

3-25-2016

Development and Evaluation of a Hypocrisy Induction Intervention for Exercise

Morgan Sophia Lee

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Development and Evaluation of a Hypocrisy Induction Intervention for Exercise

by

Morgan S. Lee

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
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Date of Approval:
March 10, 2016

Keywords: exercise, physical activity, dissonance, hypocrisy induction, health behavior,
behavior change

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Dedication

I dedicate this manuscript to God, who provides me energy when I am exhausted, hope when I become discouraged, and peace when I feel anxious. I experienced plenty of all those things during the course of this dissertation work, and I would not be at the end of the journey writing this note without His grace and guidance.

Acknowledgments

In case you were wondering, earning a doctoral degree is really hard! For me, the task would have been impossible without the help, advice, and encouragement of many wonderful people. Specific to this dissertation study, many thanks to Psi Chi – The International Honors Society in Psychology for awarding me a Graduate Research Grant to partially support the costs of the study and to the participants who dedicated their time so that I could evaluate this intervention approach; I hope this and future research I conduct can make their efforts worthwhile by helping others change their health-related behavior for the better! My gratitude also goes to my all-star team of research assistants, especially Alexis Weeks, who consistently went above and beyond the call of duty and was a great cheerleader during the difficult parts of data collection. Thanks also to my dissertation committee and to my major professor, Dr. Paul Jacobsen, whose willingness to support my goals throughout my graduate work was much appreciated.

Reflecting more broadly on my time USF, I am thankful for my many instructors and collaborators, especially Dr. Joel Kevin Thompson, Dr. Brent Small, and Dr. Brian Gonzalez. I was incredibly privileged to learn from and work alongside a large number of amazing people, many of whom are not named here but are forever etched in my memory. Of course, research studies and graduate degrees are not completed without a whole lot of paperwork, and I was blessed to work with excellent administrative teams in the Department of Psychology and at Moffitt Cancer Center. Special thanks to Christine Marsella and Laura Pierce (who I still refer to as my “program mom”), who were instrumental to my successfully navigating the endless

paperwork and countless policies! Reflecting further back in my academic work, thanks to my undergraduate mentors at UNC Chapel Hill, especially Dr. Jeannie Loeb, whose exemplary teaching and fantastic attitude sparked my passion for pedagogy to complement my enduring love of research.

On a personal note, I want to express my appreciation for my parents, but I doubt any words could describe how grateful I am for their ongoing support and how essential they have been to every accomplishment in my life. Mom and Dad, I am eager for the Lee clan's next adventure! Last, but definitely not least, I am grateful for my furry kiddo, Sydney. Golden retriever love brought a smile to my face on even the toughest days of this long journey!

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Abstract

Hypocrisy induction is a dissonance-based intervention approach that has been successful in changing a number of health-related behaviors; however, no published studies have evaluated a hypocrisy induction intervention for exercise. The present two-stage study involved developing and subsequently evaluating a hypocrisy induction intervention for exercise in a small-scale randomized controlled trial (RCT). Outcomes of interest were intention to exercise, immediate physical activity-related behavior choice, and short-term (one-week) changes in self-reported exercise and objectively assessed physical activity. Self-esteem was evaluated as a potential moderator of intervention effects. After two rounds of pilot testing in the Development Phase, the intervention was evaluated in a sample of 120 participants (60 each in the exercise intervention and no-intervention control conditions). Participants who received the intervention reported significantly greater intention to exercise than did control participants who did not receive the intervention ($p = .02$, $d = 0.43$). Small effects in favor of the intervention were also found for self-reported exercise and objectively assessed physical activity ($d = .21 - .35$), but these effects were nonsignificant. Self-esteem influenced the effect of the intervention on self-reported exercise: The intervention was more effective for participants with lower levels of self-esteem. The present findings provide preliminary support for use of hypocrisy induction interventions in exercise promotion, but additional research is needed to determine for whom and in what situations this approach is best used.

Introduction

Promoting positive health behaviors is of paramount importance in an age in which chronic disease has replaced infectious disease as the primary cause of mortality, and health care costs are rising sharply. Exercise is a particularly important health behavior, given its influence on the chronic diseases that are leading causes of morbidity and mortality in the United States (Haskell et al., 2007) and the fact that a minority of Americans meet established exercise recommendations (Centers for Disease Control and Prevention [CDC], 2013a). Over the past several decades, a wide range of exercise behavior change interventions have been explored, with varying levels of success. The well-known intention-behavior gap (Sheeran, 2002) is the phenomenon by which many who intend to exercise do not follow through with the behavior. Recently, a number of intervention approaches have been used to harness the thought-behavior inconsistencies inherent in the intention-behavior gap to encourage behavior change. One such approach, based on Cognitive Dissonance Theory, is the hypocrisy induction intervention. The study proposed here involves development and evaluation of a hypocrisy induction intervention for exercise.

Exercise and Health

Exercise is a critical behavior that influences a wide range of health outcomes including obesity, diabetes, cardiovascular disease, cancer, and aspects of mental health including anxiety and depression (US Department of Health and Human Services, 2008). The benefits of regular exercise are substantial. For example, a meta-analysis of 33 studies including over 100,000 individuals revealed a 56% greater risk of a coronary or cardiovascular event for those with low

cardiorespiratory fitness compared to those with high cardiorespiratory fitness (Kodama et al., 2009). Another meta-analysis of 10 studies including over 300,000 individuals noted that regular participation in moderate physical activity reduced the risk of type 2 diabetes by 30% compared to a sedentary lifestyle (Jeon, Lokken, Hu, & van Dam, 2007).

Exercise Participation

The vast majority of U.S. adults endorse intention to exercise; however, only half achieve the minimal recommended amounts of aerobic activity, only about 1 in 5 meet recommendations for both aerobic activity and resistance training, and approximately 1 in 4 report no physical activity participation (CDC, 2013a). These figures may underestimate the problem. Analyses using objective accelerometer-based measures of physical activity recommendation adherence have found that fewer than 5% of adults are attaining recommended levels of aerobic activity (Troiano et al., 2008). Clearly, the public's health would be best served by a major shift toward more exercise participation.

Exercise Interventions

The Community Guide, which houses the findings and reviews of the Community Preventive Services Task Force (established by the U.S. Department of Health and Human Services), recommends a number of behavioral/social, campaign/informational, and environmental/policy approaches to increasing physical activity, and research is ongoing to further evaluate current intervention approaches as well as to design new ones. Reviews of the literature suggest that well-designed interventions can have moderate and sometimes even large effects on physical activity in the short- to mid-term (Dishman & Buckworth, 1996; Foster, Hillsdon, Thorogood, Kaur, & Wedatilake, 2005; Kahn et al., 2002; Marcus et al., 2006).

However, an ongoing problem with exercise interventions is longevity of intervention effects. Because the physical and mental health benefits associated with exercise are dependent upon continued participation, sustaining exercise behavior is critical. Few studies have evaluated the long-term maintenance of intervention effects, and the minority that have done so have produced discouraging results suggesting that many people who initially increase their exercise behavior later relapse into a sedentary lifestyle (Foster et al., 2005; Marcus et al., 2000; Marcus et al., 2006). Among those who begin an exercise program, about half drop out within the first several months (Dishman, 1988). Even in young, healthy populations assessed over a short time period, exercise-related relapse is common. For example, physically active college students followed for 8 weeks demonstrated a 13% relapse rate (Sullum, Clark, & King, 2000). These troubling patterns regarding long-term maintenance of recommended levels of physical activity have led experts to ask whether occasional “boosters” might be helpful (Kahn et al., 2002) and to puzzle over why so many people who have every intention of engaging in healthy behaviors (e.g., exercise) fail to do so.

Intention-Behavior Gap

In prominent models of health behavior such as the Theory of Planned Behavior (TPB; Ajzen, 1991) and Protection Motivation Theory (PMT; Rogers, 1983), intention serves as the most proximal determinant of behavior. While the relationship between intention and behavior is intuitive and strong, decades of research has demonstrated that the intention-behavior connection is far from perfect. Sheeran (2002) performed a meta-analysis of meta-analyses and observed an effect size of $r = 0.53$, indicating that intention explains an average of 28% of the variance in behavior across a wide range of health behaviors. For exercise specifically, a meta-analysis including 32 effect size estimates from 31 studies found that intention explained 22% of the

variance in exercise behavior (Hausenblas, Carron, & Mack, 1997). Thus, a large gap exists between intention and behavior, and this gap is attributable primarily to inclined abstainers (i.e., people who intend to engage in the behavior but fail to act on those intentions) (Sheeran, 2002). Studies have shown that traditional variables from the TPB (e.g., subjective norms) and PMT (e.g., self-efficacy) do not bridge this gap, as inclined abstainers do not differ from inclined actors (i.e., people who intend to engage in the behavior and are following through on their intentions) on TPB and PMT variables (Orbell & Sheeran, 1998; Sheeran, 2002). Thus, researchers have begun to explore other means by which to explain and address the intention-behavior gap.

Dissonance-Based Approaches to Closing the Intention-Behavior Gap

Cognitive Dissonance Theory (Festinger, 1957) posits that people experience negative tension (Festinger called this tension “cognitive dissonance” (CD)) when they perceive inconsistency in their cognitions and that they are motivated to reduce this tension by changing their attitudes or behaviors. Though Festinger proposed that CD could potentially influence behavior, much of the literature on CD and the paradigms commonly used to study this phenomenon (e.g., effort justification and induced compliance), have focused primarily on attitude change. However, in the search for innovative ways to address people’s failure to maintain healthy behaviors and to close the intention-behavior gap, several intervention approaches based on the concept of CD have arisen.

Motivational interviewing is a therapeutic intervention that focuses on eliciting change talk in the client by discussing pros and cons of the client’s current status and working through any ambivalence the client is experiencing (Miller & Rollnick, 2002). Essentially, motivational interviewing attempts to induce a state of dissonance in the client and then turn that dissonance

in the direction of the desired behavior. Though motivational interviewing has rapidly gained popularity among mental health professionals, its potential for wide-scale implementation is limited because it requires one-on-one sessions with doctoral-level providers for maximal effectiveness (Miller & Rose, 2009).

Hypocrisy induction interventions are a promising dissonance-based alternative that have the advantage of being more easily implemented and much less costly. These interventions are grounded in CD but contain unique components designed to induce behavior change, relying on pre-existing inconsistencies between attitudes and behavior rather than creating inconsistency as part of the experimental manipulation. Hypocrisy induction interventions involve a two-step process (Stone & Fernandez, 2008): (1) public advocacy for the desired behavior and (2) private reminders of past failures to engage in the behavior. In a hypocrisy induction intervention, the person first publicly advocates for the behavior, typically by delivering a speech or writing an essay, ostensibly to convince others of the importance of the behavior. The person then completes a task designed to privately draw awareness to personal past failures to engage in the behavior (e.g., by generating a list of reasons why someone might not perform the behavior or answering questions about their own behavior). For example, in a study of sun protection behavior (Stone & Fernandez, 2011), participants were told they were helping develop a skin cancer prevention brochure. Participants wrote a statement advocating for sunscreen use and had their picture taken to go along with their comments (public advocacy). Participants were then given a purportedly anonymous survey in which they were asked to recall instances in the past year when they spent time in the sun without wearing sunscreen (private reminder of failure).

Evaluation of the use of hypocrisy for behavior change suggests two mechanisms of influence. First, publicly advocating for the desired behavior likely calls forth not only the

person's own attitudes but also ingrained normative behavioral standards that shape perceptions of reality; the strength of these perceptions pushes the person toward behavior change rather than attitude change to reduce the dissonance (Stone, 2012; Stone & Fernandez, 2008). Second, being mindful of past failures to engage in the behavior threatens the person's self-integrity (i.e., beliefs about one's honesty and sincerity) and influences the person to change his or her behavior in the interest of restoring this self-integrity (Stone, Wiegand, Cooper, & Aronson, 1997).

