

WHEN THE GOING GETS TOUGH, THE TOUGH GET GOING: THE EFFECTS OF
DETERMINATION AND PRIDE ON TASK ENGAGEMENT

By

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Thesis

Submitted to the Faculty of the
Graduate School of Vanderbilt University
in partial fulfillment of the requirements

for the degree of

MASTER OF SCIENCE

in

Psychology

May, 2013

Nashville, Tennessee

Approved:

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ACKNOWLEDGEMENTS

I would like to give a special thanks to Frances Christian, Elizabeth Spitzer, Kellie Kuzmuk, Katrina Ong, Anna Reif, and Nikki Sloane Sparks for their assistance with data collection. I would also like to express my gratitude to my lab directors Craig A. Smith and Leslie D. Kirby for their constant guidance and assistance; to my family, especially my mother Li-Hwa Lung for her confidence in my ability to accomplish this work and my cousin Hanna Darwish for editing the early drafts of my thesis; and to my friends for their support throughout my first years of graduate school.

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CHAPTER I

INTRODUCTION

Emotions can be categorized in general (i.e., negative or positive emotions) or specific (e.g., anger, fear, happiness, surprise, etc.) terms. Theories of emotion tend to distinguish negative emotions and generalize positive emotions (Ekman, 1992; Izard, 1977; Tomkins, 1962). To determine whether positive emotions are distinguishable, we investigated whether discrete positive emotions have distinct, context-specific motivational and adaptational functions.

Two well-known theories that generalize positive emotions are Ekman's Theory of Universality (Ekman, 1992) and the Broaden-and-Build Theory of Positive Emotions (Fredrickson, 1998; Fredrickson, 2001). Paul Ekman suggested that there are six basic emotions that are expressed and recognized cross-culturally (Ekman & Friesen, 1971; Ekman, 1989). Each of these emotions was associated with a unique facial expression (Ekman & Friesen, 1971). Ekman's list included four negative emotions: anger, disgust, fear, and sadness. Although Ekman proposed different facial expressions for these negative emotions, Ekman did not differentiate between positive emotions. Instead, happiness was the only positive emotion that was categorized as one of Ekman's basic emotions. The sixth emotion was surprise, but its valence is dependent on dispositional and situational contexts. To clarify, there are differences in how much people enjoy the experience of surprise, and surprises themselves can be pleasant or unpleasant depending on the situation.

The Broaden-and-Build Theory suggests that positive emotions as a whole are indicative of well-being, sharing motivational functions and benefits (Fredrickson, 2001). The theory emphasizes the shared ability of positive emotions to broaden thought-action repertoires and build on enduring personal resources that may be relied upon for future coping (Fredrickson, 1998). In particular, positive emotions broaden attention, cognition, and action while also building on physical, intellectual, and social resources (Fredrickson, 1998). This contrasts with the proposed function of negative emotion, which is to narrow attention (Easterbrook, 1959; Fredrickson & Branigan, 2005).

Appraisal Theory

Unlike the Broaden-and-Build theory, one theory that does distinguish positive emotions is Appraisal Theory. Appraisal theory identifies the unique quality of a particular emotion by parsing out its distinctive feelings, goals, thoughts, and action tendencies (Roseman, Spindel, & Jose, 1990; Roseman, Wiest, & Swartz, 1994). According to appraisal theory, the individual's evaluation of events and situations elicit separate emotions with specific motivational properties that dictate subsequent behavior (Arnold, 1960; Lazarus, 1966; Roseman & Smith, 2001; Smith & Ellsworth, 1985; Smith & Lazarus, 1990). Therefore, specific emotions should motivate behaviors in unique ways.

Various components of appraisal combine to describe a particular emotion. Primary appraisal dictates whether a situation is appraised as stressful, and it involves two components (Smith & Lazarus, 1990). One component is motivational relevance. Motivational relevance is the degree to which a situation is applicable to an individual's

concerns and goals (Smith & Lazarus, 1990). The second component is motivational congruence (or incongruence). Motivational congruence is the degree to which a situation is consistent with an individual's concerns and goals (Smith, 1991; Smith & Lazarus, 1990). Situations that are evaluated as motivationally relevant and motivationally incongruent will be appraised as stressful. Situations that are evaluated as motivationally relevant and motivationally congruent will be appraised as benign (Smith, 1991).

Secondary appraisal involves other appraisal components that are used to assess options and resources for coping with a situation (Smith, 1991; Smith & Lazarus, 1990). Accountability is an evaluation of agency and determines who should receive credit or blame for the outcome of a situation (Smith, 1991). Future expectancy is an evaluation of the perception of potential changes to an encounter that could make a situation more or less motivationally congruent with what the individual wants (Smith, 1991).

Within secondary appraisal, there are two appraisal components that relate to coping mechanisms, which are methods used to reduce discrepancies between one's current situation and one's goals (Smith & Lazarus, 1990). Emotion-focused coping potential is an evaluation of one's ability to regulate emotions associated with a situation. Problem-focused coping potential is an evaluation of the ability to attend to a situation so that it can be changed and become more congruent with one's goals (Smith, 1991). These appraisal components of coping potential help account for the differentiation of emotional experience. For instance, the positive emotion of determination is elicited by appraisals of motivational relevance and motivational incongruence, making it similar to negative emotions. However, evaluations of high problem-focused coping potential associated with determination distinguish it from these other negative emotions.

Moreover, many positive emotions are associated with motivational relevance, motivational congruence, and coping potential. Thus, the combination of appraisals of motivational incongruence and appraisals of high coping potential separates determination from other positive emotions.

Comparing Determination and Pride

Recent research has used these appraisal components to distinguish positive emotions (Ellsworth & Smith, 1988; Fredrickson, 1998; Katzir, Meiran, & Kessler, 2010; Smith & Kirby, 2010). Here we will extend this research and differentiate separate positive emotions by the unique behaviors they motivate. For instance, the experience of positive emotions, particularly determination or pride, has been associated with performance and perseverance (Duckworth, Peterson, Matthews, & Kelly, 2007; Williams & DeSteno, 2008). Are there differences in how determination and pride affect performance, perseverance, and engagement? Before we examine this question, a brief overview of these two emotions is required.

Determination is a positive emotion that fits a unique emotional profile (Smith & Lazarus, 1990). It is a feeling that every athlete, employee, or student is familiar with. Although the Broaden-and-Build theory states that determination should broaden thought-action repertoires in a similar manner as all other positive emotions, the literature suggests that determination may do just the opposite. Determination is characterized by perseverance and passion for long-term goals, which involves working strenuously towards goals by maintaining effort and interest in spite of adversity (Duckworth et al.,

2007). Thus, like negative emotions, determination may narrow attention rather than broaden.

There is empirical evidence that determination should be distinguished from other positive emotions like happiness, hope, and interest on the basis of appraisal components (Ellsworth & Smith, 1988). The appraisal components of determination include motivational relevance, motivational incongruence, high problem-focused coping potential, and positive future expectations (Smith, 1991; Smith, Haynes, Lazarus, & Pope, 1993). Determination serves the unique adaptive function of motivating active coping to reach or sustain mastery, and it is associated with the “core themes” of effortful optimism and the potential for success (Smith, 1991; Smith et al., 1993). These themes are exactly defined by the appraisal components for determination. In other words, evaluations of motivational relevance, motivational incongruence, and high problem-focused coping potential combine to form effortful optimism and the potential for success.

Like determination, pride is also associated with engagement and success. The appraisal components of pride include motivational relevance, motivational congruence, and self-accountability (Smith, 1991). Pride is predominantly associated with a sense of personal achievement and self-credit, and pride reinforces one’s success by increasing the likelihood that the behaviors that contributed to the success will be repeated in the future (Smith, 1991; Smith & Ellsworth, 1985). For example, after doing well on midterm exams, a student may experience pride, and this emotional experience may motivate her to succeed on upcoming final exams to reinforce her achievements. Research using an effortful and unpleasant task supported the motivational function of pride in creating

incentives for perseverance, referred to as the motivational hypothesis of pride (Williams & DeSteno, 2008). This hypothesis proposes that, when feeling proud about a recognized accomplishment, an individual feels motivated to pursue further action in that domain (Williams & DeSteno, 2008).

Two mechanisms through which pride may motivate engagement have been proposed, and these mechanisms are distinct from the way determination impacts engagement. First, pride has the ability to shape behaviors linked to social goals, such as elevated status compared to others (Keltner, Haidt, & Shiota, 2006; Tangney, 1999; Williams & DeSteno, 2008). For example, a runner experiencing pride before a race may be motivated to succeed because she wishes to be distinguished as the best on her team, whereas a runner experiencing determination before a race may be motivated to perform well because she is striving to improve on her own personal best time. Second, pride may motivate perseverance by reinforcing successful efforts so that they are more likely to occur in the future (Smith, 1991). For example, a businessman experiencing pride may be motivated to persevere towards her next accomplishment because she has succeeded in the past and feels that current successes will secure future accomplishments in her career.

Interestingly, pride may be categorized into two facets: authentic pride and hubristic pride (Carver, Sinclair, & Johnson, 2010; Tracy & Robins, 2007). Authentic pride is considered to be a more desirable form of pride that is socially adaptive and related to a variety of positive constructs including agreeableness, conscientiousness, and self-esteem (Tracy & Robins, 2007). Authentically proud individuals are likely to attribute their success to effort. In contrast, hubristic pride is related to narcissism and shame, with hubristically proud individuals tending to attribute their accomplishments to

ability rather than effort (Tracy & Robins, 2007). These two variants of pride are supported by research on the semantic meaning of pride-related words; on the dispositional tendency to experience pride; and on descriptions of actual pride experiences (Tracy & Robins, 2007).

Both determination and pride are associated with performance and engagement. However, the respective appraisal components and action tendencies of the separate emotions suggest that determination and pride may enhance perseverance in different ways and to varying degrees (Smith, 1991; Smith & Kirby, 2009; Williams & DeSteno, 2008). The appraisal components of determination combine such that the experience of determination motivates active coping behavior that prepares an individual to persevere through adversity. In contrast, pride tends to be celebratory and thereby motivates perseverance through the desire for continued success; this may not as adequately prepare an individual to persevere when “the going gets tough”. Thus, determination may be a stronger motivator of engagement compared to pride. Differences in how determination and pride influence engagement have implications for a variety of real-world settings including the classroom, the playing fields, and the workplace.

Current Experiments

The present study explores potential differences between determination and pride in the context of a stressful situation through two experiments. In both experiments, we used a mathematical problem-solving task that has been used in previous studies (Smith and Kirby, 2009). We chose to imitate a stressful problem-solving situation because this is a common experience among our sample of undergraduate students, thereby enhancing

the external validity of our experiments. We used an experimental design that tests the hypothesis that positive emotions may be differentiated from one another. In particular, we hypothesized that determination and pride have distinctive emotional profiles that should differentially influence task engagement, with determination being a better motivator of engagement compared to pride. An alternative hypothesis would instead claim that there are no differences in how discrete positive emotions broaden thought-action repertoires and build on personal resources for future use.

To test our hypothesis, the present study manipulates emotion before engaging participants in a math task with problems of varying complexity. An examination of the previous literature on the motivational properties of determination and pride provides the basis for predicting that participants would perform better, persevere more, and demonstrate more engagement when feeling the emotion of determination compared to when feeling the emotion of pride. We also predicted that, jointly, the positive emotions groups would perform better, persevere more, and demonstrate more engagement compared to a neutral condition. Perseverance was indexed by time spent solving the problems. Engagement was indexed by appraisal ratings of effort and motivational relevance. Our time measure was the only true measure of perseverance. However, ratings of motivational relevance and anticipated effort are indicators of task engagement, just as perseverance is also an indicator of engagement. For instance, reductions in motivational effort, withdrawal of effort, and reduced perseverance all indicate less engagement.

