

Contra-Trait Effort and Trait Stability: A Self-Regulatory Personality Process

by

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Date: 8 July, 2010

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Dissertation submitted in partial fulfillment of  
the requirements for the degree of Doctor of Philosophy in the Department of  
Psychology and Neuroscience in the Graduate School  
of Duke University

2010

ABSTRACT

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## Abstract

Despite the considerable influence of situational factors and the resulting variability in behavior, individuals maintain stable average ways of acting. The purpose of the studies presented in this paper was to investigate one possible explanation of this trait stability. It is hypothesized that *contra-trait* behaviors, those that are different from typical trait levels, demand more effort, or self-control, than do trait-typical behaviors. In Study 1, participants reported on the trait content of their behavior along with several other variables. In Study 2, participants completed several tasks in the lab and were instructed to act at contra-trait or trait-typical levels of conscientiousness. Support for the contra-trait effort hypothesis was found in Study 1: Participants reported that contra-trait behavior was more effortful than trait-typical behavior. In addition, habitual contra-trait behaviors, which do not require self-control, were exempt from this effect. In Study 2, no support was found for contra-trait hypotheses: Participants generally did not rate contra-trait behaviors as more effortful, and subsequent behaviors were not affected by contra-trait behaviors. The implications of the findings and the possible explanations of the non-findings are discussed.

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# 1. Introduction

The purpose of this paper is to present two studies designed to investigate one possible mechanism for stability in trait behavior. Trait standing remains largely stable over short and long periods of time, and most of the behaviors that individuals perform reflect their trait standing (that is, most behaviors manifest trait content that is similar to individuals' trait standing). Several mechanisms for trait stability have been proposed and investigated. Few of these mechanisms, however, have been empirically tested. The current research uses a self-regulatory approach to investigate stability. Because many behaviors are constrained by self-regulatory processes to some extent, a self-regulatory approach may provide new and valuable insight into trait stability. The mechanism investigated in this paper could have several implications for patterns of behavior and could help explain how trait behavior, though variable from moment to moment, maintains highly stable mean levels.

Understanding personality traits' stability and how they are related to behavior is important for several reasons. First, trait standing is related to many important life outcomes and to patterns of behavior (Fleeson & Gallagher, in press; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007), and a full account of personality traits requires an empirically supported account of the mechanisms behind the trait-behavior connection. A complete theory of personality must explain whether and how personality traits have any influence on behaviors, and also whether and how behaviors influence trait

expression. Second, any program or intervention designed to change behavior patterns will benefit from a greater understanding of how traits work. Knowledge of the circumstances under which trait behaviors are more or less likely will make changing or controlling them easier. Third, trait behavior varies considerably from moment to moment, and yet maintains relatively stable average levels over short and long periods. Understanding how these two phenomena co-occur has been a central goal of personality psychology at least since the person-situation debate was enjoined four decades ago (Mischel, 1968). Because behavior stability is a particularly important manifestation of personality, the cause of behavior stability is at least part of the cause of personality. Thus, identifying this cause will shed light on the nature of personality.

The studies described in this paper were designed to test the hypothesis that behaviors that manifest different trait content than one's trait standing, or *contra-trait behaviors*, take more effort than behaviors that manifest trait content similar to one's trait standing, or *trait-typical behaviors*. For example, a highly extraverted person (e.g., describable by a 6 on a 7-point scale) may find it more difficult to perform introverted behaviors (e.g., describable by a 2 on the 7-point scale) than extraverted behaviors. One experiment has provided direct support for the contra-trait effort hypothesis (Gallagher, Fleeson, & Hoyle, 2009). In that experiment, trait extraverts and trait introverts sustained either contra-trait or trait-typical behavior for an extended period. Extraverts who sustained contra-trait behavior reported that their behavior was more effortful and

difficult, and this effect grew stronger over time. In a subsequent task, participants who had sustained contra-trait behavior were less likely to take advantage of an incentive to act at contra-trait levels, presumably because of fatigue resulting from sustaining contra-trait behavior (all three of these findings were significant only for extraverts). The current studies were designed to replicate and extend these contra-trait effort findings.

In this paper, *trait standing* refers to scores on a measure of personality traits. For example, one might score a six on a one-to-seven scale of conscientiousness, which means that one is relatively high in conscientiousness. *Trait behavior* refers to all the behaviors that express a certain trait (Buss & Craik, 1983). For example, resisting a high-calorie dessert is an expression of the self-control facet of conscientiousness but probably expresses facets of agreeableness to a lesser degree. One of the challenges of personality psychology is defining exactly what trait standing means for the pattern of actual day-to-day behaviors (Fleeson & Gallagher, 2009); the current work may help address that challenge.

### **1.1 Personality Trait Stability**

Despite the influence of situational factors and the resulting high levels of variability in everyday behavior, individuals maintain stable average ways of acting (Epstein, 1979; Fleeson, 2001). Although the magnitude of the effect size of personality traits' relationship to single behaviors reaches only the level typical of most psychological effect sizes (around .30 in terms of correlation coefficient; Fleeson &

Gallagher, 2009; Funder & Ozer, 1983; Mischel, 1968; Myer et al., 2001), the stability of average levels of trait behavior reaches much higher, on the order of .90 for rank-order stability from week to week (Epstein, 1979; Fleeson, 2001, 2007) and up to .80 for rank-order stability over years (Terracciano, Costa, & McCrae, 2006). It is this high stability of average trait behavior that the current studies address.

Researchers have addressed several types of personality stability and have used several different labels for stability. Though some researchers use other terms such as “consistency” or “continuity” to refer to personality stability, or specific types of stability, in this paper I use “stability” generally to refer to enduring patterns in personality trait standing and behavior over time. This general definition captures the central essence of most researchers’ definitions and research goals, regardless of which terms they prefer. Regarding type of stability, the current research addresses both rank-order stability and individual differences in change. Rank-order stability is the consistency of trait standing relative to others across situations or time – individuals of low, moderate, and high trait standing relative to others at one time will have low, moderate, and high standing relative to others, respectively, at another time. Rank-order stability is different from, and independent of, mean-level stability, which refers to maintenance of specific standing on traits across situations or time within a group – the average trait standing of a group will remain the same at two different test times. A third type of stability is maintenance of trait standing within individuals, referred to as

individual differences in change (Roberts et al., 2001), and this refers to unique patterns of stability or change over time.

The current research addresses why average levels of behavior are highly correlated across time, which is rank-order consistency. When many behaviors are rated on the degree to which they manifest trait content over several days, those ratings can be plotted in a density distribution. This distribution represents the pattern of trait expression in actual behavior over time. The means of these distributions are average ways of acting; they can be seen as alternative measures of trait standing (they are related to standing on standard trait questionnaires at levels between .42 and .56 for the Big Five; Fleeson & Gallagher, 2009). Means of density distributions are stable at levels around .90 (Epstein, 1979; Fleeson, 2001, 2007). The contra-trait effort mechanism was originally proposed to address this finding of high rank-order stability; however, it could also contribute to maintenance of individual-level stability over time. In fact, the first study that provided support for the contra-trait effort mechanism was experimental, not correlational, and showed that sustaining contra-trait behavior can result in subsequent behaviors falling at or near levels consistent with trait standing (trait-typical level; Gallagher et al., 2009). This mechanism presumably would result in maintaining a stable level of trait standing over time.

Several findings have demonstrated the extremely high rank-order stability of average ways of acting. In one illustrative study, participants used Likert-type scales to

rate hour-long periods of behavior in terms of the degree to which they manifested Big Five traits five times daily for two weeks (Fleeson, 2001, Study 1). These ratings were then plotted in distributions. Each participant displayed wide variability in his or her trait behavior – most participants routinely behaved at all levels of the 1 to 7 scales, and the average standard deviation across Big Five traits was almost a full scale point. Despite this considerable variability, means of density distributions were highly stable. Split-half reliabilities averaged .91 across traits and participants; individuals' average trait levels remained the same from one week to the next, or from one half of randomly selected behaviors to the other. This finding replicates earlier ones by Epstein (1979) and has been shown in several subsequent studies (Fleeson, 2001, 2007).

Epstein (1979) posited that the variability observed in trait behaviors was merely measurement error, and that just as psychologists use the average of many items on questionnaires to measure psychological constructs, they should use the average of many behaviors to measure trait standing. Subsequent research, instead, has shown that behaviors that appear to be inconsistent across situations may actually constitute stable patterns of trait expression (Fleeson, 2007; Mischel & Shoda, 1995; Shoda, Mischel, & Wright, 1994) and that the amount of behavioral variability itself may be a stable individual difference (Fleeson, 2001; 2007). Thus, behaviors that manifest different levels of trait content may be inconsistent with each other, but may in fact be stable aspects of a coherent trait profile. This idea is shared by Mischel and Shoda's (1995)



cognitive affective personality system (CAPS) theory and Fleeson's (2001) density distributions approach, and is important to the current hypothesis. The current hypothesis addresses a possible process underlying behaviors that manifest different levels of a trait, a process that should contribute to trait stability.

In addition to the observed rank-order stability in average ways of acting, standing on personality traits remains largely stable throughout the lifespan (Roberts, Caspi, & Moffitt, 2001; Terracciano, McCrae, & Costa, 2006). Although consistent patterns of change in trait levels have been identified (Roberts, Walton, & Viechtbauer, 2006), these changes are relatively small compared to the degree of stability in trait standing, especially over shorter periods of time (three to ten years; Roberts, Wood, & Caspi, 2008). Mean-level stability in trait standing is normally on the order of .55 up to .83 for test-retest stability (Roberts et al. 2001; McCrae & Costa, 1988; Terracciano et al., 2006). These high levels of rank-order stability in average ways of acting, along with long-term mean level trait stability, raises a question of central importance to psychology: What is responsible for maintaining personality stability?

Several mechanisms that contribute to mean-level stability over time in personality have been identified (for a review, see Roberts, Wood, & Caspi, 2008). These mechanisms include person-environment interactions changing over time in patterns that serve to maintain traits. For example, people may select roles, environments, friends, and spouses that enhance or support their existing traits. This process would

result in situations that match individuals' personalities, thus minimizing demands for adaptation or change (Roberts, O'Donnell, & Robins, 2004; Roberts & Caspi, 2003). In addition to these person-environment interaction mechanisms, several social-cognitive mechanisms have been identified. Several of these mechanisms result from motivations to maintain self-consistency or identity (Brandtstadter & Renner, 1992). For example, rather than consider oneself a failure because of unmet goals, over time people may shift their goals to more closely match their life outcomes and thus be able to see themselves as successful. This process reduces the need to change personality or behavior and results in a consistent self-view.

The contra-trait effort mechanism is perhaps best seen as a self-regulatory mechanism, and more specifically, as a self-control mechanism. Self-regulation is seen by most researchers as referring to the automatic and controlled processes by which people pursue goals, present themselves socially, or conduct behavior. Self control refers to the subset of controlled self-regulatory processes, such as inhibiting prepotent responses and bringing behavior in line with social norms or goal-achievement strategies. Self-control seems crucial for contra-trait behavior, because contra-trait behavior presumably involves (1) inhibiting well-learned, possibly even biologically prescribed behaviors, and (2) generating and supporting adaptive, non-practiced behaviors. Considering such self-regulatory processes in the context of personality

brings a substantial body of psychological knowledge to bear on the study of personality processes. The current studies are one example of this integration.