Research on hypocrisy induction interventions for behavior change. Hypocrisy induction interventions have been used to change health behavior, environment sustainability-related behavior, and interpersonal/intergroup behavior (Stone, 2012). Research on hypocrisy for health behavior change began with an intervention to promote condom use among male and female sexually active young adults. Findings indicated that relative to those in no manipulation, public advocacy only, and mindful of past failures only conditions, participants in the hypocrisy condition reported greater intention to increase condom use (Aronson, Fried, & Stone, 1991). A follow-up study found that likelihood of purchasing condoms and number of condoms purchased was highest in the hypocrisy condition (Stone, Aronson, Crain, Winslow, & Fried, 1994). Subsequent studies of hypocrisy induction interventions for health behavior have investigated driver safety, playground risk behavior, sun protection, smoking, alcohol use, and exercise (Freijy & Kothe, 2013). A recent review of CD interventions for health behaviors located 20 interventions; most studies obtained significant effects on measures of attitude, intention, and/or behavior (Freijy & Kothe, 2013). Hypocrisy was the most commonly used paradigm, representing 14 of the interventions, and also the most successful paradigm, producing at least one positive effect in 11/14 studies and positive effects on all measured outcomes in 10/14 studies.

Research on hypocrisy induction interventions for exercise promotion is in its infancy. An extensive literature search revealed only two studies of hypocrisy induction interventions for exercise; neither was published in a peer-reviewed journal. Barquissau & Stone (2000) used a 2x2 (framing x responsibility) between subjects design to examine the effects of a hypocrisy manipulation on the distance cycled during a subsequent 10-minute exercise period. In the study, participants first made a videotape advocating for exercise in which they emphasized either positive benefits (positive framing condition) or avoidance of negative consequences (negative framing condition). Next, participants chose activities that kept them personally from exercising regularly from lists of optional social activities such as going to parties (high responsibility condition) and required academic activities such as attending classes (low responsibility condition). The authors hypothesized that effects would be greatest in the negative frame/high responsibility condition, but no significant differences were found. However, the study had several methodological limitations including a small sample size (65 participants total), lack of a control group that did not participate in hypocrisy induction procedures, and use of a measure of emotions that results suggested allowed participants to reduce dissonance through self-affirmation and/or trivialization rather than behavior change.

The other study (Bator & Bryan, 2007) was conducted in a naturalistic setting (a college fitness facility) and examined the effects of a hypocrisy induction intervention consisting of signing a poster advocating for exercise (public commitment component) and verbally responding to questions about the frequency and intensity of participants' personal exercise (mindful component). Participants were randomized to hypocrisy, commitment-only, mindful-only, or control conditions. Outcomes of interest were exercise intention and number of visits to the fitness facility during the subsequent two weeks. The results were inconsistent. Participants

in the hypocrisy condition reported significantly greater intention to exercise at least four times per week over the next three months and used the fitness facility more often than participants in the other conditions during the follow-up period, but they did not demonstrate higher intention on related items such as likelihood of going to a location to exercise. This inconsistent pattern of results may be due in part to the fact that the study deviated from the recommended hypocrisy induction procedure in that (1) the portion of the procedure involving reminders of past failure was not fully private and (2) the sequence of the intervention was reversed from the recommended structure such that reminders of past failure came prior to public advocacy.

Measuring dissonance. Though dissonance is assumed to mediate the effects of hypocrisy induction interventions, the construct is rarely measured directly. When dissonance is evaluated, the Dissonance Thermometer (Elliot & Devine, 1994) is used. This approach is somewhat controversial. The creators of the Dissonance Thermometer have warned that different feelings will likely be evoked by different types of cognitive inconsistencies and different dissonance paradigms, explicitly noting that the feelings evoked by the hypocrisy paradigm have not yet been determined (Devine, Tauer, Barron, Elliot, & Vance, 1999). Additionally, a small body of literature suggests that measuring affect (as is done using the Dissonance Thermometer) may reduce dissonance and thus eliminate the need for behavior change (Elliot & Devine, 1994, Exp. 1; Galinski, Stone, & Cooper, 2000; Pyszczynski, Greenberg, Solomon, Sideris, & Stubing, 1993). However, a recent systematic review (Freijy & Kothe, 2013) found no evidence to suggest that use of the Dissonance Thermometer reduces dissonance. Rather, concerns were noted as to whether the Dissonance Thermometer can reliably detect dissonance. Inclusion of the Dissonance Thermometer in dissonance-based interventions was recommended so that the reliability and validity of the measure can be established.

The role of self-esteem. Self-esteem has long been acknowledged as a potential moderator of dissonance-based interventions' effects and has been demonstrated to moderate the effects of hypocrisy induction interventions targeting other health behaviors (Peterson, Haynes, & Olson, 2008; Stone & Focella, 2011). However, the predicted directionality is disputed. According to Aronson's self-consistency revision of the original dissonance theory (Aronson, 1968; Thibodeau & Aronson, 1992), people with low self-esteem should experience less dissonance and thus be less impacted by dissonance-based interventions because their poor behavior and their expectations for their behavior will not contrast much due to their negative views of themselves. Conversely, a self-affirmation perspective (Steele, 1988) suggests that people with high self-esteem will be the ones to experience less dissonance because their positive views of themselves buffer against the effects of dissonance-based interventions.

The Current Study

Research on hypocrisy induction interventions for exercise promotion has just begun, with only two unpublished studies, both with notable methodological limitations, conducted thus far. Given the need for interventions that are effective, cost-efficient, and scalable boosters for lapses in critical preventive health behaviors, a well-designed study of a hypocrisy induction intervention for exercise will help to fill an notable gap in the literature. Should this intervention prove to be effective, efforts can begin to adapt and disseminate such an intervention for use in the broader society, and additional research can determine for which behaviors, individuals, and situations such approaches function best.

This two-stage study involved developing and subsequently evaluating a hypocrisy induction intervention for exercise in a small-scale randomized controlled trial (RCT). To address questions regarding the measurement of dissonance in dissonance-based interventions,

the study included the only published measure purporting to assess dissonance (the Dissonance Thermometer). To address questions regarding the role of self-esteem in dissonance-based interventions, the study included a measure of self-esteem. Study participants were young adults who were not engaging in regular exercise at the time of study recruitment. Physical activity declines sharply during adolescence (Caspersen, Pereira, & Curran, 1990; Gordon-Larsen, Nelson, & Popkin, 2004; Sallis, 2000) and tends to stabilize during middle adulthood (Caspersen et al., 1990); thus, young adulthood represents a critical period for intervention. Participants were randomly assigned to an exercise intervention condition or a no-intervention control condition. Outcomes of interest were intention to exercise, immediate physical activity-related behavior choice, and short-term (one-week) changes in self-reported exercise and objectively assessed physical activity. Study aims and hypotheses were as follows:

Aim 1. Develop a hypocrisy induction intervention for exercise, and test the intervention in a sample of young adults.

Goal. Design hypocrisy induction procedures that evoke substantial cognitive dissonance in most participants.

Aim 2. Evaluate the effects of the hypocrisy induction intervention for exercise relative to a no-intervention control condition on outcomes of interest.

Hypothesis. Intention to exercise, immediate physical activity-related behavior choice, self-reported exercise, and objectively assessed physical activity will be greater in the exercise intervention condition than in the no-intervention control condition.

Aim 3 (exploratory). Evaluate self-esteem as a potential moderator of intervention effects on self-reported exercise intention and behavior. Due to the contested directionality of this moderator effect, no hypotheses were formulated for testing.

Method

Overview

This two-part study involved developing a hypocrisy induction intervention for exercise behavior (Development Phase) and evaluating the intervention in small-scale RCT in which participants were assigned to an exercise intervention condition or a no-intervention control condition (Evaluation Phase).

Development Phase: Overview

In the Development Phase of the study, the hypocrisy induction intervention was tested and refined to ensure that it produces a sufficient amount of dissonance. Consequently, only one condition (the exercise intervention) was included, and the outcome measure was dissonance rather than exercise intention and behavior. Two rounds of testing were conducted.

Development Phase: Participant Screening and Recruitment

Participants were 19 male and female undergraduate students (round 1: $n = 10$; round 2: $n = 9$) from the University of South Florida who were enrolled in the Psychology Department's SONA participant pool. Potential participants were screened for eligibility using a mass testing survey completed by all students who register for the participant pool each semester. Eligibility criteria required participants to be (1) enrolled as an undergraduate student, (2) between 18 and 25 years old (because this age bracket encapsulates over 90% of those registered in the participant pool), (3) intending to but not currently engaging in regular exercise, and (4) not under recommendation from a health professional to avoid exercise (because the study intervention is designed to encourage more physical activity). To evaluate potential participants'

stage of change for exercise, the short form of the Exercise Stages of Change Measure (Marcus, Selby, Niaura, & Rossi, 1992) was administered. The measure first provides a definition of regular (i.e., recommended) exercise and then asks participants whether they exercise regularly according to the definition, providing response options that correspond to each stage of change (e.g., for the preparation stage, “No, but I intend to in the next 30 days.”). Potential participants were eligible for the study if their response to this item indicated they were in either the contemplation or the preparation stage of change. To evaluate whether potential participants had medical contraindications for exercise, the following question was asked: “Has a doctor or other health professional indicated that you should avoid exercise at the present time?” Compensation in the form of course credit was distributed according to an established schedule.

Development Phase: Procedure

Respondents who met eligibility criteria and desired to participate in the study were scheduled for a 1.5-hour lab session. Each participant was scheduled for his or her own session (i.e., study activities were completed individually rather than in a group format). Upon arrival at the lab, participants were greeted by the experimenter, provided informed consent, and completed the demographics, self-esteem, exercise behavior, and dietary behavior measures (see Measures below). The experimenter then administered the experimental portion of the procedures. First, participants were given handouts containing information about exercise recommendations and benefits of exercise. They were told that their role was to help the researchers develop health behavior-related public service announcements for college students and that they had been randomly selected to record a video about exercise. The participants were given 10 minutes to review the information and prepare their speech using a structured outline provided by the experimenter. Next, they recorded a 2- to 3-minute video in which they

advocated for regular exercise. Immediately after completing their video, participants watched their recorded speech with the experimenter. Finally, participants were given the form containing the private reminders task, which was a writing task requiring them to describe recent instances in which they failed to engage in regular exercise. (Note: Scripts for the experimental portion of the study procedure, the speech outline form, and the private reminders task form are included in the appendix at the end of this document.) Upon completion of the hypocrisy induction procedures, the experimenter immediately administered the Dissonance Thermometer (round 1) or a dissonance manipulation check (round 2). Finally, participants were debriefed regarding the purpose of the study.

Development Phase: Measures

Demographics. The following demographic characteristics were measured using a standardized self-report form: age, height, weight, race, ethnicity, marital status, living arrangement (e.g., alone, with a roommate), year in college, student status (part- or full-time), and employment status. Tobacco and alcohol use were also assessed. (Note: Copies of all study measures are included in the appendix at the end of this document.)

Self-esteem. The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965) was used to evaluate self-esteem. The RSES is a 10-item measure that asks participants to rate their agreement with each statement on a 4-point Likert scale ranging from 0 (*Strongly Disagree*) to 3 (*Strongly Agree*). Half of the items are reverse-coded, and the sum of all items is used as the participant's score.

Exercise behavior (self-report). Participation in exercise was assessed using the self-administered long form of the International Physical Activity Questionnaire (IPAQ; Craig et al., 2003). The IPAQ is a validated measure of physical activity and sedentary behavior that is

available in several forms and has been used in countries throughout the world. In the initial development study, test-retest reliability for the self-administered long form of the IPAQ was 0.81, and the IPAQ correlated 0.33 with accelerometer data (Craig et al., 2003). These results are similar to those obtained by other self-report physical activity measures (for a review, see Sallis & Saelens, 2000). The IPAQ self-administered long form contains a total of 27 questions that ask about physical activity (both the number of days per week that the participant engages in that type of activity and the duration in minutes of a typical bout of the activity) across work, transportation, domestic, and recreational domains as well as time spent sitting. Respondents are asked to report only those physical activity bouts that last at least 10 minutes.

