The Self-Regulatory Benefit of Handicaps: Do Handicapping Situations Encourage Conservation of Resources When Success is Uncertain?

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Abstract

Self-handicapping has been conceptualized as an identity-based strategy motivated by impression management and, more recently, as an avoidance coping strategy. However, additional evidence suggests that self-handicapping can provide a short-term performance boost (with detriments accruing over the long-term). I use a resource conservation perspective to suggest that this boost in performance may be attributed to an individual's motivation to conserve resources, particularly when there is reason to believe that resources spent now may be better used later.

The current study tests if handicapping situations (similar to ones created following the choice to self-handicap) encourage an individual to conserve their resources (e.g., reducing effort), allowing them to spend those resources on later tasks. It was hypothesized that individuals in a handicapping situation would show greater resource conservation (evidenced by decreased effort) as well as improved performance on a follow-up resource-dependent task, compared to those not in a handicapping situation. Additionally, I hypothesize that individuals in a handicapping situation will show greater conservation and greater subsequent performance on a resource-dependent task when there is anticipation for that follow-up task. Effort was also hypothesized to mediate the relationship between group assignment and subsequent performance differences. Finally, it was hypothesized that these relationships would be moderated by

neuroticism, conscientiousness, and self-handicapping tendencies (traditional moderators of SH).

Prior to an in-lab study, participants (N = 162 undergraduates) completed on-line measures of self-handicapping (SHS), neuroticism, and conscientiousness. Participants were then brought to the lab individually for a study supposedly testing the effects of sound on performance. They were randomly assigned to one of three groups differing in the information given regarding: (1) the level of distraction a stimulus would produce and (2) whether a follow-up task was anticipated after the noise-based task (i.e., Distraction-Anticipation, Distraction-No Anticipation, No Effect-Anticipation). All participants were first given a series of geometric tracing designs allegedly assessing their spatial reasoning ability (series contained 4 solvable designs and 2 impossible designs) and were provided with noncontingent success feedback. Then, participants were asked to complete a new series of tracing designs (eight solvable, one impossible) while a tone was playing. Participants in the distraction conditions (i.e, *Distraction-Anticipation* and *Distraction-No Anticipation*) were led to believe that the tone had the ability to significantly impair performance, while participants in the No Effect condition believed the tone had no impact on performance. Following this task, all participants were given a series of logic questions that served as an assessment of regulatory depletion.

Results supported the two primary hypotheses. When participants believed that the tone was distracting, and when they anticipated a third task, they were more accurate on the part three logic task ($F(2,159) = 7.69$, $p<.01$) compared to both those in the *No Effect-Anticipation* and the *Distraction-No Anticipation* conditions. The relationship between group assignment and part three logic performance was mediated by effort

during part two (quitting r^2 = .14; F(2, 105) = 8.43, p<.001; indirect effect b = -.05, SE = .03, 95% CI [-.12, -.01]). No theoretically meaningful moderators were found. The findings provide initial evidence for resource conservation as a new and unique motivation for self-handicapping. Implications for future research are discussed.

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Introduction

The self-regulatory benefit of handicaps: Do handicapping situations encourage conservation of resources when success is uncertain?

Self-handicapping has traditionally been conceptualized as a process of strategically creating, or claiming, an impediment to a performance as a means to protect or enhance a person's perceived competence (Berglas & Jones, 1978). When future success is uncertain, self-handicapping serves as a way to attribute failure to external impediments rather than ability, as well as to augment perceived ability in the case of success because that success was achieved in the face of obstacles (albeit self-imposed ones).

Given the apparent costs of self-handicapping (e.g., impaired performance, lower competence satisfaction; Zuckerman & Tsai, 2005) it is important to understand why someone would choose such a strategy. Research suggests that most people handicap some of the time and some people handicap most of the time. This suggests that to better understand engagement in this self-defeating behavior, we need to look more closely into its motivational underpinnings. Traditionally, self-handicapping has been conceptualized as an identity-based strategy – with the self-handicapper reaping the benefits of discounting potential failure and augmenting the implications of success. Wusik and Axsom (2014) expanded this conceptualization by offering an avoidant coping perspective. Under this conceptualization, self-handicappers receive the short-term benefits that avoidant coping affords on top of the attributional perks of utilizing a self-handicapping strategy. Now, I look to build upon why people self-handicap by examining

it as a resource conservation strategy. Each perspective on self-handicapping – identity, avoidance, and conservation - offers unique reinforcement for the behavior and, collectively, they may offer a better understanding as to why people choose to self-handicap.

Self-handicapping as an identity-based strategy

Berglas and Jones (1978), in their seminal work on self-handicapping, discussed self-presentational motives and proposed that the ambiguity created by self-handicapping could serve to maintain a favorable self-image. Such attempts at controlling the attributions of others fall under the class of behaviors best known as self-presentation (Arkin, 1981). Subsequent research supports the idea that self-handicapping behavior serves a self-presentational purpose (Kolditz & Arkin, 1982; Shepperd & Arkin, 1989). Wusik and Axsom (2014), in their meta-analysis of the self-handicapping literature, found a significant mean effect for private self-handicapping, suggesting that self-handicapping is not simply (or exclusively) done for public consumption. A significantly larger effect for public self-handicapping suggested an additive effect for audience and a motivation to preserve a publically held image. Taken together, these results suggest that self-handicapping is, in part, a strategy to protect privately held self-images as well as to manage publically held impressions.

Rhodewalt and colleagues (1995), as well as others (e.g., McCrea & Hirt, 2001), have also shown that, as an impression management strategy, self-handicapping works. When a person fails on a task following the use of a handicap, they tend to blame their failures on that handicap. Further, by blaming their failures on some external obstacle, people seem to preserve their moods and their positive self-evaluations (Feick &

Rhodewalt, 1997; Higgins, Shah, & Friedman, 1997). Success following a self-handicap, moreover, does appear to augment the implications of success – strengthening the attribution towards ability as well as bolstering positive feelings. When self-handicapping is public, audiences tend to discredit failure as being caused by external obstacles and see success as caused by superior ability (Rhodewalt et al, 1991). It is important to note that these results are for occasional or initial handicapping. Prolonged, or chronic, self-handicapping tends to have the inverse effect. Audiences typically have a lower opinion of the repeat self-handicapper (Rhodewalt, 1995).

Self-handicapping as an avoidant coping strategy

While these costs and benefits are related to identity, how does self-handicapping affect performance? There is ample evidence to suggest that, in the long run, chronic self-handicapping poses significant detriments to personal growth (e.g., lower GPA, worsening test scores, impeded athletic performances). However, while overall there is a negative relationship between self-handicapping and outcome (Wusik & Axsom, 2014), in some cases there is limited evidence of self-handicapping effectively *improving* performance (e.g., Rhodewalt & Davison, 1986; Rhodewalt et al, 1984, study 2; Kim, Lee, & Hong, 2012). Snyder and Higgins (1988) suggested that it could be that self-handicapping alleviates evaluative concerns and, as a result, frees the individual to maintain better focus on the task and perform better.

Most recently, Wusik and Axsom (2014) argued in their meta-analytic review that self-handicapping may be conceptualized as an avoidant coping strategy that offers short-term gains beyond the benefits of self-presentation. Similar to other avoidant coping strategies, the goal of self-handicapping is to avoid or escape from particular thoughts or

feelings. The individual employing a self-handicapping strategy is looking to cope with stress by avoiding diagnostic feedback and reducing anxiety produced by uncertainty.

Evidence suggests that avoidance coping, while certainty detrimental in the long run, can be an effective way to control an individual's emotional reactions. Higgins, Shah, and Friedman (1997) found that success following approaching a problem with an avoidant coping style led to increased reports of calmness. Calmness was not affected, however, when an individual utilized an approach style of coping, suggesting that calmness may be related to doing well in avoidance but not approach coping. Carver (2009) found similar evidence suggesting that success following avoidance leads to a sense of relief that approach coping does not offer. This is similar to the augmentation principle of attribution theory, which suggests that an individual who succeeds following self-handicapping receives greater impression management gains than those who did not self-handicap, given the heightened difficulty (albeit self-imposed) of the target task following the handicap.

More realistically, however, an individual utilizing an avoidant coping strategy is not likely to succeed. Utilizing an avoidant coping style typically leads to a host of aversive psychological processes such as anticipatory anxiety (Elliot & McGregor, 1999), rumination (Stroebe et al, 2002) and poor emotional control (Alberts, Schneider, & Martijn, 2012).

There is also limited evidence that suggests that engaging in an avoidant coping strategy depletes self-regulatory resources at a greater rate than other coping strategies. Alberts, Schneider, and Martijn (2012) found that individuals who attempted to avoid unpleasant emotions displayed worse performance on a subsequent self-regulatory task

than those who accepted unpleasant emotions. Similarly, Ferrari, Johnson, & McCown (1995) found that when individuals procrastinated prior to a performance, they showed lower levels of subsequent self-control. Oertig and colleagues (2012) suggest that, while avoidance can effectively ameliorate negation emotions in the short-term, the associated effort that avoidance requires and the stress it produces taxes individuals at a greater rate than those who do not avoid.

Research suggests that people tend to develop habitual ways of dealing with stress and difficulties (Carver & Scheier, 1994; Costa et al, 1996). Coping is motivated by stress exposure, reactivity, and situational demands; evidence suggests that the influence of individual differences in the experience and perception of stress may explain relationships between personality and coping (Bolger & Zuckerman, 1995). In their meta-analysis of coping and personality, Connor-Smith and Flachsbart (2007) found that individuals high in neuroticism (a personality dimension underlying the chronic experience of distressing emotions) and low in conscientiousness (a dimension defined as a tendency towards being thorough, careful, or vigilant) tend to rely more on avoidance coping. This is likely because individuals high in neuroticism tend to display heightened reactivity to aversive events and increased negative affect when exposed to negative emotion-inducing events (Gross, Sutton, & Ketelaar, 1998). Similarly, those low in conscientiousness are unlikely to proactively manage their lives to avoid excessive exposure to stressful events.

Wusik and Axsom (2014) found a similar significant correlation between high neuroticism, low conscientiousness, and self-handicapping. Individuals who are high in neuroticism tend to focus on more negative aspects of a situation and retreat from

challenges. Highly neurotic individuals are likely to have lower confidence in their own future performance, become threatened by the implications of possible future failure, and view minor frustrations as hopeless. Additionally, individuals low in conscientiousness typically display low self-discipline, a low aim for achievement, and are likely to give in to the sort term gains avoidance presents.

The short-term gains of self-handicapping, like avoidant coping in general, are tempting. By disengaging from discomfort, and by creating obstacles that allow an individual to avoid diagnostic feedback, the self-handicapping individual is given immediate relief from their anxiety (Prapavessis et al, 2003). Individuals high in neuroticism are likely to experience stronger, and more frequent, urges to avoid threats (DeYoung, 2011) and individuals low in conscientiousness are less likely to restrain from the impulse to handicap (Depue & Lenzenweger, 2005). To deny this impulse, and to actively engage in self-control, takes effort.

Self-handicapping as a resource conservation strategy

The deceptive ease with which people avoid indulging in every craving they have, voice every thought that comes to mind, or give in to every emotion they feel, obscures the amount of effort it takes to stay in control (Wagner & Heatherton, 2014). Self-control is defined as the capacity to override natural and automatic tendencies, desires, or behaviors, to pursue long-term goals (sometimes at the expense of short-term temptation), and to follow socially prescribed norms and rules (e.g., Shoda, Mischel, & Peake, 1990; Baumeister, Bratslavsky, Mauraven, & Tice, 1998). Self-regulatory resources are instrumental in displays of self-control as well as executive function. Stressful situations make severe demands on this resource, because people must engage

in active responding and must regulate themselves to adapt to difficult circumstances. As a consequence of stress, this resource becomes depleted, making it more difficult to engage in resource-reliant behaviors (e.g., self-control).

