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Publication Date

2013

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UNIVERSITY OF CALIFORNIA
RIVERSIDE

Increasing Conscientiousness to Improve Health Behaviors:
Findings From a Self-Regulation Intervention

A Dissertation submitted in partial satisfaction
of the requirements for the degree of

Doctor of Philosophy

in

Psychology

by

Serenity Sarah Della Porta

March 2013

Dissertation Committee:

Dr. Howard Friedman, Chairperson

Dr. Sonja Lyubomirsky

Dr. Kate Sweeny

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2013

The Dissertation of Serenity Sarah Della Porta is approved:

Committee Chairperson

University of California, Riverside

ACKNOWLEDGMENTS

To my beloved husband Matthew—thank you for your undying faith in me as I completed this project. You have shown me never-ending support throughout our relationship, and you continually push me to reach my greatest potential. I feel unfairly blessed to have you, and now to be the mother of our daughter Viviana. Our family is truly my dream come true and I cherish each moment we spend together. I can hardly wait to spend the rest of forever with you.

To my advisor and mentor Dr. Howard Friedman—thank you for choosing me as your student (*twice*). I learned many great lessons about health, psychology, and life under your tutelage. I sincerely appreciate everything you have taught me, and am very grateful to have had the chance to conduct research with you. I hope to use the knowledge I acquired to help people live healthier, longer lives.

I sincerely thank Dr. Sonja Lyubomirsky and Dr. Kate Sweeny for serving on my dissertation committee. I appreciate your time, energy, and willingness to share your intellect with me. Thank you both for making my dissertation a stronger project and being a pleasure to work with.

I was blessed to have great labmates while studying at UC Riverside. These women enhanced my graduate education, inspired me to think in more complex and sophisticated ways, and showed me true friendship. Dr. Peggy Kern, you gave me tremendous love and support and I will always value our time spent together. I feel fortunate to know you. Dr. Brynn Nodarse, thank you for always treating me with respect and making me feel understood. Katherine Duggan, Jasa Turkusic, and Ana Blanks, you

three made the lab feel like home and the memories we created bring a smile to my face. Thank you for encouraging me, believing in me, and always being there to listen to me complain about the IRB! I am one of the lucky few who can say I spent my graduate years with some of my favorite people.

To my research assistants, who were indispensable in making this dissertation possible. Each of you contributed significantly to the design and implementation of this study. Thank you for being a part of my research team and making my project achievable. Your efforts are truly appreciated!

Thank you to my best friend and sister Laura Mévinne. Our friendship has taught me a great deal, and has comforted me through good times and bad. You are a woman with immense integrity, whose immeasurable compassion has humbled me. I treasure our conversations, each of which feeds my soul and enlightens me. Thank you for always understanding me and being a shoulder I can lean on, and for encouraging me to complete a dissertation that is both important and meaningful.

Many people made this dissertation possible by feeding my intellect and fostering my talents. To my father Geno, who passed away my second year at UC Riverside, I am forever indebted. Thank you for teaching me to believe in myself and pursue my dreams. I know you are here with me to see this dream come to fruition. To my mother Bobbi, thank you for loving me and supporting me on this long and arduous journey. You have helped me grow stronger and wiser. To my life-long friends Alisha Mancinas and Susan Herbison, thank you for standing by me as I changed across the years. You are both people I am happy to know, and I appreciate that you continually get to know me as I

grow and develop. To my father-in-law Dr. David Della Porta and mother-in-law Grace Della Porta, you have both treated me as family from day one. Thank you for your love and respect. I am infinitely blessed to call you my parents, and love you both dearly. I know you share in my joy as we celebrate the completion of this dissertation.

Thank you to the world's best graduate student officer, Faye Harmer. You made my time at UC Riverside much more pleasurable and smooth. You have always been there for me, from the first moment we met, when you informed me I had forgotten to file my FAFSA (which you totally fixed for me), through this last moment, as we celebrate the accomplishment of my Ph.D. Thank you for remembering me when I forgot to take care of requirements, for always being kind and friendly, and for making me smile and laugh when I really needed it. I am so grateful to have had you as my ally through this process.

Lastly, I must acknowledge Punjab Palace on University Avenue for providing many delicious meals which in-large-part fueled this dissertation. Thank you for your welcoming staff and delectable food. You comforted me in ways no other cuisine could!

DEDICATION

I dedicate this dissertation and my Ph.D. to my daughter Viviana Grace Della Porta. In the five months I have been blessed to know you, you have filled me with a love unfathomable. I am inspired by your strength and perseverance. You make me laugh and smile more than I ever have before. I cannot wait to see the little girl you become and the woman you grow to be. God has truly blessed me to allow me to be your mother. May my hard work here be a testament to the kind of woman your mother is. May the lessons within this dissertation inform my parenting, and inspire you to persevere when life is challenging or difficult. I had to persevere many times to complete my graduate education. Each time I stumbled, I learned new things about myself and life. Life is like that. We learn the most when unexpected things take us places we thought we did not want to go. Always believe in yourself, my daughter. You are stronger than you can ever know, and God loves you more than you will ever realize. You can accomplish anything you dream of.

ABSTRACT OF THE DISSERTATION

Increasing Conscientiousness to Improve Health Behaviors:
Findings From a Self-Regulation Intervention

by

Serenity Sarah Della Porta

Doctor of Philosophy, Graduate Program in Psychology
University of California, Riverside, March 2013
Dr. Howard Friedman, Chairperson

Primary disease prevention requires complex health interventions that influence multiple behaviors simultaneously. Research finds conscientiousness consistently associated with better health behaviors, improved health, and longevity (Friedman & Martin, 2011). A 6-week experimental longitudinal study tested whether a self-regulation training intervention would boost conscientiousness. Changes in broad trait conscientiousness and five underlying facets (perseverance, self-control, orderliness, self-efficacy, and responsibility) were examined. As predicted, the treatment group showed a trend for increasing perseverance compared to the control group, though no differences were found in the other facets nor broad trait conscientiousness. Changes in health behavior revealed that treatment participants also improved in sleep quality relative to control participants. Self-regulation training should be further explored as a viable means for increasing perseverance and improving physical health. Other methods for increasing conscientiousness should also be considered as a prime means for enhancing health interventions.

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Chapter 1: Introduction

Preventive medicine calls for interventions that address the most prominent health concerns of today. This requires an understanding of many complex causal pathways, involving traits, socialization, health behaviors, psychophysiological reactions, and social influence. The complexity itself has hindered rapid improvements. It is the thesis of the present study that in order to make progress within the constraints of this complexity, behavioral interventions should focus on factors that can capture simultaneously a range of important individual differences and that together have been shown to predict important health outcomes.

The two current leading causes of death in the United States are cardiovascular disease and cancer; together they account for more than half of all deaths across all ethnic groups and levels of socioeconomic status (Kochanek, Xu, Murphy, Minino, & Kung, 2011). Both cardiovascular disease and cancer have been linked substantially to unhealthy behaviors, including poor diet and lack of exercise (e.g., Ross, 2010). As a comparison, the leading causes of death in 1920 included pneumonia, influenza, and tuberculosis (Murphy, 2000). Improvements in hygiene, vaccination, and medical treatment largely eradicated the threat of most microbe-based diseases, which now account for less than 3% of all deaths in the United States. Addressing the most prominent health concerns of today is remarkably complex. Although certain viruses remain as significant threats, the largest challenge by far involves identifying and trying to change complicated health behaviors that contribute to the most costly and threatening health problems. For example, obesity and inactivity—which have multiple causes—are

major and growing threats, linked to cardiovascular disease as well as multiple cancers (Guh et al., 2009).

Advances in epidemiology and health psychology are enabling the field of medicine to broaden its focus from tertiary prevention, which aims to stem disease processes that are already present, to primary prevention, which aims to prevent diseases from developing in the first place. Preventive medicine incorporates knowledge of environmental influences on health, physiological disease processes, and genetic predispositions, as well as psychosocial factors that drive individual differences in disease vulnerability and disease progression. Using a lifespan perspective, preventive medicine aims to change individuals' trajectories from ones that increase risk of disease to those leading to health and longevity.

Health psychology is a field that has much to offer preventive medicine. Health psychologists have recently identified an important personality factor that appears amenable to change and that is associated with many health outcomes and behaviors: *conscientiousness* (Friedman, 2007; Martin, Friedman, & Schwartz, 2007).

Conscientiousness and Health

Conscientiousness is a personality trait that captures a variety of facets that together characterize a tendency to be highly productive, organized, responsible, and self-controlled. Conscientiousness has been found to be associated with various positive health outcomes and longevity across a variety of samples (Kern & Friedman, 2008; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). Conscientiousness is also associated with protective health behaviors, such as eating a more nutritious diet and engaging in

regular exercise (Bogg & Roberts, 2004). A highly conscientious individual is planful, organized, motivated, detail-oriented, careful, persistent, and reliable. Thus, conscientiousness is made up of several components, although no consensus exists regarding the exact underlying facets (Roberts, Bogg, Walton, Chernyshenko, & Stark, 2004; Roberts, Chernyshenko, Stark, & Goldberg, 2005). It is easy to understand why a highly conscientious individual would excel at work, but why is a conscientious individual more likely to be healthier and live longer?

Several potential pathways link personality to health (Friedman, 2007; Kern & Friedman, 2011). Personality predisposes people to behave in certain ways, affecting health habits and other behaviors that have direct and indirect health consequences. Personality also drives the selection of situations, potentially leading the individual into healthy or unhealthy environments. The relationship between personality and health might also be a spurious one, such as if personality is driven by underlying genetic factors that also code for health outcomes like vulnerability to particular diseases. Alternatively, disease processes might produce changes in personality, creating an association between the two with the causal arrow reversed. Of all these pathways, healthy habits or behaviors and situation selection are the most promising avenues for intervention and prevention efforts.

As conscientious individuals are more likely to behave in health protective ways and select healthy environments, I suggest here that increasing individuals' conscientiousness can potentially lead to improvements in subsequent behavior, environments, and lifestyles. Researchers are just beginning to consider

conscientiousness interventions as a means of decreasing disease prevalence and increasing longevity, though such endeavors hold a great deal of promise (Hill & Roberts, 2011; Martin, Friedman, & Schwartz, 2007). To the extent that links between conscientiousness and health are indeed primarily driven by behavioral factors, interventions aimed at improving levels of conscientiousness will translate into the improvement of various health habits, with subsequent improved health outcomes. This is in contrast to traditional health promotion efforts, which tend to focus in a narrow, step-by-step attention to each health behavior (such as wearing a seatbelt, losing weight, eating more vegetables, etc.). Importantly, such interventions can also impact the situations that people select, empowering individuals to select healthier environments that align with altered health habits. Successful conscientiousness interventions might likely lead to a variety of improvements across multiple life domains, such as career and relationships.

Interventions that are able to produce change across various domains of health behavior simultaneously are increasingly valued in today's complex world. A meeting held to discuss "the science of behavior change" for the National Institutes of Health introduced the idea of "behavior bundles" (Li, 2009). This concept grows out of the finding that risky health behaviors often co-occur within individuals, in "bundles." The existence of these behavior bundles highlights the necessity for prevention measures that can address multiple health behaviors, or the whole behavior bundle, simultaneously.

Evidence is mounting for the use of psychological interventions as an effective way to produce change in person-level variables that are somewhat stable. For example,

although both happiness and resilience are enduring individual traits, there is evidence that both can be changed through interventions. Multiple studies have demonstrated that positive interventions, such as having individuals perform acts of kindness, produce lasting changes in happiness (Sin & Lyubomirsky, 2009). The United States Army is currently undertaking a large-scale resilience training program aimed at creating lasting boosts in resilience for all enlisted soldiers (Casey, 2011). These efforts are grounded in years of research supporting the importance of resilience and the utility of positive interventions as a way of promoting well-being and quality of life (Cornum, Matthews, & Seligman, 2011). The efficacy of conscientiousness interventions as a way of promoting well-being and physical health has yet to be demonstrated through empirical studies, although such interventions might be both feasible and effective. The present study begins such efforts.

Focusing on the Facets of Conscientiousness: The Role of Self-Control and Perseverance

The overall domain of conscientiousness encompasses a wide range of signature patterns of thoughts and behaviors and has shown a great deal of predictive value. However, one or two of the underlying facets of conscientiousness may drive many of the relations observed. Moreover, evidence suggests that various facets of conscientiousness differentially predict outcomes, such as level of commitment in a decision-making task and level of adaptability to changing task contexts (e.g., LePine, Colquitt, & Erez, 2000; Moon, 2001). Perhaps particular facets of conscientiousness differentially predict health behaviors. Determining whether there is a pattern of differential effects has major

implications for a conscientiousness intervention aimed at impacting health behaviors. Certain facets of conscientiousness hold more predictive value when examined alone than when used as part of a composite measure of conscientiousness (Ashton, 1998). It may be more precise to think of certain facets of conscientiousness as the primary contributors to particular outcomes, including health. To maximize the effectiveness of this intervention, all of the potential facets underlying conscientiousness are considered in order to determine which are the best candidates for intervening, in terms of both the ability to change and demonstrated effects on health-relevant outcomes. Future intervention efforts can then be tailored to the most health-relevant facets based on theory and evidence. The next step would be to examine health behaviors associated with conscientiousness, as markers of improvement to health habits. Eventually, interventions can also be tailored to unique personality profiles and their life-course trajectories in order to increase the likelihood of effectiveness.

