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PREDICTING CO-RELAPSE AMONG NUTRITION AND EXERCISE FROM ADOLESCENCE THROUGH YOUNG ADULTHOOD

Kristina Monteiro
University of Rhode Island, kmonteiro1@my.uri.edu

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BY

KRISTINA MONTEIRO

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KRISTINA MONTEIRO

APPROVED:

Dissertation Committee

Major Professor Andrea Paiva

Bryan Blissmer

James Prochaska

Nasser Zawia

DEAN OF THE GRADUATE SCHOOL

UNIVERSITY OF RHODE ISLAND

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Abstract

Despite significant public health efforts, obesity remains a stagnant outcome comprised of multiple health behaviors including fruit and vegetable intake (FV) and physical activity (PA). Existing research has provided correlates of FV and PA behaviors over development, with secular trends towards acquiring negative health behaviors (e.g., sedentary behaviors). This study examined demographic and dynamic predictors of FV and PA regression at one-year post-intervention within three samples including middle school, high school, and college. Regression is defined using the Transtheoretical Model (TTM) as being in Action or Maintenance at baseline and regressing to a pre-Action stage at one-year follow-up. The novel phenomenon of co-regression, the likelihood of regressing on a second behavior given a change in the first, was explored within each sample. Results of univariate and multivariate logistic regressions produced odds ratios that suggest inconsistent demographic but reliable dynamic predictors of FV and PA regression within each sample. Univariate logistic regressions revealed co-regression for FV and PA among middle school and college samples, but not the high school sample. These results indicate that existing behaviors, decisional balance variables (i.e., "Pros"), and self-efficacy are the most salient predictors of regression. The exploration of co-regression as a novel phenomenon provides a foundation for future research in the field. Implications for this study include the tailoring of individualized evidence-based interventions and new directions for public health research.

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CHAPTER 1

DEFINITION AND SIGNIFICANCE OF THE PROBLEM

Despite significant public health efforts (e.g., Healthy People 2020) the prevalence of obesity remains stable (e.g., NIH, 2012; Flegal et al., 2012), which aligns with findings that few youth currently meet recommended guidelines for physical activity and fruit and vegetable intake (Granner, 2004; Sanchez, Norman, Sallis, Calfas, Cella, & Patrick, 2007; Sallis, Prochaska, & Taylor, 2000). Investigating the predictors of regression among multiple health behaviors (i.e., fruit and vegetable intake and physical activity) from adolescence through young adulthood will help to better understand the interplay between behaviors and assist with the creation of evidence-based initiatives to maintain individuals engaging in a healthy lifestyle through development.

More than one-third of all adults and about one-third of children in the United States are classified as obese (Ogden et al., 2012; NIH, 2012). Trends suggest that rates of obesity among adolescents have been on the rise between the late 1980s and 2010 (Fryar et al., 2012b; Ogden et al., 2012). Research suggests that the transition between adolescence and adulthood is a period of increased risk to develop obesity, may be considered a critical period in development, and provides an ideal time for health behavior intervention (Gordon-Larsen et al., 2000). Despite significant public health efforts, no significant reduction in obesity rates in the US population has been shown over time (Flegal et al., 2012; NIH, 2012).

CHAPTER 2

REVIEW OF LITERATURE

Healthy eating is crucial for adolescent health, growth, and development (Kimmons et al., 2009). Research has provided evidence that levels of fruit and vegetable intake significantly decrease by almost one serving per day from middle to late adolescence (Granner & Evans, 2011; Larson, Neumark-Sztainer, Hannan, & Story, 2007; Granner et al., 2004). This is detrimental, as the average number of servings of fruits and vegetables consumed by adolescents is approximately three and a half servings, already below the recommended five or more servings per day (Granner et al., 2004). Less than 12% of adolescents currently meet fruit and vegetable guidelines (Sanchez, Norman, Sallis, Calfas, Cella, & Patrick, 2007). There has been no significant change in fruit and vegetable intake for adults or adolescents over the past 15 years (CDC, 2010; Kimmons et al., 2009).

Investigating dynamic predictors of fruit and vegetable intake illuminates avenues for intervention (Zabinski, Daly, Norman, Rupp, Calfas, Sallis, & Patrick, 2006). Self-efficacy is a consistent predictor of fruit and vegetable intake in older adolescents as compared to their younger counterparts, which may be a result of increased maturity and independence (Zabinski, Daly, Norman, Rupp, Calfas, Sallis, & Patrick, 2006). As adolescents transition into adulthood, self-efficacy for fruit and vegetable intake decreases, which may contribute to the lesser consumption of fruits and vegetables through adolescence and into emerging adulthood (Granner & Evans,

2011). Expectations, perceived benefits of healthy eating (i.e., "Pros"), and perceived time barriers (i.e., "Cons"), have been shown to impact fruit and vegetable intake (Granner et al., 2004; Larson, Neumark-Sztainer, Harnack, Wall, Story, & Eisenberg, 2008; Zabinski, Daly, Norman, Rupp, Calfas, Sallis, & Patrick, 2006).

Evidence-based health interventions successfully targeting fruit and vegetable intake among adolescent youth are sparse in existing literature (Zabinski, Daly, Norman, Rupp, Calfas, Sallis, & Patrick, 2006). Few recent studies (e.g., Velicer et al., 2013; Mauriello et al., 2010) have shown promising results using individually tailored computer-delivered randomized controlled trials (RCTs) to promote positive health behaviors (e.g., exercise) using the Transtheoretical Model of behavior change (TTM). Results from these studies have shown that rates of maintenance of fruit and vegetable intake were stable over a one-year follow-up (Mauriello et al., 2010;Velicer et al., 2013).

Current rates indicate that less than 25% of adolescents engaged in moderate or vigorous physical activity for at least 60 minutes daily, including activities in school and out of school (Fakhouri et al., 2014; Sallis, Prochaska, & Taylor, 2000). Physical activity declines significantly during the window of transition from adolescence to young adulthood (Nelson, Gordon-Larsen, Adair, & Popkin, 2005). A significantly larger percentage of adolescent boys meet physical activity guidelines than adolescent girls, providing some insight on demographic predictors (Sanchez, Norman, Sallis, Calfas, Cella, & Patrick, 2007).