The strength model of self-control suggests that people possess within them a limited supply of willpower that can be spent on acts of self-control and other operations of the executive system (Baumeister & Heatherton, 1996; Baumeister, Heatherton, & Tice, 1994; Baumeister, Muraven, & Tice, 2000). Every display of self-control draws from a limited supply of self-regulatory strength, leaving less available for subsequent self-regulatory acts. Depleted self-regulatory resources leave people vulnerable to self-control failures (e.g., impulsivity, poor performance, emotional reactivity). Additionally, when people are depleted their capacity to reason logically and to make judgments suffer. As a result, depleted individuals are more likely to suffer from irrational decision bias as well as make lapses in logical reasoning and judgment (Baumeister et al, 2007).

Depletion of this self-regulatory resource does not come simply from the stressor itself but from the individual's response to and effort to cope with stress (Baumeister, 2011). Behaviors such as modulating mood, strategic self-presentation, displays of self-control, and active planning (Hagger, Wood, Stiff, & Chatzisarnatis, 2010) all require self-regulatory control and draw from this limited reserve. However, not all coping strategies are created equal and not all will tax resources at an equal rate. For example, evidence suggests that resisting temptation (simply denying oneself a temping cookie) significantly spends more regulatory strength than making the decision to walk away from temptation (Magen & Gross, 2007). Self-regulation comes at a cost. Self-regulatory

strength, once depleted, is slow to recover, so after immediately exerting control there is less of this resource available for other, strength requiring tasks.

How do individuals choose their coping response? While future desires and goals guide current behavior, habits and past experiences play a large role in the selection, and automatic nature, of coping behavior. Given the limited nature of self-control strength, people must be selective in their management of self-regulatory spending. Fiske and Taylor (2001) suggest that humans place a high value on mental processing resources and, as a result, develop strategies to better save time and effort when navigating their everyday lives. Similarly, Kahneman (2011) suggests that people place an emphasis on a fast thought style (what he calls *system 1*) that relies on automaticity and seeks to conserve mental effort and cognitive resources. Depletion of our resources leads to stress and impaired performance (Hobfoll, 2002). Therefore, a person is motivated to spend the least amount of resources possible and avoid spending too much regulatory strength on a low-priority project, at risk of not having enough strength critical for subsequent (and possibly higher priority) tasks.

Muraven, Shmueli, and Burkley (2006) found that when individuals were anticipating a self-control task in the future, they expended less regulatory effort leading up to that task than those who were not anticipating a future task. Muraven and colleagues also found that this strategy paid off. When individuals conserved their resources early in the experiment (because they anticipated future tasks), they subsequently performed better on later self-control tasks than those who did not have similar anticipation.

Consider, again, the self-handicapping behavior. Placed in a situation in which an individual has an upcoming, important task to perform - a task that they are expected to do well on, these individuals may self-handicap by reducing effort (e.g., procrastination), distracting themselves, or helping other people rather than practice or prepare themselves for their performance. Through a conservation of resources lens, the argument could be made that self-handicapping behavior likely conserves an individual's resources and, after having weighed the pros and cons, an individual determines that practicing (or preparing) is a greater tax on their self-regulatory strength than other coping strategies. However, this is not the whole story. Otherwise we would find that everybody self-handicapped. Instead, we see only some people self-handicapping and some situations eliciting self-handicapping. For people to self-handicap, there first must be doubt or uncertainty over their ability to succeed.

The motivation to conserve resources should be intensified when the causal link between strength exertion and outcome is weak or non-existent. If we are self-regulatory misers then we are unlikely to spend our limited self-regulatory strength on endeavors over which our control on the outcome is ambiguous or unclear. Self-handicapping tendencies reflect uncertainty about one's own competence. An individual most likely to select a self-handicapping strategy has received feedback but is not sure if that feedback was contingent on their ability or their performance (i.e. – noncontingent feedback situation). While evidence within the avoidance coping and impression management self-handicapping literature suggests that the relationship between feedback and self-handicapping behavior is moderated by individual differences in neuroticism and conscientiousness, similar effects have not been tested through the lens of resource

conservation. It stands to reason, though, that while situationally contingent feedback likely produces confidence in the link between effort and outcome, feedback that has not been consistent with self-perceived ability is likely to produce a sense of uncertainty and low self-efficacy regarding future success as well as apprehension towards disconfirming expectations.

Self-efficacy beliefs affect whether individuals think in self-enhancing or self-debilitating ways, how well they motivate themselves, whether they will persevere during difficult times, the quality of their emotional life, their vulnerability to stress, and their resiliency to adversity. An individual displaying low self-efficacy (or, low confidence in themselves) therefore, will view situations as more hopeless (Bandura, 1997), dwell on their deficiencies, and display greater physiological arousal and subsequent performance impairment (Geer, Davison, & Gatchel, 1970).

The connection between self-efficacy and self-regulation is not surprising. It is hard to imagine an individual lacking confidence in their ability displaying a superior level of self-control and persistence. It is likely that we all can remember a time when we showed poor self-control when we felt we had little control over our environment and little confidence in our abilities. Bandura (1977) suggested that efficacy beliefs influence behavioral outcomes by reducing effort and persistence, increasing anxiety when facing threats (Bandura, et al, 1985) and negatively influencing the quality of analytical cognitive performance. Individuals with high efficacy display superior problem solving skills (Artistico, Cervone, & Pezzuti, 2003). Artistico et al (2003) found that individuals with knowledge but doubt over their ability failed to exert the required amount of effort needed for optimal performance. Put another way, despite having the tools to succeed,

individuals who doubted their ability worked less and did not exert as much effort as those who believed they would succeed (and, assumingly, believed that their resources were being put to good use).

Low self-efficacy and uncertainty over future success are significant correlates of self-handicapping (Wusik & Axsom, 2014). What is it about uncertainty that makes an individual self-handicap? It would be surprising to find a student that is unaware that studying and completing homework is linked to better performance or an athlete who is completely unaware that practice makes perfect. Most individuals are aware, at least in a logical sense, that their effort is somewhat tied to their outcomes. When faced with a challenge, we know that we *should* try even if we may not *want* to. The decision between the two, however, is not always easy.

Milkman (2012) found that when individuals were uncertain about future outcomes they were more likely to indulge in unproductive wants rather than engage in less desirable, but more productive, shoulds. From a self-handicapping standpoint, this would be an individual giving in to the temptation to reduce effort (want) rather than to fully dedicate him or herself to practicing (should) before a performance. Rather than suggest that this happens as the result of the individual giving up or thinking the trying is pointless, Milkman proposed that the uncertainty in the individual's environment makes it more difficult to resist the temptation of the wants (resistance which would further deplete self-regulatory resources). On the other hand, Converse and DeShon (2009) found that when individuals had prior experience with the self-regulatory task (in the form of a series of identical tasks), they found that self-control and self-regulation improved. They suggested that having certainty over the amount of force needed and the

likely outcome facilitated learning and influenced expectation over self-control. As a result, people could adjust their behaviors by expending more effort and resources, thereby resulting in better performances on subsequent tasks. While uncertainty led to poorer displays of self-regulation, certainty led to improved self-regulatory control.

Uncertainty brings about stress (Monat, Averill, & Lazarus, 1972; Greco & Roger, 2003). Self-handicapping is a method to cope with that stress, with the alternatives being complete withdrawal (quitting) or trying. While quitting as a coping method does alleviate stress, it also provides no chance for success. The individual who completely withdrawals from a class or quits a team no longer has any expectation of success placed upon them. However, the individual who self-handicaps cares about the task (Shepperd & Arkin, 1989). Quitting, then, would not be an attractive coping strategy.

The uncertain individual is left with two, resource-reliant options - to self-handicap or to try (there are, of course, a multitude of options in reality but we will simplify for the sake of this example). While the confident individual is likely to display greater effort (and, likely, expend more resources), individuals not confident that their effort will translate into their desired outcome are more likely to be more conservative with their regulatory resources for later use (Artistico et al, 2003). We are self-regulatory misers in that we are not always willing to spend our limited resources where we do not think they will be useful. Individuals, it seems, assess the impact their resources will have on a problem and weigh that against how much they may need those resources in the future. It could be, then, that self-handicapping, in addition to having an identity and an avoidance function, is also a strategy to conserve resources for future performances.

The Current Study

Self-handicapping appears to be an effective short-term impression management strategy as well as an avoidant coping strategy. If self-handicapping is strictly an impression management strategy, however, we should see decrements in subsequent actual performance. Monitoring our appearance and attempting to modify ourselves to manage others' impressions comes at a cost (Vohs, Baumeister, & Ciarocco, 2005). If someone employs a self-handicapping strategy then we should see detriments to their self-regulatory resources. In turn, these individuals with depleted resources should perform worse on a subsequent resource intensive task. If this were the case, the self-handicapping individual would reap the benefits of their impression management efforts, but at the cost of performance.

Similarly, if self-handicapping is strictly an avoidant coping strategy, we should see detriments to self-regulatory resources relative to engagement. For instance, self-regulatory resources are required to stop distracting thoughts (i.e., intrusive thoughts regarding the individual's potential failure), alter emotional responses towards their uncertainty, or suppress the impulse to fully escape or withdraw from the target performance. An individual's perception of poor progression and ineffective goal pursuit caused by self-handicapping may also drain resources and leave the individual feeling exhausted (Oertig et al, 2012).

This, however, does not appear always to be the case. Evidence suggests that sometimes individuals actually do *better* following self-handicapping (albeit in the short term). Some evidence suggests that individuals who employ a self-handicap when future success is uncertain tend to perform better on a subsequent task than those who persevere in the face of uncertainty (e.g., Kim, Lee, & Hong, 2012).

This suggests that there are other benefits of self-handicapping aside from impression management and avoidant coping. If self-handicapping were strictly avoidance coping, we would likely see detriments to self-regulatory resources (in the form of impaired performance) given that avoidance depletes resources. Similarly, if self-handicapping were strictly an impression management strategy, we would similarly see detriments to regulatory resources (and worse performance) given the resources required for an individual to engage in strategic impression management. Self-handicapping could be an effective short-term method of conserving resources rather than needlessly spending them on tasks that appear to have little bearing on success. Having more resources at the time of the target task (e.g., a game, test, or stressful social interaction) would allow for better mood modulation (McRae, Ochsner, & Gross, 2011), greater persistence, and overall better focus (Schmeicherl, Vohs, & Baumeister, 2003) than working from a depleted resource bank.

To examine these questions in the current study, I use a different strategy than typically employed in self-handicapping studies. In the current study it is impractical, as well as inefficient, to follow a traditional self-handicapping paradigm in which individuals are presented with a self-handicapping opportunity and are free to choose whether they handicap. Given that not every person self-handicaps, such a design would not guarantee that there would be enough people self-handicapping to generate sufficient power to detect an effect. Instead, I create a situation for individuals that replicates the circumstances that would be present had they chosen to self-handicap. Participants will be led to believe that they will be problem solving under a performance-distracting condition or a performance-neutral condition (derived from Rhodewalt, Tragakis, &

Finnerty, 2006). Those in the Distracting condition will perform a task under the assumption that they are not expected to do well (a situation similar to if they had chosen to self-handicap) while those in the No Effect condition will perform under the assumption that they will be performing under conditions that should have no effect on their performance (as if they were performing un-handicapped). All participants will then be asked to perform a logic task (derived from Schmeichel, Vohs, & Baumeister, 2003) under non-distracting conditions as a means to evaluate their self-regulatory strength and performance (as measured by persistence and cognitive accuracy). If self-handicapping is a means by which cognitive resources are conserved, then we should see participants in a condition that mimics self-handicapping performing better on a follow-up task compared to those in a condition that does not do so. Conversely, if self-handicapping is strictly an impression management strategy (which taxes self-regulatory resources; Vohs, Baumeister, & Ciarocco, 2005) or an avoidance strategy, we should see those in the non-self-handicapping situation performing better on the subsequent follow-up task. This reasoning leads to hypothesis 1a -

Hypothesis 1a: *When participants are led to believe that they will be performing under sub-optimal (i.e., handicapping) conditions and anticipate a subsequent performance, they will perform better on the subsequent task than those not placed into a handicapping situation.*

There will also be a condition in which participants are placed in a "handicapping situation" but are unaware that there will be a subsequent task that will require their resources. If self-handicapping is a means to conserve resources, as I hypothesize, we should see a significant difference between the two distracting conditions, with

participants in the *Distraction –Anticipation* condition performing better on the third task than participants in the *Distraction – No Anticipation* condition. Conversely, if participants who are assigned to the handicapping condition simply do not care about the tasks, then we should see no difference between the two distraction conditions. This reasoning leads to hypothesis 1b -

Hypothesis 1b: Participants, when placed in a handicapping situation, will perform better on a subsequent task when anticipating that follow-up task compared to those not anticipating a follow-up task.