An attempt was recently made to consolidate the possible facets of conscientiousness into a hierarchy (Roberts, Chernyshenko, Stark, & Goldberg, 2005). In total, this hierarchy contains six lowest-order facets of conscientiousness, as derived from seven major personality scales. The facets identified were industriousness, order, self-control, traditionalism, responsibility, and virtue. Another study using a lexical approach found the eight facets of reliability, orderliness, impulse control, decisiveness, punctuality, formalness, conventionality, and industriousness (Roberts et al., 2004). In 2002, Peabody and De Raad identified four facets of conscientiousness using a lexical approach with the American English language and replicated across six additional

languages (Triestean, Hungarian, Romanian, Dutch, Polish, and Czech). They labeled these four facets impulse control, responsibility, orderliness, and work. Across these studies, the facet of self-control (sometimes labeled impulse control) repeatedly emerges.

Self-control. Multiple studies have demonstrated the importance of self-control as a key facet of conscientiousness. Simply put, a person with good self-control is low on impulsivity. Roberts et al. (2004) found that people high on impulse control are described using words like careful, cautious, systematic, particular, and consistent. Self-controlled people are not described as rash, reckless, impulsive, or erratic. (All these descriptors were found to have negative correlations with the facet of impulse control). In short, a person with self-control has the ability to restrain her immediate impulses and takes the time to think through decisions before choosing to act. Self-control thus requires holding back one's impulses, which allows the individual to weigh the costs and benefits of a particular course of action.

The domain of self-control has been defined and measured in numerous ways, including self-regulation, delay of gratification, ego control, and self-discipline. Although definitions and measures of self-control show heterogeneity, a recent meta-analysis demonstrated moderate convergent validity among measures (Duckworth & Kern, 2011). The commonality found among the measures of self-control was a theme of volitional regulation of the self in order to align with personal goals and values as well as social standards and expectations. The ability to exercise self-control allows the individual to pursue goals more effectively, because such an individual is able to control impulses that may deter her from her goal.

Many, if not all, higher-order goals (e.g., complete a degree in higher education, obtain a respectable career, successfully raise a happy family, maintain good health) require many choices to be made every day that necessitate self-control. As a case in point, consider a 35 year-old single mother who wants to stay healthy and live a long life in order to watch her children grow up. However, she has been a smoker for 15 years, and knows that this behavior jeopardizes her health. In order to promote her long-term health, she must deny her strong impulses to engage in the risky behavior of smoking. There is certainly a great deal more to quitting smoking than the ability to exercise self-control. However, the inability to control one's impulses can be one of the biggest barriers to health behavior change (King, Fleming, Monahan, & Catalano, 2011). An intervention that empowers the individual to have better self-control might also increase the chances that she is able to apply (in her everyday life) any knowledge she obtains via traditional health behavior interventions.

The role of perseverance and the facet of grit. Perseverance is an important component of success across many life domains. The ability to stick with a goal in spite of obstacles or stagnation is an important individual difference highly relevant to health, and will likely be shown over time to predict a variety of important outcomes. The facet of grit is defined as passion and perseverance for long-term goals (Duckworth, Peterson, Matthews, & Kelly, 2007). This facet was recently proposed as a component of conscientiousness and has already been shown to predict meaningful outcomes. Grit is highly associated with self-control, and overlaps somewhat with the achievement-related facets of conscientiousness, but is unique in capturing the aspects of persistence and

stamina for goals across time (perseverance). Grit has been found to predict GPA, retention in the United States Military Academy at West Point, and attendance at the final round among Scripps Spelling Bee competitors (Duckworth & Quinn, 2009). This facet is closely examined in the current study to determine whether it changes in response to this self-regulation intervention.

As indicated above, conscientiousness has been shown to be associated with numerous important health behaviors including eating, smoking, and exercise (e.g., Goldberg & Strycker, 2002; McEchan, Sutton, & Myers, 2010; Rhodes & Smith, 2006; Spielberger, Reheiser, Foreyt, Poston, & Volding, 2004). Health behaviors shown to be resistant to change using traditional information-based and/or behavioral interventions should be prime targets for conjunctive conscientiousness interventions. The main hypothesis of this study is that increasing conscientiousness (in particular, self-control and perseverance) will enable individuals to put into action what they learn via more traditional methods.

The Example of Obesity

An intervention focused on increasing self-control and perseverance has the potential to impact multiple important health behaviors across a variety of situations, making these interventions a potentially cost-effective option for addressing the most persistent and complex health problems seen today. Obesity, for example, is a national health concern predictive of multiple health problems including the top two causes of death, cancer and cardiovascular disease (Guh et al., 2009). The obesity epidemic is widespread. Almost one-third of all adults within the United States can be classified as

obese, a number that has doubled over the past 30 years (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2007). Obesity is a complex phenomenon with many causes, but behavioral patterns of eating and physical activity are primary contributors to the epidemic (Van Wallegen, Steeves, & Raynor, 2011). Any intervention that effectively improves both eating and physical activity might impact rates of obesity and subsequently improve many health outcomes.

Weight management programs designed to address the problem of obesity are ubiquitous. The most common approach is termed combined therapy, because it incorporates dietary therapy, physical activity, and behavioral therapy (Van Wallegen, Steeves, & Raynor, 2011). Such programs often fail to create lasting change (Foreyt & Goodrick, 1994). Perhaps the absence of lasting change is due in part to the lack of incorporating an understanding of personality differences that drive risk for overeating and/or a sedentary lifestyle. I suggest that an intervention addressing lack of exercise and poor diet will be more effective when a lack of self-control and perseverance is identified as one root cause of these behaviors.

Conscientiousness and eating behavior. People vary greatly in their eating styles. A multitude of potential motivations and cues underlie differences in eating style. For example, overweight individuals are more likely to report eating for emotional reasons (Braet et al., 2008). Impulsivity, or the lack of self-control, is related to bulimia (Fischer, Smith, & Cyders, 2008), and this relation between symptoms of bulimia and impulsivity appears to be driven by a tendency to behave rashly when distressed. Similarly, people who are dieting and who are low in conscientiousness also report eating

more snacks between meals when they are distressed (O'Connor & O'Connor, 2004). All of the participants in this study reported indulging in more between-meal snacking when distressed, but this effect was particularly pronounced among those low in conscientiousness. Studies to date suggest an important interaction between the experience of stress and conscientiousness in predicting eating behavior.

Conscientious individuals are also more likely to display restrained eating, meaning that they control their caloric intake in order to maintain a particular (hopefully healthy) weight (Heaven, Mulligan, Merrilees, Woods, & Fairouz, 2001). People who are highly conscientious eat diets lower in fat content (Goldberg & Strycker, 2002). It is important to note that restrained eating, also called dieting by many people, has been associated with some negative outcomes like lowered self-efficacy and greater depression. However, this may be due to the fact that restrained eating often feels forced and motivated by external rewards. An ability to restrain food intake is a requirement for maintaining a healthy weight, at least until people's diets are so ingrained that they no longer have the impulse to over-indulge or eat poorly. Designing interventions that allow individuals to restrain their eating and control their impulses in a way that does not feel forced or externally motivated is an important avenue of research.

The long-term goal of all weight management programs should be to reach a point where individuals simply eat well because it is now their natural habitual pattern driven by intrinsic motivation, and no longer think in terms of restrained eating (or dieting), which is extrinsically motivated (Teixeira, Patrick, & Mata, 2011). One possible method for achieving this internalized change is to offer a self-control component as part of the

weight management intervention. This can help people develop a pattern of self-control that actually becomes part of their personality, part of *who they are*. Exercising self-control will feel natural, not forced, improving the person's ability to govern impulses to eat poorly or over-indulge and not experience negative aftereffects. Coupled with boosts in perseverance, this can lead to lifestyle change. Improving self-control and perseverance through the use of interventions may create lasting changes in these dimensions of personality, and may subsequently lead to change across a variety of other health behaviors that require people to exercise self-control and maintain perseverance.

The Positive Personality Improvement Study

More often than not, behavior change intervention programs target one or two specific health behaviors, such as eating or exercise, and they do this with one or two intervention techniques. This approach is too narrow to capture the complexity of chronic health behavior problems. My dissertation study is motivated by the idea that it will be much more effective to target the highly relevant core biopsychosocial variable of conscientiousness, which is strongly associated with many health behaviors of interest. Several intervention techniques already exist that provide an excellent basis for a combined intervention to produce increases in the overall trait of conscientiousness, which will, I predict, also improve associated health behavior bundles. My study thus will expand on the current literature by examining whether the combination of various established intervention techniques, when offered in tandem, can lead to boosts in conscientiousness, particularly in the facets of self-control and perseverance, and subsequent improvements in multiple health behaviors. Additionally, I examine a total of

five facets of conscientiousness (self-control, perseverance, responsibility, orderliness, and self-efficacy), and have the ability to test possible differential patterns among these various underlying facets.

I conducted a randomized controlled intervention that adapted several self-regulation training programs (Danish, 1997; Duckworth, Grant, Loew, Oettingen, & Gollwitzer, 2010) to increase conscientiousness. The main outcomes of interest are the facets of self-control, perseverance, the broad trait of conscientiousness, and health behaviors. This program, titled the Positive Personality Improvement Study, is a 6-week intervention that teaches individuals a variety of techniques and information regarding goal-pursuit. Similar programs have been associated with improvements in problem-solving ability, social support, and physical fitness (Goudas, Dermitzaki, Leondari, & Danish, 2006; O’Hearn & Gatz, 2002).

The Positive Personality Improvement Study is predicted to produce gains in the overall trait of conscientiousness, the facets of self-control and perseverance, and improvements in health behaviors. Specifically, I predict that individuals who complete the Positive Personality Improvement Study will:

- increase in conscientiousness (Hypothesis 1),
- increase in self-control (Hypothesis 2),
- and increase in perseverance (Hypothesis 3) at a greater rate than the waitlist control group.

Additionally, individuals (in the training condition) who complete the Positive Personality Improvement Study are predicted to:

- report more nutritious eating behavior (Hypothesis 4),
- report higher levels of physical activity (Hypothesis 5),
- report improved sleep patterns (Hypothesis 6),
- and be less likely to report problems with drinking (Hypothesis 7) across the course of the study as compared to the waitlist control group.

Chapter 2: Method

Participants

First-year students at the University of California, Riverside were recruited for participation in this study. Freshman year is a key developmental transition point, when many adult health behavior patterns begin to solidify. A total of 68 participants were eligible for the study and provided at least partial data (19 males, 45 females, 4 choosing not to report sex). Due to the longitudinal nature of the study, as well as the extensive data collection, complete data were obtained for 44 participants (15 males, 28 females, 1 choosing not to report sex). See the Results section under “Baseline Differences” for a comparison of those who provided complete data versus those with partial data.

The demographic breakdown for the total sample was 43% Asian, 35% Latino(a), 10% African American, 7% Caucasian, and 5% reporting another ethnicity. The sample met the characteristics typical for a first-year college student population. Ages ranged from 18-19, with 80% of the sample being 18 years old. Seventy-five percent of the sample lived in on-campus housing (i.e., dormitories), 18% lived with family at home, and 7% lived off-campus with roommates. Participants were pre-screened for marked signs of depression, anxiety, and serious health problems so that students who scored unusually high on either the depression or anxiety screenings might be referred to the campus counseling and/or health center(s). See below for a detailed description of the screening procedure.

As a graduate student intern at the campus wellness center (The Well), I aligned the Positive Personality Improvement Study with the Winning on Wellness (WOW)

program. The WOW program was recently launched, and is a reward program for attending wellness events. Select wellness events on campus are worth points (approximately one point per hour) and students can earn wellness-related prizes (e.g., a food journal, a free outdoor excursion). Participants in both the treatment and waitlist control groups received 7 WOW points for participating in the study. These 7 points could be redeemed for a food journal, or pooled toward a larger prize (e.g., a fitness towel or free outdoor excursion).

Recruitment. The majority of participants were recruited using the psychology subject pool. Those who joined through the subject pool also received 2 research units for completing the study (in addition to the 7 WOW points). Students were also recruited in-person at various campus locations (such as the student commons, the Bell Tower, and the dormitories). The PI (Serenity Della Porta) and one or more research assistant(s) set up a table and/or sign(s) identifying themselves as part of The Well and the WOW program along with signs about the intervention program being offered to first-year students. Students who were interested and who approached the PI and/or a research assistant were told about the WOW program and this project. Interested students were asked to provide their name and e-mail address. Specifically, first-year students were told:

"You are invited to participate in a positive personality improvement program at The Well. This program involves a series of online surveys and 6 consecutive weeks of 1-hour training workshops where you will learn a variety of skills related to goal-achievement and foster your personal strengths to help give you a more effective personality."

Screening. This screening was a means of identifying individuals who are too ill, or who have high levels of anxiety or depression. Such individuals are not fit to complete a rigorous study of this nature, and are better off improving their health behaviors through services offered by the student wellness partners.

Physical health was measured using questionnaire items developed by researchers at the World Health Organization and adopted from a previous study (Kern, 2010; also see below “Measures”). First, participants were asked how they rate their health compared to others of the same age and sex from *very poor* to *very good*. Students reporting their health as *very poor* were considered ineligible. Next, students were asked whether they have ever been diagnosed with any of 13 listed conditions. Students who reported having any of the following conditions were considered ineligible: heart attack, heart disease, stroke, thyroid disease, chronic fatigue syndrome, or cancer.

The State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1969) was used to measure anxiety. The short version of this scale was used, which contains 6 items describing symptoms of anxiety and participants rate how much they are feeling that symptom from *not at all* to *very much so*. Scores range from 0-18. Students who scored 15 or above were considered ineligible for the study.

Depression was measured using the Center for Epidemiological Studies Depression Scale (Radloff, 1977). This scale contains 20 items describing a variety of depression symptoms, each of which participants report how often they have felt this way during the past week. Scores range from 0-60. Students with a score of 44 or higher were considered ineligible for the study.