It is essential to identify dynamic predictors of physical activity among adolescents and emerging adults to create evidence-based interventions (Trost, Kerr,

Ward, & Pate, 2001; Nelson, Gordon-Larsen, Adair, & Popkin, 2005). Self-efficacy has been consistently associated with physical activity among adolescents (Craggs, Corder, van Sluijs, & Griffin, 2011; Trost, Kerr, Ward, & Pate, 2001; Sallis, Prochaska, & Taylor, 2000; Van der Horst, Paw, Twisk, & Van Mechelen, 2007). Physically inactive adolescents have reported that they feel less confident in their ability to overcome barriers to physical activity (Trost, Kerr, Ward, & Pate, 2001). Research on attitudes towards physical activity and their impact on current physical activity levels have produced conflicting results (Van der Horst, Paw, Twisk, & Van Mechelen, 2007; Bauman, Reis, Sallis, Wells, Loos, & Martin, 2012).

RCTs such as those by Velicer and colleagues (2013) and Mauriello and colleagues (2012) provide evidence that TTM-tailored, computer-delivered interventions can successfully increase the acquisition of healthy behaviors, such as exercise. Similar to results for fruit and vegetable intake, results from these studies have shown that maintenance of physical activity lasted at least one-year post intervention (Mauriello, Ciavatta, Paiva, Sherman, Castle, Johnson, & Prochaska, 2010; Velicer et al., 2013).

Much of existing research has investigated either nutrition or physical activity among adolescents, creating a lack of consistent evidence linking concurrent healthy eating behaviors and physical activity levels in adolescents and young adults (Patrick, Norman, Calfas, Sallis, Zabinsky, Rupp, & Cella, 2004). Research investigating predictors of fruit and vegetable intake and physical activity would provide a new avenue of research for multiple health behavior change and the creation of evidence-based interventions targeting complex behaviors.

Overview of the Transtheoretical Model.

Interventions that target adolescents and emerging adults must be tailored to the needs and current behaviors of the participant and should focus on the multiple factors contributing to nutrition and physical activity in adolescents, as several of these constructs are modifiable through behavior change strategies (Patrick, Norman, Calfas, Sallis, Zabinsky, Rupp, & Cella, 2004; Granner & Evans, 2011; Sallis, Prochaska, & Taylor, 2000).

The Transtheoretical Model of behavior change (TTM) (Prochaska & DiClemente, 1983; Prochaska, Redding, & Evers, 2002) integrates several theories of behavior change in order to design individually tailored interventions to modify target behaviors. The hallmark components of the TTM are the stages of change, defined as temporal dimensions describing the current attitudes, intentions, and behaviors within an individual at a given time point (Prochaska & DiClemente, 1983; Prochaska, DiClemente, & Norcross, 1992). Prochaska and DiClemente (1983) established five stages: (1) *Precontemplation*, (2) *Contemplation*, (3) *Preparation*, (4) *Action*, and (5) *Maintenance* and defined them as follows. The first stage, Precontemplation, indicates that the individual does not intend to change the target behavior within the next 6 months. If the individual intends to change the target behavior within 6 months, the individual is considered to be in Contemplation. Similarly if a plan of action to change the target behavior lies within the next 30 days and minor behavioral steps to implement the change have occurred, the individual is in Preparation. Action is described as continuously modifying the target behavior for less than 6 months, and after 6 months of consistent change the individual is considered to be in Maintenance.

Decisional balance, a core construct of the TTM, is defined as reflecting on the Pros and Cons of changing (Prochaska, et al., 1994). Considerable research has shown that perceived benefits of healthy eating (i.e., "Pros") predict fruit and vegetable intake, the decisional balance variables of the TTM may be particularly salient in developing evidence-based interventions among adolescents to increase fruit and vegetable intake (Larson, Neumark-Sztainer, Harnack, Wall, Story, & Eisenberg, 2008; Zabinsky, Daly, Norman, Rupp, Calfas, Sallis & Patrick, 2006; Granner et al., 2004).

Self-efficacy, or the perceived ability to change the target behavior, is a core dynamic construct of the TTM that is modifiable through interventions (Prochaska, DiClemente, Velicer, Ginpil, & Norcross, 1985). Self-efficacy includes confidence and temptation (Prochaska, Redding, & Evers, 2002). Confidence is described as the belief that one is able to engage in a healthy behavior across multiple contexts while temptation is described as one's temptation or urge to engage in an unhealthy behavior across multiple contexts (Prochaska, Redding, & Evers, 2002). A large amount of research has shown that self-efficacy is an important individual psychological correlate of physical activity and fruit and vegetable intake among adolescents (e.g., Granner & Evans, 2011; Sallis, Prochaska, & Taylor, 2000). The basis of the TTM is that the use of stage-matched interventions tailors material to the participant, providing individual-level feedback that increases the likelihood of behavior change.

Multiple Health Behavior Change.

Obesity is a complex outcome impacted by more than one intertwined health behavior. Multiple health behavior change considers the interrelationships among

various health behaviors that contribute to complex health related outcomes and provides the foundation for multiple health behavior interventions (Prochaska, Spring, & Nigg, 2008). Multiple health behavior change analyses allow for the covariance between and within behavioral variables to be assessed within studies.

Targeting multiple modifiable health behaviors, such as nutrition and physical activity may be the best method to address the complexity of obesity (Dietz, 2014). Research has suggested that effective interventions must focus on multiple health risk behaviors, particularly since these behaviors are entangled into behavioral patterns influencing overall health and general lifestyle (Sanchez, Norman, Sallis, Calfas, Cella, & Patrick, 2007; Nelson, Gordon-Larsen, Adair, Popkin, 2004). Evidence suggests interventions targeting multiple behaviors simultaneously may be the most effective (Spas, 2012). Interventions focusing on multiple health behaviors have been found to have more than three times the impact of an intervention targeting one specific behavior, perhaps creating a synergistic effect (Johnson et al., 2008; Velicer et al., 2013; Mauriello et al., 2010). Given the public health initiatives regarding the reduction of obesity through changes in both physical activity and healthy eating, multiple health behavior change strategies that promote sustainable overall behavior patterns provide a realistic avenue for behavior change (Nelson, Gordon-Larsen, Adair, Popkin, 2005).

Coaction.

Coaction is defined as the likelihood of success in changing a second behavior once the first behavior has been changed within the treatment or the control group at the same follow-up time points (Johnson, Paiva, Mauriello, Prochaska, Redding, &

Velicer, 2013). The effect of coaction is not a treatment effect, and has the ability to occur in both treatment and control groups; though interventions may facilitate the targeted behavior change within the treatment group, it does not necessarily create the effect of coaction (Paiva et al., 2012).

