MENTAL CONTRASTING AND COGNITIVE DISSONANCE:

A COMMON MECHANISM?

by

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(Under the Direction of Leonard L. Martin)

ABSTRACT

The action-based model of cognitive dissonance (Harmon-Jones, 1999) and mental contrasting (Oettingen, 1996) share a number of similarities. Both depend on a form of motivational inconsistency producing arousal, moderated by various subjective expectations. In the dissonance tradition, arousal and subsequent behavioral effects are moderated by expectations about whether some action or belief was freely chosen. In mental contrasting, arousal and behavioral effects are moderated by expectations of success about some desired goal. To examine whether each theory would operate similarly in the same context, participants induced to use mental contrasting or experience dissonance were compared to control conditions in two experiments. In Study 1 I examined whether mental contrasting and cognitive dissonance would replicate earlier work on arousal and performance effects (Zajonc & Sales, 1966). In Study 2 I expanded on this procedure by manipulating participant's subjective expectations with regard to each theory. Hypotheses in Study 1 were unconfirmed, though those in Study 2 received partial support. Shortcomings and recommendations for future research are discussed.

INDEX WORDS: cognitive dissonance, mental contrasting, cognitive consistency

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CHAPTER 1

INTRODUCTION

The areas of cognitive consistency and self-regulation seek to answer some of the broadest and most fascinating questions about thinking, behavior, and motivation. In this paper I propose two studies investigating connections between two such theories: mental contrasting as elaborated in fantasy realization theory (Oettingen, 1996), and the action-based model of cognitive dissonance (Harmon-Jones, 1999). Because of the broad subject matter addressed by each of these theories, it is unsurprising that they should bear some resemblance to each other. However, the similarities appear to suggest a common underlying mechanism. Specifically, I propose that each theory's effects incorporate the same kind of motivational inconsistency producing a non-specific arousal syndrome, which is moderated by subjective expectations of plausibility. I will begin by describing mental contrasting. Then, I will describe the action-based model of cognitive dissonance. Next, I will outline what seems to be the mechanism common to these two theories. Finally, I will propose two studies designed to test aspects of this common mechanism.

What is Mental Contrasting?

Mental contrasting is a self-regulatory technique identified in fantasy realization theory (Oettingen, 1996). The theory first describes two general ways we all think about the future: expectations of outcomes and free fantasies that are not connected to reality (e.g. imagining oneself to be a movie star). In light of this distinction, Oettingen (1996) proposes three kinds of self-regulatory thoughts which have differing implications for goal-commitment: indulging,

dwelling, and mental contrasting. First, indulging refers to fantasizing about the future in a way that may or may not be well-rooted in reality (e.g. imagining receiving a job promotion or becoming a superhero like Batman). As a result, only the positive incentive value of a goal predicts subsequent goal commitment. Second, dwelling refers to focusing only on the negative aspects of impending reality (e.g. the dread of working long hours in the office next week). In this case, only the negative incentive value of an outcome (e.g. the pain of getting fired) affects goal commitment. As a result, commitment to a goal may be unrealistically high (even when success is unlikely) or unrealistically low (even when success is likely).

Mental contrasting, however, refers to a combination of these strategies, in which imagining a desired future is immediately followed by considering reality. For example, consider a student who wishes to receive an A in a psychology course. The student might imagine the pride resulting from a high grade and afterwards realizes that he or she has barely studied. If the student expects his or her studying to produce a high grade, only then will he or she commit to staying home and cracking open the psychology textbook. In this way, expectations serve a valuable role for determining goal commitment in addition to the positive or negative incentive value of the contemplated future.

Mental contrasting has been called adaptive in the sense that it is moderated by goal-expectancy (Oettingen & Schworer, 2013). When expectations of success are high, mental contrasting promotes goal commitment. However, when expectations are low, it leads to goal disengagement. Thus, it appears that the technique helps us to complete realistic goals and disengage from unrealistic goals (Oettingen, 2012). A number of intervention studies have shown the benefits of mental contrasting in everyday situations. For example, middle-level healthcare managers taught to use mental contrasting reported better time management and

decision-making two weeks later relative to a group taught to use an indulging strategy (Oettingen, Mayer, & Brinkmann, 2010). Likewise, low-income children taught to use mental contrasting for an attainable foreign language goal showed higher vocabulary scores in this area two weeks later, relative to a group taught to think positively (Gollwitzer, Oettingen, Kirby, Duckworth, & Mayer, 2011). In another example, mental contrasting improved dieting outcomes for students who wished to lose weight. Relative to groups who indulged in weight loss goals or received no treatment, students taught mental contrasting not only reported lower calorie intake, but also performed more physical activity (Johannessen, Oettingen, & Mayer, 2012). To explain these effects, researchers have proposed a set of cognitive and motivational processes (Oettingen & Schworer, 2013)

Cognitive Mechanism

The cognitive effects of mental contrasting suggest that the technique alters a number of goal-relevant associations moderated by expectations of success. These associations include those between a desired future and present reality (Kappes & Oettingen, 2012), and those between a desired future and the instrumental means for success (Kappes, Singmann, & Oettingen, 2012). Experimental evidence for this point was obtained using a clever paradigm. In various studies, participants completed a mental contrasting manipulation in which they generated idiosyncratic words to represent an important aspect of the desired future, instrumental means, and present reality. Unbeknownst to them, some of these words were later used in critical trials on a lexical decision task, in which participants categorized a target word after being subliminally primed with another word. The hypothesis was that participants would show differing reaction times when primed with goal-relevant words compared to goal-unrelated words.

The rationale for this hypothesis comes from work addressing propositional learning, where the endorsement or negation of propositions affects the association between relevant mental concepts (Gawronski & Bodenhausen, 2006; Lagnado, Waldmann, Hagmayer, & Sloman, 2007). In this perspective, propositional learning first begins when some proposition linking two mental concepts is established. Afterwards, we implicitly evaluate the validity of the proposition in accordance with experience, which allows us to adjust goal-relevant associations. For example, we can imagine that the aforementioned student establishes a proposition that studying will produce a high test grade. In the second step, expectations of success serve as a validity check and subsequently alter the perceived association between studying and the high test grade. If a high test grade is perceived to be an attainable goal, the student is likely to associate studying with this outcome. However, if a high grade seems unattainable, it becomes less connected to the act of studying.

It is important to note that the sequence of contemplating the future and present reality matters tremendously. When we imagine a desired future followed by reality, we necessarily frame our thoughts about the present relative to our wishes. This not only enables our expectations of success to guide goal commitment. It also allows the detection of potential obstacles, at least when expectations of success are high. Only by recognizing these obstacles can a desired future be connected to some instrumental means for success. For example, a student who mentally contrasts (an expected) high grade with the reality of not-having-studied would find it easier to recognize a party as an obstacle to this outcome. As a result, the instrumental means of studying is connected to the outcome of receiving a high grade. However, a student who considers reality followed by the desired future is likely to consider these events in isolation. A high grade is still desirable and not-having-studied is still troubling, but a party

remains a fun and tempting event. Described as “reverse contrasting”, this backwards form of mental contrasting is functionally no different from dwelling and indulging separately. Because of its similar content, it is often used as a control condition in experiments and produces no expectation-dependent effects on goal commitment (Oettingen, 2012).