## ***1.2 The Contra-Trait Effort Hypothesis***

The contra-trait effort hypothesis posits that people find it more difficult or effortful to enact behaviors that deviate from their mean level (contra-trait behavior) than it is to enact behavior at the mean (trait-typical behavior), so that only a limited amount of contra-trait behavior can be enacted. The greater the deviation from typical mean levels, the more effort may be required. If this is the case, then contra-trait behavior is generally less likely than trait-typical behavior, and most behaviors will fall close to mean levels, with extreme contra-trait behaviors less likely. Following this reasoning, an individual who is high on extraversion may be capable of behaving at a low level of extraversion, but this behavior demands more effort and becomes fatiguing, so the individual is subsequently more likely to behave at high levels of extraversion.

The contra-trait effort hypothesis is commensurate with the idea that traits prescribe a baseline, or set-point level of behavior, and situational factors such as group processes, societal norms, and motivational factors cause deviations from that level. I assume that traits in some way prescribe a certain baseline way of behaving. This hypothesis, however, does not address how traits develop or their exact nature once they are established. It could be that traits are default ways of acting that have been learned and continually reinforced throughout development, resulting in certain

behaviors being favored (Caspi & Moffitt, 1993; Caspi & Moffitt, 1995), or that they reflect genetically influenced biological structures that shape behaviors and cognitive processes (Canli, Sivers, Whitfield, Gotlib, & Gabrieli, 2002; DePue & Collins, 1999; Riemann, Angleitner, & Strelau, 1997). The contra-trait effort hypothesis addresses only how self-control processes may influence patterns of trait behavior over time. Whatever the precise nature and development of traits, and however they result in certain behaviors being favored or prescribed over others, the contra-trait effort mechanism applies.

### **1.2.1 Three Corollaries of the Contra-Trait Effort Hypothesis**

If contra-trait behaviors demand more effort than trait-typical behavior, then at least three corollaries follow. First, contra-trait behaviors should generally be less likely than trait-typical behaviors. Over time, this should result in most behaviors falling at or near typical trait level, and that level should remain stable. Second, individuals should find contra-trait behaviors more difficult than trait-typical behaviors. There should be some measurable indication that people consciously or non-consciously find behaviors that are not at trait-typical levels harder or more effortful. Third, after sustaining contra-trait behaviors, subsequent behaviors should be more likely to fall near trait-typical level, because sustaining contra-trait behavior should result in tiring or fatigue, specifically of the processes required for contra-trait behavior. This is perhaps the most consequential corollary of contra-trait effort for specific behaviors, because it describes

how a self-regulatory process (the fatigue of inhibiting trait-typical and supporting contra-trait behavior) could mediate the effect of other situational forces on trait behavior. It suggests that even in a situation with a strong pull for contra-trait behavior, individuals' trait behaviors may depend on the effort they are willing or able to expend. The following sections describe evidence that supports each of these three corollaries.

### **1.2.1.1 Corollary 1: Frequency of contra-trait behaviors**

The first implication of the contra-trait effort mechanism is supported by experience-sampling studies of trait behavior. In these studies, participants' behaviors form density distributions with stable parameters, the most stable of which is central tendency (Epstein, 1979; Fleeson, 2001, 2007; Fleeson & Gallagher, 2009). Standing on trait measures strongly predicts average levels of behavior, with correlations on the order of .42 - .56, and predicts other parameters of behavioral distributions less strongly (Fleeson & Gallagher, 2009; Heller, Komar, & Lee, 2007). Most behaviors in these distributions fall near the mean, as indicated by measures of "spread." In 15 experience-sampling studies, participants' average standard deviation across Big-Five domains was .89 on a one-to-seven scale. The kurtosis of participants' distributions in each Big-Five domain (taken from a subset of 11 of these studies) averaged well above zero (where zero is a normal distribution), with the exception of extraversion, which averaged just below zero ( $M = -.0208$ ; Gallagher, 2010). These measures of spread indicate that for the typical individual, most trait behaviors are grouped close to or at the mean, and thus can

be considered trait-typical behaviors. Thus, although behavior regularly manifests many levels of traits (i.e., is quite variable), the majority of behaviors manifest trait content that corresponds closely to individuals' trait standing.

### **1.2.1.2 Corollary 2: Difficulty of contra-trait behaviors**

The second implication of the contra-trait effort mechanism is consistent with several findings. Paulhus and Martin (1987) found that participants rated certain social behaviors as more difficult, anxiety-provoking, and undesirable than others. Those behaviors rated highest on these dimensions were socially maladaptive (for example, quarrelsomeness and arrogance). Because participants' social behavior trait ratings were generally high, these maladaptive behaviors might be seen as contra-trait. (They also went against social norms, which could have also contributed to their difficulty). Deiner and colleagues (Deiner, Larson, & Emmons, 1984) found that novel situations were associated with more negative than positive affect, and typical situations were associated with the more positive than negative affect. This pattern was a test of whether people were more comfortable in situations that matched their personality; it could also be that novel situations called for generation of non-practiced or unfamiliar (contra-trait) behaviors, which may have taken more effort than the behaviors normally enacted in familiar situations.

Recent neural evidence indicates that decisions that are made in non-preferred or atypical ways produce patterns of activation that signal conflict. Although it does not

necessarily indicate that contra-trait behaviors are more effortful, this evidence suggests that the brain recognizes certain behaviors as contra-trait, perhaps as a signal to muster cognitive or self-regulatory resources. In one study, participants made a series of hypothetical choices between options that promised a certain outcome (e.g., receive \$5) and an option with uncertain outcomes (20% chance of receiving \$25, 80% chance of receiving nothing; DeMartino, Kumaran, Seymour, & Dolan, 2006). In this type of choice problem, people normally choose the certain option when the problem is framed in terms of gains and the uncertain option when the problem is framed in terms of losses (Tversky & Kahneman, 1981). DeMartino and colleagues found that all participants followed this normative pattern overall. However, when participants made a choice that went against this pattern, increased activation was seen in the anterior cingulate cortex (ACC; DeMartino et al., 2006). ACC activation indicates conflict in processing and “signals the need for the allocation of additional control” (Miller & Cohen, 2001, p. 191). This activation showed that when participants’ behaviors (choices) “ran counter to their general behavioral tendencies,” or were contra-trait, the brain in some way registered this atypicality (DeMartino et al., 2006, p. 687). In another study, participants showed specific patterns of activation when their decision strategy ran counter to their preferred, or trait, decision-making strategy (Venkatraman, Payne, Bettman, Luce, & Heuttel, 2009). Participants’ preferred strategy was measured both behaviorally, in their pattern of strategies used in a series of decisions, and with several questionnaires.

Activity in the dorsomedial prefrontal cortex and the right inferior frontal gyrus was related to participants' use of strategies that were different from their preferred strategy. In effect, these two findings show a neural signature of behaving in atypical ways.

The evidence that most implicates self-regulatory processes in contra-trait behavior comes from the habit and goal literatures. Behaviors that are well-learned and repeatedly enacted in the same context, called habits, demand less thought and attention than non-habitual behaviors (Neal, Wood, & Quinn, 2006; Wood, Quinn, & Kashy, 2002). They are also rated as less difficult to perform than non-habits (Wood et al., 2002), suggesting possible overlap between habits and contra-trait behavior: contra-trait behavior may be less likely to be habitual, and therefore more likely to require more conscious thought and effort. Similarly, much of goal-directed behavior is unconscious, demanding little self-control or attentional resources (Bargh & Chartrand, 1999; Shah, Kruglanski, & Friedman, 2003). To interrupt and change such prepotent behaviors takes effortful executive control, which appears to drain a limited resource, making it more difficult to inhibit and change subsequent behavior (Schmeichel, 2007). If they are learned and reinforced over time, trait-typical behaviors may be more likely to be habitual or automatic, and thus contra-trait behaviors would be more difficult and demanding of self-control (both generating atypical behaviors and inhibiting typical ones should take more self-control than simply behaving automatically).



Finally, the hypothesis that contra-trait behaviors take more effort was directly supported by Gallagher et al. (2009). In this experiment, both trait introverts and trait extraverts were instructed to maintain either contra-trait or typical-trait behavior for about 30 minutes. Those who performed contra-trait behavior rated their behavior as more effortful, and also reported that it was more difficult to follow the behavioral instructions, than trait-typical participants (although this result was only significant for extraverts).

Taken together, these findings indicate that some behaviors are more effortful than others and suggest that contra-trait behaviors may be more effortful or difficult than trait-typical behaviors.

### **1.2.1.3 Corollary 3: Consequences of contra-trait behaviors**

The third implication is that after sustaining contra-trait behavior for extended periods, subsequent behavior will be more likely to fall at or near normal trait levels. If sustaining contra-trait behavior demands effort and leads to fatigue, then this fatigue should make further contra-trait behavior less likely, because individuals may lack the necessary energy or seek to conserve energy or rest. This prediction was supported by Gallagher et al. (2009). After sustaining contra-trait energy, participants were given a second task. To create a situational “pull” for contra-trait behavior, experimenters told them that people normally perform the task better if they behave a certain way while doing it (this “certain way” was described to extraverts as introverted behavior, and to

introverts as extraverted behavior). As predicted, extraverts who had sustained contra-trait behavior were less likely to take advantage of this incentive; they were more likely to behave at trait-typical levels (this consequence of contra-trait behavior was not found among introverts).

### **1.3 Current Research Questions**

The current research was intended to conceptually replicate the findings of Gallagher et al. (2009) for extraverts. In addition, it was designed to address some of the questions left open by that experiment as well as extend the contra-trait effort idea in new directions.

One shortcoming of the Gallagher et al. (2009) study is that the results were found only among extraverts. Introverts did describe contra-trait behavior as more effortful than trait-typical behavior, but not significantly so. Also, in the second task, introverts displayed the opposite pattern of behavior than was predicted – those who had sustained contra-trait behavior continued behaving more extraverted in the second task, and those who had sustained trait-typical behavior continued acting introverted. This pattern of results suggests there might have been a situational factor at work; namely, the social norm to act extraverted in group situations. This situational factor would have given contra-trait extraverts two forces to “fight” against: their traits and the situational norm. Contra-trait introverts, on the other hand, would be fighting only against their traits while acting in harmony with the situational norm (which

presumably would ease effort demands). The current studies were designed to account for situational norms in several ways. First, in the experience-sampling (ESM) study, behaviors in all Big-Five domains were measured in context – presumably in situations with random behavioral influences. Second, in the laboratory experiment (Study 2), participants were alone during laboratory tasks. Third, the laboratory experiment focused on conscientiousness, a domain for which situational norms might be better controlled than for extraversion.