After potential participants passed the initial depression, anxiety, and health screenings, they identified which of the available workshop days and time slots they could attend according to their schedule. If prospective participants were unable to attend any of the available workshop time slots, they were considered ineligible for the study altogether. No participants were identified as ineligible due to depression, anxiety, or health. A total of 6 prospective participants were determined to be ineligible due to not being available to attend any of the workshop time slots.

Design

Eligible participants were randomly assigned to either the treatment group or a waitlist control group. Participants randomly assigned to the treatment group ($n = 38$, of whom 25 provided complete data) were then randomly assigned to pairs within their selected time slot. Participants in the treatment group were asked to come in once a week for a 50-minute workshop with their partner, for 6 consecutive weeks.

Each workshop was aimed at teaching valuable life skills that improve the individual's ability to effectively pursue and attain goals. Each workshop was offered at 4 different times per week. As mentioned above, participants selected one of these time slots based upon their own schedule and identification of the one that works for them. They attended the same time slot across all 6 weeks. Each workshop was presented to 3-8 partner pairs simultaneously. The waitlist control group ($n = 30$, of whom 19 provided complete data) attended the first workshop only and completed all of the same measures as the treatment group. The control group was also offered a condensed version of the

training (3 50-minute workshops, over 3 consecutive weeks) following the conclusion of the original intervention.

The 6-week intervention is a modified version of the 10-week self-regulation program “Going for the Goal” (GOAL; Danish, 1997). The treatment intervention was a modified version of a commonly used self-regulation program typically carried out with adolescent populations. This intervention was originally designed to increase a range of life skills (related to goal pursuit), and was adapted for use in the present study to improve young adults’ levels of self-regulation in order to increase conscientiousness. Each week involves completing a series of measures plus engaging in a 50-minute workshop with a partner. In addition to the GOAL program, the strategies of mental contrasting and implementation intentions were incorporated into the workshops. There is evidence that mental contrasting and implementation intentions can improve self-regulation (Duckworth, Grant, Loew, Oettingen, & Gollwitzer, 2010).

As noted, there are two broad outcomes of interest. First, changes in levels of conscientiousness were examined. In addition to the overall trait of conscientiousness, I examined changes in the facets of perseverance, self-control, self-efficacy, responsibility, and orderliness. Second, I examined changes in health behaviors. For health behaviors, the primary emphasis was on changes in eating patterns, levels of exercise, sleep, and drinking alcohol.

Procedures

Each week for 6 weeks participant pairs assigned to the treatment intervention group attended a 50-minute seminar. Each seminar was aimed at teaching valuable life

skills that improve the individual's ability to effectively pursue and attain goals.

Participants completed the intervention in pairs. All group sessions each week followed the same script and protocol.

Week 1: The value of goal setting. The first workshop was a combination of “Dare to Dream” and “Goal Setting” from the GOAL program (Danish, 1997). First, the program and its leaders were introduced. The program was led by the primary study investigator (Serenity Della Porta), and was assisted by one or two undergraduate research assistants. Participants were also introduced to their program partner, and were asked to introduce themselves to one another by completing an ice-breaker activity.

Next, a brief presentation was made to participants covering the value of goal setting and how to set appropriate goals. Appropriate goals are attainable but challenging, are stated positively (“I will do this” versus “I won't do that”), are specific (“I will exercise three times a week” versus “I will exercise more”), must be important to the goal setter, and must be under the goal setter's control. Goals that fit these criteria have been shown to predict increased well-being (e.g., Sheldon, 2002; Sheldon & Elliot, 1999). The presentation combined personal anecdotes and a discussion of evidence-based research. Participants were then prompted to engage in a discussion about the importance of setting goals for the future within their partner pairs. As part of this discussion, participants were asked to identify goal blockers in their lives. Goal blockers are people in participants' lives who impede them from pursuing a positive healthy future.

For this intervention, participants set two health goals. To aid in their goal setting, participants were taught the biopsychosocial model of health (Friedman, 2002).

Participants were then asked to write about their health goals for the future, keeping in mind this broader definition of health. To make this exercise more concrete, participants were asked to write a brief story about their “dream health future” 5 years, 10 years, and 15 years from now. Finally, participants were asked to spend the next week thinking about what they have learned and deciding on the goals they would like to set (they set actual goals during the session for week 2). Participants were also given a journal and were prompted to start monitoring any health behavior of interest to them (see Heimstra, 2002, for a discussion of the benefits of journaling). These journals were not collected.

Week 2: Setting reachable health goals. Week two of the intervention was based upon “Making Your Goal Reachable” from the GOAL program (Danish, 1997). First, participants were asked to set one short-term health goal. Short-term goals were defined as being possible to achieve in the next 6 weeks. Additionally, participants set one long-term health goal. Long-term health goals were defined as taking at least 2 months to achieve. After setting their goals, participants discussed the goals in their partner pairs. They gave each other feedback on the following goal criteria: stated positively, specific, important to the goal setter, under the goal setter’s control, focused on lifestyle rather than outcomes, challenging yet attainable, and fitting to the goal setter. After discussing with their partner and receiving feedback, participants had a chance to refine their goals before setting final goals for the intervention.

After the final goals were set, participants made a public verbal commitment to their goals in front of all other participants attending their time slot. People who make public commitments to their goals are more likely to succeed in achieving those goals

(e.g., Norcross, Mrykalo, & Blagys, 2002). Participants were encouraged to place reminders of these goals throughout their living space, such as placing sticky-notes on their bathroom mirror, computer, or television. Participants were provided with free sticky notes.

Next, participants were taught how to engage in mental contrasting and implementation intentions (Duckworth, Grant, Loew, Oettingen, & Gollwitzer, 2010). Mental contrasting involves imagining a desired future state in conjunction with the obstacles present in reality that hinder the attainment of that state. For example, if a student wants to improve eating habits, she will imagine what a typical day would be like when she has achieved her goal and is eating well. She would imagine this in as much detail as possible. She would also think of a current day's actual food intake. She would next be prompted to identify what exists in her current day-to-day experiences that might be preventing her from eating well, what it is that stands between her current diet and the desired goal state of eating well. Implementation intentions involve creating an action plan for what the individual will do when goal-relevant opportunity arises (Gollwitzer, 1999). Both strategies have been shown to enhance successful goal pursuit (Duckworth et al., 2010). After practicing in the workshop, participants were encouraged to practice these strategies on their own at home.

After learning mental contrasting and implementation intentions, participants came up with a plan for reinforcing their target behaviors. Along with their partner, they detailed the rewards they would give themselves when they make progress toward their goals. Participants were also asked to continue journaling across the next 4 weeks,

specifically about goal-related behaviors. Participants were instructed to make any changes they see fit in order to pursue their goals (without specific advice given regarding their goals in particular).

Week 3: Creating a plan. The third workshop was adapted from “Making a Goal Ladder” in the GOAL program (Danish, 1997). Starting this week, every workshop session began with the partner pairs providing each other a brief update regarding their progress toward their goals, and ended with a reminder to keep journaling. Following the updates, a brief presentation highlighted the utility of setting sub-goals in order to move toward a larger goal. In order to conceptualize the steps necessary to achieve their particular goals, participants were asked to complete two “goal ladders.” On the goal ladder, the top rung is the set goal and the underlying rungs are all the steps needed to successfully achieve that goal. Participants set target dates by which they wanted to achieve each rung on the ladder (each step toward their goal). Participant pairs discussed and evaluated the steps needed to achieve their goals and the deadlines they set for themselves. Lastly, participants signed a contract committing to make progress toward their goals. These contracts were copied for the participant, and the researcher retained originals until the end of the study.

Week 4: Identifying and overcoming obstacles and setbacks to goal achievement. The fourth workshop is adapted from “Roadblocks to Reaching Goals,” “Overcoming Roadblocks,” and “Rebounds and Rewards” in the GOAL program (Danish, 1997). Using a brief presentation, participants were taught how various obstacles (e.g., the availability of junk food) can get in the way of achieving their health

goals. Participants then reviewed and engaged again in mental contrasting and implementation intentions. This involved coming up with methods for bypassing potential obstacles and creating specific plans for how they would respond in difficult situations. Participants also spent time discussing these strategies with their partner.

Next, participants were specifically asked to discuss whether they had encountered any setbacks. After this discussion, participants responded to a simulated letter (which they believed was actually written by a fellow student) about a goal-striving individual who had experienced setbacks and stagnation. They then wrote a response letter, identifying strategies for how this individual might be able to navigate these setbacks. This activity was used to stimulate a partner discussion regarding persisting in the face of setbacks and knowing when to disengage from an unachievable goal. The letters were then collected and retained as qualitative data.

Week 5: Garnering social support. The fifth workshop was adapted from “Seeking Support from Others” in the GOAL program (Danish, 1997). Participants were taught about the usefulness of social support, specifically about instrumental/tangible, informational, and emotional social support (Jacobson, 1986). Next, participants were asked to reflect upon and discuss within their partner pairs how social support plays a role in health. Participants were also asked to reflect on and discuss how social support plays a role in goal setting and goal striving. Next, participants were asked to identify their “dream team”: 10 individuals (e.g., family members, close friends, role models) who can help them achieve their goals. Finally, participants drafted text messages or e-mails within their pairs asking for assistance achieving their goals. They were encouraged

to send these e-mails or text messages sometime in the following week, though no confirmation was requested.

Week 6: Identifying strengths and going for the goal. The sixth and final workshop was adapted from the last 2 weeks' sessions by the same names in the GOAL program (Danish, 1997). Using an adapted version of the Values in Action Inventory of Strength (Peterson & Seligman, 2004), participants identified their personal strengths. In pairs, participants then discussed how these strengths contribute to goal attainment and how they can improve on and use these personal strengths. After discussing, participants were asked to identify and write down specific ways they can make progress improving their personal strengths, being prompted to also apply what they have learned over the past 6 weeks.

Measures

Conscientiousness. Seven self-report measures of conscientiousness, including subscales encompassing a variety of facets, were used. All of these measures were administered to the participants at baseline (week 0, prior to the first workshop) and the final assessment (week 6, after the final workshop). Additionally, a large subset of these measures was administered following the workshops on weeks 1, 3, and 5.

IPIP Representation of the NEO-PI-R. The International Personality Item Pool (IPIP; Goldberg, 1999) representation of Costa and McCrae's 1992 NEO-PI-R scale was administered at five time-points (weeks 0, 1, 3, 5, and 6) to measure orderliness (alpha = .77), self-efficacy (alpha = .83), and broad trait conscientiousness (alpha = .80). Broad trait conscientiousness was administered only at two time-points (weeks 0 and 6). Each

subscale is measured using 10 items, each of which the participant rates on a 1-5 scale (1 = *not at all like me*, 5 = *very true of me*). Example items are “Like to tidy up” (orderliness), “Complete tasks successfully” (self-efficacy), and “Am always prepared” (conscientiousness).

UPPS Impulsive Behavior Scale. The UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001) was administered at five time-points (weeks 0, 1, 3, 5 and 6). Two subscales for the UPPS Impulsive Behavior Scale were used: urgency, which was reverse scored (12 items, alpha = .88) and perseverance (10 items, alpha = .83). Participants are asked to rate each statement on a scale of 1-5 (1 = *not at all true of me*, 5 = *very true of me*). Example items include “I have trouble controlling my impulses” (urgency) and “I generally like to see things through to the end” (perseverance).

IPIP Representation of the CPI. The IPIP representation of Gough’s 1987 CPI (California Psychological Inventory) was administered at two time-points (weeks 0 and 6). Three subscales from the IPIP representation of the CPI were used: self-control (10 items, alpha = .68), self-efficacy (10 items, alpha = .71), and responsibility (9 items, alpha = .77). Each item is rated on a 1-5 scale (1 = *not at all like me*, 5 = *very much like me*). Example items are “Am not easily affected by my emotions” (self-control), “Formulate ideas clearly” (self-efficacy), and “Return extra change when a cashier makes a mistake” (responsibility).

Chernyshenko Conscientiousness Scale (CCS). The shortened version of the CCS (original scale Chernyshenko, 2002; see Hill & Roberts, 2011 for the shortened version) was administered at five time-points (weeks 0, 1, 3, 5, and 6). Three subscales

were used: self-control (alpha = .77), responsibility (alpha = .72), and orderliness (alpha = .83). Each subscale is comprised of 10 items rated from 1-4 (1 = *disagree strongly*, 4 = *agree strongly*). Example items are “I rarely jump into something without first thinking about it” (self-control), “If I am running late, I try to call ahead to notify those who are waiting for me” (responsibility), and “I hate when people are very sloppy” (orderliness).

Behavioral Indicators of Conscientiousness Scale (BIC). The BIC (Jackson, Wood, Bogg, Walton, Harms, & Roberts, 2010) was administered at five time-points (weeks 0, 1, 3, 5, and 6). Three subscales were used: self-control (9 items, alpha = .77), organization (18 items, alpha = .89), and responsibility (10 items, alpha = .70). Participants rate each item from 1-5 (1 = *I have never performed this behavior*, 5 = *I perform this behavior quite often*). Example items include “Go shopping with list and only buy things on the list” (self-control), “File papers in a desk drawer” (orderliness), and “Keep my promises” (responsibility).

Short Grit Scale (Grit-S). The Grit-S (Duckworth & Quinn, 2009) was administered at five time-points (weeks 0, 1, 3, 5, and 6). This scale contains 8 items (alpha = .82) which participants rate from 1-5 (1 = *not at all true of me*, 5 = *very true of me*). An example item is “I finish whatever I begin.”