Evidence for the importance of sequence in mental contrasting is best illustrated by studies investigating the differential detection of obstacles. Only when the desired future is first contemplated and followed by the present reality is attending a party ever perceived to be an obstacle in the first place. In line with earlier work, subsequent goal commitment is facilitated when expectations of success are high, and weakened when they are low. In one test of this hypothesis, Kappes, Wendt, Reinelt, and Oettingen (2013) first instructed 10-12-year-old chess experts to complete a mental contrasting or a reverse contrasting task about a chess-related goal. Following the manipulation, the children self-reported their expectations of attaining this goal and were presented with one of two chess-related puzzles. These included an obstacle condition in which the player’s own queen was in the way of a possible checkmate, or a non-obstacle condition in which a checkmate must be actively created. Afterwards, the researchers measured whether or not the correct solution was found and the amount of time it took the chess experts to find the solution. As expected, in the obstacle condition, participants in the mental contrasting condition who had high expectations of success outperformed all groups, while those in the same condition with low expectations performed the worst. Participants who engaged in reverse contrasting performed squarely in the middle. However, in the non-obstacle condition, there were no differences in performance with regard to contrasting condition or expectations of success. Thus, these results appear to suggest that the sequence of mental contrasting is necessary for producing these expectancy-dependent effects, which rely heavily on the detection

of obstacles in the present. Taken as a whole, fantasy realization theory makes a strong case that we may harness the inconsistency between future and reality to provide a mental framework for pursuing attainable goals.

Motivational Mechanism

In addition to these cognitive processes, mental contrasting is also believed to incorporate a motivational mechanism similar to that proposed in Zillmann's (1971) excitation-transfer theory. That is to say, mental contrasting produces a non-specific arousal syndrome that may energize behaviors unrelated to the future being contemplated. For example, students who used mental contrasting with regard to an academic goal showed improved performance on unrelated tasks like squeezing a handgrip and writing a get-well letter to a friend (Servincer, Busatta, & Oettingen, 2014). Like other mental contrasting effects, this transfer of excitation is moderated by subjective expectations of success. When expectations are high, excitation and subsequent goal commitment increases, whereas the reverse occurs when expectations are low.

Oettingen et al. (2009) provided compelling evidence for this basic effect. In one study, participants engaged in mental contrasting or indulging about an important personal concern and rated their expectations for solving this issue. To assess excitation, researchers measured participant's systolic blood pressure (SPB) as an indicator of sympathetic arousal before and after the manipulation. Finally, as a measure of goal commitment participants reported how disappointed they would feel if this issue were not resolved. Results indicated that as expected, participants in the mental contrasting condition showed changes in SBP, moderated by goal-expectancy. When expectations of success were high SBP increased, but when expectations were low, SBP decreased. Furthermore, these changes in excitation were directly associated with the strength of subsequent goal commitment, replicating the basic mental contrasting

effect. By contrast, the indulging condition showed no differences in SBP or goal commitment relative to mental contrasting.

A follow-up study conceptually replicated this result with different measures of goal commitment (self and other-rated goal performance on a speech) and self-reported energization. In light of this evidence, the benefits of mental contrasting and its underlying mechanism have begun to take clear shape. A conflict between the desired future and present reality (but not the reverse) frames our thoughts in terms of our goals. Only when the desired future seems attainable, this process triggers an arousal syndrome which energizes behavior. Though subsequent behavior will likely support the previously desired future, laboratory experiments have demonstrated that unrelated behaviors may also be facilitated (Sevincer, Busatta, & Oettingen, 2014).

At a quick glance, mental contrasting effects might appear to be firmly rooted in the self-regulation literature. However, a number of cognitive consistency theories have proposed similar theoretical components, namely, a motivational conflict producing a non-specific arousal syndrome that energizes behavior and is moderated by subjective expectations. The action-based model of cognitive dissonance (Harmon-Jones, 1999) in particular provides well-fitting examples of each of these concepts.

The Action-Based Model of Cognitive Dissonance

The action-based model of dissonance presents itself as an updated form of the seminal cognitive dissonance theory, with an emphasis on embodied consciousness. In doing so, it makes an important distinction between a proximal and distal motive for its effects. Implicit in all cognitive consistency theories, the proximal motive refers to avoiding the discomfort of arousal. However, the distal motive truly distinguishes the action-based model

by proposing a drive for effective, unconflicted action (Harmon-Jones & Harmon-Jones, 2002). The rationale for this idea draws from an evolutionary understanding of motivational conflict. That is, for any animal capable of processing large amounts of information, inaction often has serious consequences. Though there are situations in which committing to a risky action is maladaptive, it is easy to imagine how the costs of hesitation in the animal kingdom would hinder survival.

The action-based model's most clear similarity with mental contrasting effects is the notion that motivational conflicts will produce arousal. From its perspective, thoughts are linked to action tendencies in the body, which in turn produce arousal when competing for skeletal-muscular control (Harmon-Jones, 1999). For example, contemplating an object with both desirable and undesirable qualities suggests a conflict between approach and avoidance behaviors. In this way, mentally contrasting a desired outcome with reality may be thought to induce conflicting action tendencies and subsequent arousal. After all, chasing an important goal typically involves hard work and discomfort. In line with the original dissonance theory, the action-based model claims that people have three flexible responses for reducing arousal. These include direct attitude or behavioral change, downplaying the nature of the inconsistency by rationalizing, or downplaying the magnitude of the inconsistency by trivializing the issue. Thus, a person who learns that smoking is unhealthy might quit smoking (i.e. attitude change), search for scientific evidence to the contrary (i.e. rationalization), or consider the habit to be less dangerous than the more common problem of traffic fatalities (i.e. trivialization).

Similar to energization in mental contrasting, hallmarks of dissonance arousal include various indicators of sympathetic arousal. In situations believed to evoke dissonance, people have shown heightened electrodermal activity (Elkin & Leippe, 1986; Harmon-Jones, 1999) and

self-reported negative affect (Elliot & Devine, 1994). Additionally, cognitive consistency researchers have found a common pattern of brain activity during various motivational conflicts. In both low-level response conflicts (e.g. the Stroop task) and higher-level dissonance manipulations (e.g. writing a counter-attitudinal essay), people show increased anterior cingulate cortex activation (van Veen & Carter, 2006). In light of this evidence, it would not be shocking if the arousal in both mental contrasting and dissonance theories involve the same basic motivational mechanism. In spite of these similarities, the connection between the action-based model and the remaining features of mental contrasting effects are less obvious. For example, are behaviors unrelated to the initial conflict facilitated by dissonance arousal as they are in mental contrasting? While the short answer is ‘yes’, to understand this congruence fully, it will be useful to address the early history of cognitive dissonance theory (see Harmon-Jones, Amodio, & Harmon-Jones, 2009 for review).

According to Festinger’s (1957) original ideas, any two cognitions were said to evoke arousal, when, if considered alone, the two are irreconcilable. Furthermore, Festinger assumed that the total amount dissonance could be expressed mathematically as D/D+C, where D and C represent the sums of dissonant and consonant cognitions in relation to a focal cognition. This allowed him to posit the three modes of “psychological work” previously mentioned: direct attitude or behavioral change, rationalization, and trivialization. It is important to note that in this view, the mode of dissonance reduction taken is flexibly chosen based on which avenue meets the least “resistance.” That is to say, dissonance arousal is to some extent reduced in a non-specific manner. Though the notion of “resistance” seems like a blurry concept, Festinger presented a few guidelines to clarify a hydraulic relationship between modes of dissonance reduction. If changing a particular element of cognition in a dissonant relationship produces a

greater number of dissonant relations with other elements (e.g. despising a longtime friend who once spilled water on my ugly carpet), it is more resistant to change. Furthermore, cognitions related to overt behavior and physical reality often possess this quality and are less likely to be altered.