Johnson and colleagues (2008) were the first to investigate coaction of behaviors contributing to healthy weight management, including PA, healthy eating, and emotional distress among overweight adults. Results provided evidence that among the treatment group, those who progressed to Action or Maintenance from a pre-Action stage on one behavior were 2.52 – 5.18 times more likely to progress on a second behavior; and among the control group, those who progressed to Action or Maintenance from a pre-Action stage on one behavior were 1.24 – 2.63 times more likely to progress on a second behavior. Results showed a significant increase in FV intake among the treatment group, though this behavior was not directly targeted in the intervention (Johnson et al., 2008).

Mauriello and colleagues (2010) found a similar pattern of results among high school adolescents who participated in an intervention targeting PA, FV intake, and TV time (*Health in Motion*). Individuals in the treatment group who progressed to Action or Maintenance from a pre-Action stage on one behavior were 1.4 – 4.2 times more likely to progress on a second behavior. In contrast to Johnson and colleagues' (2008) previous study results, there were no significant effects of coaction in the control group. Effects of coaction on PA and FV intake were stable at one-year follow-up (Mauriello, Ciavatta, Paiva, Sherman, Castle, Johnson, & Prochaska, 2010).

Paiva and colleagues (2012) investigated the effect of coaction among less related health behaviors, including smoking, diet, and sun protection across three population-based samples to investigate patterns of coaction among treatment and control groups. Results indicated that coaction in the treatment group was consistently higher than the control group and that coaction persisted at one- and two- year follow-ups (Paiva et al., 2012).

Velicer and colleagues (2013) examined the effects of coaction among middle school students in the targeted behaviors of PA, FV intake, and TV time. Coaction was demonstrated across every behavior pair among the treatment group at one- and two-year follow-up, demonstrating that coaction persisted over time (Velicer et al., 2013). Johnson and colleagues (2014) examined coaction for energy balance behaviors, including PA and nutrition, across middle school students, high school students, and adults. Overall, significant coaction was demonstrated among 17 of the 24 behavior pairs in the treatment group and only 3 of 24 behaviors in the control group. Taken together, these results suggest the effect of coaction is higher in the treatment group than in the control group and has the ability to persist over time for several behavior pairs.

CHAPTER 3

PURPOSE OF THE PRESENT STUDY

Mauriello and colleagues (2010) investigated coaction and suggested that adolescents who progressed to Action or Maintenance during the intervention were more likely to stay in these later stages for up to two months for PA and for up to one year for FV intake. However, this study did not examine the characteristics or behavior patterns of adolescents who regressed to a pre-Action stage from Action or Maintenance. Considering the short follow-up time for PA, it is worth investigating the characteristics of adolescents who did regress, and also whether these individuals regressed on other behaviors simultaneously. Similarly, Velicer and colleagues (2013) examined coaction and also found that middle school students who were in Action or Maintenance at baseline were more likely to remain at these later stages than those who did not receive intervention for up to three years for PA and FV intake. Velicer and colleagues (2013) also did not examine the characteristics or behavior patterns of middle school students who regressed to a pre-Action stage, opening up an avenue for the present research.

Little to no known research has identified demographic or dynamic predictors of regression on multiple healthy behaviors (e.g., reducing both fruit and vegetable intake and physical activity simultaneously). The present study fills this gap in the literature by: (1) identifying demographic and dynamic predictors of regression among individuals who are in Action or Maintenance at baseline and regress to a pre-Action

stage at one-year follow-up on fruit and vegetable intake for each population; and (2) identifying demographic and dynamic predictors of regression among individuals who are in Action or Maintenance at baseline and regress to a pre-Action stage at one-year follow-up on physical activity for each population. This study will also (3) provide an exploratory foundation for future research in the area of "co-regression", or if the likelihood of participants who regress on one behavior are more or less likely to regress on a second behavior at one-year follow-up.

It is important to distinguish between "co-relapse" and "co-regression." Although initially conceptualized as "co-relapse", we have chosen to think of this as "co-regression" instead. Use of the term co-relapse may suggest that individuals in the intervention were at some point in a pre-Action stage, took Action, and then "relapsed" back to a pre-Action stage. This study focused on co-regression, or individuals who were in Action or Maintenance at baseline, and regressed on one (FV or PA) or both (FV and PA) behaviors at follow-up. We do not know if they were ever in a pre-Action stage, and given the age of the participants, it is very plausible that they were always in A/M. Therefore, for individuals who were in Action/Maintenance at baseline there may be a mix of co-relapse and co-regression. We have decided to think of all movement to a pre-Action stage as "regression" and therefore further examine "co-regression" as well.

Hypothesis One.

Middle School. Based on existing literature cited earlier (e.g., Granner et al., 2004; Sannchez et al., 2007), it was hypothesized that age would significantly predict

FV regression at one-year follow-up and gender, specifically female, would significantly predict PA regression at one-year follow-up.

High School. Pros and Cons were expected to significantly predict FV regression at one-year follow-up, while gender, self-efficacy, Pros, and Cons were expected to significantly predict PA regression at one-year follow-up (e.g., Granner & Evans, 2011; Zabinski et al., 2006; Larson et al., 2008; Nelson et al., 2005; Sanchez et al., 2007).

College. Based on existing literature (e.g., Granner & Evans, 2011; Zabinsi et al., 2006; Larson et al., 2008; Nelson et al., 2005; Sanchez et al., 2007; Craggs et al., 2011; Trost et al., 2001), we expected self-efficacy, Pros, and Cons to significantly predict FV and PA regression at one-year follow-up. In addition, we also expected gender to predict PA regression at one-year follow-up.

Hypothesis Two.

It was expected that within each sample (middle school, high school, and college), participants who regress on either behavior (PA or FV) would also regress on the other behavior (PA or FV). Existing literature on coaction by Paiva and colleagues (2012) suggests that the effects of coaction are more concentrated in the treatment group. We assumed that co-regression would be a parallel concept of coaction and expected increased co-regression in the control group than in the treatment group.

CHAPTER 4

METHODOLOGY

Secondary data analysis was used to address the research questions of the current study. Permission was granted from the University of Rhode Island and Pro-Change Behavior Systems, Inc. to analyze three separate de-identified data sets to measure demographic and dynamic characteristics and behavior patterns of middle school, high school, and college students. The Institutional Review Boards at either the University of Rhode Island or Pro-Change Behavior Systems, Inc. approved all data sets being utilized.