Another shortcoming of the Gallagher et al. (2009) experiment may have been that the incentive presented in the second task was not appropriate for the task. The incentive to perform better on the handgrip task was meant to appeal to the students' presumed achievement motivation; however, it seems to have only affected extraverts as predicted. It could be that introverts were less concerned with achievement in this domain, or that the incentive was too weak to overcome priming or affective effects of introverts' behavior in the first task. In the current laboratory experiment, the second set of tasks (during which subsequent behavior was measured) was designed to allow for variability in behavior, and several variables were measured to investigate participants' behaviors.

A third concept that the current research addresses is habits and automatized behavior. Most people routinely act at all levels of personality traits (Fleeson, 2001; Fleeson & Gallagher, 2009). That most people display high intraindividual variability

suggests that not all contra-trait behavior is demanding or effortful. Although trait-typical behaviors are more likely to be habitual than contra-trait behaviors, some contra-trait behaviors that are regularly enacted in the presence of certain environmental cues may become habits. This would make them less effortful and less demanding than other contra-trait behaviors (Wood, Quinn, & Kashy, 2002). Similarly, contra-trait behaviors that are instrumental in achieving goals may become automatized, making them less effortful as well (Chartrand & Bargh, 1999). The habit and automatization processes would result in some contra-trait behaviors (adaptive or not) being protected from the contra-trait effort mechanism – as self-control becomes unnecessary, contra-trait effort becomes unneeded. In effect, these “contra-trait” behaviors would become part of the individual’s variable, but coherent, trait profile (or density distribution, Fleeson, 2001; or *if...then* profile, Mischel & Shoda, 1995). The current experience-sampling study addressed this possibility by measuring not only the degree to which behaviors are contra-trait and effortful, but also the degree to which they are habitual.

### **1.3.1 Overview of the Studies and Hypotheses**

In Study 1, participants reported on their behavior five times per day for seven days. In these reports, participants described a recent or ongoing behavior in terms of (1) its trait content, (2) how effortful or demanding it is, (3) whether or not it is habitual, (4) how long they were engaged in it, and (5) their behavioral plans for the immediate future. We predicted that:

**H<sub>1</sub>:** Participants would report that contra-trait behaviors are more effortful, and that as behaviors fall farther from average trait levels, they will become more effortful.

**H<sub>2</sub>:** Contra-trait behaviors that are habitual would not be more effortful than trait-typical behavior.

**H<sub>3</sub>:** Contra-trait behaviors that are sustained for longer periods of time would be more fatiguing.

**H<sub>4</sub>:** Planned future behaviors would be more likely to be at trait-typical levels for longer-sustained, non-habitual contra-trait behavior.

In Study 2, participants completed a procedure similar to the one used by Gallagher et al. (2009). Participants' trait level of conscientiousness was measured using established self-report questionnaires. Then, participants engaged in two tasks under instructions to act at different levels of conscientiousness, after which they rated the trait content and effortfulness of their behavior. Then, they completed a second set of activities in which an incentive to act contra-trait was presented, and their behavior was analyzed to determine its conscientiousness level. For this experiment, we predicted that:

**H<sub>5</sub>:** Participants would rate contra-trait behaviors as more effortful than trait-typical behaviors (except participants with mean trait levels of conscientiousness, who would show no or weak effects of contra-trait behavior).

**H<sub>6</sub>:** Subsequent behavior for contra-trait participants would be more likely to fall at trait-typical levels, despite the incentive to act contra-trait.

## **2. Study 1 Method**

### **2.1 Participants**

Sixty-three Duke undergraduates signed up to attend the initial hour-long introductory session for credit toward class requirements. Fifty-four elected to participate in the experience sampling portion of the study. Eleven of these participants were dropped for providing fewer than 15 valid reports, leaving 43 participants. The 11 Ps who provided too few reports did not differ in trait self-control or trait standing on any Big-Five trait domain ( $t_s < 1.60$ ).

### **2.2 Materials**

#### **2.2.1 Trait Scales**

##### **2.2.1.1 Behavioral distribution questionnaire**

Participants completed the behavioral distribution questionnaire (BDQ), a self-report measure of density distributions of Big-Five behavior (Gallagher, Hoyle, & Fleeson, 2010). This questionnaire has been shown to measure respondents' standard deviations of Big-Five behavior with some accuracy (instructions and a sample item appear in Appendix A; Gallagher et al., 2010).

### **2.2.1.2 Big-Five trait scales**

Participants also completed a measure of Big-Five trait standing consisting of self ratings of 35 adjectives shown to be reliable markers of the Big-Five domains (Goldberg, 1992). Participants indicated how well each adjective described them using a 1 (*not at all*) to 7 (*extremely*) scale. Reliability for this scale was acceptable in all five domains: For extraversion,  $\alpha = .88$ , for agreeableness,  $\alpha = .77$ , for conscientiousness,  $\alpha = .72$ , for emotional stability,  $\alpha = .71$ , and for openness,  $\alpha = .70$ .

### **2.2.1.3 Trait self-control scale**

Participants also completed the trait self-control scale, which has shown to be reliable and to predict several life outcomes (Tangney, Baumeister, & Boone, 2004). This scale consists of 35 statements, and respondents indicate how much each reflects how they typically are on a 1 (*not at all*) to 5 (*very much*) scale (some example items are “I am lazy,” “I never allow myself to lose control,” and “People would describe me as impulsive”). Reliability for this scale was good,  $\alpha = .84$ .

## **2.2.2 Implementation Intentions**

To encourage full and accurate completion of the ESM reports, participants completed an implementation intention form (adapted from Wood et al., 2002; this form appears in Appendix B). On this form participants described how they planned to get online and complete reports for each scheduled report time. They also rated their agreement with three statements on a 1 to 7 scale (“I intend to complete all the reports

for this study;" "At each scheduled time I will stop what I'm doing for a few minutes and complete the required report;" "I have regular access to the internet, and I will be sure to have access at the times of the scheduled reports"). Finally, participants signed a "contract" attesting to their commitment to complete the data collection.

### **2.2.3 ESM Reports**

Participants were instructed to log into the reporting website at each scheduled time, complete their report, and log out, so that timestamps associated with login recorded when the report was completed. For each report, participants first entered their ID code and indicated which of the day's five reports they were providing.

They were instructed to "think about the activity you were engaged in MOST over the last 60 MINUTES. When answering each question, describe your behavior during that activity." The next four items measured effort and were adapted from Gallagher et al. (2009). They were: "How effortful was it to perform this behavior?" "How tired or fatigued did acting the way you did make you?" "How easy was it to behave the way you did?" "How much effort did it take to act the way you did?" After reverse-scoring the third item, the mean of these four items was used as the effort score. The reliability across all participants and reports was .86.

The next 20 items measured the trait content of the behavior. These items were chosen based on their factor loadings in Goldberg (1992) and were presented in five randomly ordered blocks, with each block containing the four items for one Big-Five



trait domain. Each item was in the form, “During this activity, how \_\_\_\_\_ were you?” and participants responded on a 1 (*not at all*) to 7 (*extremely*) scale. The adjectives used were: For extraversion: *talkative, shy, withdrawn, quiet*; for agreeableness: *cold, kind, sympathetic, warm*; for conscientiousness: *organized, systematic, thorough, neat*; for emotional stability: *temperamental, moody, envious, irritable*; and for openness: *creative, intellectual, imaginative, philosophical* (Goldberg, 1992). Participants could also select *not applicable (n/a)* for one of the four adjectives in each block; on reports that included a *n/a* response state scores were calculated using the other three items. In total, *n/a* was chosen for at least one domain on 232 (21.9% ) reports, with 146 of those (13.8%) having only one “n/a.” Internal reliabilities across all participants and reports were: extraversion,  $\alpha = .77$ ; agreeableness,  $\alpha = .79$ ; conscientiousness,  $\alpha = .92$ ; emotional stability,  $\alpha = .84$ ; openness,  $\alpha = .81$ .

The next two items, taken from Wood et al. (2002), measured whether the behavior was habitual: “How often have you performed this activity in the past month” – (1) *monthly or less often*, (2) *at least once a week*, (3) *just about every day*; and “When you perform this activity, how often is it in the same physical location” – (1) *rarely*, (2) *sometimes*, (3) *usually*. Behaviors that were described as performed just about every day and usually in the same physical location were considered habits (Wood et al. 2002). The next three items were: “About how long were you engaged in this activity” – (7 *choices in 10-minute intervals*); “How much physical activity was involved in this activity”

– (1) none to (7) a great deal; and “What are you planning to do next” – (1) *this same activity, because I have to*, (2) *this same activity, because I want to*, (3) *rest*, (4) *some other behavior/activity*, (5) *I don’t know*. This future plans item was recoded as either same activity (options 1 or 2) or different activity (options 3 or 4). Option 5 was treated as missing (this option was chosen on only 29 reports (2.7 %)). The final item was: “How did you connect to the internet to complete this report” – (1) *computer at my residence*, (2) *phone or other handheld device at my residence*, (3) *computer outside my residence*, (4) *phone or other handheld device outside my residence*.

In all, including entering the subject ID and identifying the report, each report consisted of 32 items.

### **2.3 Procedure**

Participants first attended a one-hour introduction session at which the study was described with emphasis on its length and multiple daily reports. The website at which participants were to complete reports was shown to them, and they were instructed to log into the website from any device with Internet access. Participants were invited to leave the study for partial credit after the introductory meeting; eight participants accepted this invitation. Participants completed trait questionnaires and chose an ID code to be associated with their data. They also provided implementation intentions in the form of an outline of how and when they would complete reports. Participants then signed a “contract” to complete the data collection fully and

accurately. Each of the seven days of the study, participants were emailed a morning reminder to complete their reports, and this email contained the link to the report website. Participants completed five reports per day for seven days, every three hours starting at 10 AM, 11 AM, or noon (participants chose their own start time).

Initially, ten participants were dropped from analyses for providing fewer than 15 reports. Remaining reports were excluded from analyses if they were completed more than an hour before or two hours after the scheduled time, if they contained more than four missing values, if they contained more than 23 identical responses, or if they contained more than 15 identical responses to the 20 trait adjectives. In all, 142 reports were excluded for one of these reasons (11.69 percent of all remaining reports), resulting in one additional participant being dropped for having fewer than 15 reports remaining. Thus, 43 participants with an average of 24.67 reports each (or 3.5 reports per day) contributed data to analyses.

### **3. Study 1 Results**

The effects of contra-trait behavior were investigated using multilevel modeling, with behavioral reports (level 1) nested within participants (level 2). All predictor variables were centered within participants. Analyses followed a strategy based on Raudenbush and Bryk (2002).

First, contra-trait scores were calculated for each behavioral report. For each behavior, the amount of deviation from that individual's mean in each Big Five domain

was summed. That is, for each behavior, the individual's density distribution means were subtracted from the Big Five ratings for the corresponding domains, and the absolute values of these five differences were then summed across Big Five domains. Calculating contra-trait scores in this way thus captured the overall degree to which each behavior is different from trait levels, and also resulted in higher scores for those behaviors that are contra-trait in multiple domains.