Experimental evidence supported the notion of hydraulic or non-specific dissonance reduction. Götz-Marchand, Götz, and Irle (1974) defied participants' expectations on an IQ test by giving them bogus negative feedback. When faced with opportunities to re-evaluate their expectations of intelligence or denigrate the test, participants chose to take whatever route was first presented. In another experiment, Cooper and Mackie (1983) asked politically active participants to write a counter-attitudinal essay about a political issue they supported. Naturally, their well-established political attitudes were resistant to change, though these participants were more likely to denigrate those holding the counter-attitudinal position relative to a politically uninvolved group. This was taken as evidence for adding consonant cognitions to reduce dissonance. Likewise, Snyder and Ebbesen (1972) made pre-existing attitudes salient just prior to inducing participants to write a counter-attitudinal essay on the same topic. Though participants' attitudes changed little, they perceived their essays to be weaker than those who were not reminded of their pre-existing attitude. Taken together, this evidence suggests that responses to dissonance arousal are quite flexible.

Later work that grew out of dissonance theory demonstrated that like mental contrasting, arousal may be reduced in ways completely unrelated to the initial inconsistency. For example, Fazio, Zanna, and Cooper (1974) found that following counter-attitudinal behaviors, dissonance arousal may be misattributed as a feeling of general discomfort produced by mundane situational factors (e.g. a laboratory booth), thereby preventing attitude change. McGregor et al., (2001)

found that when participants elaborated on a personal dilemma involving conflicting values, they came to show more zealous attitudes about various unrelated social issues (e.g. capital punishment and abortion). Although these manipulations do not explicitly invoke mental contrasting, they are nonetheless compatible with the action-based model's broader notion of motivational conflict. Recall that all variety of thoughts are said to be connected to action tendencies. So long as approach and avoidance-related tendencies are competing for control of the body, arousal is produced. Given that dissonance arousal may be flexibly reduced in ways that do not necessarily relate to the original inconsistency, this is another facet of its conspicuous relationship with mental contrasting effects.

Finally, both mental contrasting and dissonance effects are moderated by subjective expectations. In the case of mental contrasting, this is very easily recognized as expectations of goal success. That is to say, only when expectations of success are high, mental contrasting results in energization and increased goal commitment. Although cognitive dissonance is a motivational process, it does not necessarily entail the deliberate visualization of a desired future. For this reason, moderating expectations are more nuanced, and depend largely on the experimental paradigm.

Consider the classic induced compliance paradigm in which participants are typically goaded into performing some counter-attitudinal behavior under differing circumstances. For example, a student may be asked to write an essay in support of a universally disliked policy (e.g. raising tuition fees) where he or she is either instructed to write (low choice) or encouraged subtly to write the essay (high choice). Such studies typically find that performing a counter-attitudinal behavior in the absence of a plausible reason for doing so (i.e. high choice conditions) evokes arousal and subsequent attitude change (Harmon-Jones et al., 2009). In light of this

finding, it is clear that participants feel their counter-attitudinal behaviors have at least some degree of authenticity. After all, they seem to be engaging in the behavior of their own free will. So if their violated pre-existing beliefs were not extremely rigid, then they are likely to renegotiate their attitudes to increase the likelihood of a positive outcome (e.g., I know I smoke, but I take vitamins so I will not get cancer). This essentially is the dissonance effect. It has the effect of making a positive outcome subjectively more likely. Thus, the process may be analogous to participants in mental contrasting studies who expect goal success.

By contrast, participants who have been given no choice but to engage in a counter-attitudinal behavior experience no arousal and subsequent attitude change. As a result, participants in forced choice conditions are likely to recognize that their value-inconsistent behavior is not something they want to do. They have no expectations of a satisfactory outcome but feel they have to perform the behavior. Thus, the process may be analogous to participants in mental contrasting studies who do not expect goal success. When success will likely not be attained, any goal-directed action is seen as forced and inauthentic. Though these people might correctly contrast a desired future with reality and its obstacles, they experience no increases in arousal and goal commitment.

Many have noted the so-called lumper-splitter problem in the sciences, describing the tendency of some theorists to classify various phenomena separately, whereas others take a broader, more integrative view (Fiske, 2002). The present attempt at integrating two theories under a common mechanism represents the perspective of yet another lumper, though I do believe it is not without merit. While lumpers and splitters have always served complementary roles in the sciences, the most recent “crisis” in social psychology has highlighted the problems of an overly insular approach. Among these issues include p-hacking, the file-drawer

problem, and other institutional barriers to a more inclusive, collaborative science (Mischel, 2008). Hopefully, this attempt at understanding mental contrasting and cognitive dissonance as complementary parts of a larger whole is a small step in the right direction. Given the broad similarities in motivational conflict, arousal, and non-specific energization between mental contrasting and cognitive consistency work, I propose a few basic experiments to investigate their relation to one another.

Study 1 addresses how similar energization processes in mental contrasting and cognitive dissonance might be. If they are similar, then arousal resulting from mental contrasting and arousal resulting from cognitive dissonance should influence performance on unrelated tasks in the same fashion. More specifically, energization should facilitate performance on a simple task (i.e. the dominant response) and hinder performance on a difficult task. The rationale for this hypothesis comes from a long line of social facilitation work investigating the robust effect of arousal on performance. That is, physiological arousal has a complicated relationship with performance, such that well-learned, simpler tasks are facilitated, and unfamiliar, complex, tasks are hindered. (Zajonc & Sales, 1966; Cottrell, Wack, Sekeral, & Rittle, 1968; Sanders, Baron, & Moore, 1978). Though many theories arose to clarify what conditions are necessary to produce a relevant arousal state, all share the underlying assumption that physiological arousal is the immediate cause of these performance effects. In line with the current topic, dissonance arousal has also been shown to hinder and facilitate performance on complex and simple tasks, respectively (Cottrell & Wack, 1967). In light of this work, it would be surprising if both dissonance and mental contrasting manipulations did not produce this pattern of effects. Nonetheless, it is important to investigate each perspective side by side as a preliminary test of their similarities.

If arousal produced by mental contrasting and cognitive dissonance similarly affects subsequent task performance (Study 1), then the moderating influence of expectations is another common feature that ought be investigated. In the case of mental contrasting, expectations of success have been found to be necessary for the energization and goal commitment effects that follow (Oettingen, 1996). While the specific expectations that moderate dissonance arousal depend largely on the situation, the induced compliance paradigm suggests that arousal will only be produced when the rationale for performing a generally counter-attitudinal behavior is somewhat plausible. That is, when a counter-attitudinal behavior is induced under ambiguous circumstances, attitudes for why it was chosen may be revised after the fact, largely outside of conscious awareness (i.e. high choice conditions; Festinger & Carlsmith, 1959). If dissonance and mental contrasting processes share the same mechanism, then we should expect the arousal-producing expectation conditions of each to hinder performance on a subsequent complex task relative to conditions which produce no arousal (i.e. low choice, low expectations of success).

CHAPTER 2

STUDY 1 METHODS

Participants

Participants were 197 students recruited from a participant pool made up of those taking undergraduate psychology courses. These students received partial course credit for their participation at the experiment's conclusion. Because the study investigated arousal and its effects, participants were asked to abstain from coffee, strenuous exercise, caffeine, and medication at least two hours prior to participating. This sample consisted of 69 men and 128 women.

Materials

Persuasive communication activity. Taken from Tesser, Whitaker, Martin, and Ward (1998), participants in the dissonance condition completed a worksheet inducing a counter-attitudinal behavior (see Appendix A). Specifically, participants read that the Board of Trustees is considering making all UGA students take a comprehensive exam in order to graduate. Participants were then instructed to list three persuasive reasons for or against this measure, ostensibly so that that the Board of Trustees can use this information to make their decision. In line with the induced compliance paradigm, the experimenter emphasized that while the participant may choose which side to argue for, reasons for the comprehensive exam are needed and would greatly help the researchers. All participants complied with this request. Finally, the instructions stated that this choice includes recording a pre-written speech in favor of the comprehensive exam. Once again, participants agreed, this time by signing their initials.