CHAPTER II

EXPERIMENT ONE

Method

Participants

63 undergraduate students from Vanderbilt University participated in Experiment 1 (60.3% female). They ranged in age from 18 to 22 years old ($M = 19.35$, $SD = 1.17$). Participants were 79.4% White, 7.9% Asian, 4.8% African American, and 3.2% listed themselves as “Other”. In the sample, 4.8% of the participants identified as being of Hispanic or Latino ethnic origin. The Institutional Review Board at Vanderbilt University approved all measures and procedures, and all participants provided written informed consent at the start of the experimental session. Participants received course credit in an undergraduate psychology course in exchange for their participation.

In our sample, 92.0% of participants had taken high school level calculus, with 61.8%% going on to take college level calculus. Clearly, most of the sample had completed fairly advanced coursework in math that went up to the calculus level, so the range of math ability should not have been particularly wide. Given that the problems involved in the math task involved algebra and not calculus, all of the problems were hypothetically at the ability levels of the vast majority of the participants.

Procedure

The session began with informed consent and was followed by a baseline assessment of mood. Emotion was then manipulated, and after this manipulation, participants filled out a post-induction mood assessment followed by the math task. The session concluded with a post-task survey followed by debriefing.

Emotion manipulation. Participants were randomly assigned into conditions (*Determination, Pride, or Neutral*) using a counterbalanced approach that accounted for sex. To manipulate emotion, a directed imagery task was used. This task took approximately five minutes, and during the task, participants listened to a vignette twice. For the first time, participants were instructed to listen to the vignette to get an idea of the situation. For the second time, participants were instructed to immediately begin to imagine the situation and immerse themselves in the emotional experience. A prompt instructed participants to: “Respond to the situation as strongly and as deeply as you can. For the particular time that was described to you, think about what’s happening and how you’d feel if the situation were real. For the next minute or so, please experience, as strongly and as deeply as you can, the feelings you would have if you were really in the situation.” At the end of the task, participants were given a minute to continue imagining the situation and augmenting their emotion in silence. Following the emotion manipulation, participants completed a mood assessment once more as a manipulation check that the correct emotion was induced.

Three vignettes were created for the purpose of the directed imagery task, with the specific goal of inducing a particular emotion under three conditions (*Determination, Pride, or Neutral*). The *Neutral* vignette was set in a grocery store. The *Determination* and *Pride* vignettes were both about academic test-taking situations. Each vignette was

recorded as a separate track and transferred onto an iPod, and this was how the vignettes were presented to participants. A within-subjects pilot study, in which each participant listened to and rated all three vignettes, was conducted to confirm that each vignette induced the appropriate mood, and the analysis affirms this. Transcriptions of each vignette are included below.

Determination vignette. “You are sitting in class, anticipating the handout of your midterm exam. You mentally repeat all of the information you studied. You know this is going to be a difficult midterm, but you studied throughout the weeks in order to prepare for this midterm. Right now, you are eager to start the midterm and answer all of the questions with your new knowledge. When the professor finally hands you the midterm, you flip open the exam and begin to read the questions. The worry you experience as you realize the difficulty of the questions evaporates, replaced with the single minded goal of success. You know you can ace this midterm if you put your mind and heart to it. As you attack each problem, you are determined to do your best on this midterm.”

Pride vignette. “You are sitting in class, anticipating the return of a midterm you took a few weeks ago. You recall the hours of diligent studying you did in preparation for this exam. You knew this would be a difficult course, and you stayed on top of your work throughout the weeks in order to set yourself up for success on the midterm. Right now, you are impatient to get your grade back and see if the fruits of your labor paid off. Indeed, when the professor finally hands you your graded midterm, you see that you got an A+ and thoroughly aced the exam! Any doubts that you had about the time and effort you devoted to your studies have evaporated, replaced by a validation for

the hard work and immense dedication that you have invested into your education. You knew you could ace this midterm if you put your mind and heart to it! As your professor finishes handing back the exams, you sit back and relax in your seat, reveling in your success.”

Neutral vignette. “You have just entered your local grocery store to pick up some items for the upcoming week. You start in the produce section, adding various fruits and vegetables to your cart. You take your time, thinking about what you want to cook throughout the week and what ingredients you will need. You inspect each item before placing it in your cart and moving along to the next stand of produce. After you have picked up the fresh produce you would like for the next week, you leisurely make your way through the refrigerated sections and choose various items that you are running out of. As you go through the aisles, you slowly check off items on your grocery list. You have listed some essential staples and some snack foods that you like to eat between meals. You carefully go through the list once more before heading to the checkout lines. It is then that you realize you forgot to stop by the bakery section. You make a beeline to the baked goods and pick out a few of your favorite items before finally making your way back to the checkout lines to pay for your goods.”

Mathematical problem-solving task. The math task was administered following the post-induction mood assessment. Participants were introduced to the math task through a practice block consisting of simple addition problems. After the practice block, participants filled out a complete assessment of appraisal and mood before beginning the math task. The math task consisted of a series of math problems that increased in difficulty as the task progressed. Participants first solved a relatively easy math problem.

After this initial problem participants attempted to solve a sequence of two difficult math problems that were increasing in difficulty. The third math problem had been demonstrated in previous studies to be very difficult and seemingly impossible (Smith & Kirby, 2009). This third problem was then followed by a fourth problem considered to be easier than the third problem but more difficult than the first problem. It should be noted that the fourth problem was an exact analog of the first problem, but it appeared more difficult because larger numbers were involved. A transcription of all the math problems is included below.

Problem 1. “Tom has 3 times as many goldfish as Laurie. Altogether the children have 28 goldfish. How many goldfish does Laurie have?”

Problem 2. “Tammy has \$9.70 in nickels, dimes, and quarters. The number of nickels is 4 more than 3 times the number of dimes, and the number of quarters is 5 fewer than 2 times the number of nickels. How many nickels does Tammy have?”

Problem 3. “The Elixir of Life consists of a total of 12 liters containing two solutions: Magic and Triple E. Magic is composed of three solutions: E, Double E, and Triple E in the ratio of 1:2:3, respectively. The concentration of the Elixir of Life’s secret ingredient in Double E is 2.5 times the concentration in E; and the concentration of secret ingredient in Triple E is twice the concentration in Double E. The overall concentration of secret ingredient in the Elixir of Life is 8%. How much Triple E is contained in the Elixir of Life (in liters)?”

Problem 4. “Jessica and her brother Jason have invented a fictional world inhabited by Trolinks and Raneeds. Trolinks have 4 times as many antennae as Raneeds,

and therefore are considered to be more intelligent. In a mixed marriage in which a Trolink marries a Raneed, the couple has a total of 40 antennae. How many antennae do Raneeds have?”

For each problem, participants were given three attempts to solve the problem. Participants were also given the option to skip a problem altogether, but they were unable to go back to previously skipped problems in the task. Participants had 15 minutes to solve the problems, and there was an on-screen clock indicating the amount of time left in the task. It was possible that participants would not be able to finish, given the complexity of the problems and the time constraint. Participants were given scratch paper and a calculator to solve the problems. Before the problems began and subsequently after each problem, participants responded to items intended to assess components of appraisal. See the Measures section below for more detail on these items.

Post-task survey. A variety of dispositional measures were collected in this final post-task survey, but they will not be considered in the analyses reported below.

Measures

Discrete Emotion Adjective List (DEAL). Throughout the experiment, the Discrete Emotion Adjective List (DEAL) was used to assess mood. The DEAL measures negative and positive emotions in a discrete manner by presenting groups of one to three adjectives associated with a particular emotion. Participants were asked to generate a single rating for each group. For example, after the emotion manipulation, the directions stated, “Below are a number of adjective clusters that describe different emotions or feelings. EACH group of adjectives is meant to convert to a SINGLE basic emotion or

feeling. Please indicate the extent to which you were feeling an emotion while you were responding to the situation you just imagined yourself in.”

The DEAL used in the present study was modified from the original DEAL (Griner & Smith, 2000) and contained 23 of the original adjective/emotion combinations. Participants used a 9-point Likert scale ranging from 1 (not at all) to 9 (extremely) to rate how much they were feeling the listed adjectives at the specific point in time of the experiment. For the determination ratings, the adjectives “determined”, “motivated”, and “persistent” were listed. For the pride ratings, the adjectives “proud” and “triumphant” were listed.

The DEAL was used both pre- and post- mood induction. For the analyses, measures of determination and pride (taken at both baseline and post-induction states) were taken from the DEAL.

Performance variables. Whether or not each participant correctly answered each math problem correctly was coded; this was used as an indicator of task performance. The amount of time it took for the participants to complete each problem was measured and used in the analyses as an index of perseverance.

Appraisal variables. Following each math problem, participants were surveyed on how much effort they expected to put into the problem by responding to “How much effort do you expect to expend on the next problem of the math task?”. Participants responded using a 9-point Likert scale from 1 (no effort at all) to 9 (extreme effort). Moreover, participants provided self-report ratings of how relevant each problem was to his or her goals in response to the question, “How much do you care about how well you do on the next problem of the math task?”. Participants responded on a 9-point Likert

scale that ranged from 1 (not at all) to 9 (as much as I've cared about anything).

Participants were also surveyed on ratings indicating how difficult they thought the next problem would be. The question asked, "How difficult do you expect the next problem of the math task to be?", and participants responded using a 9-point Likert scale that ranged from 1 (extremely easy and not at all difficult) to 9 (extremely difficult). Finally, ratings of coping potential were assessed by having participants respond to the question, "How well do you expect to do on the next problem of the math task?", using a 9-point Likert scale from 1 (not well at all) to 9 (extremely well).

Analysis

Data retention. For Problem 4, 10 participants were not included in the analyses because they did not have enough time to finish the problem.

Data analysis. The behavioral data was analyzed using a between-subjects multivariate analysis of variance (MANOVA) approach with contrasts. First, manipulation checks were conducted to ensure that the vignettes induced the proper emotion for each condition. Contrasts were used to compare a specific positive emotion to the other two emotions combined (*Pride vs. Determination and Neutral*; *Determination vs. Pride and Neutral*). These contrasts are different from the analyses used in the main analyses because we were asking fundamentally different questions in our manipulation checks versus in our hypothesis testing. For the manipulation checks, we were primarily interested in how the manipulation for each positive emotion enhanced the respective emotion compared to the other two conditions combined. In contrast, for the testing of our hypotheses, we were interested in contrasting the positive emotions

(*Determination vs. Pride*) as well as observing the general effects of positive emotions (*Determination and Pride vs. Neutral*). For both *Determination* and *Pride*, emotion was entered into the MANOVA as a factor, and baseline ratings of determination and pride were entered as covariates. The dependent variables were post-induction ratings of determination and pride, respectively. Baseline ratings were used as covariates to control for any individual differences in baseline emotional experience.

For the math task, each problem was analyzed separately. The dependent variables included a variety of performance and appraisal variables, as outlined above in the Measures section. Emotion was entered into the separate MANOVAs as factors. The MANOVA with contrasts analyzed overall differences between groups as well as specific comparisons. Specifically, contrasts were made between the *Determination* group and the *Pride* group as well as between the *Neutral* group and the “positive emotion” groups (*Determination and Pride*). The *Determination vs. Pride* contrast was chosen because we are interested in differences in how the two positive emotions impact performance, perseverance, and engagement in the context of the math task. The *Determination and Pride vs. Neutral* contrast was selected to observe how the experience of positive emotions in general may affect performance, perseverance, and engagement.

In addition, follow-up regression analyses were conducted on the significant results from the MANOVAs to determine any mediational effects. In particular, because of issues with the emotion manipulation, we observed whether pre-task ratings of determination or pride were mediators in the analyses. By taking a regression approach, we were able to look at ratings of emotion on a continuous scale. In terms of independent variables, two dummy variables that preserved the experimental design of the present

experiment (*Determination vs. Pride*; *Determination and Pride vs. Neutral*) were added as the first step in the regression, followed by baseline ratings of determination and pride, and finally pre-task ratings of determination and pride. Specific performance and appraisal variables were added from each math problem as the sole dependent variable in separate regressions.

