bath beyond their first felt pain than did control participants according to a test of the condition effect on the difference score, $F(1, 182) = 5.63$, $p = .0187$, and the regressed difference, $F(1, 181) = 4.55$, $p = .0343$.

We examined the mediating potential of task-specific self-efficacy by simultaneously regressing pain tolerance on self-efficacy and enhance-vs.-control. The results were consistent with mediation in that task-specific self-efficacy positively predicted pain tolerance, $B = 0.0215$, $SE = 0.0039$, 95% CI (0.0137, 0.0292), $F(1, 190) = 30.00$, $p = .0001$. Likewise, a bootstrapped

test of mediation using the PROCESS macro yielded a 95% percentile-based confidence interval that was consistent with mediation via the indirect effect of task-specific self-efficacy (log-transformed pain-tolerance: 0.0032 to 0.1210; raw pain-tolerance: 0.6441 to 25.0647). Stated otherwise, the data are consistent with the possibility that self-enhancement increased self-efficacy for enduring discomfort, which, enabled greater persistence on the cold-pressor task.

Discussion

To assess whether our previous findings would replicate in a performance domain other than creativity we randomly assigned participants to self-enhance (or not) in regard to enduring discomfort and assessed performance on a cold-pressor task. Analogous to the results of Experiments 1 – 4, self-enhancement increased persistence in the ice bath and tests of mediation were consistent with the possibility of mediation via task-specific self-efficacy (but not via general self-efficacy or subjective vitality).

General Discussion

In their landmark article, Taylor and Brown (1988) proposed that self-enhancement facilitates (among other benefits) task performance. They further offered self-efficacy as a plausible mediator, such that positively biased memories, judgments, and thoughts about the self generate a sense of effective agency that promotes a tenacity to achieve. Longitudinal studies that measured self-enhancement (primarily in regard to academic achievement) and ensuing performance are largely consistent with the possibility that self-enhancement facilitates performance (Blanton et al., 1999; Gramzow et al., 2003; Gramzow, Johnson, & Willard, 2014; Willard & Gramzow, 2009; cf., Robins and Beer, 2001).

The purpose of the current research was to experimentally test whether self-enhancement facilitates task performance by manipulating (rather than measuring) self-enhancement. In each

of five experiments, we randomly assigned participants to engage in self-enhancing memory and judgment in regard to a performance domain before engaging in a test of that domain. The results were consistent with the possibility that self-enhancement facilitates task performance. In particular, participants in Experiments 1-4 who were randomly assigned to self-enhance in regard to creativity subsequently generated more solutions and (with less consistency) more creative solutions to a creativity task than did control participants. Similarly, participants in Experiment 5 who were randomly assigned to self-enhance in regard to enduring discomfort persisted longer in the pain-inducing cold-pressor task than did control participants.

In addition to a control condition in which randomly assigned participants only completed the given performance task, we randomly assigned participants to other comparison conditions. Participants in the self-effacement condition generated negative thoughts about themselves in regard to the performance domain. Participants in the task-irrelevant self-enhancement condition generated positive thoughts about themselves on a dimension irrelevant to the performance domain. Only participants randomly assigned to self-enhance in regard to the performance domain out performed the control participants. This implies that it is not simply memories and thoughts about the domain or memories and thoughts about the positivity of the self that facilitate performance, but instead performance is facilitated by memories and thoughts that positively link the self with the performance domain. In other words, self-enhancement operates as a goal-directed force. Enhancing in regard to speed, for example, should facilitate performance on a running race but not on a spelling bee.

Mediation: Ruling-in and Ruling-out Possible Pathways

We examined potential mediators of self-enhancement's facilitative effect. We assessed the possibility that self-enhancement generates a feeling of vitality or energy (e.g., "getting

psyched") that heightens performance. We assessed such vitality in Experiments 3, 4, and 5 with the Subjective Vitality scale (Ryan & Frederick, 1997). For neither the creativity task nor the cold-pressor task did vitality evidence a complete pattern consistent with mediation. The self-enhancement manipulation increased vitality in Experiment 4 but not in Experiments 3 and 5. In Experiment 4, vitality positively predicted (independent of the manipulation) the number of generated solutions (but not the creativity of those solutions), but the estimated indirect effect indicated that vitality was not a mediator. Vitality, or at least our operationalization of vitality, appears not to be a mediator of self-enhancement's effect on performance.