### **3.1 *Contra-Trait Effort and Habitual Behavior***

Our first two hypotheses ( $H_1$  and  $H_2$ ) were that contra-trait scores would be rated as more effortful, and that this relationship would hold only for non-habitual behaviors. To test these hypotheses, we conducted a series of multilevel analyses. The outcome variable was effort ratings, and predictor variables were contra-trait scores (centered within individuals) and the habit indicator variable (0 = nonhabit, 1 = habit), all at level 1. The null model (containing no predictors) indicated that 86% of the variance in effort scores was within people ( $\sigma^2 = 2.06$ ,  $z = 22.55$ ,  $p < .001$ ), leaving 14% between ( $\tau_{00} = .34$ ,  $z = 3.57$ ,  $p < .001$ ). Variability was sufficient at both levels for further analysis. Our next model included contra-trait score, the habit indicator variable, and their interaction term as predictors. These three predictors accounted for 15% of within person variance in effort, and the interaction term was significant,  $\beta = -.20$ ,  $SE = .07$ ,  $p = .003$ . The habit indicator variable was significantly related to effort,  $\beta = -.62$ ,  $SE = .16$ ,  $p < .001$ , meaning that habits were generally less effortful than non-habits (replicating a Wood et al., 2002,

finding). In support of our prediction, contra-trait scores were significantly related to effort only for non-habitual behaviors,  $\beta = .13$ ,  $SE = .04$ ,  $p = .001$ . Among habitual behaviors, there was no relationship,  $\beta = -.07$ ,  $SE = .07$ ,  $p = .281$  (coefficients appear in Table 1).

**Table 1: Study 1 coefficients: Contra-trait effects in contextualized behavior.**

	Coefficient ( $\beta$ ) of Contra-trait Score	SE	<i>p</i> value
Habitual behaviors	-.07	.07	.280
<b>Non-habitual behaviors</b>	<b>.13</b>	<b>.04</b>	<b>.001</b>
Above-mean behaviors	.09	.06	.112
<b>Below-mean behaviors</b>	<b>.16</b>	<b>.05</b>	<b>.002</b>

*Note:* The outcome variable for all models was effort ratings on a 1-to-7 scale. Contra-trait score reflects absolute distance from each Big Five domain mean summed across all five domains.

To investigate whether contra-trait effects differed by Big Five domain, we repeated these analyses five times, replacing overall contra-trait scores with scores within each domain. (To assure that these analyses were not redundant,

intercorrelations between state scores in each domain were examined: The range of magnitudes of correlations was .054 to .482,  $M = .238$ ). The pattern of effects found in the first analysis was generally the same for three domains: conscientiousness, openness, and emotional stability. For agreeableness and (notably) extraversion, there were no differences in contra-trait effort between habitual and non-habitual behavior.

Including the items measuring length of time engaged in behaviors and amount of physical activity involved in behaviors in the full model indicated that both variables were related to effort scores; for “time engaged,”  $\beta = .11$ ,  $SE = .04$ ,  $p = .004$ , and for “physical activity,”  $\beta = .38$ ,  $SE = .03$ ,  $p < .001$  (these two variables together accounted for an additional 20% of variance). However, including these variables had no effect on the pattern of results other than slightly lowering the coefficient for contra-trait score;  $\beta = .12$ ,  $t = SE = .04$ ,  $p < .001$ .

Our third hypothesis ( $H_3$ ) was that the longer contra-trait behaviors were sustained, the more effort they would be require. To test this hypothesis, we conducted a multilevel analysis that included only those behaviors above the median contra-trait score ( $N = 532$ ). The outcome variable was again effort ratings, and predictor variables were time engaged in the behavior (centered within individuals) and the habit indicator variable (0 = nonhabit, 1 = habit), each at level 1. The null model (containing no predictors) indicated that 89% of the variance in effort scores was within people ( $\sigma^2 = 2.39$ ,  $z = 15.66$ ,  $p < .001$ ), leaving 11% between ( $\tau_{00} = .28$ ,  $z = 2.55$ ,  $p = .005$ ). Variability was

sufficient at both levels for further analysis. The next model included time engaged, the habit indicator variable, and their interaction term as predictors. These three predictors accounted for 7% of within person variance in effort. In support of our prediction, time engaged was related to effort, such that the longer the behavior was sustained, the greater the effort needed,  $\beta = .12$ ,  $SE = .06$ ,  $p = .045$ . The habit indicator variable was significantly related to effort (as it was in the full data set),  $\beta = -.99$ ,  $SE = .15$ ,  $p < .001$ , meaning that non-habits (which were coded as 0) were generally more effortful than habits (coded as 1). The interaction term was not significant, meaning that the relationship between time engaged and effort was not significantly different for habits vs. non-habits.

### **3.1.1 Person-Level Factors**

Two person-level factors were tested as potential moderators of the relationship between contra-trait behavior and effort. The first was intra-individual variability. It could be that more-variable individuals have more practice supporting contra-trait behaviors, and that practice might result in greater capacity for supporting it. If this is the case, then people with more intra-individual variability should show a weaker relationship between contra-trait behavior and effort. Two variables were used to measure intra-individual variability: standard deviations of ESM density distributions, and self-reported standard deviations from the behavioral distribution questionnaire (in each case, the mean of the SDs from the five domains was used as the intra-individual

variability score). Two models were analyzed, each including only non-habitual behaviors, and each had effort scores as the outcome variable and contra-trait scores, intra-individual variability, and their interaction term as predictors. The null model indicated that 85% of the variance in effort scores was within people ( $\sigma^2 = 1.76$ ,  $z = 18.90$ ,  $p < .001$ ), leaving 15% between ( $\tau_{00} = .32$ ,  $z = 3.40$ ,  $p < .001$ ). Variability was sufficient at both levels for further analysis. Neither measure of intra-individual variability was related to effort, and neither interaction term was significant, indicating that intra-individual variability did not moderate contra-trait effects.

The second person-level variable tested as moderator of contra-trait effects was trait self-control. It could be that individuals with generally greater capability for exerting self-control might find contra-trait behaviors less effortful than those with low self-control. To test this possibility, we analyzed a model including only non-habitual behaviors. This model had effort ratings as the outcome variable and contra-trait scores, trait self control (as measured by the trait self control scale administered at the initial session) and their interaction term as predictors. None of these predictors were significantly related to effort, indicating that trait self-control did not moderate contra-trait effects.

### **3.1.2 Directional Effects**

In Gallagher et al. (2009), contra-trait effects were found only among extraverts. Our next analysis investigated whether this pattern might have emerged because contra-



trait effects are asymmetrical. In other words, it could be that behaviors that deviate from the mean in the downward direction are more effortful. Some support for this idea comes from recent authenticity research, which found that people consistently felt more like their true selves when acting toward the high end of the Big-Five domains regardless of their trait standing (Fleeson & Wilt, 2010). If feeling unlike your true self contributes to making a behavior more effortful, then contra-trait behaviors that fall above one's mean level may be reported as less effortful than below-mean behaviors. To test this possibility, we split the current data set into below-mean (519 reports) and above-mean behaviors (542 reports), and repeated the first analysis on each data set. The hypothesized pattern of results was found among below-mean behaviors: Habitual contra-trait behaviors were not more effortful,  $\beta = -.09$ ,  $SE = .08$ ,  $p = .253$ , but non-habitual contra-trait behaviors were,  $\beta = .16$ ,  $SE = .05$ ,  $p = .002$  (interaction  $\beta = -.27$ ,  $SE = .09$ ,  $p = .004$ ). In contrast, this pattern was not found among above-mean behaviors: contra-trait behaviors were not more effortful for either habits,  $\beta = .11$ ,  $SE = .11$ ,  $p = .304$ , or non-habits,  $\beta = .09$ ,  $SE = .06$ ,  $p = .112$  (interaction  $\beta = .03$ ,  $SE = .12$ ,  $p = .807$ ). This finding suggests that contra-trait effort demands may be different according to the direction of the deviation from the mean.

### **3.1.3 Subsequent Behavior**

Our fourth hypothesis ( $H_4$ ) was that after sustaining contra-trait behavior, participants would be more likely to report plans to engage in a different activity. To

test this hypothesis, we conducted a multilevel analysis with the same two predictor variables as our first analyses; which were contra-trait scores (centered within individuals) and the habit indicator variable (0 = nonhabit, 1 = habit), all at level 1. The outcome variable in this model was the dichotomous “future plans” variable, with 0 = same activity and 1 = different activity. No main effects or interactions emerged ( $ps > .340$ ), indicating that contra-trait behavior had little effect on future plans. It could be that situational demands constrained options for future activities (for example, future activities could have been scheduled for that time), so that even if contra-trait behavior caused fatigue, participants overcame the fatigue to engage in necessary behaviors. Some evidence for this possibility can be seen in the pattern of responses: Of the 313 “same activity” responses, 194 (62%) were “*this same activity, because I have to;*” (the only other “same activity” option was “*this same activity, because I want to*”).

## **4. Study 2**

In Study 1, participants rated contra-trait behaviors as more effortful than trait-typical behaviors, with two qualifications: First, if contra-trait behaviors were habitual, they were not rated as more effortful. Second, if they were described as a trait level higher than the participants’ typical level, they were not more effortful. This second result replicates a finding of Gallagher et al. (2009) that extraverts, but not introverts, rated contra-trait behavior as more effortful. In that study and the current Study 1, and in several trait domains, contra-trait effects were found only in non-habitual behaviors

that were below typical levels. In light of these findings, the tasks for Study 2 were chosen to maximize the chances that both high-C and low-C participants' contra-trait behaviors would be non-habitual.

In Study 2 participants completed SAT-like test problems and watched a video on the computer. High-C participants should find the contra-trait instructions for the test problems more difficult because they are both below their normal level of behavior and presumably non-habitual for college students at a competitive university. Low-C participants, on the other hand, likely have practiced tasks like test-taking in a high-C manner, and might not find contra-trait instructions more difficult. For the computer video, low-C participants should find the high-C instructions more effortful (even though they are above normal trait level), because they likely have not practiced performing such a recreational activity in a high-C manner. High-C participants, on the other hand, might normally perform this behavior in a low-C manner, and despite it being below their normal trait level, might not find it more effortful. Considering the nature of these tasks, we revised our hypotheses as follows:

**H<sub>5</sub>:** High-C participants will rate contra-trait test-taking behavior as more effortful than trait-typical test-taking behavior.

**H<sub>6</sub>:** Low-C participants will rate contra-trait video-watching behavior as more effortful than trait-typical test-taking behavior.

**H<sub>7</sub>:** Mean-C participants will show small or no contra-trait effects for either task.

**H<sub>8</sub>:** Subsequent behavior for contra-trait participants would be more likely to fall at trait-typical levels, despite the incentive to act contra-trait.

#### **4.1 Study 2 Methods: Participants**

Ninety-eight (37 female) Duke students participated in the study for course credit for a psychology class, and 45 (29 female) students participated for a payment of \$17. Five hundred five credited participants first completed online assessments of conscientiousness (C). Those with the 93 lowest, 129 closest to the mean, and 123 highest C scores were invited to come to the lab to participate in the experiment. After these participants completed the study, 178 additional participants were paid to complete the online assessment of C. Of these, 93 (31 low-C, 33 mean-C, and 29 high-C) who scored in the same ranges of the invited credited participants were invited to participate in the lab. Of the 438 invited, 144 participated in the experiment. One participant was excluded from analyses because of computer malfunction, leaving a final *N* of 142 (52 low-C, 53 mean-C, and 37 high-C; 64 female). Descriptive statistics of the samples' mean C scores appear in Table 2.