Abridged Big Five Dimensional Circumplex (AB5C). Goldberg’s Abridged Big Five Dimensional Circumplex (AB5C; Goldberg, 1999) was administered at two time-points (weeks 0 and 6). Two subscales were used: orderliness (10 items, alpha = .80) and broad trait conscientiousness (13 items, alpha = .85). Each item is rated from 1-5 (1 = *not*

at all like me, 5 = very much like me). Example items are “Follow a schedule” (orderliness) and “Am careful to avoid making mistakes” (conscientiousness).

Health behaviors. A variety of health behaviors were measured throughout the study. Most of these health behaviors were measured at four time points (weeks 0, 2, 4, and 6), though some were measured at only two time-points (weeks 0 and 6).

Eating habits. Participants were asked to self-report their eating habits by answering several survey questions. These questions were adopted from Kern (2010). Participants indicated the degree to which they try to follow a balanced diet (from *not at all* to *very well*). Participants also indicated how often they eat at a fast-food restaurant, cook food at home or eat home-cooked meals, and eat breakfast (from *never* to *daily*). These items were administered weeks 0, 2, 4, and 6.

Physical activity. Questions were adopted from Kern (2010). First, participants were asked to report how often during the past seven days they engaged in physical activity for at least 20 minutes without stopping (recent physical activity). They were then asked to report how physically active they are compared to others of the same age and sex (from *much less* to *much more*) by rating four items: “How physically fit are you?,” “How physically strong are you?,” “How physically active are you?,” and “How physically flexible are you?” Recent physical activity was measured on weeks 0, 2, 4, and 6. The remaining items were administered at weeks 0 and 6.

Additional health habits. As with the eating habits and physical activity, these questions were adopted from Kern (2010). Sleep was assessed by asking participants how many hours they typically sleep at night; whether they have difficulties falling asleep,

waking up during the night, or waking up too early; and having them rate the quality of their sleep overall from *very poor* to *very good*. Participants then reported how often they consume alcoholic beverages, the number of alcoholic drinks they typically consume on an occasion when they drink, and how many times in the last 30 days they had five or more drinks on one occasion (binge drinking). These additional health habit items were administered on weeks 0, 2, 4, and 6.

Physical health. These questions were also adopted from Kern (2010).

Participants self-reported their physical health, partly for screening purposes. First, they were asked how they rate their health compared to others of the same age and sex from *very poor* to *very good*. Next, they were asked to rate their current health compared to five years ago, from *much worse* to *much better*. Participants also reported how satisfied they were with their current health, from *very dissatisfied* to *very satisfied*. These items were administered on weeks 0 and 6.

Additional individual difference measures. Additional measures relevant to both personality and health were administered. Please see “Measurement Timeline” below for details.

Subjective well-being (SWB). Two measures were administered to tap SWB. The first is the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999; alpha = .81). This scale contains four items that participants rate from 1-7 (anchors differ by item). An example item is “Compared with most of my peers, I consider myself: (1= *less happy*, 7 = *more happy*).” The second scale administered was the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985; alpha = .92). This scale contains 5 items

which participants rate from 1-7 (1 = *strongly disagree*, 7 = *strongly agree*). An example item is “The conditions of my life are excellent.”

Depression and anxiety. The State-Trait Anxiety Inventory was administered (Spielberger, Gorsuch, & Lushene, 1969; alpha = .83). The short version of this scale was used, which contains 6 items describing symptoms of anxiety and participants rate how they are feeling right now from *not at all* to *very much so*. An example item is “I am tense.” Depression was measured using the Center for Epidemiological Studies Depression Scale (Radloff, 1977; alpha = .91). This scale contains 20 items describing a variety of depression symptoms, each of which participants report how often they have felt this way during the past week.

Social support. The Provisions of Social Relations Scale was administered (Turner, Frankel, & Levin, 1983). This scale measures support from family and friends using 15 items that participants rate from 1 to 5 (alpha = .89; 1 = *not at all like me*, 5 = *very much like me*). An example friend support item is “When I am with my friends, I feel completely able to relax and be myself.” An example family support item is “No matter what happens, I know that my family will always be there for me should I need them.”

Locus of control. Two scales were used to measure locus of control. Each locus of control scale is broken down into three subscales: internal, powerful others, and chance. The first scale is the Multidimensional Health Locus of Control, Form A (Wallston & Wallston, 1978). This scale asks participants to rate how strongly they agree with 18 statements about the causes of health on a 6-point scale, from *strongly disagree*

to *strongly agree* (alpha = .73). An example item is “If I get sick, it is my own behavior which determines how soon I get well again” (internal). The second measure is the Levenson Multidimensional Locus of Control Inventory (Levenson, 1973; alpha = .81). This scale asks participants to rate how strongly they agree with 24 statements about the causes of various outcomes in life using the same 6-point scale (1 = *strongly disagree*, 6 = *strongly agree*). An example item is “To a great extent my life is controlled by accidental happenings” (chance).

Outcome expectancies. In order to measure participants’ expectancies regarding the outcome of this intervention, 6 items were written by the principal investigator (alpha = .72). These items asked participants to rate the degree to which they believe each statement is true, from *not at all true* to *very true* on a 7-point scale. An example item is “Learning new information will not help me change my habits.”

Intrinsic motivation. Participants completed a version of the Intrinsic Motivation Inventory (Ryan, 1982). Items were adapted by the principal investigator to fit the current study. This scale contains 37 items regarding the participants’ motivation for completing the surveys, tapping 6 subscales: interest/enjoyment (alpha = .94), perceived competence (alpha = .83), effort (alpha = .86), value/usefulness (alpha = .94), felt pressure/tension (alpha = .79), and perceived choice (alpha = .90). Participants rate each statement on a 7-point scale (1= *not at all true of me*, 7 = *very true of me*). An example item is “I thought this was a boring activity” (interest/enjoyment).

Demographics. Participants reported the following demographics: age, sex, ethnicity, employment status, extracurricular/volunteer hours, relationship status, and living situation.

Measurement Timeline

The demographic, anxiety, depression, and outcome expectancies measures were administered at week 0 only (baseline). The social support, locus of control, and intrinsic motivation measures were administered on weeks 0 and 6. On weeks 0 (baseline) and 6 (following the final workshop), the treatment and waitlist control group participants completed all measures, split into 2 parts that could be completed on separate occasions within the allotted timeframe (3 days). Conscientiousness and other personality measures, along with the demographic, anxiety, and depression scales (for week 0), constituted survey part 1 (it took approximately 30-40 minutes to complete this questionnaire). The remaining measures comprised part 2 of the survey (it took approximately 30-40 minutes to complete this questionnaire as well). These time estimates were derived by averaging the length of time it took each of 8 research assistants to complete these measures during pilot testing.

On weeks 1, 3, and 5, participants completed a subset of the conscientiousness measures only. On weeks 2 and 4, participants completed only the scales measuring eating habits, physical exercise, and health behaviors.

Chapter 3: Results

Forming Composites: Five Facets of Conscientiousness

The subscales used to measure different facets of conscientiousness were combined to create five composite scores: perseverance, self-control, organization, self-efficacy, and responsibility. Initial groupings of subscales into facets were based upon previous theoretical research (e.g., Costa, McCrae, & Dye, 1991) and face validity. These groupings were then checked against the between- versus within-composite inter-item correlation matrices for all of the relevant conscientiousness subscales using baseline data. A factor analysis of baseline data yielded a further check for the selection of the subscales used to calculate each composite. This factor analysis yielded 5 factors that accounted for 71% of the variance in conscientiousness. Finally, reliability analyses confirmed acceptable reliability of the resulting composite scales (see Table 1).

Perseverance. Three subscales were combined to create the perseverance composite ($\alpha = .80$): UPPS urgency (reverse-scored), UPPS perseverance, and the Grit-S. In order to form perseverance composite scores, the scores for each of these three subscales were averaged at each time-point.

Self-control. Three subscales were combined to create the self-control composite ($\alpha = .73$): CCS self-control, BIC self-control, and the IPIP representation of the CPI self-control. The CCS and BIC were administered at five time-points (weeks 0, 1, 3, 5, and 6) while the IPIP representation of the CPI was administered at only two time-points (weeks 0 and 6). The three subscales also use various rating scales (e.g., 1 to 5 versus 1 to 4). To create composite self-control scores, the scores on each subscale were first

standardized (z-scored) before averaging them at each time-point. Lastly, a constant of 5 was added to each person's score to eliminate negative numbers.

Orderliness. Four subscales were combined to create the orderliness composite (alpha = .85): IPIP representation of the NEO-PI-R orderliness, CCS orderliness, BIC organization, and the AB5C orderliness. As with self-control, the four subscales used to create the orderliness composite vary in how many times they were administered and their underlying rating scales. As with self-control, to create orderliness composite scores for each time-point the subscales were first standardized and then averaged with a constant of 5 added to final scores.

Self-efficacy. Two subscales were used to create the self-efficacy composite (alpha = .83): IPIP representation of the NEO-PI-R self-efficacy and the IPIP representation of the CPI self-efficacy. Using the same protocol as the self-control and orderliness composites, the two subscales were standardized and averaged and a constant of 5 was added to create composite scores for each time-point.

Responsibility. Three subscales were combined to create the responsibility composite (alpha = .69): CCS responsibility, BIC responsibility, and the IPIP representation of the CPI responsibility. Again, the same protocol was used as with self-control, orderliness, and self-efficacy. The three subscales were first standardized and then averaged at each time-point and a constant of 5 was added to create responsibility composite scores.

Baseline Differences

A series of *t*-tests were conducted to assess baseline differences. First, differences between the treatment and control groups were examined using all available baseline data (intent-to-treat analyses). Several significant differences were detected, particularly among certain facets of conscientiousness and locus of control (see Table 2). This finding indicates that random assignment was not entirely successful.

Next, *t*-tests were conducted comparing baseline conscientiousness (broad trait as well as the five facets) for participants who provided complete data versus those who provided only partial data. Participants who provided partial data were significantly lower in self-control compared to participants who provided complete data ($M_{\text{Complete Data}} = 5.18$, $M_{\text{Partial Data}} = 4.62$; $t(66) = 2.75$, $p < .01$). This difference in self-control reflects the phenomenon itself and is consistent with previous studies showing that self-control is relevant to task completion. No differences were found for the other facets of conscientiousness nor broad trait conscientiousness.

Lastly, *t*-tests comparing baseline conscientiousness for participants who provided complete data versus participants who provided partial data were conducted within experimental group (for the broad trait of conscientiousness and the five facets; see Table 3). Within the treatment group, no significant differences were found between participants with partial data and those with complete data in baseline conscientiousness. However, control participants who provided partial data were significantly lower in self-control ($t(27) = 2.32$, $p < .01$) and were moderately lower in responsibility ($t(27) = 1.9$, $p = .07$) compared to control participants who provided complete data.

Conscientiousness Correlations

Five Facets of Conscientiousness. The five facets of conscientiousness were correlated with one another and with the broad trait conscientiousness scales at each time point. These correlations were first transformed using Fisher's Z_r and then averaged across the time points to determine the general pattern of correlations observed among the facets over the course of the study. Average correlations were then reverse-transformed to Spearman correlation coefficients for ease of interpretation (see Table 4).

As predicted, the five facets were found to be strongly related to one another, indicating that they are part of a common construct (the broad trait of conscientiousness). Of the 10 facet-level correlations calculated for each of the five time points (50 correlations in total), 96% were significant at an alpha level of .05. The strongest observed relationship among the five facets was found between perseverance and self-efficacy ($M_r = .78$), followed by responsibility and self-efficacy ($M_r = .63$), followed by perseverance and responsibility ($M_r = .62$).

The two broad trait conscientiousness scales (IPIP representation of the NEO-PI-R and AB5C), which were administered at weeks 0 and 6, correlated significantly with each of the five facets at both time points at an alpha level of .01. The strongest relationship observed for the broad trait of conscientiousness was with perseverance for both scales (IPIP NEO-PI-R $M_r = .77$; AB5C $M_r = .73$).

Health and additional individual difference variables. All available baseline data were used to determine the pattern of relationships among the five facets of conscientiousness and the health variables. Similarly, the five facets of conscientiousness

were correlated with the additional individual difference variables collected at baseline. These correlations were calculated across treatment group and across sex. Many significant relationships emerged, demonstrating a variety of associations among facets of conscientiousness and healthy behaviors (see Table 5).

Eating habits. Participants higher on facets of conscientiousness reported healthier eating habits. Those higher in perseverance reported eating more balanced meals, $r(65) = .33, p < .01$, and eating fast food less frequently, $r(65) = -.27, p = .03$. Participants higher in broad trait conscientiousness also reported eating more balanced meals, $r(65) = .44, p < .01$, and less frequent fast food consumption, $r(65) = -.26, p = .04$. Participants higher in self-control were more likely to report cooking meals at home, $r(63) = .27, p = .03$, and reported eating breakfast more often, $r(65) = .34, p < .01$. Participants higher in responsibility also reported cooking more meals at home, $r(63) = .42, p < .01$, and eating breakfast more frequently, $r(65) = .27, p = .03$. Finally, participants higher in orderliness reported eating more balanced meals, $r(65) = .54, p < .01$.