Results

Did the Vignettes Induce the Appropriate Emotions For Each Condition?

Pride. The experience of pride was significantly different across the three conditions, $F(2,60)=13.20, p<.01$. The *Pride* group ($M=7.25$) experienced higher levels of pride following the emotion manipulation compared to the other groups, $t(62)=5.08, p<.01$. There were no differences in ratings of pride between the *Determination* group ($M=4.41$) and the *Neutral* group ($M=3.90$), $t(62)=0.85, p=.40$. See Figure 1.

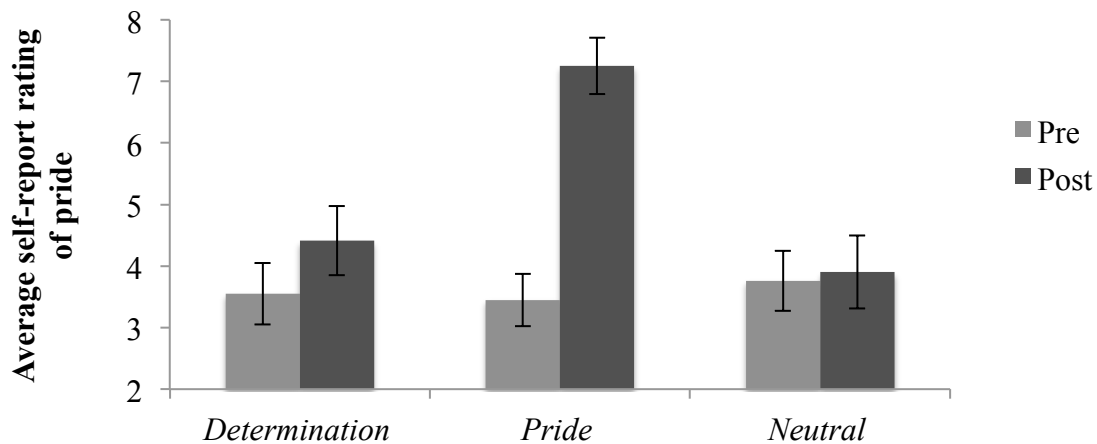
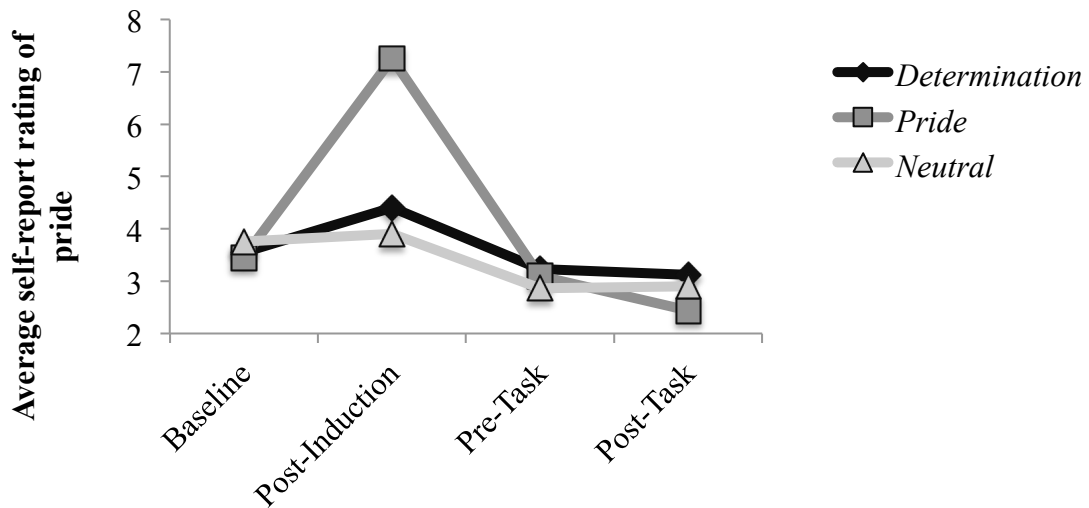


Figure 1: Pre- and Post- Induction Ratings of Pride by Emotion in Exp. 1

In terms of the time course of the experience of pride, the *Pride* group did not rate their experience of pride to be significantly different than the *Determination* group either before ($t(40)=-0.19, p=.85$) or after ($t(31)=-0.94, p=.35$) the task. See Figure 2. Similarly, the *Pride* group did not rate their experience of pride to be significantly different than the *Neutral* group either before ($t(39)=0.41, p=.68$) or after ($t(34)=-0.90, p=.37$) the task.



Note. Based on self-report ratings, the experience of pride was highest among the *Pride* group immediately following the mood induction.

Figure 2: Ratings of Pride by Emotion Throughout Exp. 1

Determination. The experience of determination was significantly different across the three conditions, $F(2,60)=4.30, p=.02$. There was no difference in ratings of determination between the *Determination* group ($M=6.82$) and the other two groups combined following the emotion manipulation, $t(62)=1.07, p=.12$. The *Pride* group ($M=6.80$) rated levels of determination significantly higher than the *Neutral* group ($M=5.00$), $t(62)=2.46, p=.02$. See Figure 3. Following the emotion manipulation, the

Neutral group ($M=5.00$) provided lower ratings of determination compared to the positive emotion groups, jointly, $t(62)=2.93, p<.01$.

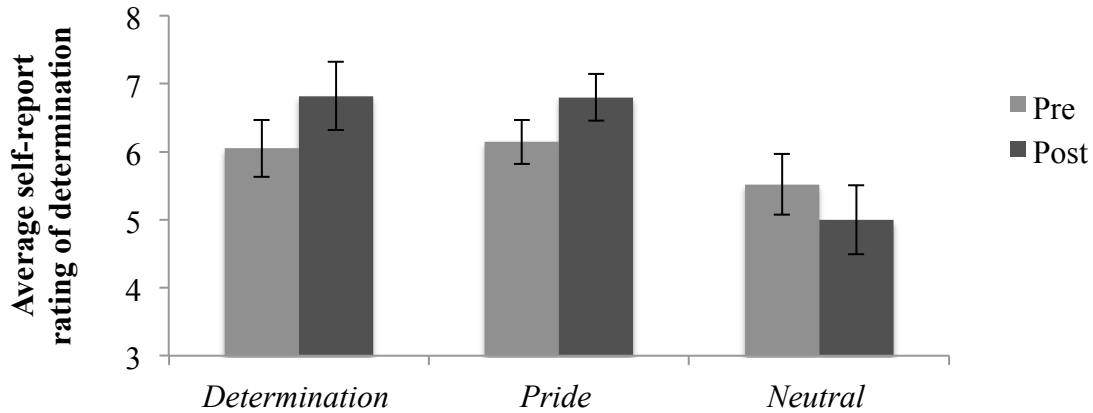
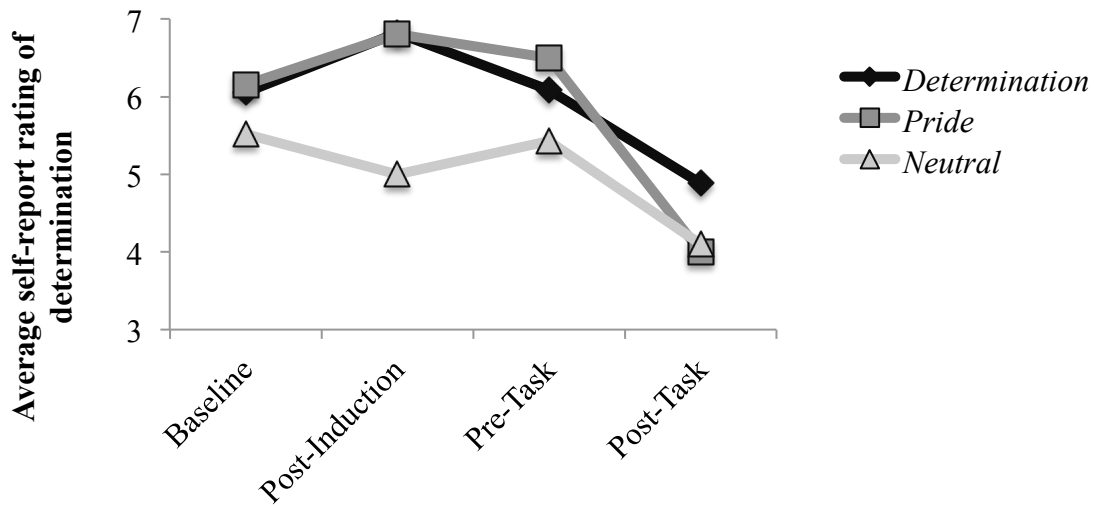


Figure 3: Pre- and Post- Induction Ratings of Determination by Emotion in Exp. 1

Follow-up comparisons were conducted to more completely characterize the pattern of means for the determination manipulation. The *Determination* group exhibited higher levels of determination following the emotion manipulation compared to the *Neutral* group, $t(62)=2.62, p=.01$. However, there was no difference between the *Determination* group and the *Pride* group in terms of ratings of determination following the emotion manipulation, $t(62)=-0.09, p=.93$.

In terms of the time course of the experience of determination, the *Determination* group ($t(41)=0.854, .40$) and the *Pride* group ($t(39)=1.13, p=.26$) did not have significantly higher baseline ratings of determination than the *Neutral* group. Before the task, the *Determination* group did not have significantly higher ratings of determination compared to the *Neutral* group, $t(41)=1.20, p=.24$. However, the *Pride* group did have

significantly higher ratings of determination compared to the *Neutral* group, $t(39)=2.18$, $p=.04$. Following the task, there were no differences in ratings of determination between the *Neutral* group and the *Determination* group ($t(35)=1.20$, $p=.24$), or between the *Neutral* group and the *Pride* group ($t(34)=-0.17$, $p=.87$). See Figure 4.



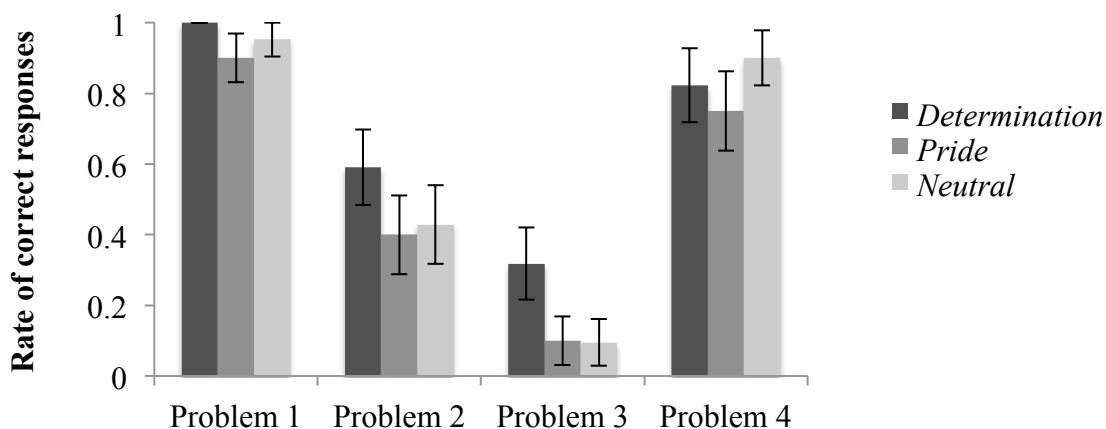
Note. Post-task ratings of determination are highest for the *Determination* group.

Figure 4: Ratings of Determination by Emotion Throughout Exp. 1

Taken together, these manipulation checks suggest that the emotion manipulation for pride was relatively successful, though the effects were not long lasting. In contrast, the emotion manipulation for determination did not successfully distinguish levels of determination between the *Determination* group and the *Pride* group. However, there were differences in reported emotional experience between the *Neutral* group and the positive emotion groups. In summary, one limitation of Experiment 1 was that the determination manipulation did not induce determination.