Hypotheses 1a and 1b are based on the assumption that improved performance will occur due to energy conservation. Individuals entering a situation in which they believe that their performance will be hindered, and that there will be a subsequent performance, should be motivated to conserve their resources (through reducing effort) for a situation in which their resources will be better spent. In the current study, participants were asked to perform in either a "handicapping" situation (i.e., performing while a distracting noise was playing) or a "nonhandicapping" situation (i.e., performing while a neutral tone was playing). Their performance during their noise-related task was monitored to observe differences in how they approach the task. If participants reduce their effort (and conserve energy) during this part of the study, we should see differences in the number of tasks they are able to solve as well as their persistence on an impossible task, with "handicapped" individuals abandoning solvable tasks more frequently and giving up on an impossible task faster. This reasoning leads to hypothesis 2 -

Hypothesis 2: Participants will reduce their effort spent on a task to a greater extent when they believe that they are performing in a handicapping situation and when

they are anticipating a follow-up task compared to both those who believe that they are performing in a nonhandicapping situation, as well as those who are not anticipating a follow-up task.

If the first two hypotheses are supported, the next task will be to determine the extent to which reducing effort mediates the relationship between group assignment and follow-up performance differences. Finding evidence for group differences in effort reduction translating into differences in follow-up performance will offer support for the argument that handicapping situations encourage individuals to reduce effort, allowing for better subsequent performance. This reasoning leads to hypothesis 3 -

Hypothesis 3: Reducing effort during the noise-related task will mediate the relationship between group assignment and follow-up performance.

Not everybody self-handicaps, however. In traditional self-handicapping studies, participants are allowed to choose whether they will handicap. Wusik and Axsom's meta-analysis (2014) reported the effect for self-handicapping as ranging from -.31 to .62. This suggests that, while self-handicapping is a common strategy, not every person will use it under every circumstance. Instead, some people are more prone to self-handicapping than others. Wusik and Axsom found that low conscientiousness and high neuroticism are significant correlates of self-handicapping and, when faced with uncertain future success, individuals with this personality pattern are more likely to seek out the short-term gains of self-handicapping at the sake of long-term costs. In the current study, it is unlikely that all individuals would view self-handicapping as a welcome opportunity. Rather, some people may be *more* stressed by the fact that they are working from a deficit and, as a result, attempt to conserve their cognitive resources.

Hypothesis 4: The effect that a handicapping situation has on a subsequent performance will be moderated by personality, where individuals low in conscientiousness and high in neuroticism will reduce effort more frequently during the handicapping situation and perform better on the subsequent task than other individuals.

Hypothesis 5: *Similarly, I hypothesize that the effect of a handicapping situation on subsequent task performance will also be moderated by individual differences in self-handicapping (as measured by the self-handicapping scale, Jones & Rhodewalt, 1982), with high self-handicappers quitting more frequently during the handicapping situation and performing better on the subsequent task compared to low self-handicappers.*

Method

Participants

One hundred sixty-two undergraduates (N_{female} = 117[1]; N_{male} = 45) from the psychology department SONA pool at a large, mid-Atlantic university volunteered for a study advertised as "Novel Approaches to Understanding Performance," focusing on the effect of sound on performance on a spatial reasoning intelligence task. Participants were compensated with extra course credit.

Design

Participants were randomly assigned to one of three groups ($N_{condition}$ = 54) differing in the information given regarding the level of distraction a stimulus would produce and whether a follow-up task was anticipated after the noise-based task. The information fell into one of three categories (representing the three experimental conditions): The stimulus was going to be *distracting* towards performance and participants anticipated a third task following the handicapping task (*Distracting – Anticipation*); the stimulus was going to be *distracting* towards performance and participants did not anticipate a third task (*Distracting – No Anticipation*); and the stimulus was going to have *no effect* on performance and participants anticipated a third task (*No Effect-Anticipation*). All groups were given the same stimulus and series of tasks.

Procedure

Prior to arriving for the study, all participants completed pretesting online. The pretesting was part of a larger, department-wide survey. Participants completed two scales from the International Personality Item Pool-50 (IPIP-50; Goldberg, 1999) -

conscientiousness (alpha = .86) and neuroticism (alpha = .84) - as well as the self-handicapping scale (Jones & Rhodewalt, 1982; alpha = .62).

For the main experiment, subjects participated individually within a single experimental session. They were met in the lab by the experimenter[2], who told them that they were going to be participating in a study regarding sound and performance. It was explained that the purpose was to explore how auditory stimuli affect an individual's focus during a complex cognitive task (see Appendix A for consent form). They were informed that a large number of individuals seek out auditory stimulation (e.g., music, television audio) while performing complex tasks (e.g., homework, writing) under the assumption that such stimulation enhances focus. The experimenter went on to report that there is little evidence supporting the benefits of auditory stimulation while performing complex tasks. Additionally, participants were told that it is possible that such stimulation is distracting and hinders performances. The alleged goal of the study was to further explore the effects of sound on performance by asking participants to take an intelligence test under varying auditory conditions. The use of intelligence as a tested construct was based both on its significance in the college population as well as its use in classic self-handicapping studies.

The experimenter then informed the participant that they would first be given a spatial reasoning intelligence assessment, looking at their ability to see patterns and solve puzzles. The experimenter went on to explain that following their assessment, participants would be given a parallel version of the task while a tone was played. Participants in "anticipation" conditions (i.e., *Distracting – Anticipation* and *No Effect-Anticipation*) were also informed that there would be a third task (one not involving any

noise stimuli), tapping into the same type of intelligence in a different way. Participants in the *Distraction – No Anticipation* condition were not informed of this third task. To this point in the study, participants had yet to be informed of the expected effect of their assigned tone.

In the first phase of the experimental session, participants were given a spatial reasoning task that required tracing an image. Participants were asked to trace a geometric shape without lifting their pencil or retracing a line they had already traced. It was explained that scoring would be based on both the successful completion of the task as well as the speed with which problems were solved (after methods in Wusik & Axsom, 2014). The experimenter first displayed a simple geometric figure and demonstrated the tracing task. Upon verbal acknowledgment of understanding by the participant, the experimenter gave the participants a series of six geometric tracing tasks of increasing difficulty, with instructions to trace the figures as accurately as possible. They were also told that the difficulty of the tasks would be similar to the difficulty of the part two (noise-based) re-test assessment. Suggesting that both tests were of similar difficulty eliminated the possible later rationalization of, "I'm doing worse because this is more difficult." Similarly, telling the participant that the two tasks were of similar difficulty implied that their performance on part 1 (the feedback they received) was their expected performance on part two. Two of the geometric shapes actually had no solution. At the completion of all designs, the experimenter "scored" the task and delivered feedback to the participant. All participants were given non-contingent success feedback (i.e., scoring in the 92nd percentile) as a means of creating some doubt and uncertainty about future performance (see *Results – Feedback on task 1* below for piloting results).

After receiving feedback on part one, participants were assigned their audio track. Participants in the *Distracting–Anticipation* and *Distracting–No Anticipation* conditions were informed that their track was "an 8 out of 10, a very distracting track." Participants in the *No Effect-Anticipation* condition were told that their track was "a 5 out of 10. Past research has shown that this tone will have no effect on your performance." All participants were played the same tone.

Prior to undertaking part two, participants were given the *Brief Mood Introspection Scale* (BMIS, Mayer & Gaschke, 1988; Appendix B), a 12-item self-report survey that assesses mood on two dimensions -- valence and arousal. One possible interpretation of the results could be that the impact of the group assignment could be mediated by mood, in that being placed in a handicapping situation could put people in a bad mood. This was important to investigate because bad moods have, at times, been shown to facilitate careful cognitive elaboration (e.g., Bless, Mackie, & Schwarz, 1992). Applying these findings to the current study, it could be that being placed in a handicapping situation upset people and, by simply being in a negative mood, these people would have increased cognitive elaboration and superior performance on logic problems. Additionally, participants were asked to indicate, "on a scale of 1-10, how distracting or enhancing will your tape be?" This question served as a manipulation check to ensure that participants understood their assignment and anticipated a Debilitating or a No Effect track.

Participants then took part in the second experimental phase, consisting of nine tracing designs under the same time restrictions as part 1. These nine tasks increased in difficulty, culminating in one impossible task at the end. These tasks were used as a

measure of persistence and effort during part two. Participants' part-two performance was scored based on the number of solvable tasks that they quit prior to solving as well as how long they persisted on the impossible tracing figure. While participants completed the tracing tasks, their "assigned track" was played through computer speakers.

At the conclusion of the nine tracing tasks, all participants were given a follow-up, "retention" task that was allegedly designed "to tap into the same type of intelligence as the tracing assessment in a different way." Participants were then given a series of 21 logical reasoning questions derived from the GRE analytical test (after Schmeichel, Vohs, & Baumeister, 2003, see Appendix C). Participants worked until they reached the predetermined time limit of 10 minutes. Prior research has suggested that resource depletion leads to poorer performance in higher order, complex tasks such as logical reasoning that presumably require self-control and executive function. Additionally, tasks requiring both self-control as well as executive function, such as the prescribed analytic test, have been shown to be the most susceptible to deficits in self-regulatory resources (Schmeichel, Vohs, & Baumeister, 2003).

The analytic test served as a marker of depleted resources in three ways. First, participants were scored based on the total number of correct answers they produced in the allotted time (*absolute score*). Second, they were scored based on how many questions they attempted in the allotted time (*speed*). This metric served as a gauge for working speed as well as a proxy measure for effort given during the task. Third, participants were assessed on the proportion of correct answers they provided in relation to the total number of questions they attempted (*accuracy*). This metric was used to determine if participants differed in their reasoning processes regardless of speed.

After the participant worked for 10 minutes on the logic questions, they were informed that the study was over. They were then debriefed. Prior to providing information regarding the true nature of the study, a suspicion probe was used to determine if the cover story was successful. This indicated that there was no suspicion and the cover story was successful per participant report. Participants were then informed of the true nature of the study (see Debriefing, Appendix D) as well as encouraged not to disclose this information to others.

Results

Pilot testing results

Feedback on task 1. By suggesting that we were testing each participant's intelligence, as well as giving non-contingent success feedback on impossible tasks, we attempted to create uncertainty as well as doubt for future success. This assumption was pilot tested prior to running the full study. Fifteen participants were administered part 1 of the aforementioned study. After receiving their performance feedback, participants were then given a confidence questionnaire to determine if the feedback created the desired effect. Three piloting questions were asked: How well did you perform on the task (Scale: 0 (better than 0% of people) – 10 (better than 100% of people); M = 9.0, SD = .38), How well do you expect to do on the following task (Scale: 0 (better than 0% of people) – 10 (better than 100% of people); M = 6.1, SD = .96), and How confident are you in doing as well or better on the following task (Scale: 0 (Not at all confident) – 10 (Extremely confident); M = 4, SD = 1.5). The results suggested that participants a) were able to report the feedback they received, b) were anticipating doing worse (on average) than their reported performance ($t(14) = 11.00$, $p<.01$), and c) reported low confidence in doing as well or better on the following task. The results, taken together, suggest that the feedback delivered achieved the desired effect in lowering confidence and creating uncertainty.