Responses to the IPAQ questions were scored in accordance with guidelines distributed by the measure's creators (IPAQ Research Committee, 2005). To account for differences in intensity between different types of activity, minutes spent in each activity are converted to MET-minutes. Each type of activity is calculated as the MET-minutes for that activity times the number of minutes per bout times the number of days per week. The three values are added together to determine a total number of MET-minutes for each participant. These totals can be calculated by domain or as a grand total. Participants' score for the recreational domain served as the outcome variable in this study.

In addition to the continuous measure, responses to the IPAQ questions were used to divide participants into three groups: low, moderate, and high physical activity. The American College of Sports Medicine recommends that adults engage in exercise of moderate intensity for at least 30 minutes per day, at least five days per week, or vigorous intensity for at least 20 minutes per day, at least three days per week (Garber et al., 2011). The "moderate" category requires this level of activity, which is a basic minimum for obtaining health benefits from

exercise. In recognition of the low standards set by these recommendations, the IPAQ creators also designed criteria for a “high” level of activity: (1) at least 3 days of vigorous intensity exercise totaling at least 1500 MET-minutes per week or (2) 7 or more days of any combination of intensity levels totaling at least 3000 MET-minutes per week. The “low” category includes any amount of exercise that does not meet the requirements for either of the other levels.

Dietary behavior (self-report). As a measure of dietary behavior, fruit and vegetable intake was evaluated using a self-report adaptation of the Fruits and Vegetables section of the 2013 Behavioral Risk Factor Surveillance System (BRFSS) (CDC, 2013b). Administered by the CDC, the BRFSS is a group of health-related surveys that is collected monthly in all 50 states. The Fruits and Vegetables section of the BRFSS contains 6 items assessing the frequency at which the participant consumes different types of fruits and vegetables. For this study, the time period of evaluation was adjusted from one month to one week to mirror the self-report measure of exercise behavior, and the total number of fruits and vegetables servings reported for the week served as the outcome variable.

Dissonance Thermometer. In round one, the extent to which the study procedures induced cognitive dissonance was evaluated using the Dissonance Thermometer (Devine et al., 1999; Elliot & Devine, 1994). The Dissonance Thermometer measures cognitive dissonance by having participants indicate the extent to which they are experiencing 14 different feelings (e.g., embarrassed, optimistic). Previous research (Elliot & Devine, 1994) has determined that the 3-item discomfort factor of the Dissonance Thermometer, which is comprised of ratings of the feelings “uncomfortable,” “uneasy,” and “bothered,” represents the affective expression of cognitive dissonance. Participants are asked to rate the extent to which they are currently feeling each of the feelings from the Dissonance Thermometer on a 7-point Likert scale ranging from 1

(*does not apply at all*) to 7 (*applies very much*). The mean of the three discomfort factor items is used as the participant's dissonance score.

Dissonance manipulation check (experimental condition version). In round two, the extent to which the study procedures led participants to recognize a discrepancy between the exercise behavior they advocated for and their current exercise behavior was evaluated using a two-part question designed for the purposes of the present study. Part one is as follows: "After completing the tasks involved in this study, do you think there is any discrepancy between what you talked about in your video and how much you usually exercise?" (Yes/No). For participants who responded affirmatively, the second part of the question was administered; participants who answered "No" to part one were not administered part two. Part two reads, "How much does this discrepancy bother you?" and is rated on a 5-point Likert scale (0 = *not at all* – 4 = *a lot*).

Development Phase: Results

Relevant to the goal for Aim 1, which was to design hypocrisy induction procedures that evoke substantial dissonance in most participants, the amount of dissonance induced by the intervention procedures served as the outcome of interest in this phase of the study. In the first round of pilot testing, the intervention was to be considered as producing a sufficient amount of dissonance if the average of the three dissonance items from the discomfort factor of the Dissonance Thermometer measure was ≥ 3.0 for $\geq 80\%$ of participants. This goal was not met, as only 2 out of 10 participants (20%) had mean Dissonance Thermometer discomfort factor scores of at least 3.0. In the second round of pilot testing (in which the dissonance manipulation check was used to evaluate dissonance), 6 out 9 participants perceived a discrepancy between the behavior they advocated for and their current behavior. Ratings of bother about this discrepancy ranged from 1-4 on the 0-4 scale, with a mean of 2.33. Because the majority of participants

reported perceiving a discrepancy and because their mean bother rating was above the midpoint of the scale with no participant reporting zero bother, it was concluded that the procedures were inducing sufficient dissonance to proceed to the Evaluation Phase of the study.

Evaluation Phase: Overview

In the Evaluation Phase of the study, the hypocrisy induction intervention refined in the Development Phase was evaluated using a randomized controlled design in which participants were assigned to an exercise intervention condition (EX) or a no-intervention control condition (NI). Participants completed the experimental procedures, wore an accelerometer for one week, and returned for a final study visit. Outcomes of interest in the Evaluation Phase were exercise intention, immediate physical activity-related behavior choice, self-reported exercise behavior, and objectively assessed physical activity.

Evaluation Phase: Participant Screening and Recruitment

The eligibility criteria and recruitment procedure for the RCT were the same as for the Development Phase, with one change: Current enrollment in a physical education course was added as an exclusion criterion. To evaluate potential participants' status for this criterion, the following question was asked: "Are you currently enrolled in or planning to enroll this semester in a physical education course?" Anticipating a medium effect size ($d = .50$) based on previous hypocrisy induction studies (e.g., Thompson, Kyle, Swan, Thomas, & Vrungos, 2002), 53 participants were required per condition to achieve 80% power to detect significant results at $\alpha = .05$ (two-tailed). Allowing for 10% attrition due to drop-outs and/or measurement error, the recruitment target was 58 participants per condition, for a total of 116 participants.

Evaluation Phase: Procedure

The RCT involved two study visits (see Figure 1 for a visual depiction of the study procedures). The recruitment process and initial administration of study measures proceeded as described above for the Development Phase. Using stratified random sampling for gender, participants were randomized to the two conditions in equal numbers using a blinded process. Before entering the room to administer the hypocrisy induction procedures, the experimenter obtained an envelope with a slip of paper indicating whether the participant had been randomized to the EX condition or the NI condition. As in the Development Phase, the experimenter then administered the experimental procedures, which were the same as those described above in the Development Phase: Procedure section. Participants in the EX condition completed these procedures. Participants in the NI condition were exposed to health behavior-related information, did not record a video, and did not complete a private reminders task. They were told they needed to wait for a period of time before completing the next part of the session and were given magazines unrelated to health or appearance to read while waiting to proceed. They waited for a similar amount of time as was needed for completion of the hypocrisy induction procedures used in the EX condition. Upon conclusion of the experimental portion of the session, participants completed the Dissonance Thermometer followed by the measures of exercise and dietary intentions and the dissonance manipulation check. The experimenter then provided instructions for wearing the accelerometer and confirmed the date and time of the second study visit to take place the following week. All participants were told they were being asked to wear the accelerometer to evaluate the comfort of the device, which was being considered for use in an upcoming study. As an immediate evaluation of the effect of the hypocrisy induction intervention on physically active behavior, the experimenter walked the participant out of the lab

and said, “I will show you out of the building. Would you like to take the stairs or the elevator?” Participants’ choices were noted to explore whether the proportion of participants choosing the stairs versus the elevator differed by study condition. Three days after the first study visit, all participants were contacted via email requesting confirmation of their plans to attend their second study session and inquiring whether they had encountered any problems with the device. Additionally, EX condition participants were asked to watch their recorded speech, which was attached to the email in a digital file. These participants were told the experimenters had found that some recordings were cut off early and were asked to watch the video and report whether or not their recording was complete. All participants were asked to respond within 24 hours. If a response was not received within the 24-hour window, a reminder message was sent each day until a response was received or the second study visit occurred. At the second study visit (one week after the first visit), participants were again greeted by the experimenter, who removed the accelerometer. Participants then completed the self-report measures of exercise and dietary behavior. Finally, participants were debriefed regarding the purpose of the study.

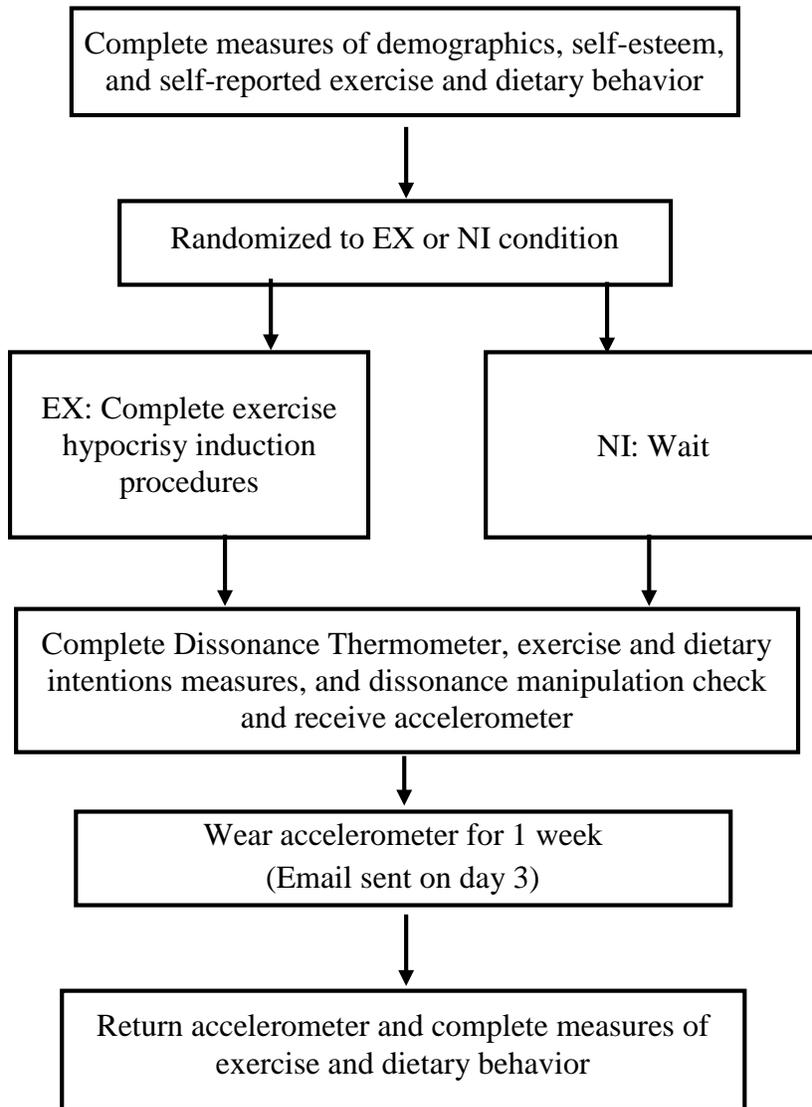


Figure 1. Flow chart depicting RCT sequence of events.

Evaluation Phase: Measures

The RCT included the same screening, demographics, self-esteem, self-reported exercise and dietary behavior, and dissonance-related measures described above. Additional measures included in the RCT are as follows:

Physical activity (objective). Post-intervention physical activity was tracked using the omnidirectional Actical accelerometer (Philips Respironics, Bend, OR) worn continuously on the

wrist. Data was collected using 30-second epochs (intervals), and raw Actical data was recorded as counts per minute. At the end of the measurement period, data were downloaded, examined for spurious data points (defined as counts greater than 20,000 (Heil, Bennett, Bond, Webster, & Wolin, 2009)) and periods of non-wear, and processed for analysis using Actical 3.10 software. Established cut points were used to identify periods of sedentary, light, moderate, and vigorous activity. Cases were included in the analyses if they contained at least four valid days (with a valid day defined as 10 or more hours of wear time) including at least one weekend day (Troiano et al., 2008; Tucker, Welk, & Beyler, 2011; Ward, Evenson, Vaughn, Rodgers, & Troiano, 2005). Mean total accelerometer counts, percentage of total time spent in moderate activity, and percentage of total time spent in vigorous activity served as the outcome variables.