Participants and Sampling.

Middle School Sample. Velicer and colleagues (2013) collected data from middle school students ($N = 4158$) across 20 middle schools within the state of Rhode Island. Participants in the comparison group participated in Pro-Change's *Health in Motion* obesity prevention program as part of this research grant. The computer based TTM-tailored intervention for PA, FV, and TV time was administered at the beginning of the 6th grade school year and annual assessments were conducted through 9th grade.

High School Sample. Mauriello and colleagues (2010) collected data from high school students ($N = 1800$) across eight high schools across the United States who participated in the same obesity prevention program outlined above. The computer based TTM-tailored intervention for PA, FV, and TV time was administered

at baseline, one month, and two months. Follow-up assessments were administered at six months and one year after baseline assessment.

College Sample. Johnson and colleagues (in preparation) collected data from college students (N = 1841) across two large state universities in the Northeastern and Southern United States who participated in Pro-Change's *liveWell*, a RCT for an intervention targeting PA, FV, and stress.

Measures.

The measures that will be used in the analyses described below were administered to participants in the treatment and control groups within an intervention, known as *Health in Motion* for the middle and high school samples and *liveWell* for the college sample. For more details on the middle school and high school measures, see Mauriello et al. (2010). For more details on the college sample, see Johnson et al. (in preparation).

Demographics.

Age and gender were collected via single item measures for all study samples.

Treatment Group.

Middle School. Participants were randomized into two groups by school in the original study. One group received the *Health in Motion* obesity prevention program, which included assessment and feedback on Fruit & Vegetable consumption, Physical Activity, and TV Time. For the purposes of this study, this treatment group is labeled the "Energy Balance Treatment Group." The other half of the participants were assigned to a prevention program focusing on smoking and alcohol prevention. For the

purposes of this study, this treatment group is labeled the "Addictive Behavior Treatment Group."

High School. Participants were randomized into two groups in the original study. One group received the *Health in Motion* obesity prevention program, which included assessment and feedback on Fruit & Vegetable consumption, Physical Activity, and TV Time. For the purposes of this study, this treatment group is labeled the "Energy Balance Treatment Group". The other half of the participants were assigned to an assessment only Control Group and therefore, for the purposes of this study, this group is referred to as the "Control Group."

College. Participants were randomized into two groups in the original study. One group received an intervention program, which included assessment and feedback on Fruit & Vegetable consumption, Physical Activity, and Stress Management. For the purposes of this study, this treatment group is labeled the "Energy Balance Treatment Group". The other half of the participants were assigned to an assessment only Control Group and therefore, for the purposes of this study, this group is referred to as the "Control Group."

Stage of Change: Fruit & Vegetable (FV).

Middle and High School. Stage was assessed regarding readiness to meet criteria of consuming five or more servings of FV each day. Response options that determined stage were: (PC) not meeting criteria and not planning to meet criteria in the next six months; (C) not meeting criteria but planning to meet criteria in the next six months; (P) not meeting criteria but planning to meet criteria in the next 30 days;

(A) meeting criteria for less than six months; or (M) meeting criteria for more than six months.

College. Stage was assessed regarding readiness to meet criteria of consuming at least four and a half cups of FV daily. Response options that determined stage were identical to those used in the previous samples.

Stage of Change: Physical Activity (PA).

Middle and High School. Meeting criteria for PA was defined as engaging in 60 minutes a day for at least five days per week. Responses options that determined stage were: (PC) not meeting criteria and not planning to meet criteria in the next six months; (C) not meeting criteria but planning to meet criteria in the next six months; (P) not meeting criteria but planning to meet criteria in the next 30 days; (A) meeting criteria for less than six months; or (M) meeting criteria for more than six months.

College. Providing a definition of PA including 150 minutes of moderate-intensity aerobic or cardio activity each week or 75 minutes of vigorous-intensity aerobic or cardio activity each week or an equivalent mix of moderate and vigorous aerobic activity each week assessed stage. Participants were asked their readiness to engage in PA according to any of the three definitions. Response options that determined stage were identical to those in previous samples.

Decisional Balance.

Middle and High School. Decisional balance was measured by two separate eight-item measures (one for FV, one for PA) with four items reflecting Pros and four items reflecting Cons. These measures assessed the perceived advantages and disadvantages in an individual's decision to engage in each behavior. Responses were

provided on a 5-point Likert scale of importance, ranging from 1 (*Not at all important*) to 5 (*Extremely important*).

College. Decisional balance was measured by two separate twelve-item measures (one for FV, one for PA) with six items reflecting Pros and six items reflecting Cons. These measures assessed the perceived advantages and disadvantages in an individual's decision to engage in each behavior. Responses were given on the same 5-point Likert scale assessing importance as in the previous samples.

Self-Efficacy (Confidence).

Middle and High School. Self-efficacy was measured by two separate six-item measures for FV and PA that assessed an individual's confidence to engage in each behavior across various situations. Responses were provided on a 5-point Likert scale of confidence, ranging from 1 (*Not at all confident*) to 5 (*Completely confident*).

College. Self-efficacy was measured by two separate six-item measures for FV and PA that assessed an individual's confidence to engage in each behavior across situations. Response options were identical to those in the middle and high school samples.

Severity.

Middle and High School. Current FV intake was reported as the number of servings of FV consumed daily. PA rates were reported as the number of days per week that participants engaged in at least 60 minutes of exercise. The number of minutes of PA in a typical day was used in analyses.

College. Participants were asked to identify how many times per month, week, and day they consumed FV and the average amount consumed on each occasion. A

summary score was computed for each participant to provide a baseline measure of FV intake. The Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1997) indicated the number of times on average the participant reported completing strenuous, moderate, or mild exercise for at least 20 minutes. Data used in analysis reflected the sum of strenuous and moderate exercise for the number of minutes in a typical day.

Data Analysis.

Hypothesis One. Within each sample, two multivariate logistic regressions were conducted with gender, age, stage, intervention group, self-efficacy, Pros, and Cons, number of serving of FV (or number of minutes of PA) as the independent variables and FV relapse (Y/N) or PA relapse (Y/N) at follow-up as the dependent variables. A preliminary series of univariate logistic regressions was used to determine the final set of predictors included in the multivariate logistic regressions.

Hypothesis Two. A series of LR analyses within each dataset evaluated the likelihood of whether relapsing on one behavior increases the likelihood of relapsing on a second behavior, and assessed any differences between the treatment and control groups separately.