Academic goals survey. To induce mental contrasting with high expectations of success, participants completed an activity via Medialab in which they were asked to elaborate on an important academic wish (see Appendix B). Furthermore, it was emphasized that this wish be challenging, yet very much achievable. In line with earlier mental contrasting work (Oettingen, 1996), the instructions guided participants to write first about the wish and its best possible outcome, followed by specific obstacles that might prevent its fulfillment.

Stroop task. All participants completed either a complex or simple version of the Stroop task (1935) via computer. The complex version consisted of 44 trials, in which participants indicated the color of inconsistent color words (e.g. RED is displayed in blue) using the keyboard. The simple version consisted of 44 trials in which the same words were presented backwards (e.g. DER is displayed in blue).

Maze. All participants also completed either a complex or simple version of a maze by hand. In the complex version, the maze was designed on top of a relatively large grid (75 x 75 squares) and thus, had many more decision points than the simpler version of the maze (25 x 25 squares).

Procedure

The experimenter first greeted participants and explained that the study's purpose was to explore how people perceive their academic experiences and complete various puzzles. Participants were then asked to have a seat at a computer, and were randomly assigned to one of the three manipulation conditions. Participants in the mental contrasting condition completed the academic goals survey, while those in the dissonance condition completed the persuasive communication activity. As a control condition, participants were asked to draw a map of campus on blank sheet of paper, labeling as many buildings as possible for the next 5 minutes.

Afterwards, participants completed simple or complex versions of maze and Stroop task, presented in a counterbalanced order. During the Stroop task, participants' reaction times were recorded for each trial as well as the number of errors they made. Likewise, the experimenter covertly recorded the time it took participants to complete the maze, and later tallied the number of incorrect paths taken. Finally, the participants were debriefed and thanked for their help.

Results

If mental contrasting and dissonance produce analogous energization processes, then participants exposed to either of these manipulations would show better performance on simple tasks than participants in the control condition (drawing a map), who presumably experienced no arousal. In line with past work on arousal and performance (Cottrell & Wack, 1967), however, participants exposed to the mental contrasting or dissonance manipulations would perform worse on the complex tasks than participants in the control condition.

I tested this hypothesis by first converting the performance scores to z-scores so that they could be combined meaningfully. Then, I submitted these scores to a mixed design factorial ANOVA using manipulation type (mental contrasting, dissonance, control) and task difficulty (simple, complex) as between factors, and type of performance on the maze and Stroop tasks (maze errors, maze time, Stroop errors, Stroop time) as a within factor. Some participants' data were not used in relevant analyses for various reasons. For the Stroop task, 5 participants' data were lost due to a computer malfunction during the experiment, and 8 participants made errors on more than half of the Stroop trials. Likewise, 13 participants' data were excluded from analyses of the maze task as they did not draw unbroken paths or took longer than the allotted 5 minutes. Because the time taken to complete each task and the number of errors made were measured on different scales, these data were converted to z-scores, prior to analyses. Table 1

and Table 2 show the means and standard deviations for each condition on the four dependent measures, for raw scores and z-scores respectively.

The analysis revealed no support for my hypotheses. There was no main effect of performance as a function of manipulation (dissonance, mental contrasting, or control) $F(2, 164) = 0.42$, $p = .66$, partial $\eta^2 = .005$ and there were no significant interactions involving the manipulation: manipulation by difficulty $F(2, 164) = 0.39$, $p = .68$, partial $\eta^2 = .005$; manipulation by performance measure $F(6, 492) = 1.03$, $p = .40$, partial $\eta^2 = .062$; manipulation by difficulty by performance measure $F(6, 492) = 0.26$, $p = .96$, partial $\eta^2 = .003$.

The only significant effects revealed by the ANOVA were not theoretically central. There was a main effect of difficulty, $F(1, 164) = 48.86$, $p < .001$, partial $\eta^2 = .230$, and an interaction between difficulty and performance measure $F(3, 492) = 10.77$, $p < .001$, partial $\eta^2 = .062$. The former indicated that participants performed worse on the complex task compared to the simple task (regardless of manipulation and performance measure). The latter suggests that task difficulty had greater effect on errors than time for the Stroop task, but greater effect for time than errors on the maze task.

Although the hypotheses were not supported by the ANOVA, I did have specific predictions that could be tested using planned comparisons. Such contrasts do not test simply for omnibus differences but for the specific pattern predicted. So, they may reveal patterns not detected by the ANOVA. I had hypothesized that, compared to the control condition, the dissonance condition and the mental contrasting condition would facilitate performance on simple tasks but hinder performance on complex tasks. I used the planned contrasts to analyze task performance collapsed across all four measures (maze errors, maze time, Stroop errors, Stroop time). For analyzing simple task performance, I did this by assigning 1 to both the mental

contrasting condition and the dissonance condition, and -2 to the control condition. For analyzing the complex task performance, I simply reversed the signs. Inconsistent with my hypotheses, there were no significant differences between experimental conditions and the control condition on simple task performance $F(1, 87) = 0.39$, $p = .54$, or complex task performance $F(1, 77) = 0.15$, $p = .70$. Furthermore, I used the same contrast codes to analyze each task performance measure separately. These analyses also failed to support my analyses. That is, there were no significant differences on the simple tasks for maze errors $F(1, 87) = 0.10$, $p = .76$, maze times $F(1, 87) = 0.29$, $p = .59$, Stroop errors $F(1, 87) = 0.53$, $p = .47$, or Stroop times $F(1, 87) = 2.98$, $p = .088$. There were also no significant differences on the complex tasks for maze errors $F(1, 77) = 0.07$, $p = .79$, maze times $F(1, 77) = 0.11$, $p = .74$, Stroop errors $F(1,77) = 0.19$, $p = .66$, Stroop times $F(1, 77) = 1.19$, $p = .28$.

I had initially hypothesized that there would be no difference between the mental contrasting group and the dissonance group but that performance in these groups would differ from that in the control condition. Given the lack of support for this hypothesis, it is possible the mental contrasting group and the dissonance group did not give rise to similar processes. So, in a subsequent contrast, I compared those two conditions to one another ignoring the control condition (contrast codes were 1, -1 and 0, respectively) on overall task performance scores. This contrast also failed to produce any significant effects in both simple $F(1, 87) = 2.07$, $p = .15$, and complex $F(1, 77) = 0.02$, $p = .88$, task conditions. Furthermore, this null effect held when each measure of task performance was analyzed separately. That is, mental contrasting condition and the dissonance condition did not differ in performance on simple tasks whether this was operationalized as maze errors $F(1, 87) = 1.23$, $p = .27$, maze times $F(1, 87) = 2.91$, $p = .092$, Stroop errors $F(1, 87) = 3.46$, $p = .066$ (marginally significant), or Stroop times $F(1, 87) = 0.04$,

p = .83. They also did not differ on the complex tasks whether this was operationalized as maze errors $F(1, 77) = 0.42$, $p = .52$, maze times $F(1, 77) = 0.48$, $p = .49$, Stroop errors $F(1,77) = 0.02$, $p = .90$ and Stroop times $F(1, 77) = 0.03$, $p = .87$.

A closer look at the data revealed that the error distributions for the performance variables were non-normal. So, I tried one more analysis using a series of Kruskal-Wallis H tests, using all participants' data. This non-parametric test is particularly useful in cases of non-normal distributions or many outliers because it detects differences on the basis of rank rather than a continuous scale. Unfortunately, these analyses also failed to reveal any significant effects (See Table 3).