Exercise intention. Participants reported their intention to exercise by responding to two items: (1) “During the next week, my goal is to exercise the following number of days,” with response options ranging from 0 to 7; and (2) “During the next week, to what extent do you intend to exercise for at least 30 minutes per day at least 5 days of the week?” which was presented using a visual analog scale on which participants selected a position along a continuum with endpoints of “*not at all*” and “*to the greatest extent possible.*” These items were designed in accordance with suggestions made by Courneya and McAuley (1993), who examined methodological issues in the assessment of physical activity intention. Both items were converted to a 100-point scale, and the average of the two was used as the measure of exercise intention.

Dietary intention. The measure of dietary intention mirrored the measure of exercise intention. Participants reported their intention to consume fruits and vegetables by responding to two items: (1) “During the next week, my goal is to eat the following number of fruits and

vegetables servings each day,” with response options ranging from 0 to 9; and (2) “During the next week, to what extent do you intend to eat least five fruits and vegetables servings each day?” which was presented using a visual analog scale on which participants selected a position along a continuum with endpoints of “*not at all*” and “*to the greatest extent possible.*” Both items were converted to a 100-point scale, and the average of the two was used as the measure of dietary intention.

Dissonance manipulation check (control condition version). Participants in the control condition completed a two-part question designed to mirror the dissonance manipulation check administered to the experimental condition participants (described above). Part one is as follows: “After participating in this study, do you think there is any discrepancy between what you did here today and your usual behavior?” (Yes/No). For participants who responded affirmatively, the second part of the question was asked; participants who answered “No” to part one were not asked part two. Part two reads, “How much does this discrepancy bother you?” and is rated on a 5-point Likert scale (0 = *not at all* – 4 = *a lot*).

Evaluation Phase: Statistical Analyses

Prior to conducting analyses relevant to the study aims, t-tests and chi-square analyses were used to determine whether the EX and NI groups differed on any demographic or behavioral variables at baseline. Any variables upon which groups differed at the $p < .05$ level were to be entered as covariates where appropriate in later analyses. Additionally, relevant psychological and behavioral variables were evaluated for skewness and kurtosis before being used in analyses. The exercise and dietary intention variables did not demonstrate large amounts of skewness or kurtosis, so no transformations were conducted for these variables. The skew and kurtosis values for the self-reported exercise behavior, self-reported dietary behavior, and

objectively assessed physical activity (mean accelerometer counts, percentage of time in moderate activity, and percentage of time in vigorous activity) variables were elevated, so square root transformed versions of these variables were created. Analyses of these outcomes were run with both the transformed and the untransformed versions of these variables.

Aim 2 involved evaluating the effects of the hypocrisy induction intervention for exercise relative to a no-intervention control condition. The outcomes of interest relevant to this aim were the measures of exercise intention, physical activity-related behavior choice, self-reported exercise behavior, and objectively assessed physical activity. For exercise intention and objectively assessed physical activity, a t-test was used to evaluate the effects of the intervention. For physical activity-related behavior choice, a chi-square analysis was used. For self-reported exercise, ANCOVA was used to examine the effect of group with baseline scores as the covariate, and the PROCESS macro for SPSS and SAS (Hayes, 2013) was used to explore self-esteem as a potential moderator. Analyses were conducted using SAS version 9.4. For all analyses, p -values ≤ 0.05 were considered statistically significant.

Results

Participant Characteristics

Participant flow is depicted in the CONSORT diagram (Figure 2). Of the 120 participants who provided consent, two were non-evaluable; thus, 118 participants are included in the current analyses. Participants' demographic, psychological, and behavioral characteristics at baseline are listed in Table 1. Overall, participants were primarily female (85%) and non-Hispanic (76%); the most common racial identities were White (47%), Asian (24%), and Black/African American (17%). The mean age of participants was 20.05 years old ($SD = 1.49$), and the mean BMI fell in the normal range ($M = 23.64$, $SD = 4.69$). Nearly all participants were unmarried (98%), and most lived with a roommate/friend (73%). Most participants were full-time students (92%), and the sample was divided relatively evenly between class years. Just over half of participants were not employed (54%), and 45% were employed part-time. Participants' reports of their physical activity resulted in 12% classified in the "low" category (i.e., not meeting minimal recommendations), 53% in the "moderate" category (i.e., meeting minimal recommendations), and 35% in the "high" category. The vast majority of participants reported no history of smoking (97%), and just over half reported drinking alcohol in the past month (51%). Participants in the EX condition did not differ significantly from participants in the NI condition on any of these characteristics (see Table 1). Correlations between participant characteristics and study outcomes are shown in Table 2.

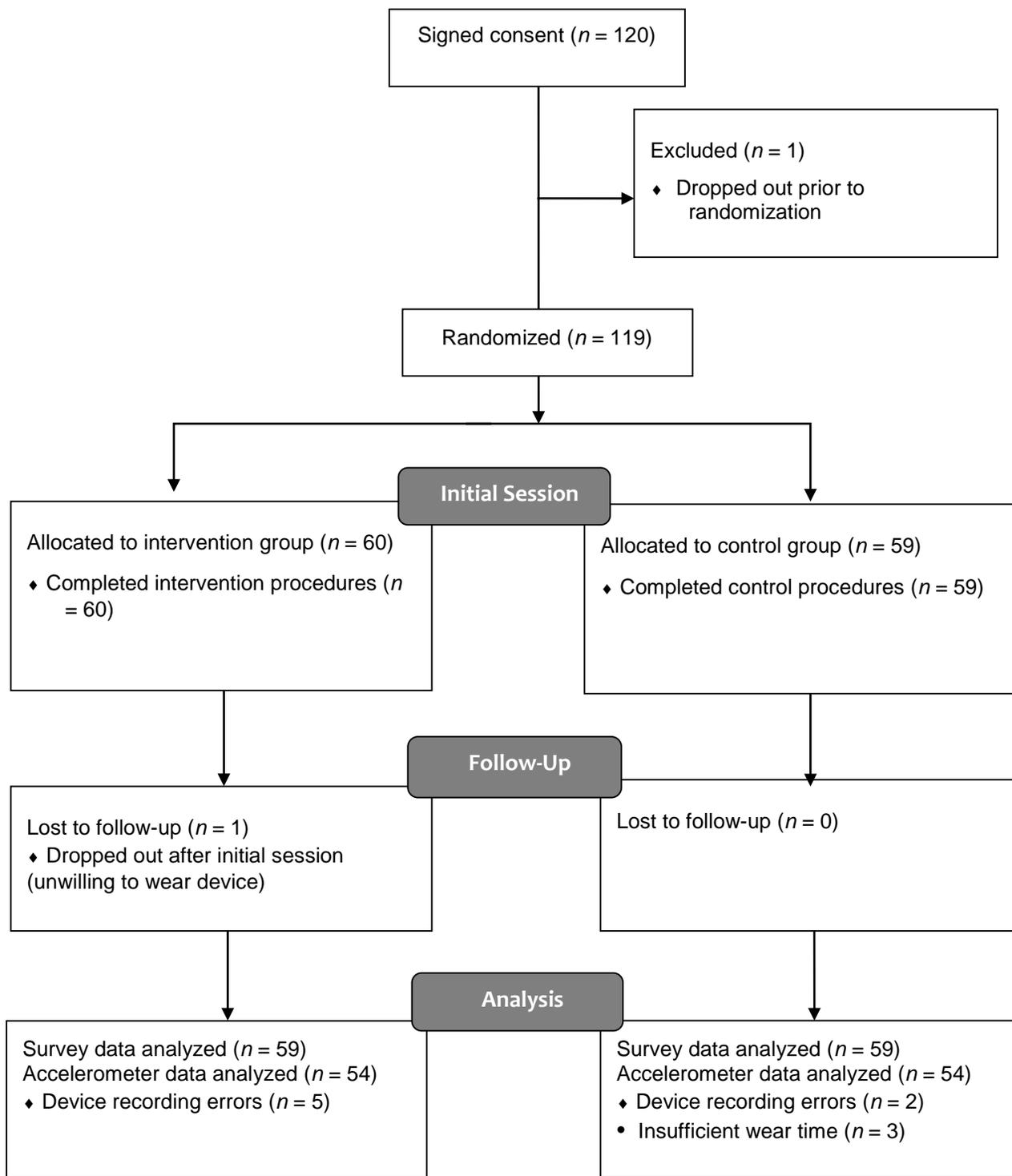


Figure 2. CONSORT diagram.

Table 1. *Participants' demographic, psychological, and behavioral characteristics at baseline (N = 118)*

| | Overall Sample (<i>n</i> = 118) | EX Condition (<i>n</i> = 59) | NI Condition (<i>n</i> = 59) | <i>p</i> -value |
|------------------------------|-------------------------------------|----------------------------------|----------------------------------|-----------------|
| Gender (% female) | 100 (85%) | 50 (85%) | 50 (85%) | .59 |
| Age, M (SD) | 20.05 (1.49) | 20.01 (1.44) | 20.10 (1.55) | .74 |
| BMI M (SD) | 23.64 (4.69) | 24.23 (5.33) | 23.05 (3.90) | .17 |
| Ethnicity (% non-Hispanic) | 90 (76%) | 46 (78%) | 44 (75%) | .67 |
| Marital Status (% unmarried) | 116 (98%) | 58 (98%) | 58 (98%) | 1.00 |
| Race | | | | .65 |
| Asian | 28 (24%) | 11 (19%) | 17 (29%) | |
| Black/African American | 20 (17%) | 12 (20%) | 8 (14%) | |
| White | 56 (47%) | 29 (49%) | 27 (46%) | |
| Other | 14 (12%) | 7 (12%) | 7 (12%) | |
| Student Status (% full-time) | 108 (92%) | 55 (93%) | 53 (90%) | .51 |
| Year in College | | | | .11 |
| Freshman | 39 (33%) | 19 (32%) | 20 (34%) | |
| Sophomore | 21 (18%) | 7 (12%) | 14 (24%) | |
| Junior | 24 (20%) | 17 (29%) | 7 (12%) | |
| Senior | 33 (28%) | 16 (27%) | 17 (29%) | |
| Not seeking degree | 1 (1%) | 0 (0%) | 1 (2%) | |
| Job Status | | | | .54 |
| Not employed | 64 (54%) | 33 (56%) | 31 (53%) | |
| Employed part-time | 53 (45%) | 25 (42%) | 28 (47%) | |
| Employed full-time | 1 (1%) | 1 (2%) | 0 (0%) | |
| Housing | | | | .08 |
| Alone | 1 (1%) | 0 (0%) | 1 (2%) | |
| With roommate/friend | 86 (73%) | 45 (76%) | 41 (69%) | |
| With family | 20 (17%) | 6 (10%) | 14 (24%) | |
| With romantic partner/spouse | 11 (9%) | 8 (14%) | 3 (5%) | |
| Activity Level | | | | .22 |
| Low | 14 (12%) | 9 (15%) | 5 (8%) | |
| Moderate | 63 (53%) | 27 (46%) | 36 (61%) | |
| High | 41 (35%) | 23 (39%) | 18 (31%) | |
| Smoking (% never smokers) | 114 (97%) | 57 (97%) | 57 (97%) | 1.00 |
| Alcohol (% no alcohol) | 60 (51%) | 30 (51%) | 30 (51%) | 1.00 |

Note. EX condition = exercise intervention condition. NI condition = no-intervention control condition.