Was There an Effect of Emotion on Performance?

We originally hypothesized that the *Determination* group would perform better than the *Pride* group. The findings support a main effect of emotion on performance. The *Determination* group performed better than the *Pride* group across all four problems in the math task, although this result only approached significance for Problem 3 and not significant for the other problems. See Figure 5.



Note. For all problems in the task, the *Determination* group performed better than the *Pride* group. However, this was not significant for any of the problems except for Problem 3. There were no significant differences between the positive emotion groups and the *Neutral* group in terms of performance.

Figure 5: Actual Performance on Each Problem by Emotion in Exp. 1

For Problem 3, the *Determination* group was more likely to solve the problem than the *Pride* or the *Neutral* groups. More participants from the *Determination* group ($M=.32$) answered the problem correctly compared to participants in the *Pride* group ($M=.10$), and this finding approached significance, $t(62)=-1.89, p=.06$. We also predicted

that the positive emotion groups would perform better than the *Neutral* group. However, the results did not support this hypothesis, as the *Neutral* group ($M=.08$) was not significantly different from the positive emotion groups in terms of actual performance, $t(62)=1.14, p=.26$.

Follow-up regression analyses were conducted on all of the problems, but they only showed that baseline pride ratings predicted decreased performance on Problem 2, $\beta=-.35, t(62)=-2.17, p=.03$. In other words, the prouder the participant was coming into our experiment, the worse she would perform on Problem 1, the easiest problem in the task. It should be noted that this result may be spurious, as it was only observed for one of the four problems in the task.

Was There an Effect of Emotion on Task Engagement?

Time. The findings from Problem 3, the most difficult problem in the task, support an effect of emotion on perseverance. There was a significant effect of emotion on time taken to complete Problem 3, $F(2,60)=4.37, p=.02$. See Figure 6. We originally hypothesized that determination would be a better motivator of perseverance than pride, as indicated by time spent on problems. The results from the most difficult problem in the task supported this hypothesis. The *Pride* group spent less time on Problem 3 than the *Determination* or the *Neutral* groups. The *Determination* group ($M=7.12$) took significantly more time to complete Problem 3 relative to the *Pride* group ($M=3.14$), $t(62)=-2.95, p<.01$. Notably, this effect was only observed in the most difficult problem, suggesting that the effects of emotion on perseverance are only relevant under conditions of high difficulty.

Along with the effect of emotion on time, it should be noted that the *Determination* group was also most likely to solve Problem 3 compared to the other groups. See Figure 7. There were no significant differences in time spent on Problem 1, Problem 2, or Problem 4 between the *Determination* and the *Pride* groups.

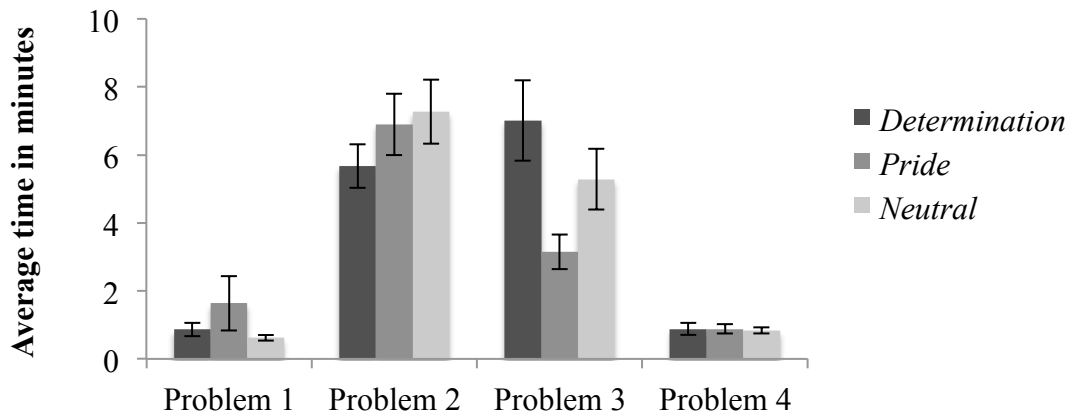
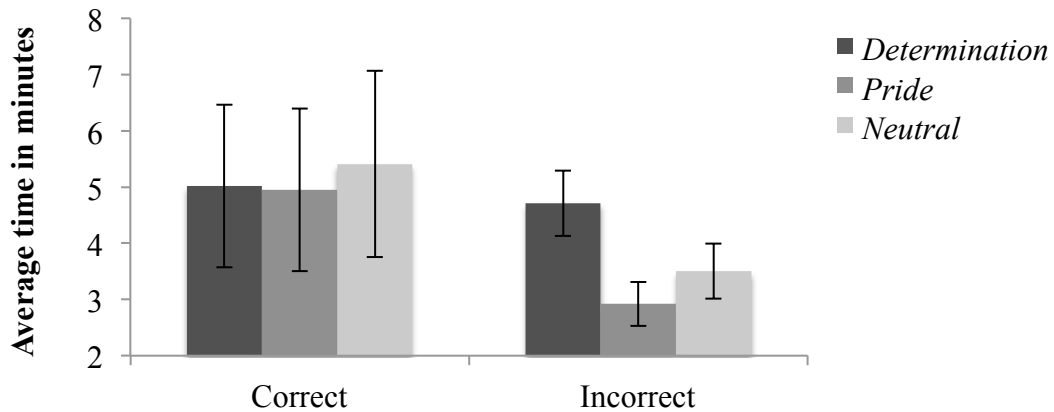


Figure 6: Time Spent on Each Problem by Emotion in Exp. 1



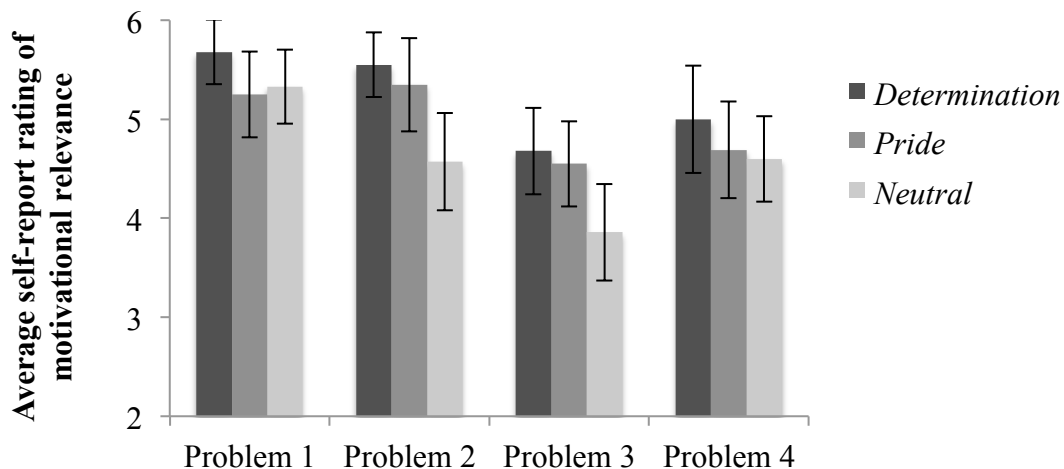
Note. Participants who answered Problem 3 correctly spent approximately the same amount of time on the problem, whereas participants who answered incorrectly exhibited an effect of emotion on time.

Figure 7: Time Spent on Problem 3 by Emotion and Performance in Exp. 1

We also predicted that, jointly, the positive emotion groups would exhibit greater perseverance than the *Neutral* group, but this hypothesis was not supported. There were no significant differences in time spent on any of the problems between the positive emotions groups and the *Neutral* group.

Appraisal ratings. Although the results of the performance variables did not support the hypothesis for a general effect of positive emotion, the results of ratings of motivational relevance supported the hypothesis that the positive emotion groups would show more task engagement compared to the *Neutral* group. There were no significant differences in ratings of anticipated effort or ratings of coping potential between groups for any of the problems in the task.

For all of the problems in the task, the *Determination* and the *Pride* groups jointly reported higher levels of motivational relevance compared to the *Neutral* group, although these results were not significant. See Figure 8.

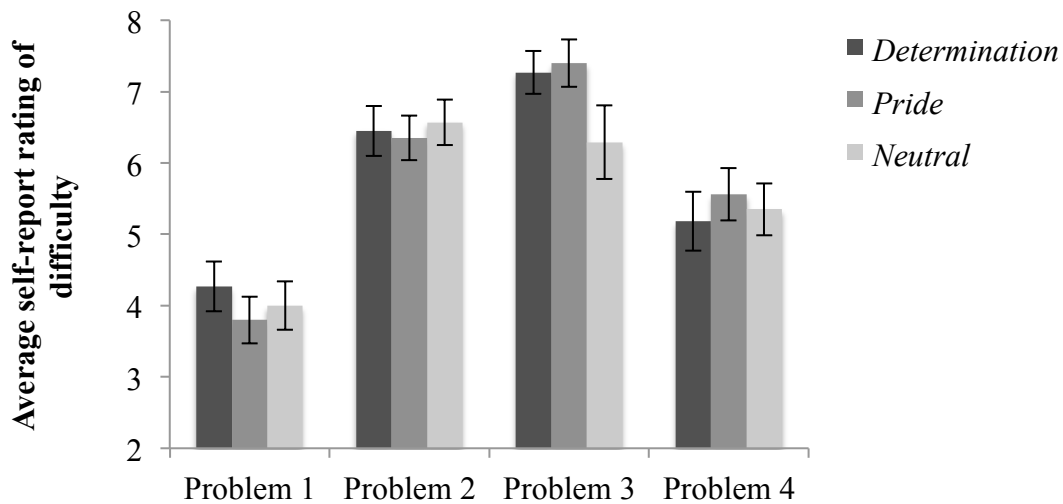


Note. There was a marginally significant difference in motivational relevance between the *Neutral* group and the positive emotion groups for Problem 2.

Figure 8: Ratings of Motivational Relevance for Each Problem by Emotion in Exp. 1

For Problem 2, there was a marginally significant effect of positive emotion on ratings of motivational relevance, suggesting that the *Determination* and the *Pride* groups were more engaged than the *Neutral* group. For Problem 2, the *Neutral* group ($M=4.44$) found the problem to be less relevant to their goals compared to the *Determination* group ($M=5.56$) and the *Pride* group ($M=5.35$), $t(62)=1.66$, $p=.10$.

Interestingly, the *Neutral* group ($M=6.29$) found Problem 3 to be less difficult compared to participants in the *Determination* group ($M=7.27$) and the *Pride* group ($M=7.40$), $t(62)=2.17$, $p=.03$. See Figure 9.



Note. For Problem 3, there was a significant difference between the *Neutral* group and the positive emotion groups with regards to ratings of difficulty.

Figure 9: Ratings of Difficulty for Each Problem by Emotion in Exp. 1

This suggests that, for the most difficult problem in the task, participants in the positive emotion groups were more accurately rating the problem as very difficult compared to the *Neutral* group. It may be the case that, for the *Determination* group, appraisals of high

difficulty do not impact perseverance or task engagement. However, for the *Pride* group, high ratings of difficulty may be related to decreases in perseverance, as indicated by the results from time spent on Problem 3.

What Happens When We Add Ratings of Determination and Pride as Covariates?

As evidenced from the above results, Problem 3 is a crucial point in the math task in terms of observing the effects of emotion. Were these effects a result of the pride induction? We included baseline and post-induction measures of pride as covariates in an attempt to address this question. If we observed the effects from Problem 3 becoming less significant, we could then deduce that the covariate notably weakens the effect, implying that the covariate is driving the observed effect. First, baseline pride ratings were added into the MANOVA as a covariate, and the logic for this was to observe if baseline pride ratings, rather than post-induction pride ratings, would explain the results we observed. Then, both baseline and post-induction pride ratings were added into the MANOVA together as covariates in the analyses to see if post-induction pride ratings were driving the effects of emotion. In other words, were baseline or post-induction ratings of pride predictive of the effects observed in the present experiment? The same analyses were performed with baseline and post-induction determination ratings.