CHAPTER 5

RESULTS

Participants.

Demographic results for all three samples, middle school, high school, and college, can be found in Table 1.

Middle School. Participants who were in Action or Maintenance for fruit and vegetable (FV) intake (n = 1251) or physical activity (n = 2347) were selected from the entire sample (N = 4158). The sample ranged in age from 10 years old to 15 years old, with a mean of 11.40 years (SD = .69) and was reasonably divided between males (52.2%) and females (47.8%). Individuals primarily identified as White, non-Hispanic (62.1%), with 14.5% of participants identifying as a mixed ethnicity. For Hypothesis one, which is examining regression within each behavior, participants with who were in A/M at BL for each behavior and completed the 12 month time point were included in the analyses; FV (n = 1251) and PA (n = 2347). See Table 2 for N's and percentages of overall regression rates for each behavior. For hypothesis two, which is examining co-regression, the sample sizes include participants who were in A/M for both FV and PA and completed the 12 month outcome time point (n = 847). Table 3 shows the sample size for people who regressed on one behavior, both behaviors, or neither behavior at 12 months by treatment group.

High School. Participants who were in Action or Maintenance for fruit and vegetable (FV) intake (n = 319) or physical activity (n = 725) were selected from the entire sample (N = 1800). The sample was evenly split between males (49.2%) and

females (50.8%) and a majority of individuals identified as White, non-Hispanic (71.5%), followed by Black (10.5%), and then Asian (7.1%). The sample ranged in age from 13 years old to 19 years old, with a mean of 15.97 years of age (*SD* = .94). For Hypothesis one, which is examining regression within each behavior, participants with who were in A/M at BL for each behavior and completed the 12 month time point were included in the analyses; FV (*n* = 319) and PA (*n* = 725). See Table 2 for N's and percentages of overall regression rates for each behavior. For hypothesis two, which is examining co-regression, the sample sizes include participants who were in A/M for both FV and PA and completed the 12 month outcome time point (*n* = 142). Table 3 shows the sample size for people who regressed on one behavior, both behaviors, or neither behavior at 12 months by treatment group.

College. Participants who were in Action or Maintenance for fruit and vegetable (FV) intake (*n* = 598) or physical activity (*n* = 1145) were selected from the entire sample (*N* = 1841). The sample ranged in age from 16 years of age to 25 years of age, with a mean of 18 years (*SD* = .62) and was predominately female (63%). Many of the participants identified as White, non-Hispanic (71%), followed by Black (13.2%), or an "other" race not listed (7.4%). For Hypothesis one, which is examining regression within each behavior, participants with who were in A/M at BL for each behavior and completed the 12 month time point were included in the analyses; FV (*n* = 598) and PA (*n* = 1145). See Table 2 for N's and percentages of overall regression rates for each behavior. For hypothesis two, which is examining co-regression, the sample sizes include participants who were in A/M for both FV and PA and completed the 12 month outcome time point (*n* = 433). Table 3 shows the sample size for people

who regressed on one behavior, both behaviors, or neither behavior at 12 months by treatment group.

Results of Hypothesis One.

Predictors of regression within fruit and vegetable (FV) intake and physical activity (PA) within each sample were examined. In the current study, regression is defined as regressing from the Action or Maintenance (A/M) stages at baseline to any pre-Action stage (i.e., Precontemplation, Contemplation, or Preparation) for the corresponding behavior at the one-year follow-up time point.

Within each sample and within each behavior, a series of univariate logistic regression analyses were conducted using SPSS v22 resulting in a series of odds ratios (ORs) with 95% confidence intervals and corresponding p-values. Variables significant at the univariate level were then included in multivariate logistic regressions.

1a. Middle School.

Fruit & Vegetable (FV). Univariate logistic regressions revealed that significant predictors of FV regression included Maintenance Stage of Change (OR = 0.63, $p = .02$, [0.43,0.92]), participation in the addictive behavior intervention group in comparison to the energy balance intervention group (OR = 1.80, $p < .001$, [1.41,2.29]), FV Pros (OR = 0.96, $p = .01$, [0.92,0.99]), and number of servings of FV (OR = 0.85, $p < .001$, [0.78,0.91]). See Table 4. When these predictors were entered into a multivariate model, participation in the addictive behavior intervention group in comparison to the energy balance intervention group (OR = 1.78, $p < .001$, [1.38,2.30]), Pros (OR = 0.96, $p = .03$, [0.93,1.00]) and number of servings of FV (OR

= 0.85, $p < .001$, [0.78,0.92]) remained significant predictors of FV regression at one-year follow-up. See Table 5.

Physical Activity (PA). Univariate logistic regressions revealed that significant predictors of PA regression included female gender (OR = 1.58, $p < .001$, [1.29,1.94]), Maintenance Stage of Change (OR = 0.43, $p < .001$, [0.33,0.56]), PA confidence (OR = 0.96, $p < .001$ [0.94,0.97]), and number of minutes of moderate and vigorous PA (OR = 0.87, $p < .001$, [0.84,0.90]). See Table 6. A multivariate model containing these predictors demonstrated all predictors remained significant. See Table 7.

1b. High School.

Fruit & Vegetable (FV). Univariate logistic regressions revealed that the only significant predictor of FV regression was participation in the control group in comparison to the energy balance intervention group (OR = 2.77, $p < .001$, [1.55,4.98]). See Table 4.

Physical Activity (PA). Univariate logistic regressions revealed that significant predictors of PA regression included female gender (OR = 0.62, $p = .02$, [0.42,0.92]), Maintenance Stage of Change (OR = 0.39, $p < .001$, [0.25,0.61]), PA confidence (OR = 0.91, $p < .001$, [0.87, 0.95]), PA Pros (OR = 0.94, $p = .04$, [0.89,1.00]), and number of minutes of moderate and vigorous PA (OR = 0.81, $p < .001$, [0.74,0.88]). See Table 6. A multivariate model containing these predictors indicated Maintenance Stage of Change (OR = 0.56, $p = .02$, [0.35,0.90]), PA confidence (OR = 0.94, $p = .005$, [0.90,0.98]), and number of minutes of moderate and

vigorous PA (OR = 0.84, $p < .001$, [0.77,0.92]) remained significant predictors of PA regression at one-year follow-up. See Table 7.

1c. College.