**Table 2: Description of Study 2 sample.**

	Low-C	Mean-C	High-C	Entire Sample
N (invited)	124	162	152	438
N (participated)	52	53	37	142
% who were male	64	47	54	55

% who were paid	25	36	38	33
Mean C score	3.56	4.68	5.79	4.56
Std. Dev. C score	.33	.19	.31	.92

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## **4.2 Procedure**

Participants were told that the study was investigating test-taking behavior. After giving informed consent, participants were seated at a computer alone in a small room and spent 15 minutes completing SAT-type test problems and 15 minutes watching a video, both on the computer. Participants were given behavioral instructions for each of these two tasks to create contra-trait and trait-typical conditions. After each of these two activities, participants completed post-activity questionnaires for about 1.5 minutes. Next, to measure subsequent behavior after participants sustained contra-trait or trait-typical behavior, participants completed two more tasks on paper that were in a packet next to the computer, which took around 10-15 minutes. To probe for suspicion of experimental hypotheses, participants then wrote down what they thought the study was about. They were then debriefed, paid if necessary, and excused.

## **4.3 Materials**

### **4.3.1 Trait Scales**

Participants completed the International Personality Item Pool C scale, which has shown internal reliability in several samples (Goldberg, 1999). Participants indicated how well each of the 20 items described them on a scale of 1 (*does not describe me well at*

all) to 7 (*describes me very well*). (Sample items are: “I am always prepared,” “I pay attention to detail,” and “I like order.”) Reliability for this scale was  $\alpha = .91$  ( $N = 683$ ).

Participants also completed a behavioral measure of three facets of C: impulse control (7 items), industriousness (7 items), and neatness (10 items; Jackson, Wood, Bogg, Walton, Harms, & Roberts, in press). On these scales, participants indicated how often they engaged in several behaviors (for example, *purchase something spontaneously, work or study long hours, clean your bedroom*). Reliabilities for these scales were good,  $\alpha = .78, .74,$  and  $.81,$  respectively.

#### **4.3.2 Test Problems and Computer Video**

These two activities were chosen to maximize the potential for contra-trait effort to be used. Even if concentrating on test problems was a contra-trait behavior for low-C participants in our sample, they likely had thoroughly practiced this behavior, having scored highly enough on high-school tests and the SAT to be accepted at a competitive university. Because it is highly practiced, this contra-trait behavior could be exempt from contra-trait effort effects. If this is the case, then the result in the current experiment would be that low-C participants in the contra-trait condition would not require more effort, and no contra-trait effects would obtain. However, it is less likely that low-C participants have practiced watching a computer video in a high-C manner, and so detecting contra-trait effects might be easier in this task. Similarly, high-C participants might normally watch a video in a low-C manner, and thus not require

more effort to perform this contra-trait behavior. Completing test problems in a low-C manner, however, is more likely a contra-trait behavior that demands effort.

To maximize the likelihood that the effects of contra-trait effort would be detected in subsequent tasks, low-C participants completed the test problems first, then watched the video. High-C participants completed the two tasks in the opposite order. Task order for mean-C participants was randomly assigned.

Test problems were sample or practice items from the SAT and GRE. Similar problems have been used in previous research (Cameron, Holmes, & Vorauer, 2009); sample problems appear in Appendix C. Problems were completed in blocks of 19 of each type of problem (i.e., 19 analogies, 19 sentence completions, 19 antonyms, 19 sentence completions, etc.), and blocks were presented in random order. Participants were told that “for the purposes of today’s study, it’s important that you complete these problems in a certain manner.” Then, low-C instructions read “Please do not spend much time thinking about each problem. Answer with your first impulse; be very quick.” High-C instructions read “Please spend time thinking about each problem. Do not answer with your first impulse; instead, be very deliberate.” Each block began with instructions for how to complete the problems (for example, “Choose the word or phrase that is most nearly opposite in meaning to the word in capital letters.”) and also repeated the behavioral instructions.

The computer video was a 15 minute documentary-style clip from a cable network television series. The clip described how cranberries are grown and harvested. In pretesting, participants ( $N = 13$ ) rated this video as slightly above neutral on five items assessing interest (*interesting, not effortful to watch, not boring, entertaining, easy to watch*); the mean of the five items on a 1 to 7 scale on which 4 was neutral was 4.35 ( $SD = .86$ ). This rating was significantly higher than that of a video that described a bridge being built ( $M = 2.12, SD = 1.94, t(30) = 3.88, p = .001, r = .597$ ).

Participants were told again that for the purposes of the study it was important that they watch the video in a certain way. Low-C instructions read, "Please simply watch the video. Casually enjoy the events and characters." High-C instructions read, "Please pay close attention to the video. Thoroughly organize the events and characters in your mind." These instructions remained at the top of the screen while the video played in a window at the center of the screen.

#### **4.3.3 Post-Task Questionnaire**

After both the video and the test problems, participants completed a questionnaire on the computer describing their feelings and behavior. This questionnaire consisted of five items to measure C (*thorough, careless, systematic, conscientious, organized*) and five to measure Agreeableness (*kind, cooperative, trustful, harsh, pleasant*) to deflect attention from C items, and perhaps minimize priming effects. Internal reliability for the C items was good;  $\alpha = .80$  when completed after the video,  $\alpha =$



.82 when completed after the problems (reliabilities for the post-task questionnaire scales are across all participants). Four items each assessed positive and negative feelings (*amusement, contentment, engagement, happiness, anger, anxiety, fear, sadness*); participants responded on nine-point scales. These eight items were chosen from items used in previous research (Gable & Harmon-Jones, 2008; Mikels, Fredrickson, et al., 2005); and they had good internal reliability: for positive feelings,  $\alpha = .89$  (post-video) and  $\alpha = .79$  (post-problems); and for negative feelings,  $\alpha = .76$  (post-video) and  $\alpha = .83$  (post-problems). One item assessed performance expectancy (*How well do you expect to do on the remaining tasks in this experiment?*). Four items assessed effort (from Gallagher et al., 2009): (1) How effortful was it to act according to the instructions you were given? (2) How tired or fatigued did acting the way you did make you? (3) How easy was it to follow the instructions you were given to behave the way you did?(reversed) and (4) How much effort did it take to act the way you did? Reliability for these items was good when completed after the video ( $\alpha = .84$ ) but low when completed after the problems ( $\alpha = .58$ ). The mean of these four items was used as the self-reported effort measure.

In all, the post-activity questionnaire consisted of 23 items.

#### **4.3.4 Paper Tasks**

On the first page of the paper packet, participants were told that the two tasks inside had been shown to predict performance on GRE- and LSAT-type tests. They were also given behavioral instructions, so that they would have an incentive to behave at

contra trait levels. Low-C instructions read: “When completing these tasks, please be very careful, and concentrate on them very closely.” High-C instructions read: “When completing these tasks, please do not be too careful, and do not concentrate on them too much.”

The first task was designed to measure the ‘neatness’ or ‘order’ facet of C (this task is adapted from Feather, 1961, and Gailliot et al., 2007). In this task, participants were instructed to trace several figures without lifting the pen and without double-tracing any line (example figures appear in Appendix D). The figures were made of dotted lines in black ink, and participants traced them in blue ink. Neatness was measured by the percentage of line segments that did not deviate from the dotted lines (i.e., crossed half or more of the dashes). After one rater scored all 142 participants’ papers, consistency in the scoring scheme was checked by arbitrarily selecting a subset of 30, which were scored by a second rater. Of the 2,151 line segments in those thirty papers, 25 (1.16%) were not initially agreed upon, and 9 (.42%) were changed, indicating that the scoring was highly consistent across papers. The mean proportion of neatly-traced lines was .58 ( $SD = .16$ ).

The second paper task was designed to measure the ‘industriousness’ facet of C; it was adapted from a measure of self-regulatory resource depletion (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Moller, Deci, & Ryan, 2006). On the page was a paragraph from a history book that described clerical processes among several

administrative offices. Participants were instructed to cross out any “e” in the passage that was not adjacent to a vowel or a space. In this task, finding, correctly identifying, and crossing out each correct ‘e’ takes diligent concentration and sustained, thorough searching. Hence, the percentage of correctly crossed-out “e”s (or “hits”) was used as a measure of industriousness. The mean of this measure was .85 ( $SD = .09$ ).

As a third measure of C, we designed a new measure of impulsivity. Thirty seconds after participants completed the computer tasks (and presumably after they had started the paper tasks), the computer screen on the desk went black, and the phrase “press spacebar to end session” flashed red and white on the lower left of the screen in 12-point font. The phrase kept flashing (changing color twice per second) until the participant pressed the spacebar. If participants pressed the spacebar, the phrase would disappear for 30 seconds, then begin flashing again. Whether or not participants ever pressed the spacebar, the time it took for participants to press the spacebar, and how many times they pressed the spacebar were all considered as separate measures of impulsivity. After examining base rates of spacebar presses, it was found that 30 participants never pressed the spacebar, and that computer malfunction caused 11 more participants not to see the flashing message (of the 41 missing, 15 were low-C, 13 mean-C, and 13 high-C). Because of this, we used the time that passed until the spacebar was pressed as the measure of impulsiveness (the 30 participants who never pressed the

spacebar were assigned the longest time of the others, 1244.5 seconds; the mean number of seconds among those who pressed the spacebar was 388.64,  $SD = 278.23$ ).

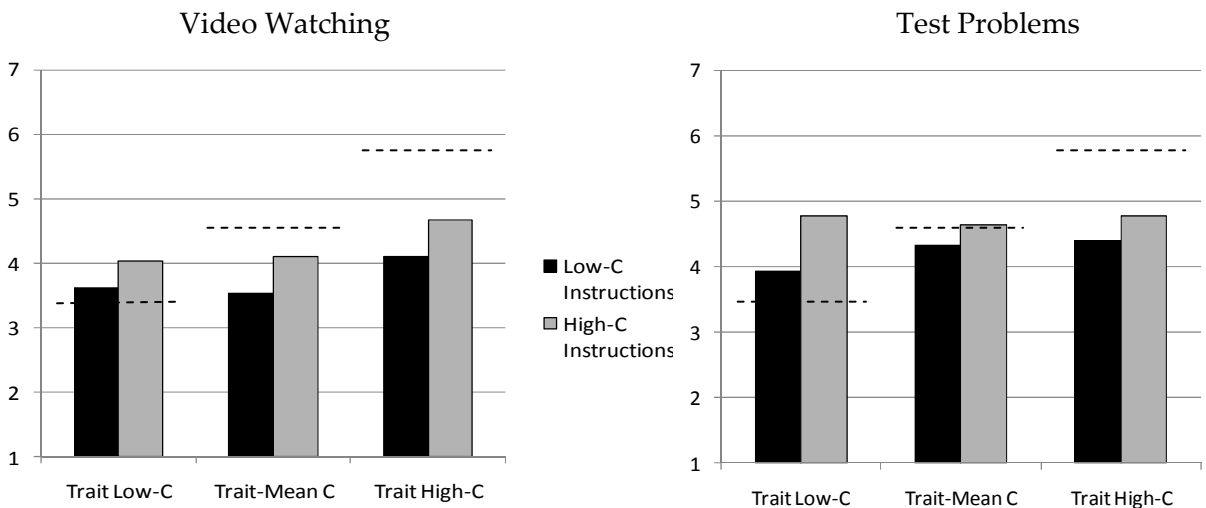
## 5. Study 2 Results

### 5.1 Manipulation Check

Participants in the low-C instructions conditions completed significantly more test problems ( $M = 79.72$ ,  $SD = 22.93$ ) than participants in the high-C instructions conditions ( $M = 52.49$ ,  $SD = 17.23$ ),  $t(140) = 7.922$ ,  $p < .001$ ,  $r = .557$ . Participants in the low-C instructions conditions took significantly less time ( $M = 11.10$  seconds,  $SD = 3.76$ ) to complete each problem than those in high-C instructions conditions ( $M = 17.43$  seconds,  $SD = 5.63$ ),  $t(140) = 7.95$ ,  $p < .001$ ,  $r = .552$ . Both these results confirm that participants followed behavioral instructions while completing test problems.