Discussion

The results of Study 1 failed to provide support for any of my hypotheses. In fact, they showed few significant differences at all. Most obviously, the results challenged my hypotheses, but more generally, the results raised some troubling questions. For example, why was no effect obtained at all for the mental contrasting manipulation or the dissonance manipulation? I used manipulations that closely paralleled those that had been used successfully in previous research. In the case of the dissonance manipulation, the persuasive communication worksheet was taken from Tesser et al. (1998), and it conforms quite well to the induced compliance paradigm used by Festinger and Carlsmith (1959). The academic goals survey completed in the mental contrasting condition was also similar to materials used in earlier work (Oettingen, 2012).

There were some differences, though. For example, in mental contrasting studies, participants are typically asked to self-report their expectations of goal success and researchers later use those expectations to assess their moderating effect on goal commitment (Oettingen & Schwörer, 2013). However, given the theoretical similarities I hypothesized between dissonance

and mental contrasting, I opted to induce high expectations of success directly, just as compliance is induced in dissonance work (Festinger & Carlsmith, 1959). Perhaps this manipulation does not work with mental contrasting or perhaps my particular operationalization was not successful.

Another factor that may have played an important role in the lack of significant findings was the relatively small sample size. In the mixed ANOVA model, for example, the manipulation type by difficulty interaction $F(2, 164) = 0.39$, $p = .68$, partial $\eta^2 = .005$ was found to have an observed power of only .12. Additionally, Levene's test, indicating unequal variance across groups, was found to be significant for three of the four dependent measures. These included maze errors $F(5, 164) = 2.27$, $p = .05$ and times $F(5, 164) = 16.92$, $p < .001$, as well as Stroop errors $F(5, 164) = 3.65$, $p = .004$. Together, these properties of the data would make it difficult to detect a significant difference even if one were present.

Another logical possibility is that the manipulations worked, but the problem was in the control condition. It is possible that drawing a map from memory may have been a daunting task for some. The ubiquity of map applications on smartphones has perhaps made the act of physically drawing a map ourselves more difficult. Perhaps the open-endedness of this task increased arousal in participants.

Of course, it is possible that neither my mental contrasting manipulation nor my dissonance manipulation produced arousal. It is difficult to measure arousal in these contexts because when participants' attention is directed to their feelings of arousal, they may take their arousal into account or attribute it to some source which may eliminate the effect of the arousal on the performance (Fazio et al., 1974). However, given the null finding in Study 1, it may be

best, in future studies, to include some measure of arousal anyway, be it a physiological one like systolic blood pressure, or a self-reported assessment of discomfort.

Although Study 1 failed to detect performance effects for dissonance and mental contrasting arousal conditions relative to a control group, Study 2 addressed a related question manipulating another theoretically relevant variable. The previous manipulations designed to produce arousal (i.e. free choice and high expectations of success) were modified to include expectation conditions in which arousal is absent (i.e. forced choice and low expectations of success). Furthermore, Study 2 included a self-report measure of arousal. This time participants completed only the complex tasks used in Study 1, in which their errors and timed performance were recorded for each like before. If mental contrasting and cognitive dissonance operate similarly, then the free choice and high expectations of success conditions should have performed worse on the complex tasks relative to their respective non-arousal conditions (i.e. forced choice and low expectations of success). Furthermore, if this time the arousal-producing mental contrasting and dissonance manipulations are effective, these groups should have reported greater arousal than their respective non-arousal conditions.

CHAPTER 3

STUDY 2 METHODS

Participants

Participants were 142 students recruited from a participant pool made up of those taking undergraduate psychology courses. Like in Study 1, these students received partial course credit for their participation. Because the study investigated arousal and its effects, participants were again asked to abstain from coffee, strenuous exercise, caffeine, and medication at least two hours prior to participating. This sample consisted of 57 men and 85 women.

Materials

Persuasive communication activity. Participants in the dissonance condition completed a worksheet inducing a counter-attitudinal behavior as in Study 1. However, unlike Study 1, half of the participants were instructed that they had no choice but to argue in favor a comprehensive exam for UGA students. Specifically, a few sentences in the instructions were modified to read the following. "Because we already have enough reasons opposing the exit exams we cannot give you a choice as to which side of the issue to write on. We have to ask you to write down some reasons why UGA should make a comprehensive exit exam mandatory for all students. In other words, just come up with three good reasons why UGA should have a mandatory exit exam, and make the reasons as persuasive as possible." In this way, participants in the dissonance condition experienced either a free or forced choice in line with earlier dissonance work (Festinger & Carlsmith, 1959).

Academic goals survey. To induce mental contrasting, participants completed an activity in which they were asked to elaborate on an important academic wish like before. However, half of the participants in the mental contrasting condition completed a modified version designed to induce low expectations of success with regard to their academic goals. The only difference between this activity and that experienced by participants in the high expectations of success condition (i.e. the task used in Study 1) was a single sentence. After, naming their goal, but before elaborating on it, participants read the following. "Sometimes things don't work out as we would like. Imagine now that your efforts have been delayed and now you have only one week to complete the same wish." As before, all versions of the task guided participants to write first about the wish and its best possible outcome, followed by specific obstacles that might prevent its fulfillment.

Arousal questionnaire. Participants reported the extent to which they felt uncomfortable, uneasy, bothered, energized, excited, and incited to act, using a seven-point Likert scale. These words were chosen because the former three have been found to indicate arousal produced by cognitive dissonance (Elliot & Devine, 2004), while the latter three have been shown to indicate arousal resulting from mental contrasting (Oettingen et al., 2009; Servincer et al., 2014).

Stroop task. All participants completed a complex version of the Stroop task (1935) via computer. Like before, this task consisted of 44 trials, in which participants indicated the color of inconsistent color words (e.g. RED is displayed in blue) using the keyboard.

Maze. Like Study 1, participants completed a maze by hand. However in Study 2, all participants completed the complex maze. Like before, this maze was designed on top of a 75 x 75 square grid.

Procedure

After greeting participants, the experimenter explained that the study's purpose was to investigate differences in how people perceive their academic performance and complete various puzzles. Next, participants were asked to have a seat at a computer cubicle, and once again they completed either the persuasive communication activity (dissonance condition) or the academic goals survey (mental contrasting condition). However, this time participants who completed each task had their expectations manipulated in one of two ways.

For participants completing the persuasive communication activity, this meant arguing for a comprehensive final exam for UGA students under free and forced choice conditions. Participants in the forced choice condition were told that because the researchers had enough viewpoints in opposition to the comprehensive exam, the participant had no choice and must write in favor of the exam. By contrast, participants in the free choice condition were merely encouraged to argue in favor the comprehensive exam. All participants complied with this request. Finally the instructions stated that this choice includes recording a pre-written speech in favor of the comprehensive exam, to which participants agreed by signing their initials.

Participants who completed the persuasive communication activity had their expectations manipulated so that they would consider their academic wish to be possible or impossible to realize. For the high expectations condition, participants were instructed to elaborate on an important academic goal they expect to attain in the next month. By contrast, participants in the low expectations condition received the same basic instructions with one addition. Following the cue to elaborate on an important academic goal, the instructions stated "sometimes things don't work out as we would like. Imagine now that your efforts have been delayed, and now you have only one week to complete the same wish."