Baseline pride as a covariate. Adding baseline pride ratings into the original MANOVA and contrast analyses as a covariate, the main effect of emotion on motivational relevance was no longer marginally significant, $t(62)=-1.62, p=.11$. The other significant and marginally significant main effects of emotion, as well as the interaction effects, were not impacted by adding baseline pride ratings as a covariate in the analysis.

Baseline and post-induction pride as covariates. Through the addition of both baseline and post-induction pride ratings into the original MANOVA and contrast analyses as a covariate, the main effect of emotion on actual performance became non-significant, $t(62)=-1.67, p=.10$. The original main effect of emotion on time remained significant after incorporating both baseline and post-induction ratings of pride as covariates. There was no impact on the beta weights associated with any of the variables except for motivational relevance, but again, the effect of motivational relevance already became non-significant after adding only baseline prides ratings as a covariate.

Baseline determination as a covariate. Adding baseline determination ratings into the original MANOVA and contrast analyses as a covariate, the main effect of emotion on motivational relevance became non-significant, $t(62)=1.62, p=.11$. Adding baseline determination ratings as a covariate in the analysis did not impact the other significant effects of emotion.

Baseline and post-induction determination as covariates. Adding post-induction determination ratings as a covariate in the analysis did not impact the significance of the main effects of emotion. Again, there was no impact on the beta weights associated with any of the variables other than motivational relevance.

By separately adding in ratings of pride and determination into the analyses as covariates, we observed which manipulation had a greater impact on the significant findings in the data. Comparing the covariate analyses, it seems that the pride manipulation partially accounted for much more of the difference in analyses compared to the determination manipulation. However, the determination manipulation still accounted for some of the difference in analyses. To be specific, the pride manipulation

drove the effects of emotion on performance and motivational relevance, whereas the determination manipulation only impacted the effect of emotion on motivational relevance. We concluded that post-induction ratings of pride were more predictive of the effects of emotion observed in Experiment 1, with pride decreasing task engagement.

The main limitation of Experiment 1 was the failure of the emotion manipulations to induce exactly what we intended. In particular, the determination manipulation did not induce determination, although the pride manipulation did induce significant increases in the experience of pride. This may have been because the piloting of the imagery task used a within-subjects design, whereas the actual study adhered to a between-subjects design. In other words, our pilot study may have demonstrated significant increases in determination and pride following the determination and pride manipulations, respectively, because participants were unintentionally comparing vignettes. For example, the determination manipulation may have been subconsciously rated as increasing feelings of determination more than the pride manipulation.

CHAPTER III

EXPERIMENT TWO

In Experiment 1, many of the results we observed were only marginally significant. In Experiment 2, we aimed to better observe the differential effects of determination and pride on performance, perseverance, and engagement by refining our methods. Specifically, we addressed the main limitation of Experiment 1 by improving the emotion manipulations and using a between-subjects pilot study to test the vignettes before collecting any data. Furthermore, based on the literature on self-efficacy, we suspected that emotion would not be the only variable impacting performance, perseverance, and engagement in the math task.

Aside from emotional experience, there are other factors that modulate performance, perseverance, and engagement. In his seminal research, Albert Bandura described how expectations about self-efficacy, which are influenced by performance accomplishment and emotional arousal, determine whether coping behavior will be used; how much effort will be spent; and perseverance (Bandura, 1977). Confidence in one's own abilities provides a feeling of self-efficacy when confronted with a difficult task or stressful situation, and this self-efficacy is likely similar to the appraisals of problem-solving coping potential that elicit determination. Smith and Kirby (2009) demonstrated how, when a task was relatively easy, there were no differences in coping potential across varying math ability. However, with a difficult task, coping potential was significantly greater within the higher levels of confidence in math ability. This difference in coping

potential could be important because research has demonstrated how too much difficulty relative to skill leads to disengagement (Deci & Ryan, 2000). If difficulty exceeds skill level, a task will likely enhance stress and thereby require elevated coping potential to maintain engagement. Indeed, under difficult conditions, increased confidence in math ability has been correlated with higher appraisals of problem-focused coping potential, increased feelings of determination, reduced resignation, and increased likelihood of correctly solving a problem (Smith & Kirby, 2009).

Based on the previous literature, we added to our original hypotheses by further hypothesizing that math confidence would enhance the effects of emotion on performance and task engagement. Thus, we predicted an interaction effect of emotion and confidence. In particular, we predicted that the effects of emotion would be stronger in more confident participants such that more confident participants in the *Determination* group would demonstrate the most success, perseverance, and engagement.

Method

Participants

77 undergraduate students from Vanderbilt University participated in Experiment 2 (81.8% female). They ranged in age from 18 to 22 years old ($M=18.87$, $SD=0.98$). Participants were 64.9% White, 16.9% Asian, 10.4% African American, and 2.6% listed themselves as “Other”. In our sample, 5.2% of the participants identified as being of Hispanic or Latino ethnic origin. In our sample, 79.2% of participants had taken high

school level calculus, with 45.5% going on to take college level calculus.

Procedure

Experiment 2 used the same procedures as Experiment 1, with important changes to the vignettes used in the emotion manipulation.

Emotion manipulation. The original auditory imagery vignettes were modified for the purpose of Experiment 2. Each vignette was again recorded as a separate track and transferred onto an iPod, and this was how the vignettes were presented to participants. A between-subjects pilot study, in which each participant listened to and rated one of the vignettes, was conducted to confirm that each vignette induced the appropriate emotion. The results from piloting affirm this. Transcriptions of each vignette are included below.

Determination vignette. “You are sitting in class, anticipating the handout of your midterm exam. You know this is going to be a difficult midterm, but you studied throughout the weeks to prepare. You think of the exam as a task to be overcome, and you consider yourself someone who has the potential to do well. Right now, you are eager to start the midterm. When the professor finally hands you the midterm, you flip open the exam and begin, determined to try hard and do your best on each question.”

Pride vignette. “You are sitting in class, anticipating the return of a midterm you took a few weeks ago. When the professor finally hands you your graded midterm, you can see that you got an A+ and thoroughly aced the exam! You give yourself a mental pat on the back because you know that you are the one responsible for your current academic achievement. As your professor finishes handing back the exams, you sit back and relax in your seat, reveling in your recent success.”

Neutral vignette. “You have just entered your local grocery store to embark on a trip to pick up some items for the upcoming week. You take your time, thinking about what you want to cook throughout the week and what ingredients you will need. As you go through the aisles, you slowly check off items on your grocery list. You have listed some essential staples and some snack foods that you like to eat between meals. You carefully go through the list once more before heading to the checkout lines to pay for your goods.”

Measures

The same measures from Experiment 1 were used in Experiment 2. Differences in how participants were partitioned into math confidence groups are described below.

Math confidence. On a scale from 0 to 100 with 0 being much worse than average and 100 being much better than average, participants rated themselves as disliking math slightly more than their average peer ($M=46.68$, $SD=28.49$). On the same scale, participants also rated themselves as slightly better at math than their average peer ($M=57.69$, $SD=19.41$). We calculated a math confidence score for each participant by averaging these two items. This yielded a two-item math confidence scale with an alpha reliability of .71. A median split was taken so as to divide participants into two groups (*Low confidence* or *High confidence*) based on math confidence. The median occurred at a score of 58.5. The highest score from the *Low confidence* group was 58 while the lowest score from the *High confidence* group was 59. One participant scored a 58.5 and therefore was not assigned to either the *Low confidence* or *High confidence* group.

Analysis

Data retention. For Problem 3, 2 participants were excluded from the analyses because they did not have enough time to finish the task in the allotted 15 minute timespan and were therefore kicked out of the task after time ran out. For Problem 4, 23 participants were not included in the analyses because they ran out of time for the task.

Data analysis. The same multivariate analysis and follow-up regression approach from Experiment 1 was used to analyze the data in Experiment 2.

Due to an unforeseen limitation with the math task, we will be presenting all four problems in the task, but we will not be discussing the last problem (Problem 4) in the task. This is because 29.9% of participants were unable to complete the task. Thus, the high rate of attrition calls into question the interpretation of any results from Problem 4.

Results

Did the Vignettes Induce the Appropriate Emotions For Each Condition?

Pride. The experience of pride was significantly different across the three conditions, $F(2,73)=26.96, p<.01$. See Figure 10. Contrasts showed that the *Pride* group ($M=7.91$) experienced higher levels of pride following the emotion manipulation compared to the other two groups, $t(76)=7.30, p<.001$. There were no differences in ratings of pride between the *Determination* group ($M=4.15$) and the *Neutral* group ($M=3.50$), $t(76)=0.78, p=.44$.

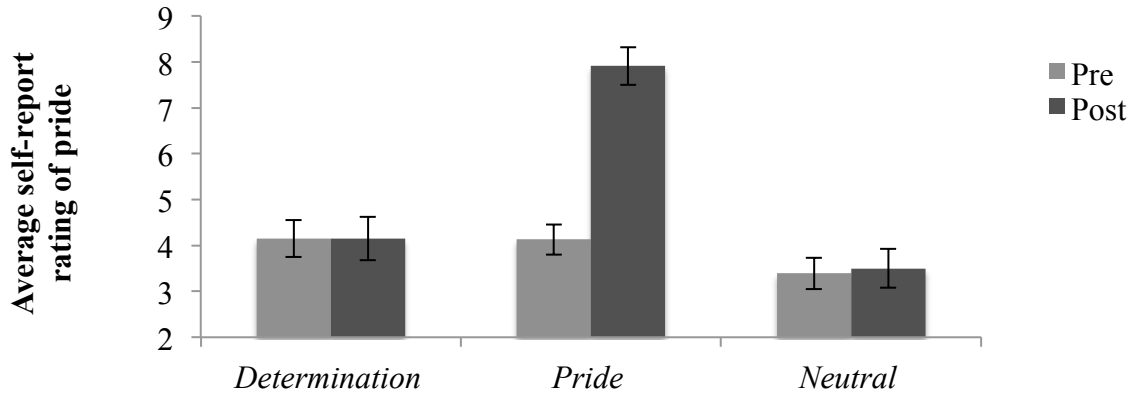
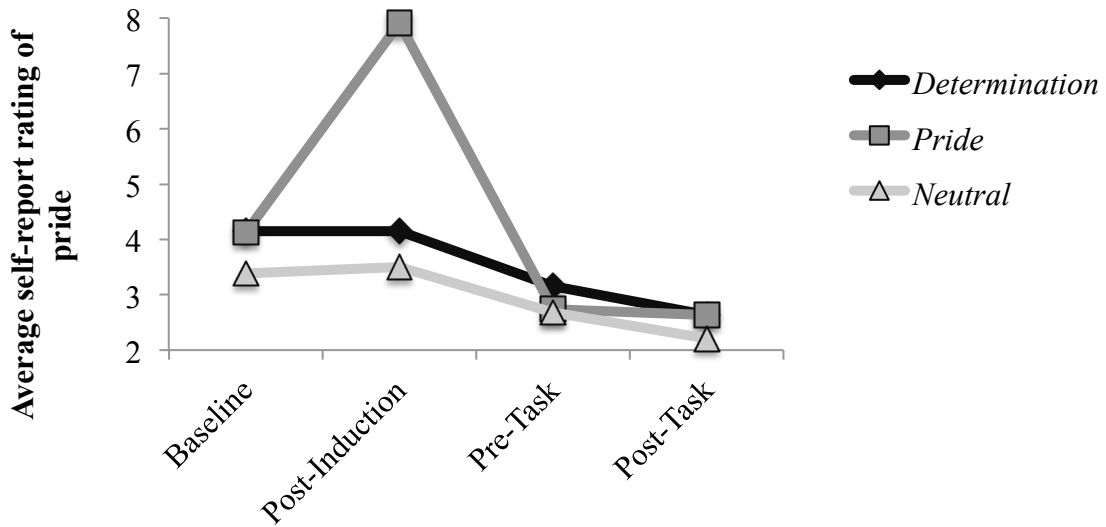


Figure 10: Pre- and Post- Induction Ratings of Pride by Emotion in Exp. 2

Similar to what we observed in Experiment 1, the *Pride* group did not rate their experience of pride to be significantly different compared to the *Determination* or *Neutral* groups either before or after the task. See Figure 11.