The utility of task 3 The set of questions used for part 3 of the experiment (logical reasoning task) was first piloted with 52 undergraduates to ensure that the questions selected did not produce a floor or ceiling effect. Participants for this phase of piloting arrived into a classroom as a group and were given brief instruction regarding the

questions. Participants were informed that the set of questions reflected an individual's logic reasoning and that they would have 10 minutes to answer as many questions as they could. Participants were encouraged to work quickly and carefully and to answer each question in order. Having participants complete the logic test without any prior tasks was done to determine the average performance on the 21 questions during an undepleted state. The results ($M_{attempted}$ = 11.3, SD = 2.2; $M_{correct}$ = 7.6, SD = 2.6; $M_{accuracy}$ = .68, SD = .22) suggested that the questions presented enough of a challenge so that not all were answered correctly, or even attempted. Additionally, the piloting suggested that these questions were not so hard as to prevent anybody from answering them correctly.

The effect of task 2 The decision to use nine tracing figures was the result of a series of pilot tests. During this phase of piloting, all participants followed a similar method (task 1 and task 3 following the previously described methodology) with systematic changes made to task 2 to ensure that a sufficient level of depletion was achieved. The tone played during task 2 was the same tone that was subsequently played for the full experiment. For each phase of the study, the mean number of items correct ($M_{correct}$) and the mean accuracy ($M_{accuracy}$) for the pilot group were compared to the mean correct and mean accuracy of the task 3 (undepleted) pilot group. All piloting phases had group sizes of 10 participants.

For the first phase of piloting, participants were given seven tracing tasks (5 solvable, two impossible) during part two. The results ($M_{correct}$ = 4, SD = 4.4; $M_{accuracy}$ = .69, SD = .12) suggested insufficient depletion when compared to the accuracy of the undepleted pilot group ($M_{undepleted}$ = .68; difference = .01). The second round of piloting had the participants completing six tracings with three impossible tasks. Again, the

results ($M_{correct}$ = 4.7, SD = .58, $M_{accuracy}$ = .56, SD = .10) suggested insufficient depletion when compared to the accuracy of the undepleted pilot group (difference = -.12), given the desired depletion effect (based on Schmeichel, Vohs, & Baumeister, 2003). Additionally, the use of impossible tasks in this phase appeared to increase the likelihood of quitting on later, solvable tasks. After approaching and abandoning an impossible task, participants were more likely to abandon later tasks whether they were solvable or not. Given that the purpose of part two was to create cognitive depletion, I did not want to create a task so difficult that participants quickly abandoned it (and, as a result, conserve energy as a product of their frustration). To achieve the desired level of fatigue during this task, I reduced the number of impossible tasks in an effort to encourage participants to engage in the task and display a consistent level of effort. The final round of piloting had participants completing nine tracing figures (8 solvable, 1 impossible). Results suggested that the tracing tasks ultimately selected for the current study produced an appropriate level of fatigue ($M_{correct}$ = 3.9, SD = 2.2; $M_{accuracy}$= .48, SD = .24) when compared to the accuracy of the undepleted pilot group (difference = -.20). Additionally, participants in this phase of piloting displayed more consistent effort, evidenced by consistently completing solvable tasks.

The main experiment

Part One

Tracing Task Performance A one-way ANOVA indicated that there was no significant difference for time spent on the part 1 tracing task between the three experimental conditions (F(2, 159) = .84, p = n.s.; *table 1*).

Brief Mood Introspection Survey Following their non-contingent success feedback and group assignment, all participants were given the Brief Mood Introspection Survey as a means to assess any mood affects caused by the initial task and group assignment. The BMIS was scored on four mood subscales: Pleasant-Unpleasant, Arousal-Calm, Positive-Tired, and Negative-Relaxed. No significant differences were found among the three groups based on any of the subscales (P-U $F(2,161) = .51$; A-C $F(2, 161) = .64$; P-T $F(2, 161) = .07$; N-R $F(2, 161) = .65$; all p = n.s.; *table 1*).

Manipulation Check Following the BMIS, but prior to beginning part 2, participants were given a one question manipulation check asking them to indicate the intended effect of their assigned tone on a scale of 1-10 (1 = Enhancing, 5 = No Effect, 10 = Distracting). All participants in the *No Effect-Anticipation* group correctly indicated their group assignment. All but ten participants in the *distraction* conditions correctly answered the manipulation check question. Individuals who answered incorrectly all overestimated the effect of the tone (all selected 10, Extremely distracting); all were retained for subsequent analyses.

Group assignment as a predictor of part 3 logic task performance and effort

There were two main predictions for the current study. First, it was predicted (Hypothesis 1a) that after being told they would be performing a target task under distracting conditions (and being led to believe they there would be a non-handicapping follow-up task), participants would perform better on the subsequent logic questions than those who were led to believe they would be performing a target task undistracted (and led to believe there would be a follow-up, non-handicapping task). Second, it was predicted (Hypothesis 1b) that after being told there would be a follow-up task after a

distracting target task, participants would perform better on the subsequent logic questions than those who were led to believe that there would be no task beyond the distracting target task. I tested these hypotheses based on three standard performance measures: absolute score (number correct), speed (number attempted), and accuracy (correct/attempted) (Schmeichel, Vohs, & Baumeister, 2003).

First, I ran a one-way ANOVA to determine whether the three groups differed based on the number of questions they got correct on the part three logic task. Results indicated that there was not a significant difference among the three groups ($F(2, 159) = 2.04$, $p = .13$; means in *table 2*).

Second, I tested whether the three groups differed based on speed (i.e., number of problems attempted). Again, a one-way ANOVA revealed that there was not a significant difference in number of items attempted ($F(2, 159) = 2.70$, $p = .07$).

I then ran a one-way ANOVA to test group differences based on participants' accuracy (number correct/number attempted). This revealed that accuracy on the logic questions significantly differed by condition ($F(2, 159) = 7.69$, $p<.01$; means in *table 2*). Protected t-tests showed that, as predicted, participants in the *Distraction –Anticipation* condition performed significantly better on the logic questions than participants in both the *No Effect-Anticipation* condition ($t(159) = 3.21$, $p<.01$; $d = .68$, 95% CI [.29, 1.06]) and the *Distraction – No Anticipation* condition ($t(159) = 3.15$, $p<.01$; $d = .61$, 95% CI [.23, 1.00]). There was no significant difference between the *No Effect-Anticipation* and the *Distraction – No Anticipation* conditions ($t(159) = .46$, $p =$ n.s.; $d = .09$; 95% CI [-.29, .47]).

Each group's accuracy on the logic questions was then compared to the performance of the pilot group (the undepleted participants; $M_{accuracy}$= .68) to determine whether their performance was significantly different than had they performed without prior depletion. A t-test showed that participants in the *Distraction – Anticipation* condition (M= .72) performed similar on the logic questions as participants in the pilot group (t(107) = -1.15, p = n.s.). Similarly, participants in the *Distraction – No Anticipation* condition performed similar to participants in the pilot group (t(107) = 1.81, p = .07). Meanwhile, there was a significant difference between the pilot group and the *No Effect-Anticipation* group (t(107) = 2.24, p<.05). This finding shows that, unlike the distraction conditions, the *No Effect* experimental condition displayed significantly worse accuracy when compared to those who were relatively "undepleted." This offers support for the argument that individuals in the *No Effect* condition are spending a significant amount of resources compared to the other conditions. Meanwhile, those in the *Distraction-Anticipation* (and to a lesser extent, the *Distraction-No Anticipation*) condition were performing similarly to those who were "undepleted." Taken together, these findings are encouraging in that they suggest individuals in the distraction conditions may be saving their resources better than those in the no effect condition. This "saving" is later translated into better accuracy during the part three logic test.

To determine whether results in the main experiment were affected by individual differences in time spent on the part 1 task, a one-way ANCOVA was run using part one performance as a covariate (see endnote 3). This was done to control for differences in participants' speed and ability on the tracing task. The results indicated that performance on the logic questions still significantly differed by condition (F(3, 158) = 7.51, p<.01).

To better understand why individuals in the *Distraction – Anticipation* condition performed significantly better on a follow-up logic task, I compared the differences between the three groups based on their effort put forth during their part two performance (i.e., their performance while the tone was playing; Hypothesis 2). As expected, there was a significant difference between the three groups based on how frequently participants left a solvable problem incomplete (table 3, $F(2, 159) = 20.18$, $p<.01$). Protected t-tests revealed that participants in the *Distraction – Anticipation* condition quit more frequently than participants in both the *No Effect-Anticipation* condition ($t(159) = 5.88$, $p<.01$; $d = 1.08$, 95% CI [.68, 1.49]) as well as the *Distraction – No Anticipation* condition ($t(159) = 5.02$, $p<.01$; $d = .96$, 95% CI[.57, 1.36]). Again, there was no significant difference between the *No Effect-Anticipation* and the *Distraction – No Anticipation* conditions ($t(159) = .87$, p = n.s.; $d = .18$, 95% CI [-.20, .56]).

A possibly related indicator of effort during part two was how long participants spent attempting to solve the final, unsolvable puzzle. Because of high observed variance on this measure, I examined the time data for outliers; two cases with extremely high z scores on impossible task persistence were univariate outliers (*see figure 1*): participant 92 in the *Distraction-Anticipation* condition ($z = 4.54$) and participant 119 in the *Distraction-No Anticipation* condition ($z = 3.91$). When these two participants were excluded, a significant difference between groups based on persistence was found ($F(2, 157) = 3.08$, $p<.05$). Protected t-tests revealed that, as expected, participants in the *Distraction – Anticipation* condition persisted less than participants in the *No Effect-Anticipation* condition ($t(159) = 2.47$, $p<.01$; $d = .48$, 95% CI [.09, .86]). However, participants in the *Distraction – Anticipation* condition were not significantly different

than those in the *Distraction – No Anticipation* condition ($t(159) = 1.42$, $p<.01$; $d = .27$, 95% CI[-.11, .65]). Similarly, there was no significant difference between the *No Effect-Anticipation* and the *Distraction – No Anticipation* conditions ($t(159) = -.97$, $p =$ n.s.; $d = .19$, 95% CI [-.56, .19]). These results suggest that when participants were told that they would be distracted during a difficult task (and, therefore, were not expected to do as well) they were significantly more likely to quit on a solvable task and abandon an impossible task more quickly (using less effort) than those who were led to believe that the tone had no effect on their performance. Additionally, for those who were told that the tone was distracting, being led to believe that there would be no additional tasks led them to expend greater effort (evidenced by quitting less than those who expected a follow up).

Finally, I regressed logic task performance on effort to determine the effect that quitting had on subsequent performance. Effort was found to predict subsequent logic task performance, with less effort (evidenced by quitting on a greater number of tracing tasks) predicting better performance on the logic exam ($b= .05$, $SE = .01$, $t(161) = 3.82$, $p<.001$). In other words, for every tracing task that a participant quit on, there was a predicted 5% increase in their performance on the logic task (i.e., .05 increase in their average on the logic test). I then tested to determine if this effect was similar across conditions. It was found that for those who believed they were being distracted and who were anticipating a third task, quitting was significantly correlated with improved part three performance ($r = .37$, $p<.01$). It appears that for those who believed that they were performing in sub-optimal conditions and that they had another task approaching, withholding effort (i.e., quitting) translated into later improved performance. For those

who were distracted and not anticipating a third task (r = .14, p = n.s.) and those who believed they were performing in neutral conditions (r = .00, p = n.s.), there was no significant correlation between quitting and part three performances. When part three logic task performance was regressed onto part two impossible task persistence, there was no significant relationship (b = .00, SE = .00, t(159) = .28, p = n.s.). Similarly, there was no significant relationship between persistence and logic performance across all three conditions (Distraction – Anticipation: b = .00, SE = .00, t(52) = 1.00, p = n.s.; No Effect: b = .00, SE = .00, t(53) = .42, p = n.s.; Distraction – No Anticipation: b = .00, SE = .00, t(52) = .45, p = n.s.).