Next, means of self-rated state C during the experimental tasks were compared between instructions groups (these ratings appear by group in Figure 1). During the video, participants who received low-C instructions rated their state C significantly lower ( $M = 3.69$ ,  $SD = 1.03$ ) than those who received high-C instructions ( $M = 4.25$ ,  $SD = 1.19$ ),  $t(140) = 3.02$ ,  $p = .003$ ,  $r = .244$ . The same was true during the test problems: low-C  $M = 4.19$ ,  $SD = 1.07$ , high-C  $M = 4.73$ ,  $SD = 1.02$ ,  $t(140) = 3.08$ ,  $p = .002$ ,  $r = .250$ . However, when state C was compared within each trait level, there were few significant differences. During the video, only trait mean-C participants behaved differently

according to instructions,  $t(51) = 1.95, p = .057, r = .260$ . During the test problems, only low-C participants behaved differently,  $t(50) = 3.23, p = .002, r = .410$ .

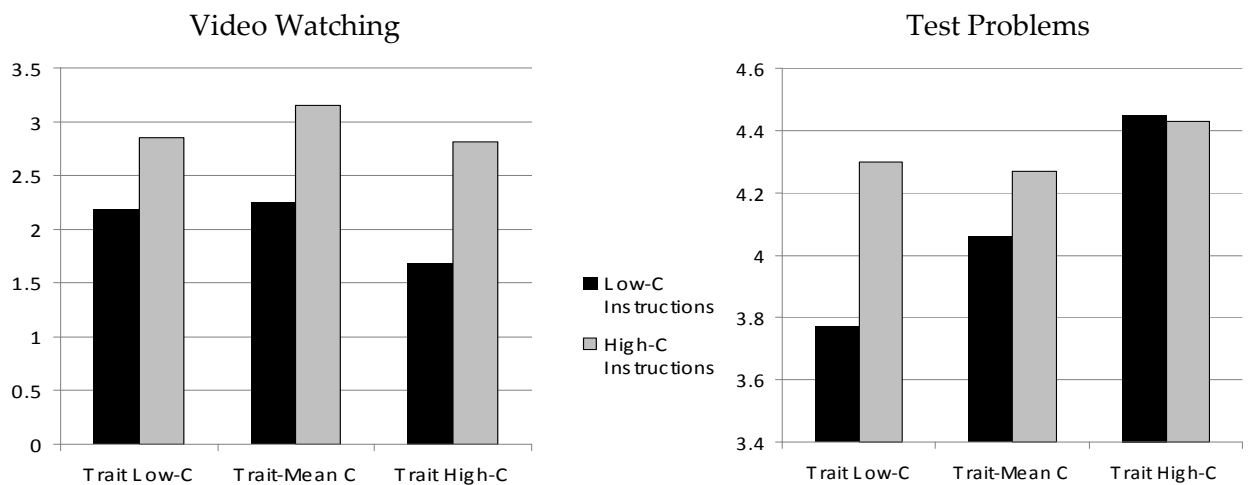


**Figure 1: Study 2 state conscientiousness ratings by trait group and activity. Dashed horizontal lines indicate each group’s mean trait standing on conscientiousness. Participants generally did not act at significantly different levels of conscientiousness, despite instructions to do so.**

This result shows that on average, participants followed behavioral instructions, but that within each trait group, participants acted at similar levels of C no matter what instructions they were given (see Figure 1). If participants’ self-ratings are accurate, this means that differences in self-rated effort and in subsequent behavior might be difficult to detect.

## 5.2 Effort Ratings

The first hypothesis for this study was that high-C participants would rate contra-trait behavior as more effortful than trait-typical behavior during the test problems, and low-C participants would rate contra-trait behavior as more effortful while watching the video. To test these hypotheses, participants' self-ratings of effort in each activity were analyzed with two 3 (trait standing: low, mean, or high C) × 2 (instructions: high or low C) ANOVAs (all effort ratings appear in Figure 2). Our hypotheses would be supported by interactions in both analyses, such that the high-C or low-C group would rate one instruction condition more difficult than the other, and the other two trait groups would show no differences or the opposite pattern of ratings.



**Figure 2: Study 2 effort ratings by trait group and activity. Participants rated the effortfulness of their behavior during the two experimental tasks. Ratings are the means of four items on a 1 to 7 scale.**

For the video watching task, there was no main effect of trait ( $F = 1.25$ ), but there was a main effect of instructions, with high-C instructions rated as more effortful to follow ( $M = 2.94$ ,  $SD = 1.45$ ) than low-C instructions ( $M = 2.10$ ,  $SD = 1.19$ ),  $F(1, 136) = 15.53$ ,  $p < .001$ ,  $r = .321$ . Contrary to predictions, follow-up contrasts showed that the effect of instructions was significant or marginally significant (and in the same direction) at all three trait levels; for the low-C group,  $F(1,136) = 3.26$ ,  $p = .073$ ,  $r = .155$ ; for the mean-C group,  $F(1,136) = 5.46$ ,  $p = .021$ ,  $r = .200$ ; and for the high-C group,  $F(1,136) = 5.87$ ,  $p = .017$ ,  $r = .208$ .

For the test problems task, there were no main effects or interactions in effort ratings (all  $F_s < 1.85$ ). Contrary to predictions but consistent with the contra-trait hypothesis, exploratory contrasts comparing instructions groups within each trait group revealed a significant difference among low-C participants: Those who received contra-trait instructions rated their behavior as more effortful ( $M = 4.30$ ,  $SD = 1.01$ ) than did those who received trait-typical instructions ( $M = 3.77$ ,  $SD = .97$ ),  $F(1,136) = 4.33$ ,  $p = .039$ ,  $r = .178$ .

### **5.2.1 Covariates: Positive Affect**

Acting at different levels of Big-Five trait domains has been shown to be associated with changes in positive and negative state affect (Fleeson, Melanos, & Achille, 2002; McNeill & Fleeson, 2006). To control for the possibility that acting at different levels of C affected the current participants' state affect and in turn effort

ratings, we repeated the two ANOVAs with positive and negative state affect ratings included as covariates. For the test problems task, including positive affect had no effect on the pattern of results. For the video-watching task, including positive affect again yielded similar results: no main effect of trait or interaction ( $F_s < 1.55$ ), but a significant main effect of instructions,  $F(1,135) = 11.08, p = .001, r = .276$ . Follow-up contrasts revealed somewhat different results than were obtained without covariates: the effect of instructions was now only marginally significant at each trait level. For the low-C group,  $F(1,135) = 3.38, p = .068, r = .158$ ; for the mean-C group,  $F(1,135) = 3.31, p = .071, r = .157$ ; and for the high-C group,  $F(1,135) = 3.45, p = .065, r = .160$ .

### **5.2.2 Negative Affect**

For the problems, including negative affect as a covariate changed the results somewhat. A significant main effect of trait emerged, such that high-C participants reported more effort ( $M = 4.44, SD = .96$ ) than low-C ( $M = 4.00, SD = 1.01$ ) and mean-C participants ( $M = 4.15, SD = .99$ ),  $F(1,135) = 4.00, p = .021, r = .237$ . Also, the interaction was marginally significant,  $F(1,135) = 3.74, p = .055, r = .164$ . Follow-up contrasts comparing instructions conditions within each trait level (to remain consistent with the analysis strategy already employed) revealed the same patterns as the original analysis, except that the difference in effort ratings in the low-C group was now only marginally significant: those who received low-C instructions reported less effort ( $M = 3.77, SD =$



.97) than did those who received high-C instructions ( $M = 4.30$ ,  $SD = 1.01$ ),  $F(1,135) = 2.90$ ,  $p = .091$ ,  $r = .146$ .

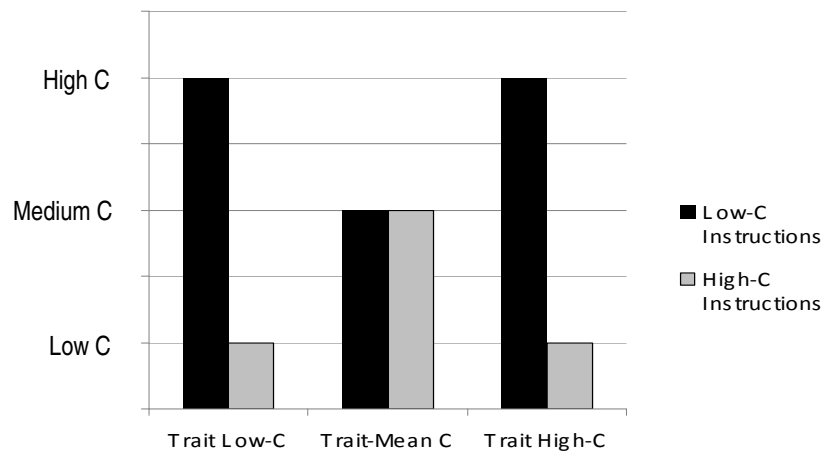
For the video-watching task, including negative affect as a covariate had no effect on the pattern of results.

In sum, participants' effort ratings showed no contra-trait effects. Low-C participants did rate high-C behaviors as more effortful than low-C behaviors during the video, but mean-C and high-C participants also reported the same difference in effort. Including performance expectancies and positive affect ratings as covariates had little effect on the results. Including negative affect as a covariate did change the results somewhat, which suggests that negative affect played a role in participants' effort ratings that obscured the effects of trait standing and a marginal interaction. The pattern revealed after accounting for negative affect, however, still does not support hypotheses.