Note. The *Pride* group reported feeling the most pride following the mood induction.

Figure 11: Ratings of Pride by Emotion Throughout Exp. 2

Determination. The experience of determination was significantly different across the three conditions, $F(2,73)=6.71, p<.01$. See Figure 12. Contrasts showed that the *Determination* group ($M=7.19$) experienced higher levels of determination following the emotion manipulation compared to the other two groups, $t(76)=2.01, p<.05$. Although we would have liked to see that there were no differences in ratings of determination between the *Pride* group and the *Neutral* group, the *Pride* group ($M=7.00$) rated levels of determination following the induction significantly higher compared to the *Neutral* group ($M=5.57$), $t(76)=-2.93, p<.01$.

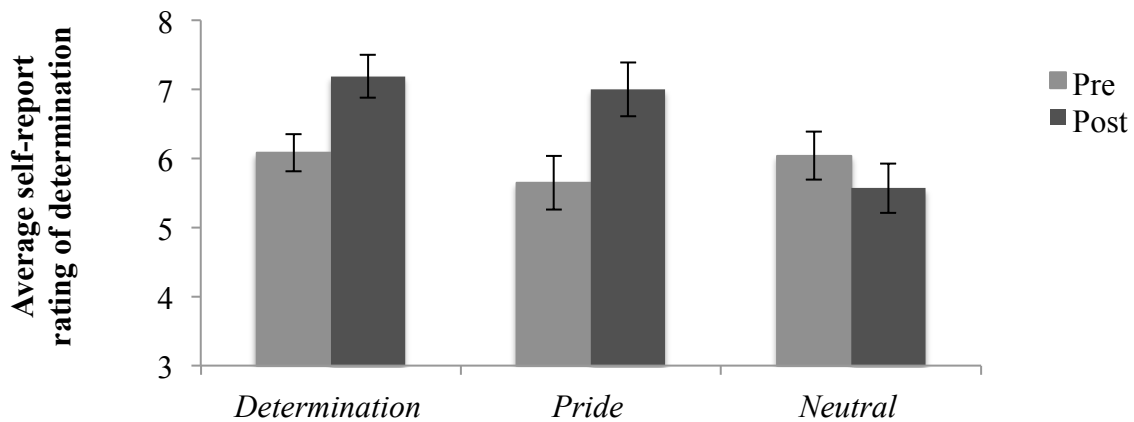
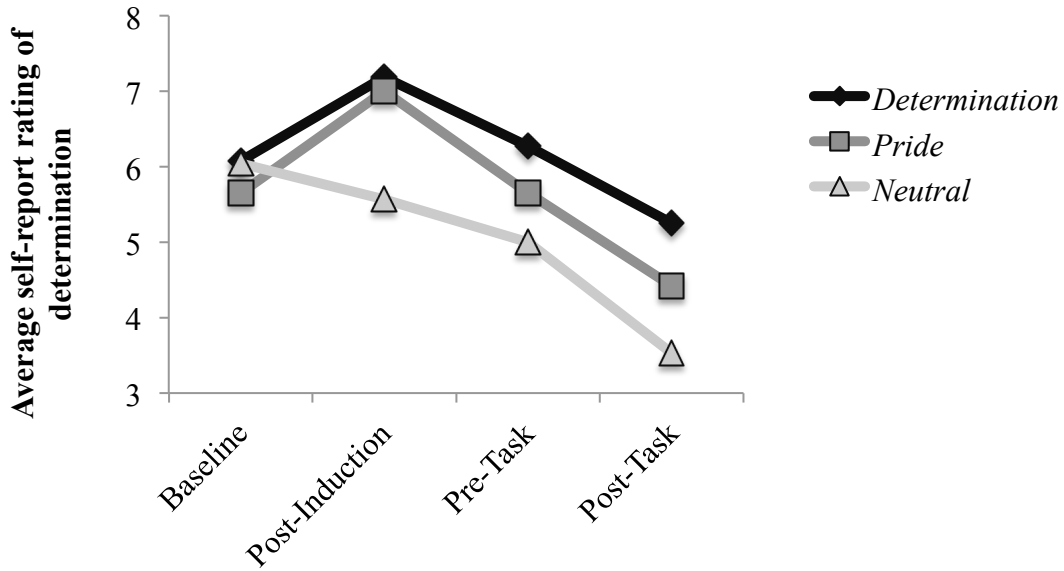


Figure 12: Pre- and Post- Induction Ratings of Determination by Emotion in Exp. 2

Follow-up comparisons were conducted to characterize the pattern of means. Post-induction determination ratings were not different between the *Determination* and *Pride* groups, $t(76)=0.26, p=.80$. However, the *Determination* group provided higher ratings of determination compared to the *Neutral* group, $t(76)=3.31, p<.01$.

Although there was no difference in ratings of determination between the *Determination* and the *Pride* groups, the positive emotion groups reported feeling

significantly more determination compared to the *Neutral* group before ($t(75)=2.28$, $p=.03$) as well as after the math task ($t(52)=2.40$, $p=.02$). See Figure 13.



Note. The fluctuation of ratings of determination throughout Experiment 2 is similar to what we observed throughout Experiment 1.

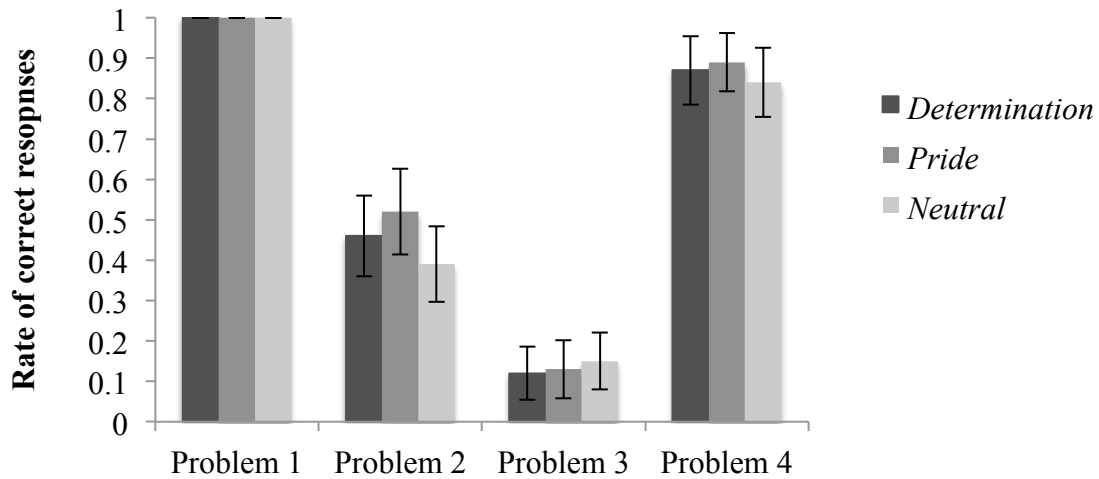
Figure 13: Ratings of Determination by Emotion Throughout Exp. 2

In summary, the vignette for pride was successful in significantly increasing ratings of pride, but it had the unexpected effect of increasing ratings of determination. The vignette for determination significantly increased ratings of determination without increasing ratings of pride.

Was There an Effect of Emotion on Performance?

We hypothesized that the *Determination* group would perform better than the *Pride* group. Unlike Experiment 1, Experiment 2 did not support this hypothesis, as there

were no significant differences in actual performance between groups for any of the problems in the task. See Figure 14.



Note. Note that all participants answered Problem 1 correctly, although less than 50% of participants answered Problem 2 correctly and less than 15% answered Problem 3 correctly.

Figure 14: Actual Performance for Each Problem by Emotion in Exp. 2

Was There an Effect of Emotion on Task Engagement?

Time. The *Determination* group spent more time on both Problem 1 and Problem 2 than the *Pride* or *Neutral* groups, although there were no significant differences between groups for Problem 1. See Figure 15. Time spent on Problem 2 was significantly different across the three conditions ($F(2,74)=4.08, p=.02$). This supported our original hypothesis that the *Determination* group would be a better motivator of perseverance than the *Pride* group. In particular, the *Determination* group ($M=7.89$) spent significantly more time on Problem 2 compared to the *Pride* group ($M=5.43$), $t(76)=2.65, p=.01$. There

were no significant differences between the positive emotion groups and the *Neutral* groups in terms of time spent on the problems.

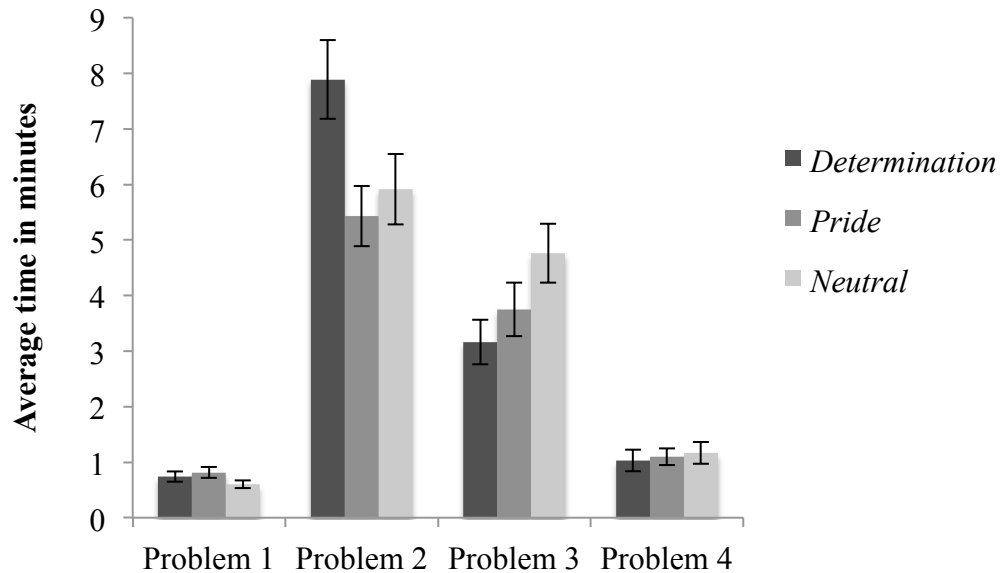


Figure 15: Time Spent on Each Problem by Emotion in Exp. 2

Notably, the effect of emotion on time observed in Problem 2 is very similar to what was observed for Problem 3 in Experiment 1. Both problems were the more difficult ones in the task, but we see the effect appear earlier in the task and for an easier problem in Experiment 2. Recall that Problem 3 was the most difficult problem, with Problem 2 being the next most difficult problem. Differences in the samples may explain differences between experiments. In particular, 92.0% of participants in Experiment 1 had completed high school level calculus, compared to 79.2% of participants in Experiment 2. Thus, the problems may have been more difficult for participants in Experiment 2 such that the differential effects of emotion come out in an easier problem compared to in Experiment

1. With the higher level of skill among participants in Experiment 1, we may not have observed any effects of emotion in Problem 2 simply because the problem was more accessible to more of the participants. Moreover, Problem 3 may have been just too difficult for our less mathematically proficient participants in Experiment 2, such that more participants were disengaging from the problem.