Physical activity and fitness. Higher scores on four of the five facets of conscientiousness were associated with higher rates of physical activity and higher scores on various markers of physical fitness. When asked to compare themselves to others of the same age and sex, participants higher in perseverance reported engaging in more frequent physical activity, $r(65) = .38, p < .01$, greater physical fitness, $r(63) = .44, p < .01$, and greater physical flexibility, $r(64) = .29, p = .02$. Similarly, participants higher in orderliness reported greater physical fitness than peers, $r(63) = .27, p = .03$. Participants

higher in self-efficacy reported higher rates of recent physical activity (within the past week), $r(63) = .31, p = .01$, and when comparing themselves to peers reported higher physical activity, $r(65) = .42, p = .01$, greater physical fitness, $r(63) = .42, p < .01$, and greater physical strength, $r(64) = .32, p = .01$. Participants higher in responsibility reported engaging in more physical activity, $r(65) = .25, p = .04$, and being more physically fit than peers, $r(63) = .34, p < .01$. Lastly, participants higher in broad trait conscientiousness reported engaging in more physical activity, $r(65) = .36, p < .01$, and reported greater physical fitness, $r(63) = .39, p < .01$, physical flexibility, $r(64) = .30, p = .02$, and physical strength, $r(64) = .30, p = .02$.

Sleep. Better sleep outcomes were associated with all but one of the five facets of conscientiousness as well as broad trait conscientiousness. Participants higher in perseverance reported fewer difficulties sleeping, $r(65) = -.29, p = .02$, sleeping a greater number of hours per night, $r(65) = .28, p = .02$, and better sleep quality, $r(65) = .46, p < .01$. Participants higher in self-control reported fewer difficulties sleeping, $r(65) = -.31, p = .01$, and a greater number of hours slept per night, $r(65) = .26, p = .03$. Participants higher in orderliness also reported fewer difficulties sleeping, $r(65) = -.32, p < .01$. Participants higher in self-efficacy reported sleeping a greater number of hours per night, $r(65) = .26, p = .03$, and better sleep quality, $r(65) = .36, p < .01$. Finally, participants higher in broad trait conscientiousness reported fewer sleep difficulties, $r(65) = -.30, p = .02$, and greater sleep quality, $r(65) = .36, p < .01$.

Alcohol consumption. Higher scores on three of the five facets of conscientiousness were associated with less frequent alcohol consumption. Participants

higher on perseverance ($r(64) = -.25, p = .04$), self-control ($r(64) = -.40, p < .01$), and orderliness ($r(64) = -.25, p = .04$), reported drinking alcohol less frequently.

Self-reported health. Higher scores on four of the five facets of conscientiousness, as well as broad trait conscientiousness, were associated with the self-reported health items. Participants higher in perseverance reported greater self-reported health (when asked to compare themselves to others of the same age and sex), $r(64) = .49, p < .01$, better health compared to five years ago, $r(65) = .33, p < .01$, and greater satisfaction with their current health, $r(64) = .55, p < .01$. Participants higher in self-efficacy also reported greater self-rated health compared to peers, $r(64) = .47, p < .01$, compared to five years ago, $r(65) = .39, p < .01$, and greater satisfaction with health, $r(65) = .56, p < .01$. Similarly, participants higher in broad trait conscientiousness also reported greater self-rated health compared to peers, $r(64) = .38, p < .01$, compared to five years ago, $r(65) = .29, p = .02$, and greater satisfaction with health, $r(64) = .45, p < .01$. Lastly, participants higher in orderliness reported greater health compared to peers, $r(64) = .31, p = .01$, and greater satisfaction with their health, $r(64) = .35, p < .01$.

Psychological well-being. The five facets of conscientiousness and broad trait conscientiousness were associated with a variety of markers of psychological well-being. Lower depression scores were associated with higher perseverance, $r(65) = -.52, p < .01$, self-control, $r(65) = -.34, p < .01$, self-efficacy, $r(65) = -.46, p < .01$, responsibility, $r(65) = -.38, p < .01$, and broad trait conscientiousness, $r(65) = -.44, p < .01$. Lower anxiety scores were associated with higher perseverance, $r(64) = -.34, p < .01$, self-

efficacy, $r(64) = -.50, p < .01$, responsibility, $r(64) = -.35, p < .01$, and broad trait conscientiousness, $r(64) = -.30, p = .01$.

Higher scores on the Subjective Happiness Scale were associated with higher perseverance, $r(65) = .52, p < .01$, self-control, $r(65) = .25, p = .05$, orderliness, $r(65) = .40, p < .01$, self-efficacy, $r(65) = .52, p < .01$, responsibility, $r(65) = .49, p < .01$, and broad trait conscientiousness, $r(65) = .45, p < .01$. Similarly, higher scores on the Satisfaction With Life Scale were associated with higher perseverance, $r(65) = .61, p < .01$, self-control, $r(65) = .27, p = .03$, orderliness, $r(65) = .49, p < .01$, self-efficacy, $r(65) = .51, p < .01$, responsibility, $r(65) = .48, p < .01$, and broad trait conscientiousness, $r(65) = .58, p < .01$.

Social support. Participants higher on the five facets of conscientiousness and broad trait conscientiousness reported higher rates of social support from family and friends. Higher social support from friends was associated with orderliness, $r(64) = .30, p = .02$, self-efficacy, $r(64) = .26, p = .03$, responsibility, $r(64) = .46, p < .01$, and broad trait conscientiousness, $r(64) = .28, p = .02$. Higher social support from family was associated with higher perseverance, $r(64) = .40, p < .01$, self-control, $r(64) = .44, p < .01$, self-efficacy, $r(64) = .27, p = .03$, responsibility, $r(64) = .45, p < .01$, and broad trait conscientiousness, $r(64) = .29, p = .02$.

Locus of control. Higher scores in the five facets of conscientiousness and broad trait conscientiousness were associated with a greater internal locus of control and lower chance locus of control and powerful others locus of control. Higher internal locus of control scores were associated with higher perseverance, $r(65) = .28, p = .03$, self-

control, $r(65) = .32, p = .01$, orderliness, $r(65) = .33, p < .01$, self-efficacy, $r(65) = .26, p = .03$, responsibility, $r(65) = .49, p < .01$, and broad trait conscientiousness, $r(65) = .37, p < .01$. Higher internal health locus of control scores were associated with higher perseverance, $r(64) = .38, p < .01$, self-control, $r(64) = .36, p < .01$, self-efficacy, $r(64) = .28, p = .03$, and responsibility, $r(64) = .34, p < .01$. Lower chance locus of control scores were associated with higher perseverance, $r(65) = -.29, p = .02$, self-control, $r(65) = -.32, p = .01$, self-efficacy, $r(65) = -.29, p = .02$, and responsibility, $r(65) = -.35, p < .01$. Lower scores on powerful others locus of control were associated with higher self-control, $r(65) = -.30, p = .01$, and self-efficacy, $r(65) = -.27, p = .03$. (No associations were found with the chance and powerful others health locus of control subscales).

Intrinsic motivation and outcome expectancies. Participants higher in the five facets of conscientiousness and broad trait conscientiousness scored higher on several facets of intrinsic motivation. Higher perceived competence was associated with higher perseverance, $r(65) = .44, p < .01$, orderliness, $r(65) = .33, p < .01$, self-efficacy, $r(65) = .44, p < .01$, responsibility, $r(65) = .48, p < .01$, and broad trait conscientiousness, $r(65) = .47, p < .01$. Higher effort scores were associated with higher perseverance, $r(65) = .28, p = .02$, orderliness, $r(65) = .25, p = .04$, responsibility, $r(65) = .27, p = .03$, and broad trait conscientiousness, $r(65) = .25, p = .05$. Lower scores on perceived pressure or tension, an indicator of extrinsic motivation, were associated with higher perseverance, $r(65) = -.35, p < .01$, self-control, $r(65) = -.26, p = .04$, self-efficacy, $r(65) = -.27, p = .03$, and responsibility, $r(65) = -.35, p < .01$. (No associations were found with the interest/enjoyment, value/usefulness, or perceived choice intrinsic motivation subscales).

Higher outcome expectancy scores were associated with higher perseverance, $r(65) = .41, p < .01$, self-control, $r(65) = .46, p < .01$, orderliness, $r(65) = .27, p = .03$, self-efficacy, $r(65) = .31, p = .01$, responsibility, $r(65) = .57, p < .01$, and broad trait conscientiousness, $r(65) = .42, p < .01$.

Conscientiousness Contrast Analyses: Treatment vs. Control

Planned contrast analyses tested whether the treatment group showed greater increases in broad trait conscientiousness (Hypothesis 1), as well as the five facets of conscientiousness (Hypothesis 2 makes a prediction regarding self-control, and Hypothesis 3 makes a prediction regarding perseverance), compared to the control group (Rosenthal, Rosnow, & Rubin, 2000). See Table 6 for means and standard deviations by experimental group and time point. The results of the planned contrast analyses are summarized in Table 7.

Hypothesis 1 predicted a linear increase for broad trait conscientiousness (-1, 1), which was measured at week 0 and week 6. The IPIP representation of the NEO-PI-R broad trait conscientiousness and the AB5C broad trait conscientiousness were averaged within time point to create the broad trait conscientiousness composite ($\alpha = .86$). This conscientiousness composite was used to calculate L-scores for the planned contrast analysis. A t -test found no significant difference between the treatment and control group for conscientiousness at the trait level, $t(47) = .58, p = .28, r_{contrast} = .08$, see Table 6 for means and standard deviations.

The five facets of conscientiousness were measured at five different time points (weeks 0, 1, 3, 5, and 6). Planned contrast analyses tested three linear patterns for each of

the five facets (see Table 7). The first pattern tested a purely linear increase (lambda weights: -2, -1, 0, 1, 2). Because both groups attended the first workshop, the second pattern tested a delayed linear increase starting at the third time point (week 3, following the second workshop). These lambda weights were derived using the following values for the five time points: 1, 1, 2, 3, 4 ($M = 2.2$; lambda weights: -1.2, -1.2, -.2, .8, 1.8). The third linear pattern tested whether this delayed increase did not take place until the fourth time point (week 5, following the fourth workshop) using the following values for the five time points: 1, 1, 1, 2, 3 ($M = 1.6$; lambda weights: -.6, -.6, -.6, .4, 1.4).

T-tests were conducted to determine whether the treatment and control group differed significantly in how well they represented each of the patterns predicted by the three planned contrasts. No support was found for Hypothesis 2 (greater linear increase in self-control for the treatment versus control group; $t(42) = .24, p = .41, r_{contrast} = .04, t(42) = .15, p = .44, r_{contrast} = .02, t(42) = .07, p = .47, r_{contrast} = .01$). Lending support to Hypothesis 3, the facet of perseverance showed a trend toward significance for the treatment group to more closely match the two planned contrasts representing delayed linear increases: a delayed increase starting week 3, $t(42) = 1.47, p = .07, r_{contrast} = .22$, and a delayed increase starting week 5, $t(42) = 1.63, p = .06, r_{contrast} = .24$. This trend was slightly weaker when predicting a purely linear increase in perseverance, $t(42) = 1.14, p = .13, r_{contrast} = .17$. See Figure 1 for a chart of mean perseverance at each time point by experimental group. For the remaining three facets, no significant differences were observed between the treatment and control group for any of the three planned contrasts (see Table 7).

Health Behavior Change *T*-Tests

To test the predictions made in Hypotheses 4 through 7, change scores were calculated by subtracting the scores at baseline from scores at week 6 (following the final workshop). *T*-tests were then used to determine whether there were any significant differences between the treatment and control group in changes for the various health behaviors that were measured, including eating (Hypothesis 4), physical activity (Hypothesis 5), sleep (Hypothesis 6), and drinking alcohol (Hypothesis 7).

Mixed results were found for Hypothesis 4. Significant differences were found for changes in frequency of eating at fast food restaurants, $t(46) = 2.01, p = .05, r = .28$, and frequency of eating breakfast, $t(46) = 2.16, p = .04, r = .30$, but not for changes in eating balanced meals, $t(46) = -.14, p = .89, r = .02$, nor cooking at home, $t(44) = .30, p = .76, r = .04$. Treatment participants showed an increase in eating at fast food restaurants while control participants showed a decrease. Treatment participants reported an increase in frequency of eating breakfast while control participants showed a decrease.

No support was found for Hypothesis 5. No significant differences were found between the treatment and control group in changes in reported levels of physical activity, $t(40) = -.91, p = .37, r = .14$, nor how fit, $t(44) = -1.06, p = .30, r = .16$, flexible, $t(45) = .69, p = .49, r = .10$, or strong, $t(45) = .56, p = .58, r = .08$, participants reported being compared to peers.

Support was found for Hypothesis 6 for changes in sleep quality. The treatment group reported a greater increase in sleep quality compared to the control group, $t(46) = 3.29, p < .01, r = .44$. See Figure 2 for mean sleep quality at each time point by

experimental group. No significant differences were found between the treatment and control group for changes in reported duration of nightly sleep, $t(26) = .63, p = .53, r = .12$, nor sleep difficulties, $t(45) = 1.22, p = .23, r = .18$.

No support was found for Hypothesis 7. No significant differences were found between the treatment and control group for changes in frequency of drinking alcohol, $t(41) = .16, p = .88, r = .02$, typical number of drinks consumed, $t(22) = -.06, p = .95, r = .01$, nor frequency of binge drinking, $t(38) = -.09, p = .93, r = .01$.

Chapter 4: Discussion

Primary disease prevention is inherently complicated, requiring an understanding of many factors relevant to disease vulnerability. Stemming the development of disease necessitates a life-course view, wherein the individual who is originally on a life-course trajectory leading to disease and mortality is able to move into a trajectory toward health and longevity. Interventions able to create such a shift in the individual's health trajectory would greatly impact both the individual and society in considerable ways.

The personality trait of conscientiousness has been shown to predict positive health outcomes and increased longevity; conscientious individuals appear more likely to be on a positive life trajectory leading to health, well-being, and longevity (Friedman & Martin, 2011). Furthermore, conscientiousness increases with age and therefore appears open to change (Roberts, Woods, & Caspi, 2008). The Positive Personality Improvement Study examined whether conscientiousness would increase in response to an intervention based on self-regulation theory, and whether such changes would translate into improved health behaviors.