Table 2. Correlations between participant characteristics and study outcomes

| | Exercise Intention | DT | Self-Reported Exercise T2 | Mean Counts | % Time Moderate Activity | % Time Vigorous Activity |
|---------------------------|--------------------|----------|---------------------------|-------------|--------------------------|--------------------------|
| Gender | 0.13 | 0.01 | 0.13 | 0.27** | 0.21* | 0.22* |
| Age | 0.10 | -0.07 | 0.10 | 0.00 | -0.06 | 0.05 |
| BMI | 0.08 | 0.13 | 0.12 | 0.16 | 0.14 | 0.15 |
| Ethnicity | 0.04 | 0.24** | -0.05 | 0.02 | 0.02 | 0.11 |
| Race | 0.07 | -0.09 | 0.21* | 0.10 | 0.13 | -0.16 |
| Marital Status | -0.07 | -0.01 | -0.01 | -0.21* | -0.20* | -0.11 |
| Student Status | 0.00 | 0.04 | 0.05 | 0.12 | 0.07 | 0.12 |
| Year in College | 0.10 | -0.04 | 0.10 | 0.03 | -0.05 | 0.10 |
| Job Status | -0.06 | -0.19* | 0.15 | 0.19* | 0.09 | 0.06 |
| Housing | 0.04 | 0.13 | -0.04 | 0.00 | -0.04 | 0.00 |
| Smoking | 0.04 | 0.11 | 0.03 | 0.11 | 0.07 | 0.12 |
| Alcohol | 0.06 | -0.12 | 0.15 | 0.13 | 0.09 | 0.04 |
| Self-Esteem | 0.01 | -0.40*** | 0.02 | 0.04 | 0.02 | 0.06 |
| Self-Reported Exercise T1 | 0.37*** | -0.09 | 0.51*** | 0.11 | 0.05 | 0.27** |

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. DT = Dissonance Thermometer. T1 = baseline. T2 = follow-up.

Dietary Intention and Behavior

Since the intervention did not target dietary behavior, no hypotheses were generated regarding the potential effects of the intervention on dietary intention and behavior. A t -test revealed no significant difference in dietary intention between the intervention condition ($M = 49.25$, $SD = 21.65$) and the control condition ($M = 46.07$, $SD = 23.98$); $t(116) = 0.76$, $p = .45$.

Likewise, ANCOVA controlling for baseline dietary behavior using the transformed versions of the dietary behavior variables showed that the effect of condition on dietary behavior at follow-up was not significant; $F(1, 58) = 1.96$, $p = .16$. The pattern of results was unchanged using the untransformed versions of the dietary behavior variables.

Process Measure: Dissonance

Intervention participants' mean score on the discomfort factor of the Dissonance Thermometer ($M = 2.02$, $SD = 1.07$) was higher than the mean score of control participants ($M = 1.79$, $SD = 0.92$), but this difference was not statistically significant; $t(116) = 1.26$, $p = .21$, $d = 0.23$. However, intervention participants reported feeling significantly more uneasy ($p = .04$), shameful ($p = .01$), and embarrassed ($p < .001$) and significantly less optimistic ($p = .004$) than control participants (see Table 3 for a comparison of the two groups on each feelings item). On the dissonance manipulation check, 68% (40/59) of intervention participants and 2% (1/59) of control participants noted a discrepancy between their normal behavior and what they did in the initial study session. Of the 40 intervention participants who noted a discrepancy, only one participant indicated no bother about the discrepancy, and the mean bother rating was 2.15 ($SD = 1.05$; scale is 0-4).

Table 3. *Participants' Dissonance Thermometer scores for individual feelings items (N = 118)*

| Item | EX Condition ($n = 59$) M (SD) | NI Condition ($n = 59$) M (SD) | t | p -value |
|--------------------------|---|---|-------|------------|
| Uncomfortable | 2.22 (1.52) | 2.27 (1.40) | -0.19 | .85 |
| Angry at myself | 1.78 (1.37) | 1.66 (1.38) | 0.47 | .64 |
| Shame | 2.07 (1.61) | 1.46 (0.84) | 2.59 | .01 |
| Uneasy | 2.03 (1.22) | 1.63 (0.95) | 2.03 | .04 |
| Friendly | 5.20 (1.32) | 5.37 (1.32) | -0.70 | .49 |
| Disgusted with myself | 1.58 (1.33) | 1.37 (0.91) | 0.97 | .33 |
| Embarrassed | 2.41 (1.71) | 1.42 (1.07) | 3.74 | <.001 |
| Bothered | 1.80 (1.35) | 1.46 (1.07) | 1.51 | .13 |
| Optimistic | 4.44 (1.32) | 5.17 (1.37) | -2.95 | .004 |
| Annoyed at myself | 2.08 (1.57) | 1.78 (1.45) | 1.10 | .28 |
| Disappointed with myself | 2.25 (1.63) | 1.80 (1.23) | 1.73 | .09 |
| Happy | 4.61 (1.39) | 5.10 (1.40) | -1.92 | .06 |
| Energetic | 4.10 (1.39) | 4.02 (1.57) | 0.31 | .76 |
| Good | 5.00 (1.46) | 5.34 (1.27) | -1.35 | .18 |

Note. EX condition = exercise intervention condition. NI condition = no-intervention control condition.

Exercise Intention

To test the hypothesis that exercise intention would be greater in the EX condition compared to the NI condition, a *t*-test was conducted. The hypothesis was supported: Intervention participants reported greater intention to exercise ($M = 59.12$, $SD = 20.14$) than did control participants ($M = 49.47$, $SD = 24.40$), and this difference was statistically significant; $t(116) = 2.34$, $p = .02$, $d = 0.43$. To explore self-esteem as a potential moderator of the relationship between study condition and exercise intention, a multivariate regression analysis was conducted regressing exercise intention on study condition, self-esteem, and an interaction term for study condition and self-esteem. Neither self-esteem nor the interaction term was significant ($p = .71$ and $p = .65$ respectively), so no further moderator analyses were conducted for this outcome.

Self-Reported Exercise

To test the hypothesis that self-reported exercise behavior at follow-up would be greater in the EX condition compared to the NI condition, ANCOVA controlling for baseline self-reported exercise behavior was conducted, first using the transformed versions of the exercise behavior variables. The hypothesis was not supported: Though intervention participants reported more exercise behavior than control participants (EX condition: $M = 22.78$, $SD = 16.53$; NI condition: $M = 17.13$, $SD = 15.26$), the effect of condition was not statistically significant; $F(1, 115) = 3.18$, $p = .08$, $d = 0.35$. The pattern of results was unchanged using the untransformed versions of the exercise behavior variables.

To explore self-esteem as a potential moderator of the relationship between study condition and self-reported exercise at follow-up, the PROCESS macro first performed a multivariate regression analysis regressing follow-up exercise behavior on baseline exercise

behavior, study condition, self-esteem, and an interaction term for study condition and self-esteem. The interaction term was significant ($p = .04$), so the effect of self-esteem in each study condition was evaluated. Self-esteem was a borderline significant predictor of follow-up exercise behavior in the EX condition [$\beta = -0.71$, $t(115) = -1.95$, CI: $-1.44 - 0.01$, $p = .05$] and was not significant in the NI condition [$\beta = 0.39$, $t(115) = 1.02$, CI: $-0.37 - 1.15$, $p = .31$]. However, the point estimate for each group did not fall within the confidence interval of the other group's point estimate, indicating that the relationship between self-esteem and exercise at follow-up was significantly different between the two groups. For descriptive purposes, follow-up exercise behavior was plotted in each condition at the mean for self-esteem as well as one standard deviation below and one standard deviation above the mean. As shown in Figure 3, follow-up exercise behavior was approximately equivalent across levels of self-esteem in the NI condition, while follow-up exercise behavior was noticeably lower as level of self-esteem increased in the EX condition.

Immediate Physical Activity-Related Behavior Choice

To test the hypothesis that participants in the EX condition would be more likely to choose the stairs over the elevator compared to participants in the NI condition, chi-square analysis was used. Due to the location of the room where study sessions were conducted, many participants opted to take a nearby staircase and were unable to be presented with a direct choice of stairs versus elevator. Participants' choice of stairs, elevator, or "other" (which consisted primarily of participants opting for the nearby staircase) did not differ by condition ($X^2(2, N = 118) = 0.23$, $p = .89$); thus, the hypothesis regarding this outcome was not supported.

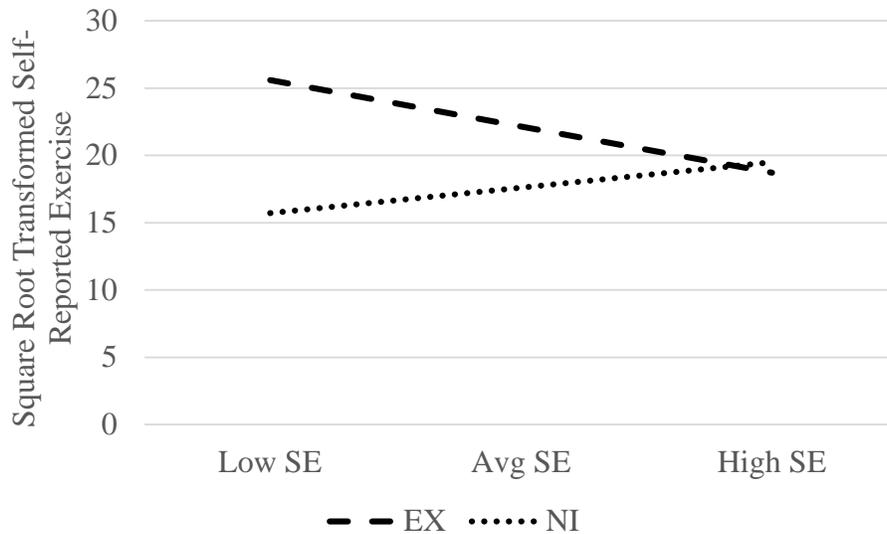


Figure 3. Follow-up self-reported exercise at the mean for self-esteem (Avg SE) and one standard deviation above (High SE) and below (Low SE) the mean in the exercise intervention condition (EX) and the no-intervention control condition (NI).

Objectively Assessed Physical Activity

After removing non-evaluable cases, 108 participants (54 in each condition) were included in the accelerometry analyses (see the CONSORT diagram in Figure 2). To test the hypothesis that objectively assessed physical activity during the week following the first study visit would be greater in the EX condition compared to the NI condition, *t*-tests evaluating mean accelerometer counts, percentage of time in moderate activity, and percentage of time in vigorous activity were conducted, first using the transformed versions of the activity variables. The hypothesis was not supported: Though intervention participants engaged in more activity than control participants according to all three variables, the differences were not statistically significant (see Table 4 for the complete results). The pattern of results was unchanged using the untransformed versions of the variables.

Table 4. Results of *t*-tests comparing objectively assessed physical activity in intervention versus control participants (*N* = 108)

| Outcome Variable | EX Condition (<i>n</i> = 54) <i>M</i> (<i>SD</i>) | NI Condition (<i>n</i> = 54) <i>M</i> (<i>SD</i>) | <i>t</i> | <i>p</i> -value | <i>d</i> |
|--------------------------|--|--|----------|-----------------|----------|
| Mean Counts | 15.01 (2.57) | 14.42 (2.00) | 1.32 | .19 | 0.26 |
| % Time Moderate Activity | 2.79 (0.73) | 2.65 (0.60) | 1.09 | .28 | 0.21 |
| % Time Vigorous Activity | 0.17 (0.23) | 0.11 (0.19) | 1.49 | .14 | 0.28 |

Note. EX condition = exercise intervention condition. NI condition = no-intervention control condition.

Discussion

This study was the first to rigorously evaluate a hypocrisy induction intervention for exercise behavior. While the availability of effective interventions to initiate exercise participation is encouraging, the lack of long-term maintenance of intervention effects and the presence of a sizable intention-behavior gap suggest that attention must be allocated to developing interventions to help people who value being active but do not exercise regularly. In this two-stage study, a hypocrisy induction intervention for exercise was developed and subsequently evaluated in a small-scale RCT.