Appraisal ratings. We hypothesized that the positive emotion groups would demonstrate more task engagement than the *Neutral* group. Thus, the *Determination* and the *Pride* groups would have shown enhanced signs of engagement compared to the *Neutral* group. The results supported this hypothesis. Ratings of effort for Problem 2 were different across the three conditions, and this result was marginally significant ($F(2,74)=2.67, p=.08$). See Figure 16. The positive emotion groups ($M=6.49$) reported anticipating to expend more effort on Problem 2 than the *Neutral* group ($M=5.70$), $t(76)=2.30, p=.02$. Follow-up regression analyses revealed that pre-task determination ratings predicted ratings of effort for Problem 2, $\beta=.30, t(74)=2.33, p=.02$. There were no other significant differences in ratings of effort between groups.

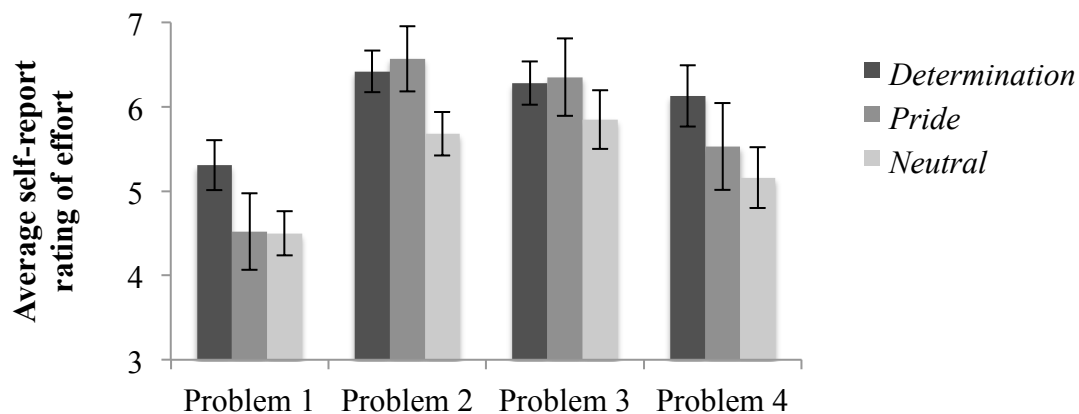
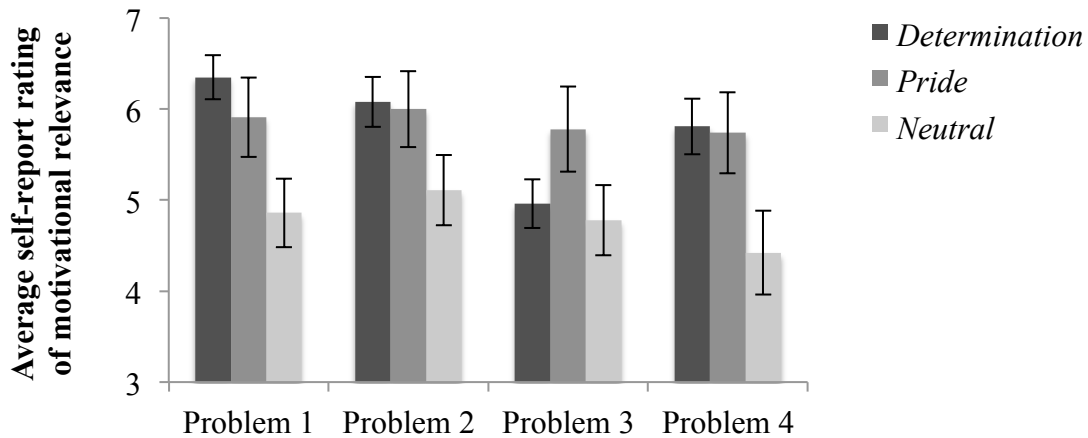


Figure 16: Ratings of Effort for Each Problem by Emotion in Exp. 2

Although there were no significant differences in motivational relevance between the *Determination* group and the *Pride* group, ratings of motivational relevance were significantly different across the three conditions for Problem 1 ($F(2,74)=4.87, p=.01$) and Problem 2 ($F(2,74)=4.01, p=.02$). See Figure 17. The positive emotion groups reported Problem 1 ($t(76)=2.97, p<.01$) and Problem 2 ($t(76)=2.14, p=.04$) to be more relevant to their motivational goals compared to the *Neutral* group.



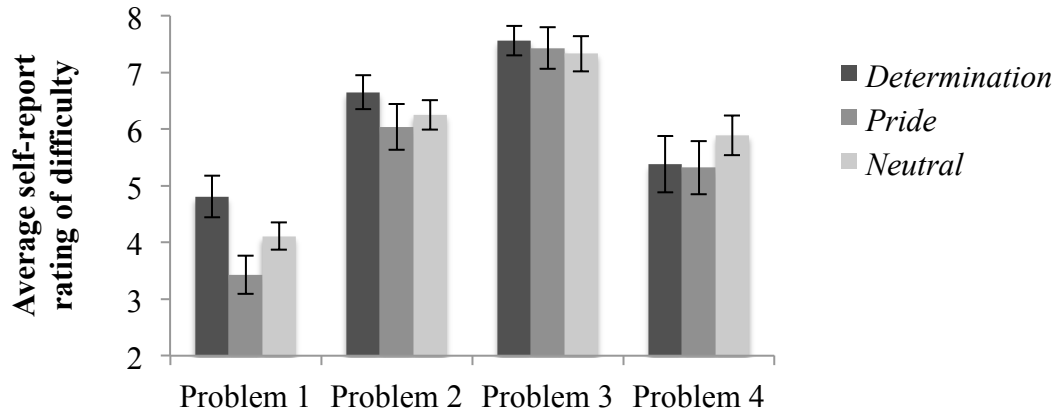
Note. The positive emotion groups found both Problem 1 and Problem 2 to be significantly more relevant to their goals compared to the *Neutral* group.

Figure 17: Ratings of Motivational Relevance for Each Problem by Emotion in Exp. 2

This replicates the findings for motivational relevance from Experiment 1. Follow-up regression analyses revealed that pre-task determination ratings predicted greater motivational relevance for Problem 1 ($\beta=.34, t(75)=2.72, p<.01$), Problem 2 ($\beta=.49, t(74)=4.11, p<.001$), and Problem 3 ($\beta=.39, t(73)=3.16, p<.01$).

Interestingly, the *Pride* group ($M=3.43$) found Problem 1 to be less difficult compared to the *Determination* group ($M=4.81$), $t(76)=2.99, p<.01$. Nonetheless, keep in

mind that there were no actual differences in performance on Problem 1 between groups, as all three groups answered correctly. See Figure 18.



Note. Aside from Problem 1, there were no significant differences in ratings of difficulty between groups.

Figure 18: Ratings of Difficulty for Each Problem by Emotion in Exp. 2

What Happens When We Add Ratings of Determination and Pride as Covariates?

Almost all of the significant effects of emotion on perseverance and engagement occurred for Problem 2. We ran the same covariate analyses performed in Experiment 1 to observe whether the effects from Problem 2 were the result of the determination induction, the pride induction, or both. Adding baseline ratings of pride and determination as individual covariates in separate analyses did not impact the significant effects of emotion.

Baseline and post-induction pride as covariates. The addition of both baseline and post-induction ratings of pride as covariates in the original analyses had an effect on the significance of some findings. In particular, the effect of emotion on ratings of effort

became only marginally significant, $t(76)=1.76, p=.08$. The effect of emotion on ratings of motivational relevance became non-significant, $t(76)=1.41, p=.16$. Adding baseline and post-induction pride ratings as covariates did not impact the significant effect of emotion on time spent on Problem 2.

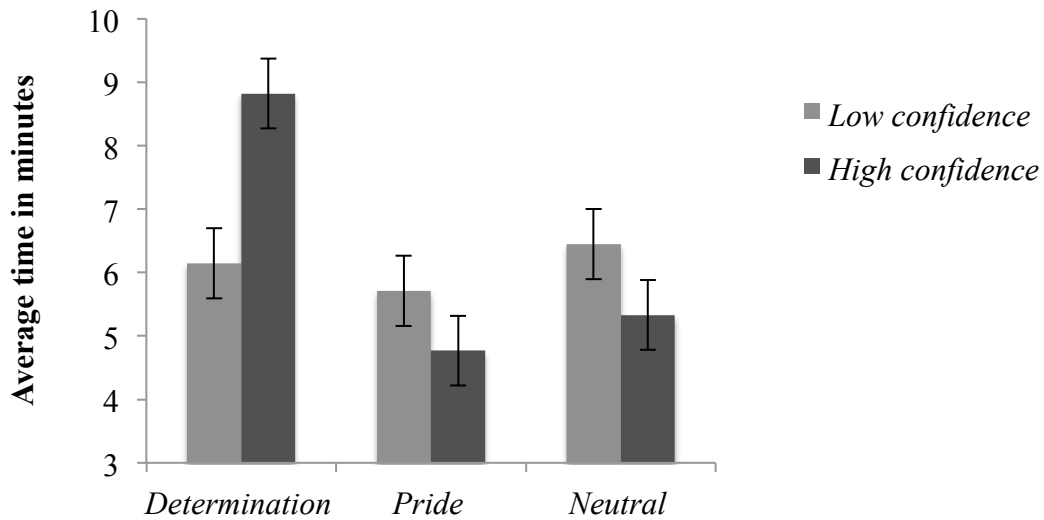
Baseline and post-induction determination as covariates. The addition of both baseline and post-induction ratings of determination as covariates in the original analyses had an effect on the same findings affected by adding ratings of pride as covariates. The effect of emotion on ratings of effort became non-significant, $t(76)=1.65, p=.10$. The effect of emotion on ratings of motivational relevance became marginally significant, $t(76)=1.71, p=.09$. Adding baseline and post-induction determination ratings as covariates did not impact the significant effect of emotion on time spent on Problem 2.

Comparing the covariate analyses in the two experiments, the determination manipulation seemed to play a larger role in Experiment 2 than in Experiment 1. To be precise, in Experiment 1, the covariate analyses suggested that the determination manipulation only drove the effect of emotion on ratings of motivational relevance. In contrast, the regression analyses from Experiment 2 showed that the determination manipulation was responsible for the effect of emotion on ratings of effort as well as on ratings of motivational relevance.

Did Emotion Interact with Confidence to Affect Performance or Task Engagement?

We hypothesized that math confidence would enhance the effects of emotion, with confident participants in the *Determination* group demonstrating better performance and enhanced task engagement. Although our results did not support an interaction effect

on performance, we did observe an interaction effect of emotion and confidence on engagement, as indexed by time spent on Problem 2, that supported our original hypothesis. See Figure 19.

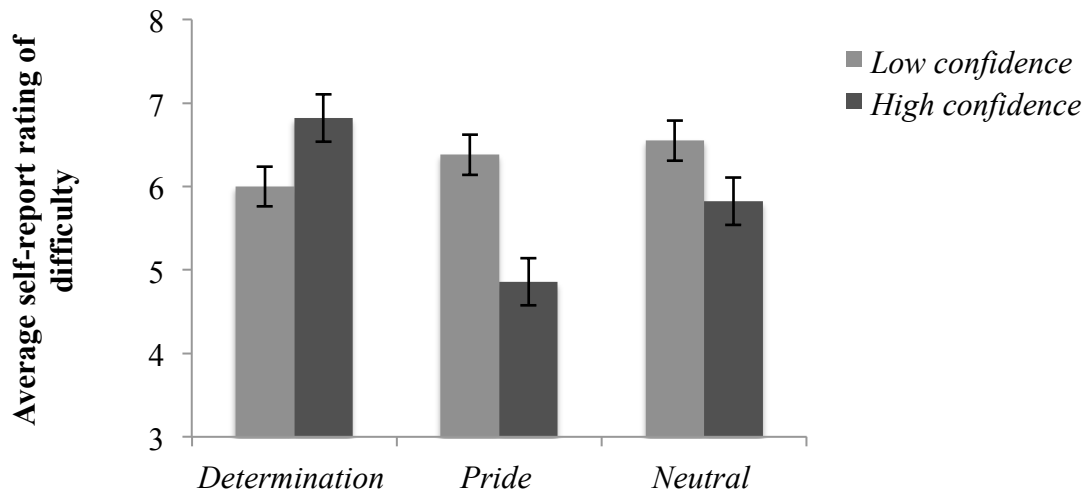


Note. There was a marginally significant interaction effect of confidence and emotion on time for Problem 2.