As a manipulation check, immediately after mentally contrasting or performing the counter-attitudinal behavior, all participants rated the extent to which they expected an acceptable outcome from performing the previous activity, using a seven-point Likert scale. While ambiguous, this question is designed to capture the relevant expectations moderating each theory's effect. For participants completing mental contrasting, this rating ought to capture expectations of success, a prerequisite for making the mental exercise seem worthwhile. For participants performing a counter-attitudinal behavior, this rating is believed to capture the plausibility of having freely chosen the behavior. For example, a participant who does not expect a somewhat satisfactory outcome cannot be expected to agree to record a counter-attitudinal speech under high choice conditions. Consistently low ratings on this measure would then indicate that the manipulation was heavy-handed, and that participants likely construe the situation as a forced choice.

Following this, participants were instructed to complete the arousal questionnaire on a computer using Medialab. This questionnaire consisted of six self-report items in which participants reported the extent to which they felt uncomfortable, uneasy, bothered, energized, and incited to act. Finally participants completed complex versions of the Stroop task (1935) and maze, in which their timed performance and errors were recorded. Finally participants were debriefed and thanked for their participation.

Results

If mental contrasting and cognitive dissonance are analogous processes, then both would produce arousal that would undermine performance on a complex task relative to a non-arousal condition. In the dissonance condition, participants would experience low arousal if they had no choice in recording the counter-attitudinal essay, and in the mental contrasting condition,

participants would experience low arousal if they had little hope their behavior would produce a positive outcome. Thus, participants may perform worse on the difficult maze and the difficult Stroop task if they record the essay of their own free choice or have high hopes their behavior will produce a positive outcome in line with classic social facilitation work (Zajonc & Sales, 1966; Cottrell et al., 1968; Sanders et al., 1978).

Task Performance. To test this hypothesis, I first converted the performance scores to z-scores so that they could be combined meaningfully. Then, I submitted these scores to a mixed design factorial ANOVA, with manipulation condition (mental vs. dissonance) and expectation condition (high vs. low) as between factors and type of performance measure on the maze and the Stroop tasks (maze errors, maze time, Stroop errors, Stroop time) as a within factor. Some participants' data were not used in relevant analyses for various reasons. Of the 142 participants, 1 participant's data was lost due to a computer error and was excluded from all task performance analyses. Additionally, 10 participants made errors on more than half of the trials on the Stroop task. Likewise, 7 participants failed to complete the maze or took longer than the allotted time of 5 minutes. Because the time taken to complete each task and the number of errors made were measured on different scales, these data were converted to z-scores, prior to analyses. Table 4 and Table 5 show the means and standard deviations for each condition on the four dependent measures, for raw scores and z-scores respectively.

The results supported my hypotheses. Participants performed significantly worse (collapsed across all performance measures) under the high expectations conditions (high choice and high expectations of success) than under the low expectation conditions (low choice and low expectations of success), $F(1, 121) = 5.58$, $p = .020$, partial $\eta^2 = .044$. This main effect did not depend on the source of the arousal (mental contrasting vs. dissonance), $F(1, 121) = 1.55$, $p =$

.22, partial $\eta^2 = .013$, the type of performance measure (maze, Stroop errors and time) $F(3, 363) = 0.21$, $p = .89$; partial $\eta^2 = .002$, or the interaction between the two, $F(3, 363) = 0.22$, $p = .091$, partial $\eta^2 = .018$. All other effects were also non-significant, all Fs < .7 (see Table 6 for full model results).

Because I predicted that both high expectation conditions would inhibit performance on complex tasks relative to low expectation conditions, I used planned comparisons to test the null hypothesis, that mental contrasting and dissonance manipulations differed in task performance under similar expectation conditions. Using z-scores, I combined maze errors, maze times, Stroop errors, and Stroop times to create a total performance score for each participant. Next I assigned contrast codes of -1 and 1 to mental contrasting and dissonance respectively, for each expectation condition. These analyses revealed that total performance did not differ between mental contrasting and dissonance conditions under both high expectation conditions $F(1, 63) = 2.12$, $p = .15$ and low expectation conditions $F(1, 58) = 0.11$, $p = .75$.

Self-Reported Arousal. I hypothesized that if mental contrasting and dissonance share a mechanism, then participants in high expectation conditions (high choice and high expectations of success) would report greater arousal than participants in the low expectation conditions (low choice or low expectations of success), regardless of the source of that arousal (dissonance or mental contrasting). I began my analysis of self-reported arousal by seeing if various items assessing arousal (*uncomfortable*, *uneasy, bothered, energized,* and *incited to act*) held together in a coherent scale. I found that the Cronbach's Alpha using all of the items was .65. This analysis also revealed that the item-intercorrelation for *energized* was particularly low (.08). So, I dropped that item from analysis and improved the Cronbach's Alpha to .72.

Next, I summed the remaining arousal items for each participant and submitted those sums to a factorial ANOVA, with expectation condition (high choice/expectations of success and low choice/expectations of success) and manipulation type (mental contrasting or dissonance) as factors. This analysis did not support my hypothesis. The arousal scores did not differ as a function of manipulated expectations: high (M = 11.63, SD = 4.81) versus low (M = 11.04, SD = 4.17) $F(1, 137) = 0.57$, $p = .45$, partial $\eta^2 = .004$. Furthermore, the arousal scores did not differ as a function of condition: mental contrasting (M = 11.49, SD = 4.17) versus dissonance (M = 11.20, SD = 4.83) $F(1, 137) = 0.17$, $p = .69$, partial $\eta^2 = .001$. There was also no effect of the interaction of manipulated expectation condition, $F(1, 137) = 2.15$, $p = .14$, partial $\eta^2 = .015$. However, these results should be interpreted with caution. Levene's test indicating unequal variance across groups, was found to be significant for the measure of arousal $F(3, 137) = 3.10$, $p = .029$.

Manipulation Check. Finally, I examined the manipulation check. That is to say, I examined differences in the extent to which participants reported that they expected an acceptable outcome as a result of agreeing to complete a high or low choice counter-attitudinal behavior, or engaging in mental contrasting with high or low expectation of success. Because the check was referring to somewhat different outcomes in the mental contrasting condition (goal attainment) and dissonance condition (effect of writing the essay), I analyzed the two conditions separately.

I had hypothesized that high expectation conditions would report a more positive outcome than participants in the low expectation conditions in both the mental contrasting and dissonance groups. Contrary to this hypothesis, however, participants in the dissonance condition did not did not expect different outcomes in high (M = 3.72, SD = 1.47) versus low choice (M =

4.03, $SD = 1.22$) conditions, $t(69) = -0.95$, $p = .34$, $d = -.23$. On the other hand, participants who mentally contrasted with high expectations of success ($M = 5.67$, $SD = .86$) did expect a more acceptable outcome than those in the low expectations ($M = 5.15$, $SD = 1.18$) condition, $t(68) = 2.11$, $p = .04$, $d = .51$.

Discussion

Hypotheses for Study 2 were partially supported. On one hand, participants under high expectation conditions performed worse on the complex tasks compared to participants in the low expectation conditions -- and this was true regardless of the manipulation (dissonance versus mental contrasting) or the combined measure of task performance (maze, Stroop, time, errors). However, there were no differences in self-reported arousal based on expectation conditions.

Both high expectation manipulations (for mental contrasting and dissonance) undermined performance on a complex task, and there was no difference between the two with regard to their effect, and the effect was the same regardless of how performance was measured. This pattern is at least suggestive of the possibility that dissonance and mental contrasting give rise to a similar arousal state that then undermines performance on a complex task. Of course, additional research (with significant results for arousal) would be needed before we could draw this conclusion with confidence.

It is interesting that this main effect existed alongside no effects on the self-report measure of arousal. This null result may be further evidence of the weak effect of the manipulation. It may also support the general idea that significant differences on performance measures can be obtained in the absence of self-reports related to those measures (e.g., Nisbett & Wilson, 1977).