Fruit & Vegetable (FV). Univariate logistic regressions revealed that significant predictors of FV regression included Maintenance Stage of Change (OR = 0.51, $p = .01$, [0.30,0.84]) and FV confidence (OR = 0.89, $p = .004$, [0.78,0.91]). See Table 4. When these predictors were entered into a multivariate model, only FV confidence (OR = .90, $p = .007$, [0.83, 0.97]) remained a significant predictor of FV regression at one-year follow-up. See Table 5.

Physical Activity (PA). Univariate logistic regressions did not reveal any significant predictors of PA regression. See Table 6.

Results of Hypothesis Two.

The previous analyses investigated predictors of regression for FV intake and PA from baseline to one-year follow-up separately within each age group. Coaction (the increased likelihood of taking action on a second behavior, given changing a first behavior) has been demonstrated across multiple studies (Paiva et al, 2012; Johnson et al, 2014). This section of the project provided an exploratory analysis of a parallel concept, co-**regression**, examining if there is an increased likelihood of regressing on a second behavior, given regression on a first behavior. Participants who were in Action or Maintenance for ***both*** FV intake and PA at baseline were selected for analysis.

2a. Middle School.

Two logistic regressions were conducted on participants who were in A/M at baseline for both PA & FV, one in the addictive behavior treatment group ($N = 390$) and one in the energy balance treatment group ($N = 457$). Results revealed significant co-regression in both the addictive behavior treatment group (OR = 2.65, $p = .001$, [1.52, 4.60]) as well as in the energy balance group (OR = 2.34, $p < .001$, [1.45, 3.77]).

2b. High School.

Two logistic regressions were conducted, one in the energy balance treatment group ($N = 77$) and one in the control group ($N = 65$). Results did not reveal significant co-regression in the energy balance treatment group (OR = 1.76, $p = .54$, [0.29, 10.58]) or in the control group (OR = 4.06, $p = .11$, [0.73, 22.64]).

2c. College.

Two logistic regressions were conducted, one in the energy balance treatment group (N = 212) and one in the control group ($N = 221$). Results revealed significant co-regression in the energy balance treatment group (OR = 6.32, $p = .01$, [1.56, 25.66]) and borderline significant co-regression in the control group (OR = 3.71, $p = .06$, [0.95, 14.51]).

CHAPTER 7

CONCLUSION

The purpose of this study was to identify predictors of regression among nutrition and exercise within several different age populations and to explore the potential phenomenon of co-regression. Specifically, hypothesis one sought to identify demographic and dynamic predictors of regression of fruit and vegetable intake (FV) and rates of physical activity (PA) among middle school students, high school students, and college students. Middle school, high school, and college were chosen specifically because of the notable declines in healthy eating and physical activity during these periods of growth and aging. Existing literature has investigated correlates of FV and PA separately, but less frequently has investigated them as predictors in conjunction within the same sample. While research has identified correlates of FV and PA among independent samples, this is also one of the few studies to utilize Transtheoretical Model (TTM) measures as predictors of regression for FV and PA from baseline to one-year follow-up.

Coaction, or the increased likelihood of taking action on a second behavior given change in the first, has recently been demonstrated across multiple studies (e.g., Paiva et al., 2012; Johnson et al., 2014). This is the first study to explore the phenomenon of co-regression, which is defined as the increased likelihood of regressing on a second behavior given change in the first. Hypothesis two sought to investigate co-regression within each of the three samples.

Predictors of Fruit & Vegetable (FV) and Physical Activity (PA) Regression.

Middle School. Based on existing research (Granner et al., 2004; Sanchez et al., 2007), it was hypothesized that age would significantly predict FV regression within the middle school sample. However, results indicated that an Action Stage of Change (versus Maintenance), participation in the addictive behavior intervention group versus the energy balance group, decreased FV Pros, and a lower number of servings of FV all independently predicted FV regression among middle school students. When entered into the multivariate model, Stage of Change no longer predicted FV, but the other predictors remained significant. While age did not significantly predict FV, alone or in combination, this may be due to the limited age range within this dataset, as almost all participants (91%) included in analysis were between 11 and 12 years of age. This study is among the first to suggest that these specific TTM constructs are significant predictors of FV regression among middle school students from baseline to one-year follow-up. These findings align with the four effects findings that treatment group, Stage of Change, Pros, Effort (Pros) and Severity (FV servings) predict long-term changes in diet across multiple adult populations (Blissmer et al., 2010).

Significant predictors of PA regression within the middle school sample included being of female gender, an Action Stage of Change (versus Maintenance), lower confidence, and a decreased number of minutes of PA both independently and in combination with one another. Based on existing data (e.g., Sanchez et al., 2007) gender was hypothesized to be a significant predictor of PA among this age group, and this was supported by the data. These findings suggest that existing behaviors and

confidence in the ability to engage in PA are salient in predicting regression among this population.

High School. In the high school sample, it was expected that Pros and Cons would significantly predict regression on FV based on existing literature (e.g., Granner & Evans, 2011) suggesting that personal attitudes and beliefs are predictors of FV during this time of development. Results indicated that the only significant predictor of FV was intervention group in that individuals in the control group were more likely to regress at follow-up than individuals in the energy balance intervention group. While our hypothesis was not supported, it could be that peer attitudes and beliefs play a larger role during this age and were not assessed in this study.

In regard to PA, it was hypothesized that gender, confidence, PA Pros, and PA Cons would predict regression among high school students based on results from multiple studies and reviews (e.g., Nelson et al., 2005). The data from this study reveal that significant independent predictors of PA regression include being of female gender, an Action Stage of Change, decreased confidence, reduced PA Pros, and fewer number of minutes of PA. When entered in a multivariate model, Stage of Change, confidence, and number of minutes of PA significantly predicted PA regression. Importantly, gender and PA Pros did not remain significant predictors when entered into the multivariate model. This is not surprising, as both gender and Pros were weak independent predictors. This pattern of findings suggests that existing behaviors, perceived benefits, and confidence in the ability to engage in PA are important predictors of regression within this population.

College. Within the college sample, confidence, FV Pros, and FV Cons were expected to significantly predict FV regression based on existing evidence (e.g., Larson et al., 2008). Results illustrated that an Action Stage of Change and decreased confidence predicted FV regression both independently and in combination with one another.

Lastly, it was expected that gender, confidence, Pros, and Cons would predict PA regression among college students based on existing literature (e.g., Tost et al., 2001). Pros and Cons were not assessed in the college sample due to dynamic assessment and therefore did not allow for the full testing of this hypothesis. However, none of the remaining predictors reached statistical significance.

Discovering Co-regression.