Changes in Conscientiousness

Hypotheses. No support was found for Hypothesis 1, which predicted an increase in broad trait conscientiousness in response to the self-regulation intervention.

Hypothesis 2, which predicted increased self-control in response to the intervention, was also not supported. However, our data did show a trend for increasing perseverance in response to our self-regulation intervention, lending support to Hypothesis 3. These results indicate that teaching self-regulation skills may lead to increases in perseverance,

but did not directly support self-regulation training as a viable means for increasing broad trait conscientiousness or self control.

Perseverance. An increase in perseverance was experienced by individuals who were taught skills related to setting and pursuing goals. Perseverance is an important individual characteristic associated with a variety of positive outcomes. For individuals wishing to effectively set and pursue goals, perseverance is a key resource for dealing with obstacles and setbacks and continuing forward in the face of difficulties. Teaching self-regulation techniques has been found to increase the individual's chances of success in achieving her goals (Danish, 1997) and is associated with boosts in positive outcomes such as social support and physical fitness (Goudas, Dermizaki, Leondari, & Danish, 2006). In addition, our results indicate that learning these skills also has great potential for boosting perseverance.

The perseverance composite was calculated using the Short Grit Scale (Duckworth & Quinn, 2009) along with the perseverance and urgency (reversed) subscales of the UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001). Although grit has only recently been proposed as a component of conscientiousness, it has already been found to predict important outcomes such as GPA and retention at West Point Military Academy (Duckworth & Quinn, 2009; Duckworth, Peterson, Matthews, & Kelly, 2007). Self-regulation interventions, if able to boost grit, could potentially lead to increases in these other positive outcomes as well. Whether or not changes in grit can also translate into better health outcomes is an important avenue for future research.

Perseverance may also increase the likelihood of success when attempting health behavior change. As the individual tries to establish a new, healthier habit and abolish an old, unhealthy one, she will inevitably encounter challenges and hindrances. Healthy behaviors, such as eating nutritiously and remaining physically active, are complex. Many reasons may explain why one person eats well and exercises while another does not. These multifaceted health behaviors are difficult to change and put a constant strain on the individual's will power. Very few people have consistently high will power, and nearly everyone who is ultimately able to change health behaviors does so partly because they persevere when experiencing minor failures along the way. Health interventions might successfully incorporate self-regulation strategies to boost individual perseverance, hopefully enabling people to better achieve their health behavior change goals.

Changes in Health Behaviors

Our data showed several significant differences between the treatment and control groups for changes in health behaviors. Results were mixed for Hypothesis 4, which predicted healthy changes in eating behavior for treatment participants compared to control participants. Treatment participants increased in eating breakfast (a behavior shown to promote better health, Rampersaud, Pereira, Girard, Adams, & Metz, 2005), but also increased in fast food consumption (a clearly unhealthy behavior). It is unclear why these changes in eating occurred, though perhaps treatment participants were more rushed for time due to the additional responsibility of attending weekly workshops.

No differences between the treatment and control group were observed in changes in physical activity nor changes in physical fitness; thus, no support was found for

Hypothesis 5, which predicted healthy changes in physical activity and fitness for the treatment group. Given the short duration of the study and the complex nature of exercise habits, it is not surprising that changes were not observed. However, such changes may have been observed had the study continued for a longer period of time (see below for limitations).

Support was found for Hypothesis 6, which predicted healthy changes in sleep for the treatment versus the control group. Treatment participants reported an increase in sleep quality over the duration of the study as compared to control participants. However, no differences were observed for changes in hours of sleep per night nor rates of sleep difficulties.

Hypothesis 7, predicting healthy changes in drinking behavior for the treatment group, was not supported. No differences were observed between the treatment and control groups for changes in frequency of drinking alcohol, number of alcoholic drinks typically consumed, nor frequency of binge drinking. Notably, very few participants reported any problem drinking behaviors. Thus, changes in these behaviors are not necessarily to be expected.

Conscientiousness and the Positive Life Trajectory

Using baseline data, conscientiousness and its underlying facets were found to be associated with many important health behaviors (e.g., eating, physical activity) as well as markers of psychological well-being, social support, locus of control, and outcome expectancies. These findings correspond with but elaborate previous research linking conscientiousness to positive health behaviors and longevity (see Friedman & Martin,

2011) as well as other positive life outcomes (e.g., Friedman, Kern, Hampson, & Duckworth, 2013; Kern, Friedman Martin, Reynolds, & Luong, 2009). Our data help further identify a variety of key associations and broaden our understanding of which health promoting factors are most closely associated with conscientiousness. See Table 8 for the specific facets of conscientiousness related to each variable (see Table 5 for reported correlations). Because of the high initial correlations among elements of conscientiousness and healthy behaviors, further large changes as a function of conscientiousness training were not likely in the short run, and so the improvements that did result are encouraging for future efforts in this area.

Health behaviors. As with previous research, conscientiousness was found to be related to healthy eating (e.g., Goldberg & Stryker, 2002). Although only a small number of studies have examined conscientiousness as a predictor of eating behavior, our results, along with these few previous studies, indicate that being more conscientious might incline the individual to eat well. For example, being higher on orderliness was associated with eating balanced meals. To eat balanced meals, the individual must identify what the various categories of nutrition are (e.g., protein, vegetables) and plan meals that include a variety of food types. This requires organization skills, such as constructing a meal plan and shopping list. The relationships between eating and various facets of conscientiousness should be examined further as potential pathways from conscientiousness to better health, and to help us understand and encourage healthier eating.

Moderate physical activity is an important component of a healthy lifestyle. Baseline data found that greater physical activity and fitness were related to higher levels of conscientiousness. A recent meta-analysis also identified conscientiousness as a positive predictor of physical activity (Rhodes & Smith, 2006). This may help to explain the consistent association between conscientiousness and better health and longevity. For example, being higher on self-efficacy might help motivate the individual to better carry out and stick with an exercise plan. Future research should examine physical activity and physical fitness as relevant factors in models of conscientiousness and health.

Conscientiousness was related to better sleep at baseline, as indexed by fewer sleep difficulties, higher sleep quality, and greater number of hours slept per night. Previous research has also found higher conscientiousness linked to better sleep quality (Williams & Muroz, 2009). Perhaps highly conscientious individuals sleep better, reassured by a confidence in their ability to succeed despite difficulties (perseverance) and to accomplish important tasks (self-efficacy). Many studies have identified an association between sleep and better health, including both sleep quality (e.g., Pilcher, Ginter, & Sadowsky, 1997) and sleep duration (e.g., Cappuccio, D'Elia, Strazzullo, & Miller, 2010). Indeed, more restful sleep may explain part of the association between conscientiousness and health. Given the findings here, this area is especially deserving of further research.

Conscientiousness was associated with less frequent drinking. Specifically, perseverance, self-control, and orderliness were all associated with less frequent alcohol consumption. The average age of a participant in the Positive Personality Improvement

Study was 18. This lower frequency of drinking could indicate that being higher in conscientiousness leads to a healthier relationship with alcohol, one that may remain across the lifespan. College students who begin drinking heavily at a young age have a much poorer prognosis, both for their career and health (Wechsler & Wuethrich, 2002).

All three self-rated health items measured at baseline were associated with various facets of conscientiousness. Self-rated health is a reliable predictor of many important health outcomes, including mortality (Jylha, 2009). Our findings echo the relationship between higher conscientiousness and better health found in numerous other samples (e.g., Goodwin & Friedman, 2006).

Individual Differences. Participants higher in conscientiousness were found to possess characteristics that are part of and appeared to promote a positive life trajectory, such as lower depression, higher social support, and higher intrinsic motivation. These relationships may also help inform why conscientiousness is consistently associated with better health and longevity.

Higher conscientiousness was associated with various markers of psychological well-being. Taken together, our findings demonstrate greater psychological and emotional health for participants higher in conscientiousness, who were less depressed, less anxious, happier, and more satisfied with their lives. Previous research has linked personality to psychological well-being, though conscientiousness is usually not the focus, with neuroticism and extraversion more often in the spotlight (e.g., Deneve & Cooper, 1998). However, our data indicate that improved psychological health might be an important pathway from conscientiousness to better physical health. Highly

conscientious people may experience less stress in their lives because they are more planful, organized, motivated, and dependable. Lower levels of stress might be one reason why highly conscientious people appear to be psychologically healthier.

Participants higher in conscientiousness at baseline reported greater levels of social support from family and friends. Social support is a key component of psychological well-being and is associated with better physical health (e.g., Broadhead et al., 1983; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). One possible reason people higher in conscientiousness are healthier might be that they either perceive or receive more social support (perceived social support can be as important as received social support, e.g., Norris & Kaniasty, 1996). For example, people who are more responsible (i.e., more trustworthy) might build stronger and more steadfast friendships, likely increasing both perceived and received social support from friends. The role of social support in conscientiousness and health should be examined more closely, as part of bringing both personality and social relations together to bear on a life-course understanding of health.

Participants higher in conscientiousness were more likely to report an internal locus of control and less likely to report a chance or powerful others locus of control. Individuals with an internal locus of control take greater responsibility for the outcomes in their lives. An internal locus of control has been linked to better health behaviors and greater intentions to change (Ajzen, 2002). If an individual believes that she can effect change in her life, she will have higher intentions, set higher standards for herself, and aim to achieve greater levels of success. Our results indicate that being more conscientious is related to a higher internal locus of control. It appears that the

conscientious individual believes the outcomes in her life are due to her choices and actions, not random luck nor the choices of powerful others. This belief shapes how the individual approaches important life decisions, as she believes that her choices will ultimately affect future events in her life.

Participants higher in conscientiousness were more likely to report several aspects of intrinsic motivation. Specifically, when it came to the tasks of this study (i.e., filling out weekly surveys), participants higher in conscientiousness felt more competent, put forth more effort, and felt less tense or pressured. Highly conscientious people might be more intrinsically motivated due to their greater self-efficacy and responsibility, both of which were linked to intrinsic motivation in our study. Self-determination theory posits intrinsic motivation as a fundamental individual difference; being intrinsically motivated helps fulfill a basic human need for autonomy and promotes happiness (Ryan, Huta, & Deci, 2008). A recent meta-analysis linked intrinsic motivation to increased physical activity and greater intentions to change (Hagger & Chatzisarantis, 2009). Whether intrinsic motivation plays an important role in the association between conscientiousness and health should be further explored.

Participants higher in conscientiousness were more likely to expect positive improvements when putting forth the effort to change behavior. That is, they reported higher outcome expectancies. This positive attitude might increase the likelihood that highly conscientious individuals will follow through with the effort needed to accomplish health behavior change, because they believe this effort will lead to the desired improvements. Previous research has linked outcome expectancies to self-efficacy, an

important facet of conscientiousness (Shell, Colvin, & Bruning, 1995). Interestingly, higher outcome expectancies have also been proposed as an important construct mediating the association between optimism and better health (Scheier & Carver, 1987). Future studies should more closely examine the role of outcome expectancies in conscientiousness and health.

Promising Avenues for Primary Prevention

All in all, the results suggest that interventions that increase conscientiousness or its underlying facets are promising ways to achieve primary prevention in health and medicine. The multitude of health behaviors related to conscientiousness, identified in this study and previous research, make it a viable target for interventions designed to influence a variety of important health behaviors simultaneously (i.e., interventions targeted at behavior bundles). But little previous research has taken this broad, dimensional approach to personality and health promotion.

The Positive Personality Improvement Study tested whether teaching a variety of self-regulation skills could boost conscientiousness or its underlying facets. Results demonstrate that self-regulation training is a promising way to increase perseverance, an important facet of conscientiousness, but did not support this method as a short-term means for increasing broad trait conscientiousness nor the facets of self-control, orderliness, self-efficacy, or responsibility.

The skills needed to set and achieve goals (i.e., those taught during self-regulation training programs such as the Positive Personality Improvement Study) might lead to increased perseverance via several pathways. Experiences setting and achieving goals can

build the individual's confidence in her ability to succeed across various life domains, motivating her to stick with goals when encountering hardship. Furthermore, several of the workshops in the Positive Personality Improvement Study taught strategies for dealing with obstacles and setbacks; participants learned ways to successfully continue pursuing goals in the face of adversity. For example, mental contrasting allowed individuals to conceptualize barriers between what is and what will be once their goal state is achieved. In addition, implementation intentions involved devising plans for dealing with opportunities to make progress toward a goal, including contingency plans for situations involving difficulty along the way.

It is easy to imagine how self-regulation skills could boost perseverance. Part of the reason people falter when pursuing goals is because they are unprepared to make sudden important choices when faced with unexpected challenges; this added stress makes them prone to resort to habitual patterns. Observing themselves revert back to old habits, people often believe they are unable to change or incapable of making improvements. Many may give up on their goals. Sticking with a goal requires pushing forward despite these experiences and necessitates ample motivation and a positive attitude, both of which are promoted by the feelings of preparedness and competence that result from learning self-regulation strategies. The knowledge that one possesses these important life skills could be one reason we observe increased perseverance.

Strengthening perseverance may lead to a variety of positive health behaviors and improved functioning. Baseline perseverance was related to eating well, greater physical activity, greater physical fitness, better sleep, less frequent alcohol consumption, higher

self-rated health, better psychological well-being, higher social support, an internal locus of control, and positive outcome expectancies. Boosting perseverance could subsequently lead to improvements in these factors as well. Our data indicate that sleep improved in the treatment versus the control group across the six week duration of the study, perhaps demonstrating improvements associated with increasing levels of perseverance.