### ***5.3 Conscientiousness in Subsequent Behavior***

Data from four participants (1 low-C, 1 mean-C, and 2 high-C) were mislabeled or lost, reducing the total N for these analyses to 138. In these tasks, support for the contra-trait effort mechanism would take the form of an interaction. Specifically, there should be no effects of instructions among the mean-C group, because instructions should not have been very effortful to follow. Among high-C and low-C groups, however, effects of instructions should emerge: Those who received high-C behavioral instructions should act at low-C levels, albeit for different reasons (trait low-C

participants because their sustained contra-trait behavior should fatigue them, and trait high-C participants because they should have no fatigue effects from their behavior). Similarly, those who received low-C instructions should act at high-C levels during the paper tasks. This predicted pattern is illustrated in Figure 3. The pattern can be applied to each of the three measures of subsequent C behavior and their respective dependent variables (C behavior or time to spacebar press).



**Figure 3: Predicted levels of conscientiousness in subsequent behavior.**

### 5.3.1 Impulsiveness

To test whether contra-trait behavior caused subsequent impulsiveness behavior to fall closer to mean levels, a 3 (trait standing: low, mean, or high C) x 2 (instructions: high or low C) ANOVA was conducted with the time elapsed before the first spacebar press as the dependent variable. This analysis revealed no main effects or interactions (all  $F_s < 2.20$ ).

Participants' behavior in these subsequent tasks may have been affected by their perceived performance in the preceding tasks. It may also have been affected by participants' state affect in the preceding tasks. To test for these possibilities, the analysis of impulsivity was repeated with participants' ratings of performance expectancy after the second task and second affect ratings each entered as covariates. None of these covariates had any effect on the results.

### **5.3.2 Neatness**

To test whether contra-trait behavior caused subsequent neatness behavior to fall closer to mean levels, we next conducted the same 3 (trait standing: low, mean, or high C) x 2 (instructions: high or low C) ANOVA with the proportion of lines traced as the dependent variable. This analysis revealed a main effect of trait such that low-C participants were neater ( $M = .63, SD = .16$ ) than mean-C ( $M = .56, SD = .18$ ) and high-C ( $M = .54, SD = .11$ ) participants,  $F(2,136) = 3.49, p = .033, r = .226$ . There was no main effect of instructions, and no interaction ( $F_s < 1$ ).

Including participants' ratings of performance expectancy after the second task in the analysis of neatness scores resulted in very little difference in results; only the main effect of trait was reduced to marginal significance,  $F(2,136) = 2.84, p = .062, r = .205$ .

Including participants' state positive and negative affect ratings in the analysis each reduced the main effect of trait to non-significance or marginal significance ( $F_s < 2.90$ ).

In sum, it seems that low-C participants as a group were somewhat neater in this task than the other trait groups. This is contrary to the hypothesized pattern. When state affect was accounted for, this effect disappeared, suggesting that affect, and not effort, may have played a role in participants subsequent neatness behavior.

### **5.3.3 Industriousness**

To test whether contra-trait behavior caused subsequent neatness behavior to fall closer to mean levels, we next conducted the same 3 (trait standing: low, mean, or high C) x 2 (instructions: high or low C) ANOVA with the proportion of correctly crossed-out e's as the dependent variable. This analysis revealed no main effects or interaction (all  $F_s < 1$ ). Including expectancy ratings and state affect as covariates did not change the results.

## **6. General Discussion**

In Study 1, clear support was found for the contra-trait effort hypothesis. Participants described non-habitual contra-trait behaviors as more effortful than trait-typical behaviors, and the greater the deviation from the mean, the more effort was reported. For habitual behaviors, which presumably do not require self-control processes, participants did not describe contra-trait behaviors as more or less effortful than trait-typical behaviors. These effects were found within participants and across all Big-Five domains, and the pattern held even after statistically controlling for amount of physical activity and the length of time participants had engaged in each behavior. Two

person-level factors, intra-individual variability and trait level of self-control, were tested as moderators of the contra-trait effect. Neither moderated contra-trait effects, suggesting that differences in frequency of contra-trait behavior, or in general self-control ability, had no implications for whether contra-trait behaviors are more effortful.

Study 2, in contrast, provided no support for the contra-trait effort hypothesis. Participants generally did not report contra-trait conscientiousness behaviors as more effortful than behaviors closer to typical trait level. Instructions to act at contra-trait levels also did not cause subsequent behaviors to fall closer the participants' mean levels. These null findings may have been the result of the degree to which participants actually acted at contra-trait levels – self-reported state conscientiousness during the experimental tasks indicated that participants with different behavioral instructions actually acted at similar levels of conscientiousness. Thus, Study 2 was an unsatisfying test of contra-trait effects, because participants generally did not act at contra-trait and trait-typical levels.

## **6.1 Limitations**

### **6.1.1 Study 1**

One drawback of Study 1 was that participants themselves described the trait content of each behavior they reported, leaving open the possibility that the positive relationship between contra-trait scores and effort ratings may have been an artifact of participants' general evaluations of their state feelings. That is, some third variable,

such as negative affect, may have increased both effort ratings and contra-trait scores in certain situations. It is not clear, however, why some unmeasured variable would systematically bias personality state ratings in a contra-trait direction. The lack of more information about participants' behavior and circumstances at each report limits the exploration of such alternative explanations.

A second limitation was the measurement of subsequent behavior. ESM reports were kept as brief as possible to avoid fatigue in participants and to quickly capture participant's momentary feelings of their behavior. Such brevity limits the ability to comprehensively assess many variables, and so the assessment of subsequent behavior was constrained to a single item. This item might not have accurately captured whether or not participants were able to sustain contra-trait behavior. The best test of subsequent behavior hypotheses would include some measure of the behaviors participants actually did engage in after their reports. The limitations on the length of reports in Study 1 precluded this type of measure, and might have resulted in an unsatisfying test of this particular hypothesis.

### **6.1.1 Study 2**

Regardless of whether they received high-C or low-C instructions, participants in Study 2 did not act at very different levels of C. This failure to produce contra-trait vs. trait-typical behavior resulted in a poor test of contra-trait effort hypotheses. Several factors could have played a role in participants' levels of C behavior. First, the

behavioral instructions may not have been strong enough. It could be that regardless of trait standing, participants entered the lab and began the experiment at a certain “default” level of C, which may be the default level for all class-related activities. If that were the case, participants may have simply completed the study with the same degree of conscientiousness with which they approach similar activities, and weak behavioral instructions might have provided little motivation to behave differently. This possibility had been anticipated, and the experimental activities were chosen to take advantage of students’ presumed intrinsic motivations (to excel at academic pursuits, and to relax and enjoy computer videos). Students’ default approach to class requirements might have trumped these motivations.

A second possibility is that participants actually did behave according to instructions, but that difference in behavior was not reflected in state C ratings. There is some evidence for this possibility in that participants on average did take more time to complete test problems and completed fewer problems in high-C instructions conditions, even though this difference was generally not reflected in state C ratings. When participants rated their state C, they might not have considered their behavior to be higher or lower on the five items measuring C. This possibility seems unlikely, because the C items (*thorough, careless, systematic*) seem to be appropriate for capturing the C content of the activities participants completed. In fact, the behavioral instructions

for the video included the words *thoroughly* and *carefully* in the high-C instructions condition.

Whatever the cause, the critical limitation of Study 2 seems to have been that participants did not act at contra-trait vs. trait-typical levels according to instructions. In the first test of the contra-trait effort hypothesis in Gallagher et al. (2009), where support was found among extraverts, participants reported acting at significantly different levels of extraversion according to their behavioral instructions. The lack of such contra-trait and trait-typical levels of behavior in the current Study 2 seems to have limited the ability to observe contra-trait effort effects.

## **6.2 Implications**

### **6.2.1 Personality Stability**

The contra-trait effort mechanism was proposed to explain intra-individual maintenance of trait levels (or “individual differences in change,” Roberts et al., 2008). The result of contra-trait behavior being more difficult, and of difficulty increasing with distance from typical levels, is that most behaviors will be more likely to fall near trait-typical levels. The result of this process operating over time would be long-term maintenance of individuals’ trait level. At the group level, the result would be both rank-order stability and mean level stability. Personality trait levels do show substantial rank-order and mean-level stability over time (Costa & McCrae, 1988; Lockenhoff et al., 2008; Roberts et al., 2008; Terracciano, Costa, & McCrae, 2006), and several mechanisms



have been proposed to account for this stability (for a review see Roberts et al. 2008). In terms of self-regulatory processes, the contra-trait effort mechanism is perhaps unique in that it involves self-control ability rather than long-term or short-term goals (such as personal strivings; Emmons, 1996). As such, it may be that differences in self-control ability in different behavioral domains, or different self-control capacity in different situations, may affect personality stability. For example, an individual with a job that requires extensive self-control may display fewer contra-trait behaviors.

In terms of mean-level change, traits are not completely stable over the life span (Roberts et al., 2006), and this fact raises the question of how contra-trait effort is related to personality stability over time. Mean-level stability applies only to group averages, and does not address stability within individuals, whereas contra-trait effort applies to individuals' maintenance of their trait levels. The contra-trait effort mechanism could work against long-term mean level trait changes such as the general increases in conscientiousness and agreeableness (Roberts et al. 2006). That is, other factors may need to overcome contra-trait effort effects to change mean levels. Conversely, contra-trait effects could simply shift with changes in trait levels, serving at each period to maintain the current level. The finding that mean levels of personality traits do change over the life span suggests this latter possibility might be more likely. Whatever the forces that lead to mean-level changes over the life span, contra-trait effort effects may

shift along with trait levels as new behaviors are practiced and habitualized, and other behaviors are enacted less often and require more effort.

### **6.2.2 Self-Regulation and Personality**

Why is contra-trait behavior more effortful? The findings of Study 1 that habitual behavior seems to be exempt from the contra-trait effort effect implicates self-control processes. Habitual behaviors are carried out with little conscious processing or effort (Wood et al., 2002). As such, even if they are at atypical trait levels, they likely require no extra effort. Trait-typical behaviors likely are less effortful because of similar processes. First, trait-typical behavior may initially be easier to enact because it is prescribed by the trait (for example, it may be easier for a high sensation-seeker to try an illicit drug). Second, as individuals repeatedly enact trait-typical behaviors, they likely fine-tune procedural memory and build skills that make these behaviors more efficient and less effortful. These processes would result in trait-typical behaviors becoming prepotent. The executive functions required to inhibit prepotent response and generate different behaviors require effortful self-control.

Connections between self-regulation and personality processes have been proposed (see Hoyle, 2006). For example, Baumeister, Gailliot, DeWall, and Oaten (2006) reviewed findings that suggest that when self-regulatory energy (“ego energy”) resources are depleted, individuals may show greater inter-individual variability in social behavior because they are less able to inhibit individual differences that go against

societal norms. The contra-trait effort mechanism may moderate self-regulatory energy depletion – different behaviors may deplete self-regulatory resources for different people (Baumeister et al., 2006 also suggest this possibility). For example, instructions to stifle displays of emotional reactions to arousing stimuli may be less draining of self-control resources for people who score high on emotional stability. Such people routinely show little emotion, and might build self-control skills that demand less effort.