Hypothesis two sought to investigate the phenomenon of co-regression within each of the samples. Coaction is described as the increased likelihood of taking action on a second behavior, given changing on a first behavior. Co-regression is the parallel concept, or the increased likelihood of regressing on a second behavior, given a regression in a first behavior. Specifically, we sought to understand if participants who regress on one behavior (e.g., FV) are more or less likely to regress on a second behavior (e.g., PA) at one-year follow-up.

Differences in coaction have been found between treatment and control groups, with higher rates of coaction consistently revealed in the treatment group (Paiva et al., 2012). This may be due to effects such as transference of behavior change principles communicated in the treatment group carrying over to the second behavior (Johnson et al., 2014). Since co-regression was assumed to be a parallel concept to coaction, we

expected higher rates of co-regression among control groups than treatment groups, due to the protective or treatment effect of the intervention.

Middle School. Within the middle school sample, co-regression was found among the addictive behavior treatment group as well as in the energy balance group. Within FV, there was a significant difference between co-regression among treatment and control group at one-year follow-up (X^2 (1) = 22.02, p < .001); however this effect was not found for PA.

High School. In contrast to the middle school sample, there were no effects of co-regression found among the high school sample for either behavior. There was a significant difference between treatment and control groups for FV at one-year follow-up (X^2 (1) = 12.03, p < .001), but not for PA.

College. College students did show a significant effect of co-regression in the treatment group, and a borderline significant effect of co-regression in the control group. Within each behavior, there were no significant differences between treatment and control groups.

The findings here both support and refute existing literature on the demographic and dynamic predictors of FV and PA among these developmental age groups. However, simply overlaying population-based findings onto the individual-level is inaccurate. As a field, we know far less about behavior change within the individual versus populations. Analyzing multiple behavior change is much more complex than assessing change of individual behaviors. Results did indicate an increased number of dynamic variables were significant predictors of regression in the middle school population. This suggests that adolescence is the optimal time to

intervene, because variables that are malleable via interventions are more impressionable at this time.

The effect of co-regression is an exciting discovery as an emergent phenomenon. While our results were inconsistent with those of coaction (i.e., expecting higher co-regression in the control group), it is worth noting that these results may be more similar to singular action results. Singular action is evident when analyzing participants who change only one behavior in a behavior pair after removing participants who were successful and changed both behaviors in a RCT (Yin et al., 2013). For example, singular action would include participants who progress on FV, but make no progress on PA. Yin and colleagues (2013) found significant, but low treatment effect sizes for singular action versus paired action. Their results also suggest that singular action is not predictable by type of behavior pair (i.e., heterogeneous or homogenous pairs) or by treatment versus control group. Co-regression results are most similar to those of singular action, in that there were inconsistent findings of co-regression among treatment versus control groups. Preliminary analyses on heterogeneous behavior pairs (FV & stress; PA & stress) have provided initial support that type of behavior pair does not impact co-regression. Singular action and co-regression both involve failure on one (or both) health behaviors within an intervention. Therefore, co-regression may be more similar to singular action than coaction, which indicates success on both health behaviors in a behavior pair.

Limitations and Future Directions.

This study is constrained to the three samples used in analysis and their respective measured constructs and protocol. Our analyses were restricted to energy balance behaviors. Future research may investigate the role of co-regression among behaviors that are not as closely linked, such as FV and sun exposure. Preliminary analyses investigating FV and stress and PA and stress yielded inconsistent co-regression. Co-regression among addictive behaviors (e.g., alcohol use, smoking) should be explored to determine the effect of co-regression on heterogeneous behaviors. Identifying predictors of co-regression would also provide insight on this new phenomenon and the situations under which it occurs. Investigating the effect of relapsing on a healthy behavior (e.g., FV) and the effect on acquiring negative behaviors (e.g., TV time) would also capture the multifaceted nature of behavior change.

The data used here differed in various aspects, such as sampling and intervention protocol, which were not consistent across samples. Specifically, due to the dynamic nature of the assessments, not all participants completed every measure. For example, college students who met guidelines for FV at baseline were not asked about Pros and Cons. Moreover, assessments were self-report, and participants reported their respective stage based on given criteria rather than actual reported servings of fruits and vegetables or minutes of physical activity. Due to differences in protocol, extended follow-up time points (e.g., 24-months, 36-months) could not be examined in all samples. Future research should methodically replicate these findings across samples with identical protocol over multiple years. Replication of these

findings within an adult population would provide insight into the hypothesis that developmental and secular trends are more prominent than treatment change, and thus rates of co-regression decrease over the course of development.

Use of the term "co-relapse" suggests that participants began a trial in a pre-Action stage, progressed to Action or Maintenance at a specified time point post-intervention, and then returned to a pre-Action stage at follow-up. The present study analyzed the characteristics of participants who began in Action or Maintenance and acquired negative health behaviors, which is viewed as regressing to a pre-Action stage, at follow-up. It is worth exploring actual co-relapse among these samples to identify patterns that may be consistent with coaction, co-regression, or singular action. Further investigation into co-regression and its related constructs is necessary in order to better understand the conditions in which they occur.

This study examined the characteristics of participants progressing through developmental time points in middle school, high school, and college. Secular trends in these populations exert pressure on individuals to acquire negative health behaviors. The results presented here are impacted by developmental change and intentional change, and cannot be disentangled. However it may be hypothesized that developmental change can outperform intentional change. Replication of these analyses with an adult population with established behavior patterns may produce different results.

Conclusions.

The present study identified demographic and dynamic predictors of regression of individuals who are in Action of Maintenance at baseline and regress to a pre-

Action stage at one-year follow-up on fruit and vegetable intake among middle school, high school, and college samples. This study also identified demographic and dynamic predictors of regression of individuals who are in Action or Maintenance at baseline and regress to a pre-Action stage at one-year follow-up on physical activity among those samples. We identified several demographic and dynamic predictors of regression for both fruit and vegetable intake and physical activity among the three samples, providing insight for development of a variety of interventions, including those targeting weight control behaviors.

Lastly, this was the first study to investigate the phenomenon of co-regression, or the likelihood that participants who regress on one behavior are more or less likely to regress on a second behavior. We found a significant effect of co-regression in two of the three samples, providing a foundation for a phenomenon that should be explored in future research.