Figure 19: Time Spent on Problem 2 by Emotion and Confidence in Exp. 2

Specifically, confident participants in the *Determination* group ($M=8.82$) spent more time on Problem 2 compared to less confident participants in the *Determination* group ($M=6.15$) and confident participants in the *Pride* group ($M=4.77$), $t(74)=-1.80$, $p=.08$. This result remained marginally significant after controlling for actual performance, $t(74)=-1.79$, $p=.08$. Confident participants in the *Determination* group may represent individuals with higher trait levels of determination, or grit, compared to other groups as well as less confident participants in the *Determination* group.

Interestingly, confident participants in the *Pride* group ($M=4.86$) rated Problem 2 as less difficult than confident participants in the *Determination* group ($M=6.82$). This result became more significant after including actual performance on Problem 2 as a covariate, $t(74)=-2.28, p=.03$. See Figure 20. There were no other significant interaction effects.



Note. There was an interaction effect of confidence and emotion on ratings of difficulty for Problem 2, $t(74)=-2.18, p=.03$.

Figure 20: Ratings of Difficulty for Problem 2 by Emotion and Confidence in Exp. 2

The interaction effects with time and difficulty support the idea that there are two facets of pride: authentic pride and hubristic pride (Tracy & Robins, 2007). Less confident participants in the *Pride* group may represent authentic pride, which is associated with fulfillment and characterized by attributing success to effort. In contrast, confident participants in the *Pride* group may be more hubristically proud, which is associated with arrogance and tendencies to attribute success to innate ability.

Importantly, Experiment 2 did not manipulate these separate variants of pride, and therefore, conclusions on this topic are purely speculative. However, the observed patterns support this speculation because hubristically proud participants, perhaps like the confident participants in the *Pride* group, tend to be smug and thereby would be reluctant to admit that a problem was difficult. In contrast, authentically proud participants, like the less confident participants in the *Pride* group, would be more likely to accurately evaluate a difficult problem as difficult. Indeed, the ratings of difficulty for Problem 2 provided by less confident participants in the *Pride* group are congruent with the ratings of difficulty provided by the *Determination* and the *Neutral* groups, whereas the ratings provided by confident participants in the *Pride* group are markedly lower.

A major limitation of Experiment 2 is that 29.9% of participants were unable to complete the task because they ran out of time. Although there was no systematic effect of emotion on task completion, results from Problem 4 were not analyzed due to the high attrition rate. This was an unforeseen limitation, as we did not encounter this problem with time during Experiment 1.

The findings from Experiment 2 replicated the effects of emotion on time and motivational relevance observed in Experiment 1. In particular, both experiments demonstrated how determination and pride differentially impact perseverance as indexed by time spent on problem. In terms of appraisal ratings related to task engagement, both experiments showed how the experience of determination and the experience of pride prompted greater appraisals of motivational relevance compared to a neutral condition. Experiment 2 also demonstrated how the experience of positive emotions is a better motivator of effort compared to a neutral condition.

CHAPTER IV

GENERAL DISCUSSION

We originally hypothesized that determination would result in a greater increase in performance, perseverance, and engagement compared to pride. We found that there are significant differences in how determination and pride impact task engagement, with determination serving as a better motivator of engagement compared to pride. The results for performance were not as straightforward. Although Experiment 1 demonstrated a marginally significant effect of emotion on performance, with determination enhancing performance compared to pride, Experiment 2 did not replicate these findings. Thus, based on the present study, we cannot convincingly claim an effect of emotion on performance. However, we observed three compelling effects of emotion on engagement.

The Positive Emotion Effect

The effect of positive emotion on increasing task engagement aligns with the hypotheses of the Broaden-and-Build Theory of Positive Emotions that suggest positive emotions have shared motivational functions and benefits that broaden thought-action repertoires and build on personal resources (Fredrickson, 1998; Fredrickson, 2001). The “positive emotion effect” also supports findings in the positive psychology literature that specify the general benefits of experiencing positive emotions (Danner et al., 2001).

In Experiment 1, there were marginally significant effects of positive emotion on enhancing ratings of motivational relevance and ratings of difficulty for Problem 3. In

Experiment 2, we observed slightly different results. There were significant effects of positive emotion on increasing ratings of effort and ratings of motivational relevance for Problem 2. It is puzzling why we did not observe an effect of positive emotion on ratings of effort in Experiment 1, or an effect on ratings of difficulty in Experiment 2. This may be related to differences between the skill levels of participants between experiments and thereby differences in the difficulty of the problems that generated effects of emotion between experiments. The interaction effect of emotion and math confidence on ratings of difficulty for Problem 2 in Experiment 2 may also explain why we did not see a main effect of positive emotion on difficulty. Thus, the effect was unobservable until we took a closer look at confidence. Importantly, in all of these observed effects, the *Determination* and the *Pride* groups had similar means that were both different from the *Neutral* group.

We also observed effects that are contrary to this positive emotion effect. There were no effects of positive emotion on performance in either experiment. Moreover, there were differences in how each positive emotion impacted time spent on Problem 2 in Experiment 2. Thus, there are limitations to the Broaden-and-Build theory. The present study demonstrated how positive emotions do not always broaden and build nor do they always broaden and build in the identical manner, as shown by the “pride effect” and the “determination effect”.

The Pride Effect

The effect of pride on task engagement converges with previous literature that outlines the distinct characteristics and motivational properties of pride as an emotion (Keltner et al., 2006; Smith & Ellsworth, 1985; Tangney, 1999; Williams & DeSteno,

2008). Appraisal theory states that pride is motivated by appraisals of motivational relevance and motivational congruence. Pride results from personal success, and it reinforces that success, making future perseverance in similar setting more likely. In the context of the math task, the *Pride* group may have seen little incentive to persevere (Williams & DeSteno, 2008). In Experiment 1, the *Pride* group did not persevere through Problem 3, the most difficult problem in the task, after decreased success on Problem 2 compared to Problem 1.

The specific motivational functions of determination and pride may have explained the observed pride effect. Determination is an emotion that is specifically theorized to produce engagement and perseverance, with high problem-focused coping potential as a key appraisal component. Unlike determination, pride is not elicited by the appraisal of high coping potential, and the action tendency associated with pride is more about celebrating success than focusing in on the situation at hand. The ways in which determination and pride motivate success are importantly different—the effects of determination are immediate, whereas pride is more likely to operate over time by rewarding successful efforts so that these efforts are more likely to be employed when needed again in the future. Thus, pride may not motivate effort “in the now” in the way that determination might.

The covariate analyses from both Experiment 1 and Experiment 2 suggest that pride was partially driving the observed effects of emotion. The effects of emotion on appraisal variables such as motivational relevance became less significant after controlling for baseline and post-induction ratings of pride. Although Experiment 1

primarily emphasized the effects of pride on reducing task engagement, Experiment 2 suggested that the experience of pride was not the sole factor that impacted engagement.

The Determination Effect

The effect of determination demonstrated in Experiment 2 converges with appraisal theory, which describes how determination is motivated by appraisals of motivational relevance and motivational incongruence (Smith, 1991). The determined individual may feel more inclined to sustain coping efforts and thereby persevere to improve his or her situation (Ellsworth & Smith, 1988; Smith, 1991). Thus, according to appraisal theory, it makes sense that the *Determination* group spent more time on the problems in the math task compared to the *Pride* group.

Although the covariate analyses from Experiment 1 do not suggest that determination is driving the observed emotion effects, the covariate analyses and the regression analyses from Experiment 2 support the determination effect. Both positive emotion groups experienced increases in determination because of imperfections in the emotion manipulation. Thus, using a regression approach to collapse determination ratings to a continuous scale revealed the effect of determination on task engagement. Specifically, pre-task determination ratings predicted ratings of effort and motivational relevance on Problem 2. Taken together with the covariate analyses, determination and pride played independent roles in impacting task engagement in the present study.

Both the pride effect and the determination effect have crucial implications for the Broaden-and-Build theory. In particular, the present study advocates for a discrete approach to positive emotions. Determination and pride are not the same in terms of the

behaviors that they motivate. We observed differences in task engagement that highlight this distinction, with determination enhancing engagement and pride reducing engagement. Therefore, not all positive emotions serve the same purpose as the Broaden-and-Build theory describes. Moreover, the present study does not support the notion that determination broadens thought-action repertoires. Instead, the experience of determination seems to focus one's attention and effort on the task at hand, whereas other positive emotions like pride do not motivate engagement and perseverance in the same manner.

Limitations and Future Directions

The main limitation of the present study was the lack of clarity for the emotion manipulations, particularly the induction for pride. Although the *Pride* group exhibited a large increase in the experience of pride following the induction, they also reported increased feelings of determination. This may have been because of the similar contexts for the positive emotion vignettes. For the pride vignette, participants were instructed to imagine receiving a graded exam and seeing that they aced it. Pride motivates perseverance by reinforcing prior successes, and participants were informed in the consent that they would be completing a problem-solving task. Thus, we induced pride in our participants and then provided a context for them to reinforce their recent imagined success.

An interesting observation in the present study is that the effect of the pride induction on the experience of pride was robust but fleeting. Notably, the effect of the pride induction on the experience of determination was relatively stable in comparison.

Although the *Pride* group reported significant increases in the experience of pride following the induction, the effect of the emotion manipulation on self-reported emotional state disappeared by the time participants started the math task. Yet, there were still significant effects of pride on task engagement. This suggests that even though the subjective experience may not have been long lasting, some residue of experiencing pride existed and pride's motivational tendency was sustained throughout the task.

Another limitation of the present study is that it does not examine the variants of pride, particularly authentic versus hubristic pride. Authentic pride is associated with fulfillment and productivity; in contrast, hubristic pride is associated with arrogance and smugness (Tracy & Robbins, 2007). The *Pride* group may have experienced increases in determination following the mood induction because of authentically proud participants in the group. However, because this was not explicitly observed or manipulated in the present study, we can only speculate on how these two facets of pride may have impacted the results.

Before moving forth with future research, it is important to re-examine the vignettes because the flaws in the emotion manipulation may explain some of the differences between Experiment 1 and Experiment 2. Thus, a follow-up experiment will use two new pride vignettes in addition to the determination and neutral vignettes from Experiment 2. The purpose of constructing new pride vignettes is two-fold. First, we intend to address the limitations of the pride vignette that are attributed to its similarity with the determination vignette. In other words, we intend to make the situational context of the determination and pride vignettes less similar. Second, we intend to construct two pride vignettes to differentiate between authentic and hubristic pride, which may explain

the interaction effects of emotion and math confidence that we observed in Experiment 2.

A final limitation of the present study is that the math task was sub-optimally designed to measure perseverance at a problem-by-problem level. Participants were given 15 minutes to complete the task. In Experiment 2, we observed that a non-trivial proportion of participants were taking their time on the first half of the task, and then either rushing through the second half of the task or running out of time on the last problem. This may explain some of the observed differences between Experiment 1 and Experiment 2, as the significant results from Experiment 1 may have been in a different context than the significant results from Experiment 2. In our follow-up experiment, we will amend the math task such that participants will be given the same time limit on each problem so that we may observe how participants persevere on each problem.

Conclusion

The present study supports the differentiation of positive emotions. In the context of a problem-solving task, we found a pride effect of decreased task engagement and a determination effect of increased engagement. The pride effect seemed more stable compared to the determination effect; both experiments supported the pride effect, whereas the determination effect was only supported in Experiment 2. Although we found overlap in the ways determination and pride impact task engagement, the present study rejects the alternative that all positive emotions are generally the same. Instead, we conclude that discrete positive emotions have similarities and differences in how they impact task engagement. Future work should use this approach of observing behavior to differentiate between the diverse range of positive emotions.

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