To achieve significant, lasting primary prevention, health interventions must target psychosocial factors that capture a variety of important individual differences simultaneously, as well as ones that are related to multiple health behaviors. Conscientiousness has been shown to be one such factor. Future research should continue to explore how interventions might influence broad trait conscientiousness and its underlying facets.

Results from the Positive Personality Improvement Study indicate that it may be possible to promote the facet of perseverance. Self-regulation training led to a trend in increasing perseverance and should be further explored as a promising avenue for boosting conscientiousness in the long run. However, efforts to increase broad trait conscientiousness and other facets of conscientiousness during the six weeks of our study were unsuccessful. Thus, it remains unclear whether increased perseverance will ultimately lead to increased conscientiousness. Future studies should include a follow-up assessment that exceeds one or two months to better answer this question (see limitations below).

Methods for increasing conscientiousness are only recently being explored. Psychological theories should be mined for factors and training techniques that might

influence facets of conscientiousness. For example, the Positive Personality Improvement Study was based upon Self-Regulation Theory (Danish, 1997). This and other viable theories should be explored when testing future interventions (e.g., Self Determination Theory, Theory of Planned Behavior). A combination of methods will work best to increase conscientiousness. Identifying these methods is an important direction for future research in health psychology and preventive medicine.

Limitations

It should be noted that random assignment was unsuccessful, and that participants in the treatment group were significantly higher in perseverance at baseline. They were also significantly higher in orderliness, responsibility, physical activity, internal locus of control, and outcome expectancies. One or more of these variables may have influenced how individuals in the treatment group responded to the self-regulation training. For example, perhaps being higher in perseverance, orderliness, or responsibility makes it easier to learn self-regulation techniques. Alternatively, individuals higher in one or more of these facets may already possess a greater number of self-regulation skills prior to beginning the study and so could not quickly improve further.

Participation in this study demanded a great deal of time and effort. Participants in either group completed weekly surveys that took approximately 30 minutes to complete for each of the six weeks. Participants in the treatment group were also required to attend a 50-minute workshop every week for the duration of the study. The reward offered for participation was likely insufficient to compensate for these demands. Along with the

longitudinal design, this high time requirement likely led to increased attrition in this study.

Six weeks is a relatively short period of time to observe changes in personality and behavior. A longer observation period would have been ideal, though a longer follow-up was impossible in the current study due to small sample size and attrition. This brief observation period restricted our ability to determine whether changes in personality or behavior resulted from participation in the treatment group. Important changes may have occurred after the last survey was administered, though such changes were unfortunately not assessed.

Beyond the experimental intervention, many interesting relationships emerged among health behaviors and conscientiousness. The correlational nature of the data on which they are based precludes our ability to draw causal inferences. However, when taken with previous findings, it is now even more clear that conscientiousness plays a key role in health promotion and disease prevention.

Closing Remarks

The most outstanding health concerns of today, including cardiovascular disease and cancer, are highly complex and often multiply-caused and slow to develop. This necessitates making primary prevention a top priority in health and medicine. These devastating illnesses are related to numerous important health behaviors that appear to be resistant to change. Health interventions designed to aid people in changing such difficult behaviors can be more effective by incorporating an understanding of conscientiousness. Individuals high in this attribute experience a variety of positive outcomes, including

better health and longevity. Findings from the Positive Personality Improvement Study suggest that at least one facet of conscientiousness is open to change. Hopefully, other interventions that increase additional facets of conscientiousness will be identified; such programs are a promising way to improve health. As individuals increase in conscientiousness over time, they may begin to experience the multifarious health benefits we have consistently seen associated with this pivotal personality trait.

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Table 1

Final scales used to calculate composite scores at each time point along with Cronbach's alpha levels for each of the five conscientiousness facets.

Facet	Scale and Subscale
Perseverance $\alpha = .80$	UPPS Urgency, reversed UPPS Perseverance Grit-S
Self-control $\alpha = .73$	CCS Self-control BIC Self-control IPIP CPI Self-control
Orderliness $\alpha = .85$	IPIP NEO-PI-R Orderliness CCS Orderliness BIC Organization AB5C Orderliness
Self-efficacy $\alpha = .83$	IPIP NEO-PI-R Self-efficacy IPIP CPI Self-efficacy
Responsibility $\alpha = .69$	IPIP CPI Responsibility CCS Responsibility BIC Responsibility

Note. α = Cronbach's alpha correlation coefficient.

Table 2

T-tests for significant differences between the treatment and control group at baseline using all available data.

Scale	<i>T</i>-Test	Treatment <i>M</i> (<i>n</i>)	Control <i>M</i> (<i>n</i>)
<i>Personality</i>			
UPPS Urgency, reversed	$t(66) = 3.11, p < .01$	3.75 (39)	3.21 (29)
Perseverance Composite	$t(66) = 2.17, p = .03$	3.59 (39)	3.28 (29)
NEO Orderliness	$t(63) = 2.67, p = .01$	3.58 (36)	3.19 (29)
ABC Orderliness	$t(63) = 2.41, p = .02$	3.62 (36)	3.25 (29)
CCS Orderliness	$t(63) = 2.21, p = .03$	3.46 (36)	3.17 (29)
Orderliness Composite	$t(63) = 2.27, p = .03$	5.21 (36)	4.74 (29)
CCS Responsibility	$t(63) = 2.59, p = .01$	3.74 (36)	3.48 (29)
<i>Health behaviors</i>			
Recent Activity	$t(61) = 2.01, p = .05$	3.54 (35)	2.86 (28)
<i>Additional</i>			
Health Locus of Control, Internal	$t(62) = 2.36, p = .02$	4.52 (36)	4.09 (28)
Health Locus of Control, Chance	$t(62) = -2.46, p = .02$	2.79 (36)	3.34 (28)
Locus of Control, Internal	$t(63) = 2.23, p = .03$	4.46 (36)	4.13 (29)
Locus of Control, Chance	$t(63) = -2.99, p < .01$	2.76 (36)	3.32 (29)
Outcome Expectancies	$t(63) = 2.43, p = .02$	5.60 (36)	5.07 (29)

Table 3

Baseline differences in conscientiousness by treatment group and data completion status.

Broad trait conscientiousness	Treatment Group	Control Group
<i>Data Completion Status</i>		
<i>Complete Data</i>	3.70 (.57)	3.52 (.56)
<i>Partial Data</i>	3.47 (.35)	3.32 (.47)
T-test	$t(34) = 1.24, p = .22$	$t(27) = .94, p = .36$
Perseverance	Treatment Group	Control Group
<i>Data Completion Status</i>		
<i>Complete Data</i>	3.63 (.6)	3.32 (.61)
<i>Partial Data</i>	3.53 (.68)	3.19 (.46)
T-Test	$t(37) = .46, p = .65$	$t(27) = .55, p = .58$
Self-control	Treatment Group	Control Group
<i>Data Completion Status</i>		
<i>Complete Data</i>	5.23 (.88)	5.11 (.75)
<i>Partial Data</i>	4.74 (.76)	4.48 (.57)
T-Test	$t(34) = 1.62, p = .11$	$t(27) = 2.32, p = .03$
Orderliness	Treatment Group	Control Group
<i>Data Completion Status</i>		
<i>Complete Data</i>	5.36 (.84)	4.75 (.93)
<i>Partial Data</i>	4.87 (.81)	4.72 (.43)
T-Test	$t(34) = 1.62, p = .11$	$t(27) = .12, p = .91$
Self-efficacy	Treatment Group	Control Group
<i>Data Completion Status</i>		
<i>Complete Data</i>	5.20 (1.11)	4.92 (.85)
<i>Partial Data</i>	5.00 (.49)	4.66 (.91)
T-Test	$t(34) = .57, p = .57$	$t(27) = .76, p = .45$
Responsibility	Treatment Group	Control Group
<i>Data Completion Status</i>		
<i>Complete Data</i>	5.20 (.72)	4.99 (.82)
<i>Partial Data</i>	5.09 (.8)	4.41 (.71)
T-Test	$t(34) = .41, p = .68$	$t(27) = 1.90, p = .07$

Table 4

Personality correlations averaged across data collection time points.

	Perseverance	Self-control	Orderliness	Self-efficacy	Responsibility	IPIP NEO-PI-R
Self-control	.59					
Orderliness	.50	.32				
Self-efficacy	.78	.37	.42			
Responsibility	.62	.46	.49	.63		
IPIP NEO-PI-R	.77	.46	.69	.68	.68	
IPIP AB5C	.73	.49	.63	.62	.70	.76

Table 5

Significant correlations at baseline (week 0) for the five facets of conscientiousness, broad trait conscientiousness, health, and additional individual difference variables.

Category Scale/Variable	with Category Scale/Variable	Correlation
<i>Conscientiousness Composites</i>		
Perseverance	<i>Conscientiousness Composites</i>	
	Self-control	$r(65) = .54^{**}$
	Orderliness	$r(65) = .49^{**}$
	Self-efficacy	$r(65) = .68^{**}$
	Responsibility	$r(65) = .55^{**}$
	Conscientiousness	$r(65) = .80^{**}$
<i>Health Variables</i>		
	Eating balanced meals	$r(65) = .33^{**}$
	Eating fast food	$r(65) = -.27^*$
	Physical activity ^a	$r(65) = .38^{**}$
	Physical fitness ^a	$r(63) = .44^{**}$
	Physical flexibility ^a	$r(64) = .29^*$
	Difficulties sleeping	$r(65) = -.29^*$
	Hours slept per night	$r(65) = .28^*$
	Sleep quality	$r(65) = .46^{**}$
	Frequency of alcohol consumption	$r(64) = -.25^*$
	Self-reported health ^a	$r(64) = .49^{**}$
	Self-reported health compared to 5 years ago	$r(65) = .33^{**}$
	Satisfaction with health	$r(64) = .55^{**}$
<i>Additional Variables</i>		
	Depression (CESD)	$r(65) = -.52^{**}$
	Anxiety (STAI)	$r(64) = -.34^{**}$
	Subjective Happiness Scale	$r(65) = .52^{**}$
	Satisfaction with Life Scale	$r(65) = .61^{**}$
	Social Support, Family	$r(64) = .40^{**}$
	Health Locus of Control, Internal	$r(64) = .38^{**}$
	Locus of Control, Internal	$r(65) = .28^*$
	Locus of Control, Chance	$r(65) = -.29^*$
	Intrinsic Motivation, Perceived competence	$r(65) = .44^{**}$
	Intrinsic Motivation, Effort	$r(65) = .28^*$
	Intrinsic Motivation, Felt pressure or tension	$r(65) = -.35^{**}$
	Outcome Expectancies	$r(65) = .41^{**}$
Self-control	<i>Conscientiousness Composites</i>	

	Orderliness	$r(65) = .31^*$
	Responsibility	$r(65) = .49^{**}$
	Conscientiousness	$r(65) = .48^{**}$
	<i>Health Variables</i>	
	Cooking meals at home	$r(63) = .27^*$
	Eating breakfast	$r(65) = .34^{**}$
	Difficulties sleeping	$r(65) = -.31^*$
	Hours slept per night	$r(65) = .26^*$
	Frequency of alcohol consumption	$r(64) = -.40^{**}$
	<i>Additional Variables</i>	
	Depression (CESD)	$r(65) = -.34^{**}$
	Subjective Happiness Scale	$r(65) = .25^*$
	Satisfaction with Life Scale	$r(65) = .27^*$
	Social Support, Family	$r(64) = .44^{**}$
	Health Locus of Control, Internal	$r(64) = .36^{**}$
	Locus of Control, Internal	$r(65) = .32^{**}$
	Locus of Control, Chance	$r(65) = -.32^{**}$
	Locus of Control, Powerful others	$r(65) = -.30^*$
	Intrinsic Motivation, Felt pressure or tension	$r(65) = -.26^*$
	Outcome Expectancies	$r(65) = .46^{**}$
Orderliness	<i>Conscientiousness Composites</i>	
	Self-efficacy	$r(65) = .32^{**}$
	Responsibility	$r(65) = .51^{**}$
	Conscientiousness	$r(65) = .69^{**}$
	<i>Health Variables</i>	
	Eating balanced meals	$r(65) = .54^{**}$
	Physical fitness ^a	$r(63) = .27^*$
	Difficulties sleeping	$r(65) = -.32^{**}$
	Frequency of alcohol consumption	$r(64) = -.25^*$
	Self-reported health ^a	$r(64) = .31^*$
	Satisfaction with health	$r(64) = .35^{**}$
	<i>Additional Variables</i>	
	Subjective Happiness Scale	$r(65) = .40^{**}$
	Satisfaction with Life Scale	$r(65) = .49^{**}$
	Social Support, Friends	$r(64) = .30^*$
	Locus of Control, Internal	$r(65) = .33^{**}$
	Intrinsic Motivation, Perceived competence	$r(65) = .33^{**}$
	Intrinsic Motivation, Effort	$r(65) = .25^*$
	Outcome Expectancies	$r(65) = .27^*$