We assessed in Experiments 4 and 5 the mediating potential of two forms of self-efficacy. We assessed with the Generalized Self-Efficacy Scale (Schwarzer & Jerusalem, 1995) a domain-independent belief in one's capacity to respond to difficult situations and overcome obstacles. Adhering to Bandura's (1982) conceptualization that self-efficacy is domain specific, we also assessed self-efficacy in regard to the performance domain (i.e., creativity, enduring discomfort). The self-enhancement manipulation had no impact on the domain-independent form of generalized self-efficacy, thereby eliminating it as a mediator. On the other hand, the domain-specific form of self-efficacy evidenced a complete pattern consistent with mediation on both the creativity and cold-pressor task: (a) The self-enhancement manipulations increased self-efficacy in regard to creativity and enduring discomfort, respectively; (b) Self-efficacy at creativity and enduring discomfort positively predicted (independent of the self-enhancement manipulation) performance on the creativity task and pain-inducing cold-pressor task, respectively; (c) Finally, estimates of the indirect effect from self-enhancement to each performance measure were consistent with the possibility of mediation via domain-specific self-efficacy. These studies suggest that engaging in self-enhancing memory and thought about the self in regard to a given

performance domain fosters a sense of efficacy in that domain, which, in turn, facilitates performance in that domain. These data are consistent with Taylor and Brown's (1988) proposition that self-enhancement facilitates task performance by fostering a sense of efficacy.

Moderation: Are There Limits to Self-Enhancement's Performance Facilitating Effect?

Self-enhancement cannot make the impossible possible. Ennobling the self with better-than-average eagle-like attributes would ensure a fast thud rather than a graceful swoop from cliff to ground. Given the inconsistency between Experiment 1 and 2 in the effect of self-enhancement on the subjective creativity of the generated solutions, we tested in Experiments 3 and 4 the possibility that self-enhancement interacts with skill/ability. We anticipated that self-enhancement would improve the creative quality of abstract minded persons who are predisposed to creativity. Abstractness did indeed positively predict performance on the creativity task: more abstract-minded participants generated more solutions and more creative solutions than did less-abstract minded participants. Yet, abstractness did not moderate the effect of self-enhancement.

The lack of a Self-Enhancement x Abstractness effect is consistent with the strong argument that that self-enhancement facilitates performance regardless of skill, ability, or predisposition and implies that self-enhancement can make the impossible possible, which we deem impossible. Of course, another possibility is worth considering. We had sufficient variation in our assessment of abstractness to observe its positive association with performance on the creativity task. But, it is plausible that we lacked sufficient variation at the lower end of the abstractness continuum to observe its moderating effect. Stated otherwise, our participants who were "lower" in abstractness were abstract enough to benefit from self-enhancement. Indeed, acceptance into college likely entails at least a modest level of abstract thinking and 75% of participants in Experiments 3 and 4 scored above 3.20 on the Openness scale (anchored at 1 and

5) and above 7 on the Intuition scale (anchored at 0 and 20). In this instance, sampling college students likely limited our ability to observe the moderating effect of skill/ability/pre-disposition on self-enhancement. Perhaps a sample more evenly distributed across the abstractness continuum would have revealed that self-enhancement facilitates the creative quality of persons predisposed for creativity, but not of persons who lack such a pre-disposition.

It is also worth considering whether unmeasured variation in the abstractness of our judges contributed to the lesser consistency of the self-enhancement manipulation on the subjective creativity rating than on the number of generated solutions. Assessing creativity is certainly a fuzzier task than is a simple count and, in this instance, the adage "it takes one to know one" might be apt. Perhaps we would have observed greater consistency between-studies in the subjective creativity measure had we assessed the abstractness of our judges and formed a creativity mean that was weighted by each judges' abstractness.

While pondering issues of moderation, it is worth mentioning that we do not claim the effect documented in the current research to be context invariant and unaffected by other factors. As is the purpose of laboratory experiments, we created a controlled environment to test the plausibility of an idea, namely Taylor and Brown's (1988) proposition that self-enhancement has a causal and positive effect on performance. Our results are consistent with that possibility but the do not imply that self-enhancement always improves performance. Indeed, in Experiment 2 self-enhancement boosted performance when enhancement was task relevant, but not when it was task irrelevant. In other contexts, even task-relevant self-enhancement might be ineffective. In the current experiments, for example, there was no outcome (beyond self-admiration) contingent on performance. If we incentivized participants with desirable rewards for their performance (e.g., $100 per minute in the cold-pressor task), perhaps task-relevant self-

enhancement would have a negligible effect. Surely other motivations and contexts can mute (and yet others, intensify) the effect of self-enhancement. Nonetheless, the results are revealing of human nature: Self-enhancement can facilitate performance. It goes beyond regulating self-worth and wellbeing and impacts behavior. Which might be why self-enhancement is so prevalent (Sedikides & Skowronski, 2000; Sedikides, Skowronski, & Gaertner, 2004).