Mediation Analysis

In the previous analyses, group assignment was shown to be 1) significantly related to performance on the part three logic task, and 2) significantly related to effort put forth during the part two "distraction" task. Effort also significantly predicted performance on the part three logic task. To test hypothesis three, I examined whether effort mediated the effect of group assignment on subsequent logic task performance.

Mediation was tested by assessing the significance of the cross product of the coefficients for group to effort path (the *a* path) and the effort to logic task performance relation controlling for condition (the *b* path). An *ab* cross product approach tests the statistical significance of the difference between the total effect (*c* path) and the direct effect (*c'* path), which is the impact of treatment on outcome adjusting for the effect of the mediator. The Sobel test is the most familiar cross product method. However, one limitation of Sobel is the assumption of normal distribution of *ab*. Therefore, a non-parametric method was used (Preacher & Hayes, 2004; Preacher & Hayes, 2008), which

solves the issue of distribution by bootstrapping. Parameter estimates presented below are based on 5,000 bootstrap samples.

First, the mediation model was tested contrasting the *Distraction – Anticipation* and the *No Effect-Anticipation* condition (*figure 2*). This analysis served to test the primary hypothesis that differences in expectation during performance (i.e., the difference between believing that the tone was distracting and the tone had no effect) would significantly predict differences in performance on the logic task through effort. In the meditational analysis (r^2 = .14; F(2, 105) = 8.43, p<.001), the indirect effect of group assignment on logic performance through effort was significant (beta = -.05, 95% CI [-.12, -.01]). When controlling for effort, the direct effect of group assignment on logic performance reduced in strength (c'; beta = -.27, t(107) = 2.09, p <.01). This suggests that effort partially mediated the relationship between group assignment and part three logic task performance. Preacher and Kelly (2011) recommend that the most effective way to evaluate the indirect effect size is to evaluate the magnitude of the indirect effect relative to the maximum possible indirect effect. The task, then, is to interpret the proportion of the maximum possible indirect effect that could have occurred. The proportion of the maximum observed indirect effect that was observed was also found to be significant (b = .05, SE = .04, 95% CI [.003, .14]).

Next, the mediation model was tested contrasting the *Distraction – Anticipation* and *Distraction – No Anticipation* conditions (*figure 3*). This served to address whether observed differences between the *Distraction – Anticipation* and the *No Effect-Anticipation* conditions could be attributed to simply not caring about task 2 performance. Should this be the case, it would be likely that we would see no differences

in accuracy between the two distraction groups (anticipation vs. no anticipation). However, if these results are better attributed to conservation strategies, we should see participants in the *Distraction – Anticipation* condition better conserve their resources than those not expecting a follow up. In the mediation analysis (r^2 = .15, F(108) = 9.29, p<.01), the indirect effect of group assignment on logic task performance through effort was significant (beta = -.10, p<.05). When controlling for effort, the direct effect of group assignment on logic task performance became non-significant (c'; beta = -.20, t(108) = -1.58, p = n.s.). This suggests that effort fully mediated the relationship between distraction conditions (i.e., *Distraction- Anticipation* and *Distraction–No Anticipation*) and part three logic task performance. The proportion of the maximum observed indirect effect that was observed was also found to be significant (b = .10, SE = .04, 95% CI [.02, .19]).

Analysis of Moderators

To test hypotheses four and five, theoretically meaningful moderators (*table 4; for correlations, see table 5)* were analyzed. For the following moderator analyses (*table 6)*, group assignment was restricted to the *Distraction – Anticipation* and *No Effect-Anticipation* conditions in order to conserve degrees of freedom as well as to specifically test moderators when comparing a "handicapped" and a "non-handicapped" group. A step-wise regression was then run to test whether conscientiousness and neuroticism had an interactive effect in predicting part three logic task performance. First, neuroticism and conscientiousness were found to not significantly predict part three logic performance (F(2, 105) = .30, p = n.s.). Adding group assignment into step two significantly increased explained variance in part three logic performance (F(1, 104) = 4.26, p<.01; b = -.13,

t(104) = -3.48, p<.01). Adding the interactions between group and conscientiousness as well as group and neuroticism (step 3) did not add significant variance explained, nor were the interactions significant predictors of part three logic performance. Similarly, adding a three-way interaction between group, neuroticism, and conscientiousness in the final step did not add to the predictive power.

Finally, the self-handicapping scale was tested to determine whether it was a significant moderator of the relationship between group assignment (Distraction-Anticipation vs. No Effect Anticipation) and part three logic task performance (Hypothesis 5). Similar to conscientiousness and neuroticism, self-handicapping was not found to be a significant moderator (SHS: b = .01, SE = .01, t(104) = .57, p = n.s.; interaction: b = -.003, SE = .01, t(104) = -.53, p = n.s.; see table 7).

Discussion

The present findings provide initial evidence, albeit indirectly, that self-handicapping behavior may serve to effectively conserve cognitive resources when future success is uncertain. While previous experimental self-handicapping research has focused on two primary motives for self-handicapping (i.e., impression management and avoidance), these findings offer support for the idea that handicapping conditions may also allow an individual to conserve energy for later performance. When individuals were led to believe that they would be performing under sub-optimal (i.e., distracting) conditions, they were more likely to reduce their effort (evidenced by more frequently quitting on solvable tasks and spending less time working on an impossible task). This reduction of effort translated into better accuracy on a subsequent logic task (a self-regulatory resource-reliant task).

Further evidence that handicapping conditions may allow for conservation of energy was demonstrated by the finding that participants, when in a distracting condition and not anticipating a follow-up task, performed worse on a follow-up logic task than participants in a similarly distracting condition who anticipated the follow-up. These individuals were less likely to conserve their resources (i.e., they quit less often) and displayed lower accuracy on the follow up logic task. These results, taken together, suggest that participants in the *Distraction – Anticipation* group may have taken advantage of the handicapping situation presented to them and used that as an opportunity to reduce their effort leading up to their final task. When individuals were not presented with a plausible explanation for potential failure (told that the tone had no effect), they were more likely to work to completion on all tasks and expend more

energy. Similarly, when individuals in the *Distraction – No Anticipation* condition were not presented with an expectation for future assessment, they were unlikely to conserve energy, as there was no apparent reason to do so.

In traditional self-regulation studies, depletion is typically evidenced by deficits across three measures: absolute score, speed, and accuracy. In the current study, I only found depletion in accuracy. If an individual scores well in the absolute sense, there is no indication of how careful they performed. It could be that a subset of individuals moved quickly through the questions and got a number correct simply as a product of the number they attempted. On the other hand, if an individual employed a greater pool of cognitive resources, it is likely that they would display greater vigilance, more careful responding, and higher accuracy. Additionally, the task itself was framed as a test of intelligence. It could be that participants in the "undepleted" condition displayed differences in accuracy because accuracy is often what is valued in test taking. Rarely does a student approach a test where hit-rate is what matters. Instead, it is likely this college sample approached this test like other tests they have encountered and placed a value on accuracy. This focus on accuracy led to a value in maximizing correctness and minimizing incorrectness.

Additionally, it could be that individuals are not displaying resource conservation (conservation that may translate into improvements in all three domains) but, rather, they may be displaying a motivational shift. After withholding effort, individuals may be more primed to display a "have-to" motivation (e.g., I have to be careful on this and score high) rather than a "want-to" motivation (e.g., I want to move quickly through these). Recently, the model of resource conservation has come under

increased scrutiny as researchers work to integrate multiple lines of research and theory and expand our understanding of self-regulation. Inzlicht, Schmeichel, and Macrae (2013) proposed that what we have traditionally called "resource depletion" is better described as a shift in motivation from "have-to" to "want-to." Drawing from a number of lines of research such as opportunity cost (Kurzban et al, 2013), labor/leisure tradeoffs (Kool & Botvinick, 2012), and the effects of cognitive fatigue (Hockey, 2013), Inzlicht suggests that we are not simply "resource-depleted" but, rather, we are strategically taking survey of the situation and determining whether to choose cognitive work or leisure. While our current study suggests that individuals perform better following handicaps because they are using less cognitive resources, it could also be that they are experiencing motivational shifts as a result of the handicapping situation. Future research should consider Inzlicht's process model to better understand both the benefits of self-handicapping as well as the process of self-regulation.

The paradigm presented in this study served as a proxy for a situation that would be created should an individual choose to handicap. It is important to note that in this study, the choice to handicap was taken away from the individual. In a more natural setting, an individual would have the ability to chose whether to handicap. The conditions of this study sought to replicate a situation that would occur immediately after that decision. This was done for two reasons. First, given the relatively low base-rate of self-handicapping occurring in a lab setting, I wanted to ensure that I had enough individuals in a handicapping situation (performing while "distracted") to test against those in a non-handicapping situation. Second, while adding this level of control decreased the natural conditions of self-handicapping (essentially creating an other-imposed handicap), it

allowed me to isolate the effect that the handicap itself had on subsequent performance. Nonetheless, despite these arguments, I acknowledge that whether actual *self*-handicapping produces these results remain to be seen.

In the study, participants were presented with a condition under which they would perform and provided with the expectation for their future performance. I then was able to examine the effect that being in a condition that offers an explanation for failure and reduces expectation has on an individual's performance. What I discovered was that being in such a condition appeared to facilitate a reduction of effort. This reduction led to conservation of resources that directly led to improved performance on a follow-up task.

While quitting on a solvable task was found to mediate the relationship between condition and logic performance, the same was not found for persistence on the part two impossible task. This could be because there is a higher degree of ambiguity in the meaning of an individual's persistence on a task. While some individuals could persist for a long time due to a high level of consistent effort, it is equally as plausible that an individual is "persisting" without expending any effort. An individual could just as easily appear to persist while they simply look at the task and run out the clock. This ambiguity, as well as the difficulty in making an effort-based judgment on why someone is persisting, could have likely led to persistence on an impossible task not mediating the relationship between condition and logic performance. Further, whereas there was relatively low variability in the quitting data, the high level of variability found in the time-dependent data, while not enough to mask group differences, may have lead to a non-significant meditation path.

Moderator analysis

While the evidence supported hypotheses 1-3, we were unable to find support for meaningful moderators of the effects (hypotheses 4 & 5). There are a number of possible explanations for this. First, it could simply be that the study did not have sufficient power to detect a meaningful effect. While the selected sample size approached the critical number to detect a medium effect of a single moderator (target $F^2 = .15$, err prob = .05, power = .95, target N = 119; based on similar moderator effects – e.g., DeCastella, Byrne, & Covington, 2013; Tandler, Schwinger, Kaminski, & Stiensmeier-Pelster, 2014), it was far short of the target sample size to detect a small effect (target $F^2 = .02$, err prob = .05, power = .95, target N = 863). Additionally, to test simultaneous moderation or an interactive effect among the moderators would take significantly more power.

It is also possible that significant moderation was not achieved because of the nature of the paradigm. Participants were not free to choose the conditions under which they performed. It is possible that the individual differences examined play a significant role in the *decision* to self-handicap rather than have any meaningful control over the *effect* of the handicap. The current study relieved the participant of the responsibility to choose whether to handicap him or herself. This may have reduced the impact of any theoretically meaningful moderators. While additional research should be done to draw stronger conclusions, it could be that the difference between individuals does not lie in the benefits they received from the handicap but, rather, their motivation to engage in a handicap or not. Under this explanation, self-handicapping can be considered similar to a drug in that all individuals feel the effect but only some are motivated to seek out that effect.