The first study aim was to develop and test a hypocrisy induction intervention for exercise. After two rounds of pilot testing in the design phase, the goal of designing hypocrisy induction procedures that evoke substantial cognitive dissonance in most participants was met. The second study aim was to evaluate the effects of the hypocrisy induction intervention for exercise relative to a no-intervention control condition. The hypothesis that exercise-related outcomes would be superior in the intervention condition was partially supported. Intention to exercise was significantly higher in intervention condition participants compared to control condition participants, and this effect was not moderated by self-esteem. By contrast, immediate physical activity-related behavior choice did not differ between groups; however, this measure was not able to be employed as intended due to unavoidable circumstances related to the location where the sessions were conducted. Additionally, objectively assessed physical activity (mean accelerometer counts, percentage of time in moderate activity, and percentage of time in vigorous activity) did not differ significantly between groups, though the means differed

noticeably in the expected direction. Furthermore, a trend ($p = .08$) for more self-reported exercise in the intervention condition was observed, but the difference was not significant. Finally, self-esteem was found to interact with study condition in predicting self-reported exercise at follow-up. Specifically, results suggested that level of self-esteem had little impact on self-reported exercise among participants in the no-intervention control condition, while lower levels of self-esteem were associated with more self-reported exercise in the exercise intervention condition.

Exercise-Related Outcomes

In the present study, the hypocrisy induction intervention for exercise demonstrated a medium-sized effect on intention to exercise. This finding is comparable to the medium-sized effect demonstrated in the previously discussed study by Bator and Bryan (2007), in which a similar exercise intervention delivered in a naturalistic setting increased intention to exercise at least four times per week. Positive effects of hypocrisy induction interventions on behavioral intentions have also been demonstrated in studies of other behaviors including smoking and sexual risk behavior (see Freijy & Kothe, 2013 for a review).

The present intervention demonstrated a small-to-medium effect on self-reported exercise and small effects on objectively assessed physical activity outcomes. The literature on hypocrisy induction interventions' effects on behavioral outcomes has been largely positive, with the majority of studies reviewed by Freijy and Kothe (2013) demonstrating a positive effect on at least one behavioral outcome. However, evaluating the strength of the effects found in prior studies to those found in the present study is complicated by the inconsistent methodology and reporting of prior studies including lack of a control group, failure to perform statistical analyses for outcomes, and omission of effect sizes or the information needed to calculate them.

Additionally, the earlier studies evaluated self-reported behavior or discrete behavioral choices, making the period of continual objective assessment of behavior used in this study unique and difficult to situate in the context of the earlier literature. Overall, the direction of the findings for self-reported exercise and objectively assessed physical activity agree with the earlier literature and provide support for further evaluation of hypocrisy induction interventions in the context of exercise, though the fact that these effects failed to reach statistical significance must be acknowledged.

Furthermore, the findings for self-reported exercise, in which the effect of the intervention fell just outside statistical significance and a significant interaction was observed between study condition and self-esteem, align with those of a previous study of hypocrisy induction for smoking behavior and general healthy lifestyle habits (Peterson et al., 2008). In that study, a similar pattern of a nonsignificant effect of hypocrisy induction and a significant interaction between study condition (i.e., hypocrisy versus control) and self-esteem was observed in the context of intention to quit smoking (study one) and intention to improve health-related lifestyle behaviors (study two). Interestingly, self-esteem appeared to have the opposite effect in the present study versus Peterson et al. (2008): In the present study, self-esteem was negatively related to the outcome (i.e., self-reported exercise) in the hypocrisy condition, while Peterson et al. (2008) found that self-esteem was positively related to the outcome (i.e., intention to change smoking or health-related lifestyle behaviors) in the hypocrisy condition.

This divergence in findings illustrates the ongoing debate in the literature between Aronson's self-consistency perspective (Aronson, 1968; Thibodeau & Aronson, 1992), which suggests people with low self-esteem should be less impacted by dissonance-based interventions, and Steele's self-affirmation perspective (Steele, 1988), which suggests people with high self-

esteem should be less impacted by dissonance-based interventions. The present study's findings for self-reported exercise behavior agree with the latter view, while Peterson et al.'s results align with the former. Given the differences in targeted behaviors evaluated in the present study versus that of Peterson et al. and the fact that self-esteem moderated the self-reported behavior but not the intention outcome in the present study (Peterson et al. did not include a behavioral measure), it is difficult to draw definitive conclusions about these findings. The role of self-esteem in hypocrisy induction interventions clearly warrants additional evaluation.

Dissonance Measurement

In the present study, dissonance served as a process variable and was measured using two different methods. The majority of the participants in the intervention condition and almost none of the participants in the control condition reported a perceived intrapersonal discrepancy and discomfort with that discrepancy on the dissonance manipulation check measure, while the between-groups difference on the Dissonance Thermometer was not significant. These findings have implications for measurement of dissonance in studies of dissonance-based interventions, suggesting the Dissonance Thermometer may not be an adequate measure of dissonance for hypocrisy induction intervention studies. The present results were not explicitly predicted, but they fit in the context of existing literature on the Dissonance Thermometer: The creators of the measure have acknowledged it may not be adequate for all types of dissonance induction (Devine et al., 1999), and other studies of dissonance-based interventions have also achieved results indicative of dissonance induction despite Dissonance Thermometer results suggesting dissonance was not induced (e.g., Simmons, Webb, & Brandon, 2004). At this time, it cannot be absolutely ruled out that the dissonance manipulation check captured some other construct and/or

that the effects of these interventions have been due to a mechanism other than dissonance, but these alternative explanations seem less likely.

The present findings may also be useful as an early exploration of the feelings that are impacted by hypocrisy induction interventions. The results presented here suggest that rather than leading to greater feelings of being uncomfortable, uneasy, and bothered as suggested by the Dissonance Thermometer, dissonance in hypocrisy induction interventions may lead participants to feel more shameful, uneasy, and embarrassed and less optimistic. Reduced optimism is a potentially negative consequence; however, the fact that participants in the intervention condition reported greater intention to exercise than control participants suggests the reduced optimism did not negatively impact their motivation to exercise. Further evaluation of the Dissonance Thermometer and the feelings induced by hypocrisy induction interventions is warranted before firm conclusions can be drawn.

Specificity of the Intervention

The intervention developed and evaluated in the present study was designed to target exercise behavior. However, this problem is not unique to exercise behavior. Similar lapses in healthy behavior and discrepancies between intention and behavior occur in other preventive health behaviors. Interestingly, previous hypocrisy induction intervention studies have not explored whether the effects of hypocrisy induction are behavior-specific or evoke a general state of health behavior-related dissonance that might produce changes in other health behaviors not specifically targeted by the intervention. The lack of differences between the intervention group and the control group in this study in the context of fruits and vegetables intake intention and self-reported dietary behavior suggests the effects of hypocrisy induction are behavior-specific. Nonetheless, additional exploration of this question in future studies may be warranted.

Strengths and Limitations

The present study featured several strengths including the theory-based intervention design of the intervention, pilot testing of the intervention in the development phase, use of psychometrically sound self-report measures as well as an objective measure of physical activity, recruitment of an ethnically and racially heterogeneous sample, and carefully executed RCT procedures in the evaluation phase. The study was methodologically rigorous and carefully conducted; nonetheless, several limitations should be noted. For the primary analyses, the study was powered to detect medium-sized effects. The sample size may have been inadequate to detect the smaller effects (ranging from $d = .21$ to $d = .35$) that were observed in the self-reported exercise and objectively assessed physical activity analyses; a larger sample may have rendered these effects significant. Also with regard to the sample, only 15% of participants were male; ideally, the gender split would have been more equal to allow for evaluation of differences in outcomes based on gender. Additionally, the location of the study sessions precluded proper administration of the behavior choice measure, leaving the effects of the intervention on immediate physical activity-related behavior choices unknown. Furthermore, this study recruited only college students between 18 and 25 years of age. This limited the findings' generalizability to the broader U.S. adult population but allowed for targeting of an important at-risk subpopulation. Future studies should evaluate this intervention in a sample that more closely represents the general adult population. Finally, because this was an early exploration of a hypocrisy induction intervention for exercise, the study was designed to evaluate short-term effects; its longevity should be tested in a future study.

Future Directions

The present study and its findings point to a number of topics for future research to explore. Given the ubiquity of technology and the need for cost-efficient, scalable interventions, a future study might explore a hypocrisy induction intervention for exercise that is delivered in a web- or application-based format. Additionally, future studies may evaluate whether it is possible to effectively target more than one health behavior at a time in a hypocrisy induction intervention. Furthermore, though the mechanisms by which hypocrisy induction exerts its effects have been hypothesized, systematic evaluation of the mechanisms of the hypocrisy induction intervention approach has not yet been undertaken. Finally, as hypocrisy induction is one of several behavior change approaches involving self-perception, comparison of this approach to others may be warranted. Interestingly, self-affirmation interventions in which participants affirm personally-relevant values in order to reduce stress and defensiveness appear to operate in nearly the opposite manner as hypocrisy induction interventions but may also promote health behavior change (Harris, 2011; Harris & Epton, 2009). A future study might compare a self-affirmation intervention versus a dissonance-based intervention in the context of exercise.

Conclusion

This study was the first to rigorously evaluate a hypocrisy induction intervention for exercise behavior. Participants who received the intervention reported significantly greater intention to exercise than did control participants who did not receive the intervention. Small effects in favor of the intervention were also found for self-reported exercise and objectively assessed physical activity, but these effects were nonsignificant, likely due to limited power. Self-esteem influenced the effect of the intervention on self-reported exercise: A negative

relationship between self-reported exercise post-intervention and self-esteem was found, indicating that the intervention had a greater impact on self-reported exercise in participants with average or below average self-esteem. The present findings provide preliminary support for use of hypocrisy induction interventions in exercise promotion, but additional research is needed to determine for whom and in what situations this approach is best used. If additional research supports its efficacy, hypocrisy induction has the potential to be a cost-efficient, scalable booster for lapses in exercise behavior.

References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.
- Aronson, E. (1968). Dissonance theory: Progress and problems. In Ableson et al. (Eds.), *Theories of cognitive consistency: A sourcebook* (pp. 5–27). Chicago: Rand McNally.
- Aronson, E., Fried, C., & Stone, J. (1991). Overcoming denial and increasing the intention to use condoms through the induction of hypocrisy. *American Journal of Public Health*, 81, 1636-1638.
- Barquissau, M., & Stone, J. (2000). *When hypocrisy induced dissonance encourages exercise behavior*. Unpublished manuscript, University of Arizona.
- Bator, R.J., & Bryan, A. (August, 2007). Revised hypocrisy manipulation to induce commitment to exercise. Poster presented at the annual conference of the American Psychological Association, San Francisco, CA.
- Caspersen, C. J., Pereira, M. A., & Curran, K. M. (2000). Changes in physical activity patterns in the United States, by sex and cross-sectional age. *Medicine and Science in Sports and Exercise*, 32, 1601-1609.
- Centers for Disease Control and Prevention. (2013a). Adult participation in aerobic and muscle-strengthening physical activities — United States, 2011. *Morbidity and Mortality Weekly Report*, 62, 326-330.