The findings of the current Study 1 and of Gallagher et al. (2009) suggest that more effort is required to sustain certain behaviors. This raises the question of whether more self-regulatory resources are needed for those behaviors, and whether those resources are limited. Ego-depletion research (Muraven & Baumeister, 2000) has identified such a limited store of energy that seems to support self-regulatory behaviors in many domains. Several findings in the contra-trait research provide clues that ego energy might not be at play. The first is that participants in Study 1 could report using contra-trait effort. None of the literature on self-regulatory energy depletion reports manipulation checks in the form of self-reported fatigue or effort, which suggests people may be unable to report such depletion. In the current Study 1, in contrast, participants responded to four items that were related to the degree to which their behavior was contra-trait. A second clue from the contra-trait research is that in Gallagher et al. (2009), extended contra-trait effort was not related to declines in handgrip strength, which is one measure of self-regulatory resource depletion (Muraven, Tice, &

Baumeister, 1998). Although firm conclusions cannot be drawn from null results, this pattern of results at least suggests that contra-trait behavior may not depend on the same store of energy that other behaviors have been shown to depend on.

Study 1 provides evidence that habitual behaviors are exempt from contra-trait effort effects. This raises the possibility that the frequency of adaptive behaviors that are contra-trait, and thus unlikely to be enacted, could be increased by “habitualizing” them. For example, a patient with hypertension might need to manage their illness with daily doses of medication and exercise. For a low-conscientiousness person, maintaining these behaviors may require great effort. If, however, the behaviors can be practiced to the point that they become habitual, or automatic, then the patient would no longer need to muster the self-control effort to perform them. In fact, the substantial amount of intra-individual variability in trait behavior suggests that such automatization, or habitualization, of contra-trait behaviors might be common. Conceptualizing self-control as a personality process in this way has promising potential in theoretical and applied settings.

### **6.2.3 Asymmetrical Directional Effects**

The findings of Study 1 suggest that contra-trait effort effects might only apply to contra-trait behaviors that are below typical trait levels. This finding parallels other recent research on a different personality process – authenticity. Studies have found that people feel more authentic, or true to themselves, when they are acting towards the high

end of Big-Five trait domains (with the neuroticism domain reverse-keyed as emotional stability; Fleeson & Wilt, 2010). Notably, this finding was true regardless of participants' trait standing – it was not always the case that people felt most authentic when acting at their average trait level. For example, introverted participants reported feeling more true to themselves when acting extraverted. If feelings of authenticity have some bearing on the amount of effort involved in a behavior, then such feelings may make contra-trait behavior more effortful, and more specifically, may only make below-mean contra trait behavior more effortful. Authenticity may be related to effort through affect. For example, in Fleeson and Wilt (2010), lower ratings of authenticity were related to lower ratings of positive and higher ratings of negative affect. Lower positive and higher negative affect might make below-mean contra-trait behaviors more effortful, and opposite affective consequences of above-mean behavior may counteract contra-trait effort effects.

A second reason that contra-trait behavior above mean levels may not be as effortful as below-mean contra trait behavior is that the higher poles of the Big-Five domains are more socially desirable than the lower poles (again, when neuroticism is keyed as emotional stability). It is more socially acceptable and valued in Western culture to act at high levels of each of the Big-Five domains. Reinforcement in the form of social acceptance or approval might make above-mean contra-trait behavior more rewarding and, in turn, less effortful. For example, acting more agreeable than one's

typical trait level may elicit friendly and warm behavior from others, which might reduce the experience of effortfulness. Future research that investigates this pattern of contra-trait effects could be designed to test such social feedback mechanisms.

#### **6.2.4 Differences Between Big-Five Domains**

The current studies tested contra-trait effects in all five Big-Five domains. Together with the findings of Gallagher et al. (2009), there is reason to believe that contra-trait effort may have different effects in these different domains. The current Study 1 indicated that the general finding that non-habitual, but not habitual, contra-trait behaviors require more effort did not hold in the extraversion and agreeableness domains. Study 2 found no contra-trait effects in the domain of conscientiousness (although participants' levels of behavior did not provide a strong test). Gallagher et al. (2009) found contra-trait effects in the extraversion domain, but only in one direction. This pattern of findings suggests at least some differences in contra-trait and trait-typical behavior based on Big-Five domain and situational forces. For example, extraversion behaviors might be more subject to contra-trait effects in small group situations, where behaviors are easily evaluated in terms of extraversion, and where differences in introverted vs. extraverted behaviors are readily apparent. Being aware of your degree of contra-trait behavior – that is, knowing whether or not your current behavior is like or unlike you – may contribute to whether or not contra-trait effort is engaged or

recognized. Extraversion behavior in a group may engender this awareness much more than solitary conscientiousness behavior.

The current pattern of findings raises the question of whether contra-trait effects are more likely to be observed in contextualized or controlled (laboratory) behaviors. This too might differ by trait domain – contra-trait effects were found in contextualized conscientiousness behaviors, but not in the laboratory. As already described, all the participants in the current Study 2 might have approached the experiment with the same baseline level of conscientiousness, thus erasing trait-level differences. However, in contextualized conscientiousness behaviors, non-habitual contra-trait behaviors were associated with higher ratings of fatigue. Perhaps contextualized behaviors allow for more natural expression of conscientiousness trait levels, and thus more variability in degrees of contra-trait behaviors. In other Big-Five domains, circumstances that allow for detecting contra-trait effects may be different. In the extraversion domain, for example, situational norms of contextualized behaviors might call for more well-practiced behaviors, diminishing contra-trait effects. Laboratory settings may call for less habitual contra-trait behaviors, making effects easier to detect.

A third difference between trait domains may be how well specific behaviors represent standing on the trait domain. Big-Five domains are by definition very broad, and a wide array of behaviors can be described in terms of each domain. It may be a challenge to identify behaviors that both exemplify the trait domain and are easily rated

by participants. An ESM design avoids this challenge by sampling whatever behaviors participants are engaged in at the moment. A second way to avoid this challenge is to measure facets of Big-Five domains, or narrow traits. For example, measuring trait decision-making style, and then engaging participants in contra-trait vs. trait-typical decisions, might make contra-trait effects easier to measure and perhaps even greater in magnitude.

### **6.3 Conclusion**

Individuals display wide variability in everyday behavior – they act at nearly all levels of traits. Despite this variability, individuals maintain stable mean levels of trait behavior (Epstein, 1979; Fleeson, 2001; 2007). This finding shows both variability and stability in behavior: Situational forces lead to specific behaviors that manifest all levels of traits, but the average of these single behaviors is stable. The current research tested one explanation for how this stability is maintained among the considerable variability in behavior. Support was found for the idea that non-habitual contra-trait behaviors take more effort than trait-typical behaviors, and that self-control plays a role in this effect. However, the current findings also indicate that methods for investigating this mechanism will need to be further developed and refined. Contra-trait effort might be an important mechanism that acts on everyday behaviors and serves to maintain trait stability over time.





## Appendix A

### INSTRUCTIONS:

For each of these adjectives, please indicate how much of the time during the past week you acted at each at each number on the scale. That is, how much of the last week did you act not at all rash? How much of the time did you act a little rash? How much of the time did you act moderately rash – and so on. For each of the adjectives, write a percentage next to each number, making sure that the percentages add up to 100%. Think about the examples on this first page before you go on to the rest of the questions:

### EXAMPLE:

#### Rash

What percentage of the time did you rate your behavior as...

1. ...not at all rash?     \_\_\_% of the time
2.                   .             \_\_\_% of the time
3.                   .             \_\_\_% of the time
4.                   .             \_\_\_% of the time
5.                   .             \_\_\_% of the time
6. ...very rash?           \_\_\_% of the time

**total = 100%**

## Appendix B

### Intentions to complete study

Please rate your agreement with these three statements using this scale:

1-----2-----3-----4-----5-----6-----7

Fully disagree

Fully agree

- \_\_\_\_ 1. I intend to complete all the reports for this study.
- \_\_\_\_ 2. At each scheduled time, I will stop what I'm doing for a few minutes, and complete the required report.
- \_\_\_\_ 3. I have regular access to the internet, and I will be sure to have access at the times of the scheduled reports.

Now, take a few minutes to think about how you will complete the reports. Please think about where you will be at noon, 3, 6, 9, and midnight of each of the next 7 days, and answer the following questions:

Where will you (most likely) be? Will your Monday-Wednesday schedule be different than your T-Th schedule? Different from your Friday schedule? Weekend schedule? **For each time and day, write down where you will be, and then how you will get online.** It could be in your dorm room, at the library, from your phone or laptop, or anywhere else.

#### Monday-Wednesday:

Noon \_\_\_\_\_  
3 \_\_\_\_\_  
6 \_\_\_\_\_  
9 \_\_\_\_\_  
midnight \_\_\_\_\_

**Tuesday-Thursday:**

Noon \_\_\_\_\_

3 \_\_\_\_\_

6 \_\_\_\_\_

9 \_\_\_\_\_

midnight \_\_\_\_\_

**Friday:**

Noon \_\_\_\_\_

3 \_\_\_\_\_

6 \_\_\_\_\_

9 \_\_\_\_\_

midnight \_\_\_\_\_

**Weekend:**

Noon \_\_\_\_\_

3 \_\_\_\_\_

6 \_\_\_\_\_

9 \_\_\_\_\_

midnight \_\_\_\_\_

Finally, please sign the bottom of this page to indicate your agreement to complete all the reports for this study. Your signature confirms that you understand the importance of completing as many reports as possible. It also confirms that you understand that this study requires five reports per day, and that you intend to complete all (or nearly all) of these reports for full payment of \$30 at the end of the study.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Appendix C

*Sentence completion:*

Directions: Each sentence below has one or two blanks, each blank indicating that something has been omitted. Beneath the sentence are five words or sets of words. Choose the word or set of words for each blank that best fits the meaning of the sentence as a whole.

1. It is widely accepted for colleges to have honor codes in place to discourage cheating. The specific features of these codes, however, are often quite \_\_\_\_\_.  
(A) dangerous  
(B) humble  
(C) anticipated  
(D) restrained  
(E) controversial

*Antonyms:*

Directions: Each question below consists of a word printed in capital letters, followed by five words or phrases. Choose the word or phrase that is most nearly opposite in meaning to the word in capital letters.

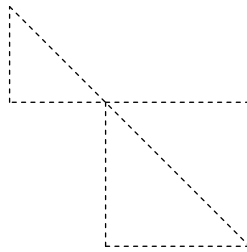
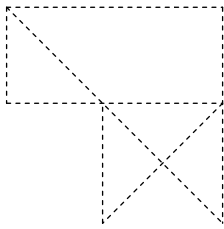
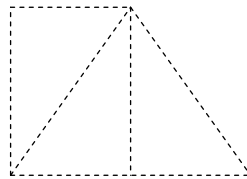
2. CAPITULATE:  
(A) resist  
(B) exonerate  
(C) initiate  
(D) escalate  
(E) defame

*Analogies:*

Directions: In each of the following questions, a related pair of words or phrases is followed by five pairs of words or phrases. Select the pair that best expresses a relationship similar to that expressed in the original pair.

3. QUELL : UPRISING ::  
(A) bite : hunger  
(B) quench : thirst  
(C) strike : labor  
(D) incite : hostility  
(E) indulge : habit

## Appendix D



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