Another possibility is that the self-report items I chose did not adequately assess the arousal that was produced. Different items might have produce a significant difference on the self-report measure. A third possible explanation for the null results on the arousal measure is small effect size of arousal manipulation. Hypothetically, it could be argued that the manipulations produce just enough arousal to have an effect on performance but not enough of an effect to reflect itself in subjectively different experiences. Perhaps in future studies comparing the arousal effects of mental contrasting and dissonance, researchers could examine electrodermal activity and systolic blood pressure as used in previous dissonance (Elkin & Leippe, 1986; Harmon-Jones, 1999) and mental contrasting work (Oettingen et al., 2009).

CHAPTER 4

GENERAL DISCUSSION

In light of their shared emphases, it seemed plausible to me that mental contrasting and dissonance phenomena give rise to a similar arousal state that might then influence performance on subsequent tasks. Thus, I hypothesized in Study 1 that participants induced to engage in mental contrasting (with high expectations of success) or feel cognitive dissonance (free choice) would experience arousal relative to a control group (drawing a map), causing them to replicate previously observed performance effects (Servincer et al., 2014; Cottrell & Wack, 1967). Specifically, both groups were expected to perform better on simple tasks and worse on complex tasks relative to the control group. These predictions, however, were not supported.

In Study 2, I hypothesized that directly manipulating the level of expectations might provide a clearer test of my hypotheses. Thus, participants writing a counterattitudinal essay with high choice or pursuing a goal with high expectations of success (high expectation, arousal-producing conditions) would perform worse on complex tasks than participants forced to write the essay or pursing a goal with little chance of attaining it (low expectation, non-arousal conditions). With this design, these predictions were supported. Specifically, participants in what were presumably the high expectation conditions performed worse than participants in what were presumable the low expectation conditions.

This significant outcome in the context of the null results in Study 1 raises the possibility that the map drawing, control condition used in Study 1 may have actually produced arousal and prevented the detection of performance effects. If this were the case, it would explain how in

Study 2, when high and low expectations were directly manipulated, performance effects were found. However, the relative lack of evidence from the manipulation check (probing expectations of an acceptable outcome) and the self-reported arousal measure in Study 2 make it difficult to draw any strong conclusions.

Although these experiments shed little light on the potential relationship between cognitive dissonance and mental contrasting, they do highlight some major caveats to avoid when studying both phenomena together. First, although dissonance effects are often reported in the social psychological literature, they are not necessarily easily to produce. Though numerous mental contrasting effects have been observed in the time since fantasy realization theory (Oettingen, 1996) was proposed, these effects may not be particularly robust either. For this reason, it is important to use a larger sample size.

Because both the dissonance and the mental contrasting manipulations generally failed to produce effects, future studies will require more extensive pretesting of materials. One method of inducing dissonance that may be more comparable to the mental contrasting manipulation is some form of the effort justification paradigm. For example, if all participants share some goal, dissonance may be induced by making the goal unexpectedly difficult to achieve.

In Study 2, manipulating and measuring expectations (high choice/high chance of goal success and low choice/low chance of goal success) produced inconsistent effects. There was an effect on task performance for both the mental contrasting and dissonance groups, but there was no indication on the manipulation check that the manipulation of expectations was effective for participants in the mental contrasting condition. It might have been better if I had measured expectations, as in previous mental contrasting research, than attempt to manipulate it. It might also be interesting to use an analogous measure in the dissonance condition. Future research

might assess the extent to which participants feel they made an authentic choice about writing the counter attitudinal essay. These self-reports differences might have a more direct relation with the performance effects than an attempted manipulation that could affect people to different extents without those differences being taken into consideration.

In spite of the shortcomings of this study, there are still some interesting ideas that could be explored. For example, maybe other effects from the dissonance literature may be compared to mental contrasting, like affirming an unrelated value. Perhaps the misattribution of arousal is capable of enhancing and diminishing both mental contrasting and dissonance effects. Regardless of how these issues are resolved, the nuanced link between cognitive consistency and self-regulation has an exciting future of intertwined research.

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APPENDIX A

Persuasive Communication Activity

We are interested in seeing which aspects of a persuasive communication increase its effectiveness. So, we are asking participants in this study to write a message to could potentially change people's minds on a given issue. The issue we have chosen is comprehensive exit exams mandatory for all students.

The Board of Trustees is considering making all UGA students take a comprehensive exam in their last year. If students pass the exam, then they can graduate. If they do not pass, then they cannot graduate. If this rule were to pass, it would go into effect next year. So, it would affect you and most of the students here. While debating this decision, the Board of Trustees is looking for arguments on both sides of the issue.

To help them in their deliberations, we would like you to write down some reasons why UGA should make a comprehensive exit exam mandatory for all students. In other words, we would like you to come up with three good reasons why UGA should have a mandatory exit exam. And we would like you to make these reasons as persuasive as possible.

Once we have collected enough arguments from our participants, we are going to pass these arguments on to the Board of Trustees so they can consider them while making their decision. Just write your reasons on this sheet and do your best to make them as persuasive as possible.

UGA students should take a comprehensive exit exam because:

1)

2)

3)

In a few minutes, you will be asked to make an audiotape recording of a persuasive speech. The speech is already written and we wrote it to be effective. Our question, though, is how do tone of voice, rate of speech, and so on influence the effectiveness of the spoken arguments? To answer this question, we will have several students record the speech. Once again, the speech will center on a comprehensive exit exam for UGA students next year, and the Board of Trustees has agreed to listen to the recorded speeches.

I agree that I will record a speech in favor of a comprehensive exit exam.

____

Initials Date

APPENDIX B

Academic Goals Survey

1) Think about the next month. What is the most important wish or concern in your academic life? Please choose a wish that is challenging for you, but one that you definitely expect to fulfill in the next month, and write it in the space below.

2) What would be the best outcome of fulfilling your wish? How would fulfilling your wish make you feel?

3) Sometimes things don’t work out as we would like. What is the main obstacle that stands in your way? What is it within you that holds you back from fulfilling that wish?

4) Now take a moment and imagine your main obstacle. Imagine things fully. Write your thoughts below.

TABLE 1

Study 1

Means and Standard Deviations

Dependent Measure	Manipulation Type	Difficulty	*M*	*SD*	*N*
Maze Errors	Mental Contrasting	Simple	0.93	1.53	30
		Complex	1.20	1.68	25
		Total	1.05	1.59	55
	Dissonance	Simple	0.59	0.78	29
		Complex	0.97	1.18	29
		Total	0.78	1.01	58
	Control	Simple	0.68	1.17	31
		Complex	1.00	1.06	26
		Total	0.82	1.12	57
	Total	Simple	0.73	1.20	90
		Complex	1.05	1.31	80
		Total	0.88	1.26	170
Maze Time (seconds)	Mental Contrasting	Simple	45.93	19.16	30
		Complex	106.51	62.87	25
		Total	73.47	53.67	55
	Dissonance	Simple	37.95	11.69	29
		Complex	118.07	61.66	29
		Total	78.01	59.73	58
	Control	Simple	44.07	21.34	31
		Complex	107.39	57.92	26
		Total	72.95	52.48	57
	Total	Simple	42.72	18.10	90
		Complex	110.99	60.32	80
		Total	74.84	55.15	170
Stroop Errors	Mental Contrasting	Simple	1.20	1.19	30
		Complex	1.56	1.56	25
		Total	1.36	1.37	55
	Dissonance	Simple	0.69	1.00	29
		Complex	1.66	2.27	29
		Total	1.17	1.81	58
	Control	Simple	0.77	0.96	31
		Complex	1.88	3.65	26
		Total	1.28	2.60	57
	Total	Simple	0.89	1.06	90
		Complex	1.70	2.61	80
		Total	1.27	1.98	170
Stroop Time (seconds)	Mental Contrasting	Simple	30.67	5.10	30
		Complex	33.80	5.54	25
		Total	32.09	5.48	55
	Dissonance	Simple	30.97	4.41	29
		Complex	34.09	4.05	29
		Total	32.53	4.48	58
	Control	Simple	32.89	6.46	31
		Complex	35.63	9.01	26
		Total	34.14	7.78	57
	Total	Simple	31.53	5.45	90
		Complex	34.45	6.44	80
		Total	32.93	6.10	170