- Centers for Disease Control and Prevention (2013b). Behavioral Risk Factor Surveillance System Survey Questionnaire. Atlanta, Georgia: U.S. Department of Health and Human Services.
- Courneya, K. S., & McAuley, E. (1993). Predicting physical activity from intention: Conceptual and methodological issues. *Journal of Sport & Exercise Psychology, 15*, 50-62.
- Craig, C.L., Marshall, A.L., Sjostrom, M., Bauman, A.E., Booth, M.L., Ainsworth, B.E., ... Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine & Science in Sports & Exercise, 35*, 1381-1395
- Devine, P.G., Tauer, J.M., Barron, K.E., Elliot, A.J., & Vance, K.M. (1999). Moving beyond attitude change in the study of dissonance-related processes. In E. Harmon-Jones & J. Mills (Eds.), *Cognitive dissonance: Progress on a pivotal theory in social psychology* (pp. 297-323). Washington, D.C.: American Psychological Association.
- Dishman, R. K. (1988). *Exercise adherence*. Champaign, IL: Human Kinetic Books.
- Dishman, R. K., & Buckworth, J. (1996). Increasing physical activity: A quantitative synthesis. *Medicine and Science in Sports and Exercise, 28*, 706-719.
- Elliot, A.J. & Devine, P.G. (1994). On the motivational nature of cognitive dissonance: Dissonance as psychological discomfort. *Journal of Personality and Social Psychology, 67*, 382-394.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Evanston, IL: Row, Peterson.
- Foster, C., Hillsdon, M., Thorogood, M., Kaur, A., & Wedatilake, T. (2005). Interventions for promoting physical activity. *Cochrane Database of Systematic Reviews*, Issue 1. Art. No.: CD003180. DOI: 10.1002/14651858.CD003180.pub2.

- Freijy, T., & Kothe, E. J. (2013). Dissonance-based interventions for health behaviour change: A systematic review. *British Journal of Health Psychology, 18*, 310-337.
- Galinsky, A. D., Stone, J., & Cooper, J. (2000). The reinstatement of dissonance and psychological discomfort following failed affirmations. *European Journal of Social Psychology, 30*, 123-147.
- Garber, C.E., Blissmer, B., Deschenes, M.R., Franklin, B.A., Lamonte, M.J., Lee, I.-M., ... Swain, D.P. (2011). Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: Guidance for prescribing exercise. *Medicine & Science in Sports & Exercise, 43*, 1334-1359.
- Gordon-Larsen, P., Nelson, M. C., & Popkin, B. M. (2004). Longitudinal physical activity and sedentary behavior trends: Adolescence to adulthood. *American Journal of Preventive Medicine, 27*, 277-283.
- Harris, P. R. (2011). Self-affirmation and the self-regulation of health behavior change. *Self and Identity, 10*, 304-314.
- Harris, P. R., & Epton, T. (2009). The impact of self-affirmation on health cognition, health behaviour and other health-related responses: A narrative review. *Social and Personality Psychology Compass, 3*, 962-978.
- Haskell, W.L., Lee, I.M., Pate, R.R., Powell, K.E., Blair, S.N., Franklin, B.A., & ... Bauman, A. (2007). Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Medicine and Science in Sports and Exercise, 39*, 1423-1434.

- Hausenblas, H. A., Carron, A. V., & Mack, D. E. (1997). Application of the theories of reasoned action and planned behavior to exercise behavior: A meta-analysis. *Journal of Sport & Exercise Psychology, 19*, 36-51.
- Hayes, A.F. (2013). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. New York, NY: The Guilford Press.
- Heil, D. P., Bennett, G. G., Bond, K. S., Webster, M. D., & Wolin, K. Y. (2009). Influence of activity monitor location and bout duration on free-living physical activity. *Research Quarterly for Exercise and Sport, 80*, 424-433.
- IPAQ Research Committee. (2005). Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ): Short and long forms. Retrieved from <http://www.ipaq.ki.se/scoring.pdf>
- Jeon, C. Y., Lokken, R. P., Hu, F. B., & Van Dam, R. M. (2007). Physical activity of moderate intensity and risk of type 2 diabetes A systematic review. *Diabetes Care, 30*, 744-752.
- Kahn, E. B., Ramsey, L. T., Brownson, R. C., Heath, G. W., Howze, E. H., Powell, K. E., ... & Corso, P. (2002). The effectiveness of interventions to increase physical activity: A systematic review. *American Journal of Preventive Medicine, 22*, 73-107.
- Kodama, S., Saito, K., Tanaka, S., Maki, M., Yachi, Y., Asumi, M., ... & Sone, H. (2009). Cardiorespiratory fitness as a quantitative predictor of all-cause mortality and cardiovascular events in healthy men and women: A meta-analysis. *JAMA, 301*, 2024-2035.
- Marcus, B. H., Forsyth, L. H., Stone, E. J., Dubbert, P. M., McKenzie, T. L., Dunn, A. L., & Blair, S. N. (2000). Physical activity behavior change: Issues in adoption and maintenance. *Health Psychology, 19*, 32-41.

- Marcus, B. H., Selby, V. C., Niaura, R. S., & Rossi, J. S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly for Exercise and Sport*, *63*, 60-66.
- Marcus, B. H., Williams, D. M., Dubbert, P. M., Sallis, J. F., King, A. C., Yancey, A. K., ... & Claytor, R. P. (2006). Physical activity intervention studies: What we know and what we need to know. *Circulation*, *114*, 2739-2752.
- Miller, W.R., & Rollnick, S. (2002). *Motivational interviewing: Preparing people for change*. New York: Guilford Press.
- Miller, W.R., & Rose, G.S. (2009). Toward a theory of motivational interviewing. *American Psychologist*, *64*, 527-537.
- Orbell, S., & Sheeran, P. (1998). "Inclined abstainers": A problem for predicting health-related behaviour. *British Journal of Social Psychology*, *37*, 151-165.
- Peterson, A. A., Haynes, G. A., & Olson, J. M. (2008). Self-esteem differences in the effects of hypocrisy induction on behavioral intentions in the health domain. *Journal of Personality*, *76*, 305-322.
- Pyszczynski, T., Greenberg, J., Solomon, S., Sideris, J., & Stubing, M. J. (1993). Emotional expression and the reduction of motivated cognitive bias: Evidence from cognitive dissonance and distancing from victims' paradigms. *Journal of Personality and Social Psychology*, *64*, 177-186.
- Rogers, R. W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In B. L. Cacioppo & L.L. Petty (Eds), *Social psychophysiology: A sourcebook*. London: Guilford.
- Sallis, J. F. (2000). Age-related decline in physical activity: A synthesis of human and animal studies. *Medicine and Science in Sports and Exercise*, *32*, 1598-1600.

- Sallis, J.F., & Saelens, B.E. (2000). Assessment of physical activity by self-report: Status, limitations, and future directions. *Research Quarterly for Exercise and Sport*, 71, 1-14.
- Sheeran, P. (2002). Intention-behaviour relations: A conceptual and empirical review. In W. Stroebe, & M. Hewstone (Eds.), *European review of social psychology*, Vol. 12 (pp. 1-36). Chichester, UK: Wiley.
- Simmons, V. N., Webb, M. S., & Brandon, T. H. (2004). College-student smoking: An initial test of an experiential dissonance-enhancing intervention. *Addictive Behaviors*, 29, 1129-1136.
- Skotte, J., Korshøj, M., Kristiansen, J., Hanisch, C., & Holtermann, A. (2014). Detection of physical activity types using triaxial accelerometers. *Journal of Physical Activity & Health*, 11, 76-84.
- Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (pp. 261–302). San Diego, CA: Academic Press
- Stone, J. (2012). Consistency as a basis for behavioral interventions: Using hypocrisy and cognitive dissonance to motivate behavior change. In B. Gawronski & F. Strack (Eds.), *Cognitive consistency: A fundamental principle in social cognition* (pp. 326-347). New York: Guilford Publications, Inc.
- Stone, J., Aronson, E., Crain, A. L., Winslow, M. P., & Fried, C. B. (1994). Inducing hypocrisy as a means of encouraging young adults to use condoms. *Personality and Social Psychology Bulletin*, 20, 116-128.

- Stone, J., & Fernandez, N. C. (2008). To practice what we preach: The use of hypocrisy and cognitive dissonance to motivate behavior change. *Social and Personality Psychology Compass*, 2, 1024-1051.
- Stone, J., & Fernandez, N. C. (2011). When thinking about less failure causes more dissonance: The effect of elaboration and recall on behavior change following hypocrisy. *Social Influence*, 6, 199-211.
- Stone, J., & Focella, E. (2011). Hypocrisy, dissonance and the self-regulation processes that improve health. *Self and Identity*, 10, 295-303.
- Stone, J., Wiegand, A. W., Cooper, J., & Aronson, E. (1997). When exemplification fails: Hypocrisy and the motive for self-integrity. *Journal of Personality and Social Psychology*, 72, 54-65.
- Sullum, J., Clark, M. M., & King, T. K. (2000). Predictors of exercise relapse in a college population. *Journal of American College Health*, 48, 175-180.
- Thibodeau, R., & Aronson, E. (1992). Taking a closer look: Reasserting the role of the self-concept in dissonance theory. *Personality and Social Psychology Bulletin*, 18, 591-602.
- Thompson, S. C., Kyle, D., Swan, J., Thomas, C., & Vrungos, S. (2002). Increasing condom use by undermining perceived invulnerability to HIV. *AIDS Education and Prevention*, 14, 505-514.
- Troiano, R. P., Berrigan, D., Dodd, K. W., Mâsse, L. C., Tilert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine and Science in Sports and Exercise*, 40, 181-188.

Tucker, J. M., Welk, G. J., & Beyler, N. K. (2011). Physical activity in US adults: Compliance with the physical activity guidelines for Americans. *American Journal of Preventive Medicine, 40*, 454-461.

US Department of Health and Human Services. (2008). Physical Activity Guidelines Advisory Committee Report. Washington (DC): ODPHP Publication No. U0049. 2008. Retrieved from: <http://www.health.gov/paguidelines/Report/pdf/CommitteeReport.pdf>.

Ward, D. S., Evenson, K. R., Vaughn, A., Rodgers, A. B., & Troiano, R. P. (2005). Accelerometer use in physical activity: Best practices and research recommendations. *Medicine and Science in Sports and Exercise, 37*, S582-S588.

Appendix A: IRB Approval Letter



RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
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10/2/2014

Morgan Lee, M.A.
Psychology
8258 Dunham Station Dr.
Tampa, FL 33647

RE: **Expedited Approval for Initial Review**

IRB#: Pro00018846

Title: Development and Evaluation of a Hypocrisy Induction Intervention for Exercise

Study Approval Period: 10/2/2014 to 10/2/2015

Dear Ms. Lee:

On 10/2/2014, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents outlined below.

Approved Item(s):

Protocol Document(s):

[Study Protocol](#)

Consent/Assent Document(s)*:

[EvaluationPhaseInformedConsentV2-Clean.docx](#)

[DevelopmentPhaseInformedConsentV2-Clean.docx](#)

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent document(s) are only valid during the approval period indicated at the top of the form(s).

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your study qualifies for a waiver of the requirements for the documentation of informed consent as outlined in the federal regulations at 45CFR46.117(c) which states that an IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either: (1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern; or (2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval by an amendment.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,



John Schinka, Ph.D., Chairperson
USF Institutional Review Board

Appendix B: Screening: Exercise Stages of Change Measure

Regular Exercise is any planned physical activity (e.g., brisk walking, aerobics, jogging, bicycling, swimming, rowing, etc.) performed to increase physical fitness. Such activity should be performed *5 or more days* per week for at least *30 minutes* per session (a total of at least 150 minutes per week). Exercise does not have to be painful to be effective but should be done at a level that increases your breathing rate and causes you to break a sweat.

Do you exercise regularly according to that definition?

- Yes, and I have been for MORE than 6 months.
- Yes, and I have been for LESS than 6 months.
- No, but I intend to in the next 30 days.
- No, but I intend to in the next 6 months.
- No, and I do NOT intend to in the next 6 months.