Self-efficacy	<i>Conscientiousness Composites</i>		
	Responsibility	$r(65) = .41^{**}$	
	Conscientiousness	$r(65) = .63^{**}$	
	<i>Health Variables</i>		
	Recent physical activity	$r(63) = .31^*$	
	Physical activity ^a	$r(65) = .42^{**}$	
	Physical fitness ^a	$r(63) = .42^{**}$	
	Physical strength ^a	$r(64) = .32^*$	
	Hours slept per night	$r(65) = .26^*$	
	Sleep quality	$r(65) = .36^{**}$	
	Self-reported health ^a	$r(64) = .47^{**}$	
	Self-reported health, compared to 5 years ago	$r(65) = .39^{**}$	
	Satisfaction with health	$r(64) = .56^{**}$	
	<i>Additional Variables</i>		
	Depression (CESD)	$r(65) = -.46^{**}$	
	Anxiety (STAI)	$r(64) = -.50^{**}$	
	Subjective Happiness Scale	$r(65) = .52^{**}$	
	Satisfaction with Life Scale	$r(65) = .51^{**}$	
	Social Support, Friends	$r(64) = .26^*$	
	Social Support, Family	$r(64) = .27^*$	
	Health Locus of Control, Internal	$r(64) = .28^*$	
	Locus of Control, Internal	$r(65) = .26^*$	
	Locus of Control, Chance	$r(65) = -.29^*$	
	Locus of Control, Powerful others	$r(65) = -.27^*$	
	Intrinsic Motivation, Perceived competence	$r(65) = .44^{**}$	
	Intrinsic Motivation, Felt pressure or tension	$r(65) = -.27^*$	
	Outcome Expectancies	$r(65) = .31^*$	
	Responsibility	<i>Conscientiousness Composites</i>	
		Conscientiousness	$r(65) = .65^{**}$
		<i>Health Variables</i>	
		Cooking at home	$r(63) = .42^{**}$
Eating breakfast		$r(65) = .27^*$	
Physical activity ^a		$r(65) = .25^*$	
Physical fitness ^a		$r(63) = .34^{**}$	
Self-reported health ^a		$r(64) = .28^*$	
Satisfaction with health		$r(64) = .25^*$	
<i>Additional Variables</i>			
Depression (CESD)		$r(65) = -.38^{**}$	
Anxiety (STAI)		$r(64) = -.35^{**}$	
Subjective Happiness Scale		$r(65) = .49^{**}$	

	Satisfaction with Life Scale	$r(65) = .48^{**}$
	Social Support, Friends	$r(64) = .46^{**}$
	Social Support, Family	$r(64) = .45^{**}$
	Health Locus of Control, Internal	$r(64) = .34^{**}$
	Locus of Control, Internal	$r(65) = .49^{**}$
	Locus of Control, Chance	$r(65) = -.35^{**}$
	Intrinsic Motivation, Perceived competence	$r(65) = .48^{**}$
	Intrinsic Motivation, Effort	$r(65) = .27^*$
	Intrinsic Motivation, Felt pressure or tension	$r(65) = -.35^{**}$
	Outcome Expectancies	$r(65) = .57^{**}$
Conscientiousness	<i>Health Variables</i>	
	Eating balanced meals	$r(65) = .44^{**}$
	Eating fast food	$r(65) = -.26^*$
	Physical activity ^a	$r(65) = .36^{**}$
	Physical fitness ^a	$r(63) = .39^{**}$
	Physical flexibility ^a	$r(64) = .30^*$
	Physical strength ^a	$r(64) = .30^*$
	Difficulties sleeping	$r(65) = -.30^*$
	Sleep quality	$r(65) = .36^{**}$
	Self-reported health ^a	$r(64) = .38^{**}$
	Self-reported health, compared to 5 years ago	$r(65) = .29^*$
	Satisfaction with health	$r(64) = .45^{**}$
	<i>Additional Variables</i>	
	Depression (CESD)	$r(65) = -.44^{**}$
	Anxiety (STAI)	$r(64) = -.30^*$
	Subjective Happiness Scale	$r(65) = .45^{**}$
	Satisfaction with Life Scale	$r(65) = .58^{**}$
	Social Support, Friends	$r(64) = .28^*$
	Social Support, Family	$r(64) = .29^*$
Locus of Control, Internal	$r(65) = .37^{**}$	
Intrinsic Motivation, Perceived competence	$r(65) = .47^{**}$	
Intrinsic Motivation, Effort	$r(65) = .25^*$	
Outcome Expectancies	$r(65) = .42^{**}$	

Note. Each correlation is only reported once in the table. * = $p < .05$, ** = $p < .01$

^aWhen asked to compare themselves to others the same age and sex.

Table 6

Means and standard deviations for conscientiousness including broad trait and the five facets by experimental condition and time point.

	Baseline	Week 1	Week 3	Week 5	Week 6
Composite	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
<i>Conscientiousness</i>					
<i>Treatment</i>	3.63 (.52)	--	--	--	3.68 (.54)
<i>Control</i>	3.45 (.53)	--	--	--	3.43 (.58)
<i>Perseverance</i>					
<i>Treatment</i>	3.59 (.62)	3.51 (.58)	3.58 (.61)	3.71 (.65)	3.72 (.65)
<i>Control</i>	3.27 (.56)	3.41 (.64)	3.30 (.55)	3.31 (.69)	3.37 (.64)
<i>Self-control</i>					
<i>Treatment</i>	5.08 (.86)	5.13 (.75)	5.12 (.83)	5.11 (.81)	5.10 (.88)
<i>Control</i>	4.89 (.74)	4.82 (.81)	4.84 (.67)	4.88 (.81)	4.87 (.79)
<i>Orderliness</i>					
<i>Treatment</i>	5.21 (.85)	5.08 (.91)	5.26 (.93)	5.19 (.82)	5.20 (.84)
<i>Control</i>	4.74 (.78)	4.86 (.81)	4.71 (.71)	4.79 (.87)	4.76 (.93)
<i>Self-efficacy</i>					
<i>Treatment</i>	5.14 (.96)	5.16 (1.00)	5.19 (1.05)	5.24 (.93)	5.15 (.93)
<i>Control</i>	4.83 (.86)	4.79 (.97)	4.79 (.91)	4.73 (1.02)	4.81 (.99)
<i>Responsibility</i>					
<i>Treatment</i>	5.17 (.74)	5.14 (.86)	5.23 (.87)	5.13 (.84)	5.13 (.81)
<i>Control</i>	4.79 (.82)	4.72 (.94)	4.81 (.90)	4.85 (.98)	4.84 (.89)

Table 7

Planned contrast analyses by facet.

Predicted Pattern	<i>Pure linear increase for broad trait conscientiousness.</i>				
	Week 0	Week 1	Week 3	Week 5	Week 6
Lambda	-1	--	--	--	1
<i>T-test</i>	$t(47) = .58, p = .28$				
Predicted Pattern	<i>Pure linear increase by each facet of conscientiousness.</i>				
	Week 0	Week 1	Week 3	Week 5	Week 6
Lambda	-2	-1	0	1	2
<i>T-tests</i>					
Perseverance	$t(42) = 1.14, p = .13$				
Self-control	$t(42) = .24, p = .41$				
Orderliness	$t(42) = -.84, p = .20$				
Self-efficacy	$t(42) = .40, p = .35$				
Responsibility	$t(42) = -.26, p = .40$				
Predicted Pattern	<i>Steady through week 1, linear increase weeks 3-5.</i>				
	Week 0	Week 1	Week 3	Week 5	Week 6
Lambda	-1.2	-1.2	-.2	.8	1.8
<i>T-tests</i>					
Perseverance	$t(42) = 1.47, p = .07$				
Self-control	$t(42) = .15, p = .44$				
Orderliness	$t(42) = -.70, p = .24$				
Self-efficacy	$t(42) = .31, p = .38$				
Responsibility	$t(42) = -.44, p = .33$				
Predicted Pattern	<i>Steady through week 3, linear increase weeks 5-6.</i>				
	Week 0	Week 1	Week 3	Week 5	Week 6
Lambda	-.6	-.6	-.6	.4	1.4
<i>T-tests</i>					
Perseverance	$t(42) = 1.63, p = .06$				
Self-control	$t(42) = .07, p = .47$				
Orderliness	$t(42) = -.76, p = .23$				
Self-efficacy	$t(42) = .38, p = .35$				
Responsibility	$t(42) = -.64, p = .26$				

Note. All p-values are one-tailed.

Table 8

Health and individual difference variables along with each of the facets of conscientiousness found to be significantly related at baseline.

Eating Behaviors

Eating more balanced meals
Perseverance
Orderliness
Broad trait conscientiousness

Cooking more meals at home
Self-control
Responsibility

Eating breakfast more often
Self-control
Responsibility

Eating fast food less frequently
Perseverance
Broad trait conscientiousness

Physical Activity and Fitness

Higher rates of recent activity
Self-efficacy

Higher rates of physical activity compared to peers
Perseverance
Self-efficacy
Responsibility
Broad trait conscientiousness

Greater physical fitness compared to peers
Perseverance
Orderliness
Self-efficacy
Responsibility
Broad trait conscientiousness

Greater physical flexibility compared to peers
Perseverance
Broad trait conscientiousness

Greater physical strength compared to peers
Self-efficacy
Broad trait conscientiousness

Sleep

Fewer difficulties sleeping
Perseverance

Self-control
Orderliness
Broad trait conscientiousness
Greater number of hours slept per night
Perseverance
Self-control
Self-efficacy
Better sleep quality
Perseverance
Self-efficacy
Broad trait conscientiousness

Alcohol Consumption

Less frequent alcohol consumption
Perseverance
Self-control
Orderliness

Self-rated Health

Greater health compared to others same age and sex
Perseverance
Orderliness
Self-efficacy
Responsibility
Broad trait conscientiousness
Greater health compared to 5 years ago
Perseverance
Self-efficacy
Broad trait conscientiousness
Greater satisfaction with health
Perseverance
Orderliness
Self-efficacy
Responsibility
Broad trait conscientiousness

Psychological Well-being

Lower depression scores
Perseverance
Self-control
Self-efficacy
Responsibility
Broad trait conscientiousness
Lower anxiety scores

Perseverance
Self-efficacy
Responsibility
Broad trait conscientiousness
Higher subjective happiness ratings
Perseverance
Self-control
Orderliness
Self-efficacy
Responsibility
Broad trait conscientiousness
Higher satisfaction with life scores
Perseverance
Self-control
Orderliness
Self-efficacy
Responsibility
Broad trait conscientiousness

Social Support

Greater social support from friends
Orderliness
Self-efficacy
Responsibility
Broad trait conscientiousness
Greater social support from family
Perseverance
Self-control
Self-efficacy
Responsibility
Broad trait conscientiousness

Locus of Control

Higher internal health locus of control
Perseverance
Self-control
Self-efficacy
Responsibility
Higher internal locus of control
Perseverance
Self-control
Orderliness
Self-efficacy
Responsibility

Broad trait conscientiousness
Lower chance locus of control
Perseverance
Self-control
Self-efficacy
Responsibility
Lower powerful others locus of control
Self-control
Self-efficacy

Intrinsic Motivation

Higher perceived competence when completing tasks of this study
Perseverance
Orderliness
Self-efficacy
Responsibility
Broad trait conscientiousness
Higher effort toward tasks of study
Perseverance
Orderliness
Responsibility
Broad trait conscientiousness
Felt less tense or pressured when completing study tasks
Perseverance
Self-control
Self-efficacy
Responsibility

Outcome Expectancies

Expected positive improvements would result from efforts to change
Perseverance
Self-control
Orderliness
Self-efficacy
Responsibility
Broad trait conscientiousness

Figure 1. Mean perseverance values at each time point by experimental group.

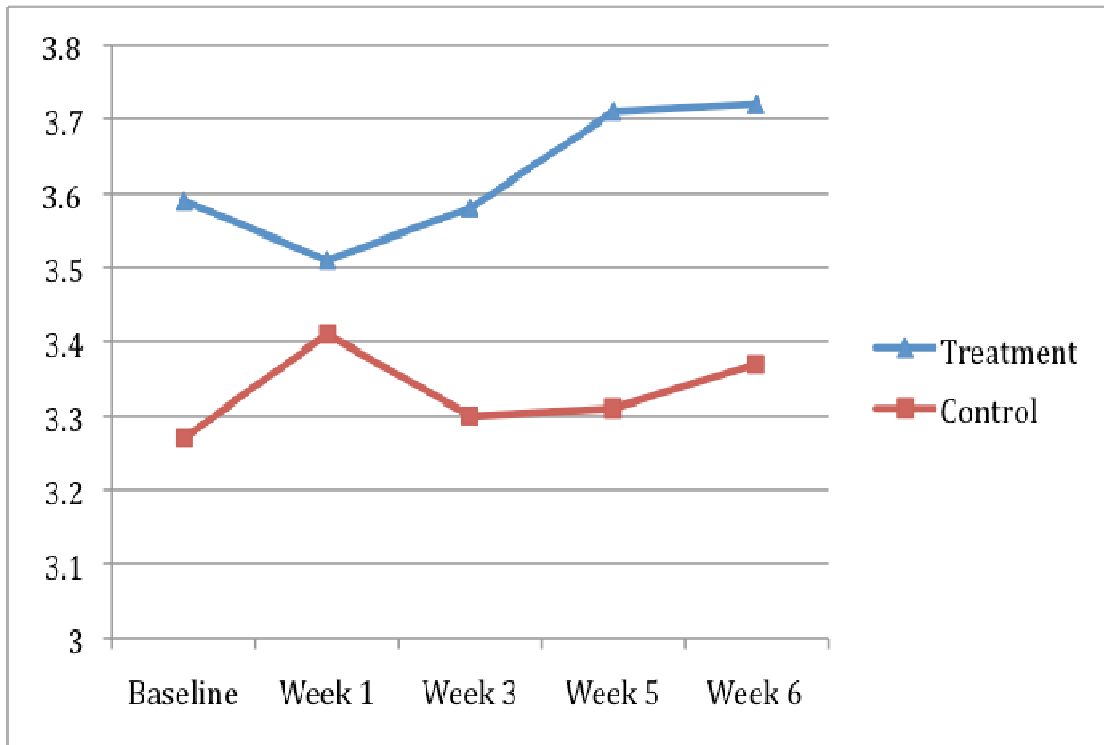


Figure 2. Mean sleep quality values at baseline and week 6 by experimental group.