A third explanation for the null results could be that conservation of resources as a motivation for self-handicapping is distinct from impression management and avoidance motives. The moderators tested in this study were derived from a meta-analysis that only considered avoidance and impression management as motivations. It is possible that the individual differences that contribute to those motives may not also contribute to an individual motivated to conserve their resources. When considering an avoidance motivation, it makes sense that low conscientiousness and high neuroticism make self-handicapping attractive. The individual, experiencing significant anxiety, may not have the focus and drive (i.e., the conscientiousness) required to work through that anxiety and handicapping may be seen as an under-modulated behavior. Conserving resources, however, may take more planning and strategy. This motivation could consider self-handicapping as behavior over-modulated. In this scenario, the handicap is a strategic choice in which the individual decides that effort spent at one time (e.g., during practice) is fruitless and expending it then would leave less to use later (i.e., when being evaluated). If this explanation is true, then the question becomes: what are the theoretically meaningful correlates of this motivation? For example, cognitive exhaustion (a correlate of burnout, Lee & Ashforth, 1996, as well as greater conservation, Park et al, 2013) may better correlate with a conservation motivation than an impression management one. Also, where do these three motivations overlap and where are they distinct? For instance, it may be that certain self-handicapping strategies serve certain motivations better than others. Claiming a handicap may suit the impression management drive (a public behavior that may have low chance of actually damaging performance)

while doing little to conserve resources. Similarly, withholding practice may better conserve resources while drinking the night before a test may better aid in avoidance.

Finally, it is also likely that the current paradigm evoked uncertainty in individuals who would not typically have chosen an uncertainty-producing handicapping situation. For instance, someone who is highly conscientious may be less likely to choose to be distracted and, therefore, being placed into a distracting condition may be more novel to them than someone who typically choses a handicapping situation. This paradigm may situationally overwhelm the individual (particularly if the intended effect is a novel one) and lead to an underestimation of individual differences. While the current paradigm gained power in testing regulatory benefits from being in a handicapping situation, that same power may have washed out most effects of individual differences.

The reinforcing nature of self-handicapping The current study speaks to why handicapping situations may be particularly reinforcing to some people; those placed in a handicapping situation were more likely to reduce their effort and, in turn, performed *better* on a later task than those who consistently tried hard. From the participant's point of view, the third task was a similar intellectual assessment and their performance would reflect their ability. Similarly, individuals who choose to self-handicap are opting to practice or prepare in suboptimal conditions despite logical detriments to a future, assessed performance. The current study found that those who reduce their practice effort showed better performance when they believed that they were practicing in a suboptimal environment. This is similar to an individual who chooses to self-handicap and then shows improved performance later. Prior theorists have postulated that this improved performance could be because of the empowering effect of their impression management

strategy (eg,.Luginbuhl & Palmer, 1991) or their reduced anxiety (Harris & Snyder, 1986).

However, as the current study has suggested, impression management strategies and avoidance coping likely have a detrimental effect on self-regulatory resources. Instead, it is likely that individuals benefited from a larger pool of regulatory resources going into their target task. In a more naturalistic example, this would be similar to an individual who, following a reduction in their studying or procrastinating before a test (both common self-handicapping strategies), performs better because they have expended less effort and are better rested. This small boost to their performance is a shortsighted gain with long-term consequences. While these individuals have shown an improved performance, the gains are not sustainable (Wusik & Axsom, 2015). Continually putting off studying, chronically skipping practice, or insistence in preparing in suboptimal conditions are likely to impede personal growth and prevent the individual from improving in their target task.

Limitations and future directions

While the results offer support for a newly proposed motive for self-handicapping, there are limitations to consider. First, and likely most importantly, the individuals in the study did not choose to handicap. Follow-up research must be conducted to test the conservation benefits of self-handicapping following the decision to handicap (putting the self *back* into self-handicap). By allowing an individual to choose to practice in a sub-optimal condition (distraction vs. no distraction), we would be able to better test the impact that choosing to self-handicap has on an individual's later performance. While this paradigm may not fit the traditional self-handicapping approach

(with the handicap occurring during the target performance), I believe that it still works as a representation of self-handicapping in the natural environment. An individual choosing to practice or prepare in sub-optimal conditions (in the current study, performing task two while distracted) should, logically, present difficulties for the final task.

Our current suggestion, that the choice to perform under such conditions is strategic to increase later performance, is novel and may not precisely fit with the traditional understanding of self-handicapping. However, the kernels of self-handicapping are still there. Individuals are entering an evaluative setting with low confidence. Individuals are performing/preparing in a condition that, on the surface, should make it more difficult to perform. An audience, should they witness this occurring, could reasonably explain that any failure in part three could be because the handicapper was distracted during part two (and, therefore, could not reap the full benefits that part two offered). Suggesting that this choice was strategic to improve performance does not violate an assumption of self-handicapping as much as it suggests that our traditional view of self-handicapping is too narrow.

Additionally, while the current paradigm had adequate power to test the main hypotheses, it may have either lacked the power necessary to appropriately test for meaningful moderators or, given the nature of the paradigm, situationally overwhelmed individuals and washed out any individual difference effects. Additional study should look more closely into the moderators of these effects to better address aforementioned questions.

The current study has expanded the conceptualization of self-handicapping into a multidimensional construct with the introduction of a novel motivation. Future research is required to better establish this motive as well as examine how it relates to the other established motivations (i.e., avoidance and impression management). Understanding how these three motivations interplay, as well as how they are distinct from one another, will likely increase our ability to predict self-handicapping as well as allow us to better combat it. Further, the addition of this new motivation likely calls for a revision to our standard self-handicapping scale. When developed, the self-handicapping scale was created solely based on the impression management literature and even in its current state lacks rigorous psychometric testing. The introduction of this new motive suggests that the scale should be revised to represent the multidimensional nature of self-handicapping. Inclusion of this motive, as well as avoidance (also not represented on the scale), may better tap into individual differences in self-handicapping, better target "self-handicappers," and increase the predictive power of the self-handicapping scale.

Finally, there are a number of clinical implications of this current study as well as clinical applications for the expanded conceptualization of self-handicapping motives. Self-handicapping as a specific coping strategy has multiple motivations behind it and, by understanding those motivations, one can better target the treatment of self-handicapping behaviors. For example, if self-handicapping was presenting itself in the clinical setting as a therapy interfering behavior (Linehan, 1993), a better understanding of the underlying motives could better equip the therapist in addressing these behaviors and targeting them through specific interventions. An intervention targeting self-handicapping driven by avoidance (e.g., exposures) may look different than an

intervention targeting self-handicapping driven by impression management (e.g., cognitive restructuring) or driven by a desire to conserve resources (e.g., progressively more taxing exercises building self-regulatory ability).

Better tools to identify self-handicapping clinically, as well as to better establish the motives behind handicapping, could significantly decrease handicapping in session as well as help equip a chronically handicapping client with coping strategies to better overcome handicapping in their lives. With time and additional research, we will be capable of better studying and assessing the motives of self-handicapping as well as better establish self-handicapping as a multi-dimensional construct.

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Endnote 1: The effects of gender

Gender was fairly evenly distributed across the three conditions. There were no gender differences in part 1 tracing performance (M_{male} = 333.31, SD = 133.96; M_{female} = 321.36, SD = 131.61; t(160) = .51, p = n.s.), frequency of quitting during part two (M_{male} = 1.76, SD = 1.41; M_{female} = 1.74, SD = 1.33; t(160) = .05, p = n.s.), or performance on the logical reasoning task (M_{male} = .52, SD = .25; M_{female} = .47, SD = .25; t(160) = 1.09, p = n.s.). Additionally, a regression analysis revealed that there was no significant interaction between gender and group assignment in predicting quitting (b = -.11, SE = .26, t(158) = -.41, p = n.s.) or subsequent logical reasoning performance (b = -.02, SE = .05, t(158) = -.32, p = n.s.), suggesting that gender was not a significant moderator.

Endnote 2: Experimenter Consistency

Two experimenters were used throughout the study. Experimenter 1 ran roughly 2/3 of the participants (exp 1 N = 108; exp 2 N = 54). Distribution of experimental condition by experimenter did not differ significantly, nor did the experimenters differ significantly on any key outcomes (quitting on part 2, $t(160) = 1.12$, p = n.s.; part 3 absolute score, $t(160) = .79$, p = n.s.; part 3 accuracy (number correct/number attempted), $t(160) = .88$, p = n.s.).

Endnote 3: ANCOVA analysis

Prior to performing a one-way ANCOVA, a series of analyses found that the assumptions of normality of sampling distributions, linearity, homogeneity of variance, and homogeneity of regression were satisfactory.

Table 1. Group differences on Part 1 performance and BMIS, Mean (SD)

	Distraction – Anticipation	*Distraction – No Anticipation*	*No Effect- Anticipation*	*F*
Pt. 1 Performance (in sec)	307.80 (143.39)	325.63 (125.79)	340.61 (126.34)	.84
Pleasant-Unpleasant	32.57 (6.75)	33.54 (6.59)	32.24 (7.46)	.51
Arousal-Calm	12.81 (3.53)	12.24 (4.10)	13.07 (4.11)	.64
Positive-Tired	10.94 (3.75)	11.19 (4.10)	11.20 (4.34)	.07
Negative-Relaxed	4.83 (2.09)	4.46 (2.32)	4.91 (2.10)	.65

All results non-significant

Table 2. Logical Reasoning Task Performance by Condition

Condition	*Absolute Score (No. Correct)*		*Speed (No. Attempted)*		*Accuracy (% Correct)*	
	M	*SD*	*M*	*SD*	*M*	*SD*
Distraction – Anticipation	7.59	2.60	10.52	2.11	.72	.19
Distraction – No Anticipation	6.81	2.21	11.43	2.57	.61	.18
No Effect-Anticipation	6.72	2.57	11.43	2.34	.59	.19

Table 3. Part 2 tracing behaviors, by condition

Condition	*Tasks left Unsolved*		*Persistence (in sec.) on impossible task*		*Persistence (in sec.) on impossible task, cases excluded*	
	M	*SD*	*M*	*SD*	*M*	*SD*
Distraction – Anticipation	$2.59_{a, b}$	1.31	119.23	79.52	112.41_{c}	62.40
Distraction – No Anticipation	1.43_{a}	1.11	140.66	91.97	133.88	78.05
No Effect-Anticipation	1.22_{b}	1.22	149.64	90.36	149.64_{c}	90.36

a: $t(106) = 4.99$, $p<.001$
b: $t(106) = 5.62$, $p<.001$
c: $t(105) = 2.47$, $p<.05$

Table 4. Descriptive Statistics of Moderators

	Mean (SD)	Min-Max	Skewness	Kurtosis
Neuroticism	23.7 (7.0)	11 – 47	.70 (.19)	.46 (.38)
Conscientiousness	38.9 (6.2)	15 – 50	-.69 (.19)	.96 (.38)
Self-handicapping	31.8 (6.6)	17 – 48	.15 (.20)	-.30 (.39)

Table 5. Correlations Among Moderators and Target Variables

	1	2	3	4	5
1. Neuroticism	1				
2. Conscientiousness	-.32**	1			
3. Self-handicapping Scale	.41**	-.51**	1		
4. Number quit during part 2	.08	-.002	.07	1	
5. Part 3 Logic Task (Accuracy)	-.05	.03	-.04	.29**	1

** *p<.01*

Table 6. Stepwise regression analysis testing neuroticism, conscientiousness, group (Distraction-Anticipation vs. No Effect-Anticipation) and their interactions in predicting task 3 accuracy