TABLE 2

Study 1

Z-score Means and Standard Deviations

Dependent Measure	Manipulation Type	Difficulty	*M*	*SD*	*N*
Maze Errors	Mental Contrasting	Simple	0.01	1.23	30
		Complex	0.22	1.35	25
		Total	0.11	1.28	55
	Dissonance	Simple	-0.27	0.63	29
		Complex	0.04	0.95	29
		Total	-0.12	0.81	58
	Control	Simple	-0.20	0.93	31
		Complex	0.06	0.85	26
		Total	-0.08	0.90	57
	Total	Simple	-0.15	0.96	90
		Complex	0.51	1.05	80
		Total	-0.07	1.01	170
Maze Time	Mental Contrasting	Simple	-0.55	0.34	30
		Complex	0.51	1.10	25
		Total	-0.07	0.94	55
	Dissonance	Simple	-0.69	0.21	29
		Complex	0.71	1.08	29
		Total	0.01	1.05	58
	Control	Simple	-0.59	0.36	31
		Complex	0.53	1.02	26
		Total	-0.08	0.92	57
	Total	Simple	-0.61	0.32	90
		Complex	0.59	1.06	80
		Total	-0.05	0.97	170
Stroop Errors	Mental Contrasting	Simple	-0.05	0.53	30
		Complex	0.11	0.70	25
		Total	0.02	0.61	55
	Dissonance	Simple	-0.28	0.45	29
		Complex	0.15	1.02	29
		Total	-0.07	0.81	58
	Control	Simple	-0.28	0.43	31
		Complex	0.15	1.63	26
		Total	0.02	1.16	57
	Total	Simple	-0.61	0.48	90
		Complex	0.59	1.17	80
		Total	-0.05	0.89	170
Stroop Time	Mental Contrasting	Simple	-0.05	0.80	30
		Complex	0.09	0.87	25
		Total	-0.18	0.86	55
	Dissonance	Simple	-0.36	0.69	29
		Complex	0.13	0.64	29
		Total	-0.11	0.70	58
	Control	Simple	-0.06	1.02	31
		Complex	0.37	1.42	26
		Total	0.14	1.22	57
	Total	Simple	-0.27	0.86	90
		Complex	0.20	1.01	80
		Total	-0.05	0.96	170

TABLE 3

Study 1

Kruskal-Wallis H Test: Mental Contrasting (MC) Counter-attitudinal Behavior (CB) and control groups

Dependent Measure	*df*	*H*	*p*-value	Mean Rank
Simple Stroop Errors	2	0.33	.19	MC = 53.52, CB = 42.93, Control = 44.21
Simple Maze Errors	2	0.35	.84	MC = 48.58, CB = 47.25, Control = 45.13
Complex Stroop Errors	2	0.61	.74	MC = 52.42, CB = 47.09, Control = 50.38
Complex Maze Errors	2	0.53	.77	MC = 48.35, CB = 47.85, Control = 52.27

TABLE 4

Study 2

Means and Standard Deviations

Dependent Measure	Manipulation Type	Expectations	*M*	*SD*	*N*
Maze Errors	Mental Contrasting	High	1.53	1.08	32
		Low	0.97	1.35	30
		Total	1.26	1.24	62
	Dissonance	High	1.33	1.16	33
		Low	1.20	1.13	30
		Total	1.27	1.14	63
	Total	High	1.43	1.12	65
		Low	1.08	1.24	60
		Total	1.26	1.19	125
Maze Time (seconds)	Mental Contrasting	High	144.93	64.24	32
		Low	107.15	57.69	30
		Total	126.65	63.58	62
	Dissonance	High	112.21	54.73	33
		Low	121.23	58.03	30
		Total	116.51	56.05	63
	Total	High	128.32	61.39	65
		Low	114.19	57.81	60
		Total	121.54	59.88	125
Stroop Errors	Mental Contrasting	High	2.34	3.11	32
		Low	2.50	2.69	30
		Total	2.42	2.89	62
	Dissonance	High	2.39	2.63	33
		Low	1.47	1.80	30
		Total	1.95	2.30	63
	Total	High	2.37	2.85	65
		Low	1.98	2.33	60
		Total	2.18	2.61	125
Stroop Time (seconds)	Mental Contrasting	High	35.55	5.48	32
		Low	33.45	4.30	30
		Total	34.53	5.02	62
	Dissonance	High	34.90	3.90	33
		Low	34.05	6.02	30
		Total	34.49	5.00	63
	Total	High	35.22	4.72	65
		Low	33.75	5.19	60
		Total	34.51	4.99	125

TABLE 5

Study 2

Z-score Means and Standard Deviations

Dependent Measure	Manipulation Type	Expectations	*M*	*SD*	*N*
Maze Errors	Mental Contrasting	High	0.23	0.91	32
		Low	-0.24	1.14	30
		Total	0.00	1.05	62
	Dissonance	High	0.07	0.98	33
		Low	-0.05	0.95	30
		Total	0.01	0.96	63
	Total	High	0.15	0.94	65
		Low	-0.14	1.05	60
		Total	0.01	1.00	125
Maze Time	Mental Contrasting	High	0.37	1.07	32
		Low	-0.26	0.96	30
		Total	0.07	1.06	62
	Dissonance	High	-0.17	0.91	33
		Low	-0.02	0.96	30
		Total	-0.10	0.93	63
	Total	High	0.09	1.02	65
		Low	-0.14	0.96	60
		Total	-0.02	0.99	125
Stroop Errors	Mental Contrasting	High	0.02	1.08	32
		Low	0.08	0.94	30
		Total	0.05	1.01	62
	Dissonance	High	0.04	0.92	33
		Low	-0.28	0.62	30
		Total	-0.11	0.80	63
	Total	High	0.03	0.99	65
		Low	-0.10	0.81	60
		Total	-0.03	0.91	125
Stroop Time	Mental Contrasting	High	0.20	1.08	32
		Low	-0.21	0.85	30
		Total	0.00	0.99	62
	Dissonance	High	0.07	0.77	33
		Low	-0.09	1.19	30
		Total	-0.01	0.99	63
	Total	High	0.14	0.93	65
		Low	-0.15	1.03	60
		Total	0.00	0.98	125

TABLE 6

Study 2

Mixed ANOVA Model: Overall Task Performance

Effect		Hypothesis *df*	Error *df*	*F*	*p*-value	Partial Eta Squared	Observed Power
Between Subjects	Intercept	1	121	0.09	.77	.001	.06
	Manipulation Type	1	121	0.61	.44	.005	.12
	Expectations	1	121	5.58	.020	.044	.65
	Manipulation Type x Expectations	1	121	1.55	.22	.013	.24
Within Subjects	Task	3	363	0.05	.95	.000	.06
	Task x Manipulation Type	3	363	1.07	.37	.003	.12
	Task x Expectations	3	363	16.25	<.001	.002	.09
	Task x Manipulation Type x Expectations	3	363	0.35	.85	.018	.55