Appendix C: Demographics Questionnaire

1. Today's date: □□/ □□ /□□ (month/day/year)
2. Birth date: □□ / □□/ □□ (month/day/year)
3. Ethnic group (choose one):
 - Hispanic/Spanish/Latino
 - Not Hispanic/Spanish/Latino
4. Racial Background (choose the option that best fits you):
 - American Indian or Alaskan Native
 - Asian
 - Black or African American
 - Native Hawaiian/Pacific Islander
 - White
 - Other race: _____
 - More than one race
5. Marital status (choose one):
 - Never married
 - Currently married
 - Separated/divorced
 - Widowed
6. Year in College (choose one)
 - Freshman
 - Sophomore
 - Junior
 - Senior
 - Not a degree-seeking student
 - Other: _____
7. Current school enrollment status (choose one):
 - Full-time student (≥ 12 credit hours per semester)
 - Part-time student

8. Current employment status (choose one):
- Employed full-time (≥ 30 hours per week)
 - Employed part-time
 - Not currently employed

9. Current living arrangement (choose one):
- Alone
 - With roommate/friend
 - With family
 - With romantic partner/spouse

10. What is your height?

Feet: _____

Inches: _____

11. What is your weight?

Pounds: _____

12. During your lifetime, have you smoked at least 100 cigarettes (5 packs or more)?
- Yes
 - No

[For participants who select “yes”]

12a. How many cigarettes do/did you typically smoke each day?

cigarettes: _____

12b. Have you smoked in the past month:

Yes, approximately _____ cigarettes per day

No, I quit about _____ years OR _____ months ago

12c. How many years in total have you smoked, or if you have quit, how many years did you smoke?

Number of years: _____

13. Have you had any alcoholic drinks in the past month?
- Yes
 - No

[For participants who select “yes”]

13a. Which of the following best describes the number of alcoholic drinks you had in the past month? (choose one)

- 1-3 times a month
- 1-3 times a week
- 4-6 times a week
- 1 time a day
- 2 times a day
- 3 or more times a day

Appendix D: Rosenberg Self-Esteem Scale

Instructions: Below is a list of statements dealing with your general feelings about yourself. If you strongly agree, circle **SA**. If you agree with the statement, circle **A**. If you disagree, circle **D**. If you strongly disagree, circle **SD**.

- | | | | | | |
|-----|--|----|---|---|----|
| 1. | On the whole, I am satisfied with myself. | SD | D | A | SA |
| 2. | At times, I think I am no good at all. | SD | D | A | SA |
| 3. | I feel that I have a number of good qualities. | SD | D | A | SA |
| 4. | I am able to do things as well as most other people. | SD | D | A | SA |
| 5. | I feel I do not have much to be proud of. | SD | D | A | SA |
| 6. | I certainly feel useless at times. | SD | D | A | SA |
| 7. | I feel that I'm a person of worth, at least on an equal plane with others. | SD | D | A | SA |
| 8. | I wish I could have more respect for myself. | SD | D | A | SA |
| 9. | All in all, I am inclined to feel that I am a failure. | SD | D | A | SA |
| 10. | I take a positive attitude toward myself. | SD | D | A | SA |

Appendix E: International Physical Activity Questionnaire

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?
 Yes
 No **[Skip to part 2]**

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, heavy construction, or climbing up stairs **as part of your work**? Think about only those physical activities that you did for at least 10 minutes at a time.
_____ days per week
 No vigorous job-related physical activity **[Skip to question 4]**

3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?
_____ hours per day
_____ minutes per day

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.

_____ days per week

No moderate job-related physical activity [Skip to question 6]

5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?

_____ hours per day

_____ minutes per day

6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.

_____ days per week

No job-related walking [Skip to part 2]

7. How much time did you usually spend on one of those days **walking** as part of your work?

_____ hours per day

_____ minutes per day

PART 2: TRANSPORTATION PHYSICAL ACTIVITY

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?

_____ days per week

No traveling in a motor vehicle [Skip to question 10]

9. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?

_____ hours per day

_____ minutes per day

Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place**?

_____ days per week

No bicycling from place to place [Skip to question 12]

11. How much time did you usually spend on one of those days to **bicycle** from place to place?

_____ hours per day

_____ minutes per day

12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place**?

_____ days per week

No walking from place to place [Skip to part 3]

13. How much time did you usually spend on one of those days **walking** from place to place?

_____ hours per day

_____ minutes per day

PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY

This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shoveling snow, or digging **in the garden or yard**?

_____ days per week

No vigorous activity in garden or yard [Skip to question 16]

15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?

_____ hours per day

_____ minutes per day

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?

_____ days per week

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?

_____ hours per day

_____ minutes per day

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?

_____ days per week

No moderate activity inside home [Skip to part 4]

19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?

_____ hours per day

_____ minutes per day

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

_____ days per week

No walking in leisure time [Skip to question 22]

21. How much time did you usually spend on one of those days **walking** in your leisure time?

_____ hours per day

_____ minutes per day

22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?

_____ days per week

No vigorous activity in leisure time [Skip to question 24]

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?

_____ hours per day

_____ minutes per day

24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?

_____ days per week

No moderate activity in leisure time [Skip to part 5]

25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?

_____ hours per day

_____ minutes per day

PART 5: TIME SPENT SITTING

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?

_____ hours per day

_____ minutes per day

27. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend day**?
_____ hours per day
_____ minutes per day

Appendix F: Dietary Behavior: Fruits & Vegetables Intake

These next questions are about the fruits and vegetables **you** ate or drank during the past 7 days. Please think about all forms of fruits and vegetables including cooked or raw, fresh, frozen, or canned. Please think about all meals, snacks, and food consumed at home and away from home.

1. During the past week, how many times per day or week did you drink 100% PURE fruit juices? Do not include fruit-flavored drinks with added sugar or fruit juice you made at home and added sugar to. Only include 100% juice.

- Per day: _____
- Per week: _____
- Never

2. During the past week, not counting juice, how many times per day or week did you eat fruit? Count fresh, frozen, or canned fruit.

- Per day: _____
- Per week: _____
- Never

3. During the past week, how many times per day or week did you eat cooked or canned beans such as refried, baked, black, garbanzo beans, beans in soup, soybeans, edamame, tofu, or lentils. Do NOT include long green beans.

- Per day: _____
- Per week: _____
- Never

4. During the past week, how many times per day or week you eat dark green vegetables such as broccoli or dark leafy greens including romaine, chard, collard greens, or spinach?

- Per day: _____
- Per week: _____
- Never

5. During the past week, how many times per day or week did you eat orange-colored vegetables such as sweet potatoes, pumpkin, winter squash, or carrots?

- Per day: _____
- Per week: _____
- Never

6. Not counting what you just told me about, during the past week, about how many times per day or week did you eat OTHER vegetables? Examples of other vegetables include tomatoes, tomato juice or V-8 juice, corn, eggplant, peas, lettuce, cabbage, and white potatoes that are not fried such as baked or mashed potatoes.

- Per day: _____
- Per week: _____
- Never

Appendix G: Dissonance: Dissonance Thermometer

Below are words that can describe different types of feelings. For each word, please indicate how much it describes *how you are feeling right now* by circling a number on the scale. "1" means "does not apply at all" and "7" means "applies very much" to how you are feeling *right now*. Don't spend much time thinking about each word. Just give a quick, gut-level response.

| | Does not apply at all | | | Applies very much | | | |
|--------------------------|--------------------------|---|---|----------------------|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Uncomfortable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Angry at myself | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Shame | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Uneasy | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Friendly | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Disgusted with myself | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Embarrassed | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Bothered | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Optimistic | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Annoyed at myself | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Disappointed with myself | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Happy | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Energetic | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Good | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Appendix H: Exercise Intention

The following are statements about your plans to exercise. Exercise can be defined as physical activity lasting for 10 minutes or more that makes your heart beat considerably faster than normal. Activities such as brisk walking, swimming laps in the pool, dancing, playing tennis, and riding a bike are considered to be exercise. Activities such as housework, gardening, and playing golf are not considered to be exercise.

1. During the next week, my goal is to exercise the following number of days.....

0 1 2 3 4 5 6 7

2. During the next week, to what extent do you intend to exercise for at least 30 minutes per day at least 5 days of the week?

Not at all

To the greatest extent possible

Appendix I: Dietary Intention

The following statements are about the foods you intend to eat or drink in the next week. Include all foods you intend to eat, both at home and away from home, when you choose your answers.

1. During the next week, my goal is to eat the following number of fruits and vegetables servings each day

0 1 2 3 4 5 6 7 8 9

2. During the next week, to what extent do you intend to eat least five fruits and vegetables servings each day?

Not at all

To the greatest extent possible

Appendix J: Exercise Intervention Script

We are developing health promotion videos for college students. Videos like these often feature celebrities or doctors, but we think students might be influenced more by peers they can relate to. We plan to compare the impact of professional- versus peer-delivered messages. Are you willing to help us with this by recording a video? (Continue if the participant says yes.)

Excellent, thank you! Based on your ID number, you have been selected to create a video about exercise. Here is a handout with information about exercise recommendations as well as a list of benefits of exercise. Also, here is a form you can fill out to help craft your speech. We would like for you to begin by introducing yourself to viewers and then to describe the exercise recommendations. Then we would like for you to talk about the benefits of exercise, incorporating at least 5 of the benefits from the handout; we encourage you to include others of your own if you think of any you want to mention. Finally, we would like for you share one or two of the top reasons why exercise is important to you personally and to end with the statement, 'Exercise at least 5 days per week. If I can do it, so can you!' Altogether, you should plan to speak for about 3 minutes. Do you have any questions?" (Proceed once the participant is clear about the task.) "I am going to leave for 10 minutes to give you time to prepare. I will come and get you when it is time to record your speech. (Exit, and wait 10 minutes before returning.)

(Retrieve participant and ask if they are ready to record their video. Answer questions if needed, then proceed with the video task.) Great, please sit in this chair, facing the camera. Relax, and don't worry about making mistakes in your speech. The more natural and genuine you are, the better. Feel free to consult your outline anytime you need to during the speech. (Start the recording, and record until the participant finishes their speech.) Great job. Just to make sure the entire speech was recorded, let's watch it together now." (Play video.)

Before we wrap up with this portion of the session, I have one more task for you. To help us better understand college students' real-life experiences, we want to collect information about situations that affect their day-to-day health behaviors. To do this, we would like for you to complete a short writing task. Your response will be completely anonymous. Are you willing to complete this task?" (Continue if the participant says yes.) "Thank you! Here is the form describing the task. I will leave while you complete it. You have plenty of time left in the session, so please take your time with the task, and let me know when you are finished." (Exit, and return when the participant indicates they are done with the writing task.)

Great, thank you. You are all done this portion of the session. We have a few more things for you to do. (Proceed with the next portion of the study.)

Appendix K: No-Intervention Control Script

Because of your study ID number, you will not be asked record a video. However, we need to wait for 20 minutes before doing the other study tasks. Please feel free to browse through the magazines during this waiting period. (Show participant the magazines, exit, and return after 20 minutes.)

Thank you for waiting so patiently. We have a few more things for you to do. (Proceed with the next portion of the study.)

Appendix L: Health Promotion Video Speech Outline

- Introduction (first name, year in college)

- Description of exercise recommendations

- Discussion of exercise benefits
 - Benefit 1:

 - Benefit 2:

 - Benefit 3:

 - Benefit 4:

 - Benefit 5:

 - Other benefits (optional):

- Explanation of 1-2 reasons why exercise is personally important to you

- “Exercise at least 5 days per week. If I can do it, so can you!”

Appendix M: Private Reminders Task

College students fail to exercise regularly for many reasons. To make this project's messages relevant for college students, we would like to gather some information about situations where students intend to exercise but don't follow through.

Please describe 3-4 situations in the past month when you had an opportunity to exercise but didn't end up doing so. For example, you might have had time to jog on a treadmill at the recreation center on campus after finishing class but ended up going to hang out a friend's apartment instead.

Please describe each situation in as much detail as possible. Your writing will be kept completely anonymous, and the more detail you provide, the more you will help us understand the situations that occur in college students' lives with regard to exercise.

1. [text box for response]

2. [text box for response]

3. [text box for response]

4. [text box for response]