Step	Predictor	b	t	R^2	Adjusted R^2	$R^2 \Delta$
1	Neuroticism	.00 (.00)	-.18	.01	-.01	.01
	Conscientiousness	.00 (.00)	.68			
2	Neuroticism	-.00 (.00)	.20	.11**	.08	.01
	Conscientiousness	-.00 (.00)	.75			
	Group	-.13 (.04)	-3.48**			
3	Neuroticism	-.00 (.02)	-.28	.13**	.09	.02
	Conscientiousness	-.01 (.01)	-1.36			
	Group	-.59 (.31)	-1.50			
	Group X Neuroticism	.00 (.01)	.48			
	Group X Conscientiousness	.01 (.01)	1.69			
4	Neuroticism	-.00 (.01)	-.15	.15**	.10	.02
	Conscientiousness	-.01 (.01)	-.28			
	Group	.05 (.47)	.09			
	Group X Neuroticism	-.02 (.02)	-1.15			
	Group X Conscientiousness	-.01 (.01)	-.40			
	Group X Neuroticism X Conscientiousness	.00 (.00)	1.44			

*p<.05 ** p<..01

Table 7. Stepwise regression analysis testing SHS, group (Distraction-Anticipation vs. No Effect-Anticipation) and their interaction in predicting task 3 accuracy

Step	Predictor	b	t	R^2	Adjusted R^2	$R^2 \Delta$
1	Self-handicapping Scale	.00 (.003)	.14	.00	-.01	.00
2	Group	-.13 (.04)	-3.51**	.12**	.10**	.12**
	Self-handicapping Scale	.01 (.02)	.20			
3	Group	-.03 (.19)	.55	.12**	.09**	.003
	Self-handicapping Scale	.01 (.01)	.57			
	Group X Self-handicapping Scale	-.003 (.01)	-.53			

***p<.001*

Figure 1. Scatter plot of Part 2 Persistence task, by condition

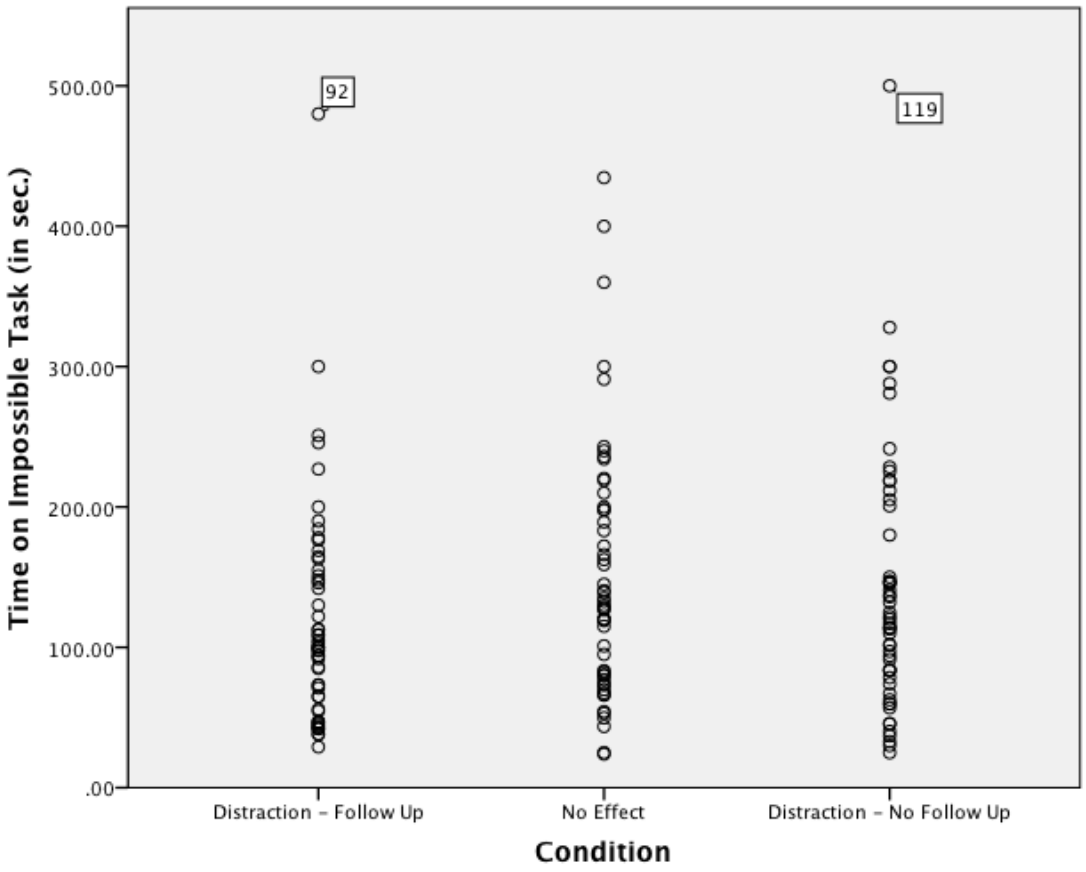
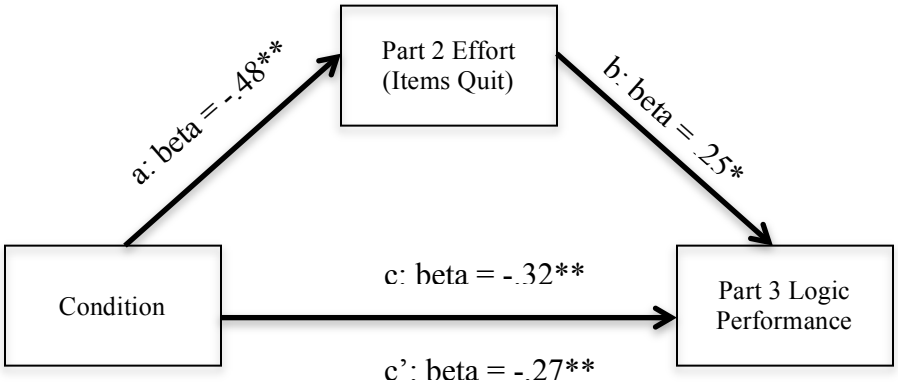
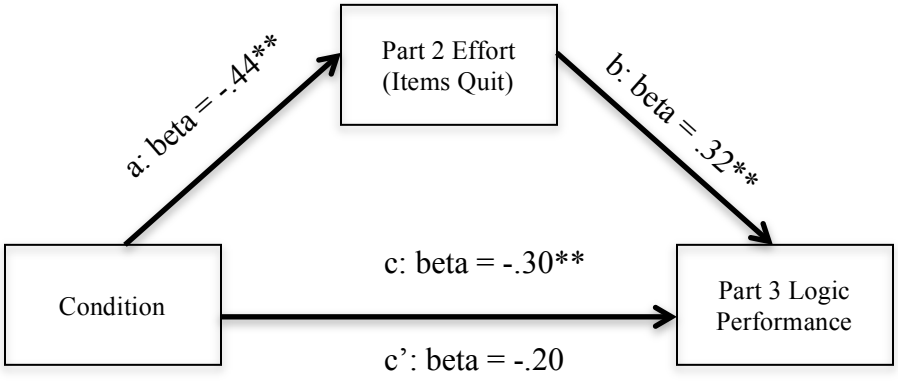


Figure 2. Effort mediating the effect of group assignment on part 3 logic performance, Comparing Distraction-Anticipation with No Effect-Anticipation



Indirect effect: beta = -.05, p<.05
*p<.05 **p<.01

Figure 3. Effort mediating the effect of group assignment on part 3 logic performance, Comparing Distraction-Anticipation with Distraction-No Anticipation



Indirect effect: beta = -.10, p<.01
*p<.05 **p<.01

Appendix A. Information Sheet

Approaches to Performance

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Information Sheet for Participants in Research Projects Involving Human Subjects

Title of Project: Approaches to Performance
Investigator(s): Michael Wusik & Danny Axsom
(mwusik@vt.edu) (axsom@vt.edu)

Institutional Review Board Contact: David Moore, moored@vt.edu, 540-231-4991;
Dr. David Harrison, dwh@vt.edu, 540-231-4422

I. Purpose of this Research/Project
This study looks at the effects of music on performance on a spatial reasoning task.

A total of 200 students are needed for the study. All students who are signed-up through the SONA research site at Virginia Tech can participate. Students must be 18 years of age or older.

II. Procedures
For this study, you will be shown a spatial reasoning task utilized to test intelligence and later tested on your performance on that task based on speed and accuracy. You will be asked to perform the second task while a pre-selected tone is played.

III. Risks
There is no more than minimal risk associated with this study. This means that the tasks require as much stress or less stress than everyday tasks you are used to performing. However, if you decide at any time that you do not want to participate, you are allowed to leave without any consequences.

IV. Benefits
There are not any tangible rewards for your participation in the study; however, your participation will increase your awareness of how research in psychology works. Your participation also has the potential to increase scientific knowledge in this area.

V. Extent of Anonymity and Confidentiality
Your participation in the study is completely anonymous and confidential. Your answers to questions will in no way be linked to your name or identifying information. When you end the study you will be asked to enter your Virginia

Tech PID; however, your PID will not be linked to your responses and is only to make sure that you receive research credit.

VI. Compensation
Participation in this study will earn you 1.5 research credits.

VII. Freedom to Withdraw
You are free to withdraw from the study at any time without penalty.

VIII. Subject's Permission
I have read and understand the Consent Form and conditions of this project. I acknowledge that I am 18 years of age or older.

_____ _____
Participant Signature Date

If you have any questions or concerns regarding this project, you may contact any or all of the following individuals:

Dr. David Moore, Chair of the Institutional Review Board, moored@vt.edu, 540-231-4991
Dr. David Harrison, Departmental Chair of the Human Subjects Committee, dwh@vt.edu, 540-231-4422
Dr. Danny Axsom, Principal Investigator, axsom@vt.edu, 540-231-6495

Appendix B. Brief Mood Introspection Scale

Brief Mood Introspection Scale (BMIS)

by John D. Mayer

INSTRUCTIONS: Circle the response on the scale below that indicates how well each adjective or phrase describes your present mood.

(definitely do not feel) (do not feel) (slightly feel) (definitely feel)

0 1 2 3

Lively	0	1	2	3	Drowsy	0	1	2	3
Happy	0	1	2	3	Grouchy	0	1	2	3
Sad	0	1	2	3	Peppy	0	1	2	3
Tired	0	1	2	3	Nervous	0	1	2	3
Caring	0	1	2	3	Calm	0	1	2	3
Content	0	1	2	3	Loving	0	1	2	3
Gloomy	0	1	2	3	Fed up	0	1	2	3
Jittery	0	1	2	3	Active	0	1	2	3

Overall, my mood is:

Very Unpleasant — Very Pleasant

-10 –9 –8 –7 –6 –5 –4 –3 –2 –1 0 1 2 3 4 5 6 7 8 9 10

Please indicate on the scale below the intended effect of your assigned tone:

Enhancing — No effect — Distracting

1 2 3 4 5 6 7 8 9 10

Appendix C. Logic Questions

1. The company should not be held responsible for failing to correct the control-panel problem that caused the accident. Although the problem had been mentioned earlier in a safety inspector's report, companies receive hundreds of reports of such problems and Industry Standard No.42 requires action on these problems only when an accident is foreseeable.

If the second sentence in the paragraph above is factually correct, the answer to which of the following questions is most relevant in helping to determine whether or not the company violated Industry Standard No.42 when it failed to correct the control-panel problem.

(A) Was the accident serious?

(B) Was the control-panel problem of a type that is known to indicate that an accident is likely?

(C) Since the accident, has the company done a special safety check on all control panels?

(D) Did the safety inspector mention more than one problem in the same report?

(E) How long was the control panel in use before the problem was discovered?