Connections and a Caveat

The current research has clear connections to other fields of research. Education research, for example, has long embraced the importance of self-efficacy to academic performance (Zimmerman, 2000). Initial research was troubled with inconsistent links between self-efficacy and performance and, as Bandura (1982) argued, resolution came with assessments of self-efficacy that were specific to the performance task (Pajares, 1996). Our mediation tests of generalized vs. domain-specific self-efficacy evidenced the same tendency. Interestingly, in his review of the education literature, Pajares (p. 566) noted that "one of the thorniest problems...is whether feeling good about oneself is primarily responsible for increased achievement or whether successful performance is largely responsible for stronger feelings of self-worth." Our experiments de-thorn this issue and indicate that the former is indeed possible: self-enhancement increases achievement. The field of Sports Psychology also emphasizes the link between self-efficacy and performance and, here too, substantially stronger positive associations with performance are found among domain-specific than generalized measures of efficacy (Moritz, Feltz, Fahrbach, & Mack, 200). Similarly, Organizational Psychology appreciates the importance of self-efficacy for job performance (Gist & Mitchell, 1992).

A relevant issue for all of these fields is how to increase self-efficacy as a means of improving performance. As we discussed previously, research indicates that self-efficacy

develops from both performance feedback (Bandura & Jourden, 1991) and social comparison feedback (Klein, 1997) demonstrating task proficiency. Perhaps one of the more interesting findings of the current research is the possibility that efficacy beliefs can be auto-generated via self-enhancement. Participants who were randomly assigned to engage in a positively biased memory trace of their recent past in regard to creativity or discomfort endurance subsequently reported stronger confidence in their efficacy in those domains. This occurred regardless of whether we assessed self-efficacy before or after the performance task; thereby indicating that it was the self-enhancing memory trace and not performance-based inferences that promoted self-efficacy. Although these findings are of strong theoretical interest, an important caveat is necessary regarding their applied potential.

For the reader interested in improving personal performance, we caution against concluding that self-enhancement alone is a good tool (e.g., Baumeister, Campbell, Krueger, & Vohs, 2003). There likely are other strategies that would provide a larger performance boost than would mere self-enhancement. For athletes interested in improving their game or musicians wanting to improve their recitals, we recommend practice and more practice (Macnamara, Hambrick, Oswald, 2014). Self-enhancement without practice would likely be a fast track to failure. Again, the purpose of our research was to test whether self-enhancement can improve performance. We did not test whether self-enhancement is the best way or a good way to do so.

Conclusion

The current experiments indicate that self-enhancement facilitates task performance and that facilitative effect is plausibly mediated, in part, by domain-specific self-efficacy. Returning to Muhammad Ali, perhaps talent and training made him the greatest and his flair at self-enhancement enabled him to be “the double greatest.”

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Footnotes

[1]Participants wrote their uses for the creativity test on separate slips of paper, which we subsequently stapled together. The staples released for 19 participants from Experiments 1 – 4 (2.78% of the 682 participants) and their slips were lost before being transcribed in the database.

[2]We computed a Cohen's *d* and a 95% CI of the *d* for between condition comparisons of the number of uses measure (for Experiments 1 – 4) using the corresponding χ^2 and sample size of the Poisson distributed inferential test.

[3]Insko et al. (2001) used the Openness subscale of the Big Five and the Sensing-Intuition scale of the Myers-Briggs Type Indicator (Myers, McCauley, Quenk, & Hammer, 1998). IRB concern with copyright infringement prevented our use of the Myers-Briggs. Hence, we used the Intuition subscale of the Keirsey Temperament Sorter, which assesses the same construct as the Sensing-Intuition scale (Tucker & Gillespie, 1993).

[4]Although the Condition x Order interaction was not significant for vitality and task-specific self-efficacy, the reader might find it interesting that, in each instance, the condition effect was descriptively stronger when vitality and task-specific self-efficacy were assessed before rather than after the creativity task. Such a pattern is entirely consistent with mediation in that the pre-task assessment is not contaminated by self-inferences that may have occurred on the creativity task (e.g., "I'm good at this"). The vitality means for the enhancement and control conditions are 4.84 and 4.28, respectively when measured before the creativity task and 4.60 and 4.50 when measured after the creativity task. Likewise, the task-specific self-efficacy means for the enhancement and control conditions are 65.99 and 56.45, respectively when measured before the creativity task and 62.89 and 61.58 when measured after the creativity task.

[5]Weight and body temperature positively predicted pain threshold and height positively predicted pain tolerance. Inclusion of height, weight, and body temperature as covariates does not alter conclusions regarding self-enhancement and we report the results of tests that do not include covariates.