2-6. In a game, exactly six inverted cups stand side by side in a straight line, and each has exactly one ball hidden under it. The cups are numbered consecutively1 through 6. Each of the balls is painted a single solid color. The colors of the balls are green, magenta, orange, purple, red and yellow. The balls have been hidden under the cups in a manner that conforms to the following conditions:

The purple ball must be hidden under a lower-numbered cup than the orange ball.
The red ball must be hidden under a cup immediately adjacent to the cup under which the magenta ball is hidden.
The green ball must be hidden under cup 5.

2.Which of the following could be the colors of the balls under the cups, in order from 1 through 6?

(A) Green, yellow, magenta, red, purple, orange
(B) Magenta, green, purple, red, orange ,yellow

(C) Magenta, red, purple, yellow, green, orange
(D) Orange, yellow, red, magenta, green, purple
(E) Red, purple, magenta, yellow, green, orange

3. If the magenta ball is under cup 4, the red ball must be under cup

(A) 1
(B) 2
(C) 3
(D) 5
(E) 6

4. A ball of which of the following colors could be under cup 6?

(A) Green
(B) Magenta
(C) Purple
(D) Red
(E) Yellow

5. If the purple ball is under cup 4, the orange ball must be under cup

(A) 1
(B) 2
(C) 3
(D) 5
(E) 6

6. Which of the following must be true?

(A) The green ball is under a lower-numbered cup than the yellow ball.
(B) The orange ball is under a lower-numbered cup than the green ball.
(C) The purple ball is under a lower-numbered cup than the green ball.
(D) The purple ball is under a lower-numbered cup than the red ball.
(E) The red ball is under a lower-numbered cup than the yellow ball.

7. Riothamus, a fifth-century king of the Britons, was betrayed by an associate, fought bravely against the Goths but was defeated, and disappeared mysteriously. Riothamus' activities, and only those of Riothamus, match almost exactly those attributed to King Arthur. Therefore, Riothamus must be the historical model for the legendary King Arthur.

The argument above requires at least one additional premise. Which of the following could be such a required premise?

(A) Modern historians have documented the activities of Riothamus better than those of any other fifth-century king.

(B) The stories told about King Arthur are not strictly fictitious but are based on a historical person and historical events.

(C) Riothamus' associates were the authors of the original legends about King Arthur.

(D) Legends about the fifth century usually embellish and romanticize the actual conditions of the lives of fifth-century nobility.

(E) Posterity usually remembers legends better than it remembers the actual historical events on which they are based.

8. A worldwide ban on the production of certain ozone-destroying chemicals would provide only an illusion of protection. Quantities of such chemicals, already produced, exist as coolants in millions of refrigerators. When they reach the ozone layer in the atmosphere, their action cannot be halted. So there is no way to prevent these chemicals from damaging the ozone layer further.
Which of the following, if true, most seriously weakens the argument above?

(A) It is impossible to measure with accuracy the quantity of ozone-destroying chemicals that exist as coolants in refrigerators.

(B) In modern societies, refrigeration of food is necessary to prevent unhealthy and potentially life-threatening conditions.

(C) Replacement chemicals that will not destroy ozone have not yet been developed and would be more expensive than the chemicals now used as coolants in refrigerators.

(D) Even if people should give up the use of refrigeration, the coolants already in existing refrigerators are a threat to atmospheric ozone.

(E) The coolants in refrigerators can be fully recovered at the end of the useful life of the refrigerators and reused.

9. Testifying before the Senate committee investigating charges that cigarette manufacturers had manipulated nicotine levels in cigarettes in order to addict consumers to their products, tobacco executives argued that cigarette smoking is not addictive. The primary reason they gave in support of this claim was that cigarette smoking was not regulated by the Federal Drug Administration.

For the tobacco executives' argument to be logically correct, which of the following must be assumed?

(A) Substances that are not addictive are not regulated by the Federal Drug Administration.

(B) The tobacco executives lied when they claimed that cigarette smoking was not addictive.

(C) Some addictive substances are not regulated by the Federal Drug Administration.

(D) There is no scientific proof that cigarette smoking is addictive.

(E) Substances that are not regulated by the Federal Drug Administration are not addictive.

10. A study of native born residents in Newland found that two-thirds of the children developed considerable levels of nearsightedness after starting school, while their illiterate parents and grandparents, who had no opportunity for formal schooling, showed no signs of this disability.

If the above statements are true, which of the following conclusions is most strongly supported by them?

(A) Only people who have the opportunity for formal schooling develop nearsightedness.

(B) People who are illiterate do not suffer from nearsightedness.

(C) The nearsightedness in the children is caused by the visual stress required by reading and other class work.

(D) Only literate people are nearsighted.

(E) One-third of the children are illiterate.

11. There is clear evidence that the mandated use of safety seats by children under age four has resulted in fewer child fatalities over the past five years. Compared to the five-year period prior to the passage of laws requiring the use of safety seats, fatalities of children under age four have decreased by 30 percent.
Which one of the following, if true, most substantially strengthens the argument above?

(A) The number of serious automobile accidents involving children under age four has remained steady over the past five years.

(B) Automobile accidents involving children have decreased sharply over the past five years.

(C) The use of air bags in automobiles has increased by 30 percent over the past five years.

(D) Most fatal automobile accidents involving children under age four occur in the driveway of their home.

(E) The number of teenage drivers has increased by 30 percent over the past five years.

12. Lycopene, glutathione, and glutamine are powerful antioxidants that neutralize the free radicals that are produced in the body as a result of routine bodily processes. An excess of these free radicals in your system causes rapid aging because they accelerate the rate of cellular damage. Aging is simply the result of this damage. Thus, to slow down aging it is necessary to supplement your diet with these antioxidants on a daily basis.
Which of the following, if true, most seriously undermines the author's contention?

(A) Most persons aren't concerned with the effects of aging until it is too late to do anything.

(B) Exercise associated with normal daily activities effectively neutralizes and dissipates the free radicals that are produced as a result of routine bodily processes.

(C) The cost of antioxidants is exorbitantly high and well beyond the budget of most consumers.

(D) Only overweight people who do not exercise on a daily basis are likely to have an excess of free radicals in their systems.

(E) Smoking cigarettes is one of the main causes of cellular damage in humans.

13. Is it wrong for doctors to lie about their patients' illnesses? Aren't doctors just like any other people we hire to do a job for us? Surely, we would not tolerate not being told the truth about the condition of our automobile from the mechanic we hired to fix it, or the condition of our roof from the carpenter we employed to repair it. Just as these workers would be guilty of violating their good faith contracts with us if they were to do this, doctors who lie to their patients about their illnesses violate these contracts as well, and this is clearly wrong.

The conclusion of the argument is best expressed by which of the following?

(A) Doctors who lie to their patients about their illnesses violate their good faith contracts with their patients.

(B) Doctors often lie to their patients about their illnesses.

(C) Doctors are just hired workers like mechanics and carpenters.

(D) It is wrong for doctors to lie about their patients' illnesses.

(E) Doctors, like mechanics and carpenters, enter into good faith contracts with us when we hire them.

Questions 14-17 refer to the following passage:
When the goalie has been chosen, the Smalltown Bluebirds hockey team has a starting lineup that is selected from two groups:
First Group: John, Dexter, Bart, Erwin
Second Group: Leanne, Roger, George, Marlene, Patricia
When deciding on the players in the lineup, the coach considers the following requirements:
Two players are always chosen from the first group, while three are chosen from the second group.
George will only start if Bart also starts.
Dexter and Bart will not start together.
If George starts, Marlene won't start.
The four fastest players are: John, Bart, George and Patricia
Three of the four fastest players will always be chosen.

14. If George is in the starting lineup, who must also start?

A. Marlene or John
B. Dexter or Leanne
C. Dexter or John
D. John or Patricia
E. Marlene or Roger

15. Which of the following pairs cannot start together?

A. Erwin and Dexter
B. George and John
C. Roger and John
D. John and Bart
E. Patricia and Marlene

16. If Marlene is on the starting lineup, which of the following players on the first group of players will also be starting?

A. John
B. John and Dexter
C. John and Bart
D. John, Dexter and Bart
E. John, Erwin and Bart

17. Of the following hockey players, who must start?

A. Patricia
B. John
C. George
D. Marlene
E. Bart

Questions 18-21 refer to the following passage:

On a popular children's television show, there are four little animals that make up the digitally animated "Creature Buddies." As digital creations, they can't make a live stage performance. So while the Creature Buddies are on tour, each is represented by a puppet that is operated by a chief and an assistant puppeteer.

The Creature Buddies are: a dragon, gorilla, kangaroo, and tiger.
The Creature's Names are: Audrey, Hamish, Melville, and Rex.
The Chief Puppeteers are: Ben, Jill, Paul and Sue.
The Assistant Puppeteers are: Dave, Gale, Pam and Tom.

Melville isn't the puppet who is operated by Sue and her assistant Pam.
Hamish's chief puppeteer (who is not Jill) is assisted by Tom.
Ben is in charge of the dragon, but Jill doesn't have anything to do with the kangaroo.

Dave is the assistant puppeteer for the tiger.
Rex, whose chief puppeteer is Paul, isn't the gorilla (whose name is not Melville).

18. What is the name of the Dragon?

A. Audrey
B. Hamish
C. Melville
D. Rex
E. Dave

19. Who is the assistant puppeteer for Melville?

A. Dave
B. Gale
C. Pam
D. Tom
E. Ben

20. Which chief puppeteer works with Tom?

A. Ben
B. Jill
C. Paul
D. Sue
E. Rex

21. What kind of animal does Gale work with?

A. Dragon
B. Gorilla
C. Kangaroo
D. Tiger
E. Lemur

Appendix D. Debriefing Sheet

Thank you for your participation! Allow us to take a moment to tell you more about the true purpose of this study. The focus of our study was to look into positive displays of self-handicapping behaviors. When faced with a difficult task in which future replication of previous success is uncertain, people are more likely to engage in behaviors, or report behaviors, that hinder performance. Traditionally, these behaviors are viewed as negative by society (i.e. – alcohol use, procrastination) and are therefore easily detected. This study targeted helping, a positive behavior less likely to be discouraged, as a form of self-handicapping. Because we needed to observe your behaviors in as natural an environment as possible, you were initially misled into believing that the purpose of the study was to look at spatial reasoning and intelligence. This was used as a cover story so that your behaviors throughout the study and your effort displayed towards the task were as natural as possible. Please note that we did not test your intelligence during this study. We would now like to give you more information about this study as well as tell you about our expected results.

Using a cover story, or supplying a false purpose for a study, is used in psychological research in order to obtain natural responses that are unaffected by researchers' observations nor by what the participants know about the study. Typically, when one is given information or a prediction is made about their behavior (i.e. – you will perform better or worse on a task) that individual will change their behavior to match and confirm that information. We did not want you to change your behavior due to the fact that you knew how we predicted you would behave. This is why the information given to you was limited.

In this study, you were placed in one of three groups. You were either told that the music would help your performance and that there would be a follow-up task, that the music would hurt your performance and that there would be a follow-up task, or that the music would hurt your performance and that there would be no follow-up task. You were then observed how you performed on the third task (the logic questions). We expect that those who were told that the task would hurt your performance and that there was a follow up task would perform the best on the logic questions.

Your role in this study is greatly appreciated. We apologize again for not being able to be completely honest and hope you now understand the true nature of the study as well as the importance of secrecy. That being said, we request that you aid in our research effort by ***NOT TELLING OTHERS*** about the true nature of the study. Future participants knowing that we are looking for helping behaviors may act unnaturally during the practice period. We hope that you enjoyed being a part of this active research experiment. We appreciate your effort and time. Thank you!

Please be assured that your participation in this study will be kept confidential and anonymous. If you have any questions regarding this research, please contact Danny Axsom (axsom@vt.edu).