TABLE 1: DEMOGRAPHICS

	Middle School (N=4158)		High School (N=1800)		College (N=1841)	
	%	**N**	**%**	**N**	**%**	**N**
Gender						
Male	52.20%	2162	50.80%	915	36.40%	671
Female	47.80%	1976	49.20%	885	63.10%	1162
Ethnicity						
Indian/Alaskan Native	2.20%	93	0.60%	9	0.30%	5
Asian/Pac. Islander	3.00%	123	7.10%	128	4.70%	87
Black, not Hispanic	3.80%	157	10.50%	189	12.40%	227
Hispanic	12.40%	516	5.50%	99	13.90%	254
White, not Hispanic	62.30%	2584	71.50%	1287	65.40%	1200
Other	1.40%	60	1.40%	26	1.40%	25
Combination	14.30%	593	3.40%	62	1.90%	35
Unknown	0.60%	19	-	-	-	-
Intervention Group						
Treatment	47.50%	1974	62.70%	1128	49.40%	910
Control	52.50%	2184	37.30%	672	50.60%	931
	Mean (sd)		**Mean (sd)**		**Mean (sd)**	
Age	11.4 (0.69)		16.0 (0.94)		18.0 (0.62)	

TABLE 2: RATES OF REGRESSION BY BEHAVIOR

	Fruit & Vegetable			Physical Activity		
	Middle School	High School	College	Middle School	High School	College
A/M at BL	1251	319	598	2347	725	1145
Regressed at 12 months	517 41.3%	76 23.80%	104 17.40%	509 12.70%	145 20.00%	82 7.20%

TABLE 3: RATES OF CO-REGRESSION

Fruit & Vegetable and Physical Activity

	Middle School		High School		College	
	Energy Balance Tx	Addictive Behavior Tx	Energy Balance Tx	Ctrl	Energy Balance Tx	Ctrl
A/M both at BL	**326**	**383**	**52**	**48**	**102**	**83**
Regressed on FV only at 1 year	121 37.1%	101 26.4%	6 11.5%	17 35.4%	27 26.5%	21 25.3%
Regressed on PA only at 1 year	22 6.7%	41 10.7%	7 13.4%	2 4.2%	3 2.9%	4 4.8%
Regressed on both at 12 months	55 16.9%	51 13.3%	2 3.8%	6 12.5%	8 7.8%	6 7.2%
Regressed on neither at 1 year	128 39.3%	190 49.6%	37 71.3%	23 47.9%	64 62.8%	52 62.7%

TABLE 4: UNIVARIATE FRUIT & VEGETABLE PREDICTORS OF REGRESSION

			95% C.I.		
		Odds Ratio	Lower	Upper	Sig.
Middle School	Female	1.22	0.95	1.55	0.12
	Age	0.81	0.65	1.02	0.08
	Maintenance SOC	0.63	0.43	0.92	**0.02**
	Addictive Behavior Treatment	1.80	1.41	2.29	**< .001**
	FV Pros	0.96	0.92	0.99	**0.01**
	FV Cons	1.00	0.98	1.02	0.92
	FV Confidence	0.99	0.97	1.00	0.15
	FV Servings per day	0.85	0.78	0.91	**< .001**
High School	Female	0.90	0.51	1.58	0.72
	Age	0.88	0.66	1.19	0.41
	Maintenance SOC	0.52	0.20	1.37	0.19
	Control Group	2.77	1.55	4.98	**< .001**
	FV Pros	0.96	0.90	1.03	0.24
	FV Cons	1.02	0.96	1.08	0.58
	FV Confidence	-	-	-	-
	FV Servings per day	0.98	0.83	1.14	0.76
College	Female	0.68	0.38	1.19	0.18
	Age	0.95	0.60	1.49	0.82
	Maintenance SOC	0.51	0.30	0.84	**0.01**
	Control Group	0.88	0.54	1.44	0.62
	FV Pros	-	-	-	-
	FV Cons	-	-	-	-
	FV Confidence	0.89	0.83	0.97	**< .001**
	FV Servings per day	0.94	0.87	1.01	0.07

TABLE 5: MULTIVARIATE FRUIT & VEGETABLE PREDICTORS OF REGRESSION

			95% C.I.		
		Odds Ratio	Lower	Upper	Sig.
Middle School	Maintenance SOC	0.69	0.46	1.03	0.07
	Addictive Behavior Treatment	1.78	1.38	2.30	**< .001**
	FV Pros	0.96	0.93	1.00	**0.03**
	FV Servings per day	0.85	0.78	0.92	**< .001**
High School	Control Group	2.77	1.55	4.98	**0.00**
College	Maintenance SOC	0.54	0.26	1.11	0.09
	FV Confidence	0.90	0.83	0.97	**.007**

TABLE 6: UNIVARIATE PHYSICAL ACTIVITY PREDICTORS OF REGRESSION

			95% C.I.		
		Odds Ratio	Lower	Upper	Sig.
Middle School	Female	1.58	1.29	1.94	**< .001**
	Age	1.09	0.90	1.32	0.37
	Maintenance SOC	0.43	0.33	0.56	**< .001**
	Addictive Behavior Treatment	1.14	0.93	1.40	0.20
	PA Pros	0.99	0.95	1.03	0.63
	PA Cons	1.08	0.97	1.21	0.18
	PA Confidence	0.96	0.94	0.97	**< .001**
	PA Minutes Typical Day	0.87	0.84	0.90	**< .001**
High School	Female	0.62	0.42	0.92	**0.02**
	Age	0.86	0.69	1.06	0.16
	Maintenance SOC	0.39	0.25	0.61	**< .001**
	Control Group	1.24	0.85	1.82	0.27
	PA Pros	0.94	0.89	1.00	**0.04**
	PA Cons	1.06	0.99	1.13	0.09
	PA Confidence	0.91	0.87	0.95	**< .001**
	PA Minutes Typical Day	0.81	0.74	0.88	**< .001**
College	Female	1.27	0.74	2.17	0.38
	Age	0.92	0.62	1.37	0.70
	Maintenance SOC	0.81	0.50	1.31	0.39
	Control Group	1.45	0.90	2.35	0.13
	PA Pros	0.96	0.80	1.14	0.61
	PA Cons	0.90	0.71	1.13	0.37
	PA Confidence	0.93	0.86	1.01	0.09
	PA Minutes Typical Day	0.99	0.95	1.03	0.56

TABLE 7: MULTIVARIATE PHYSICAL ACTIVITY PREDICTORS OF REGRESSION

			95% C.I		
		Odds Ratio	Lower	Upper	Sig.
Middle School	Female	1.48	1.19	1.83	**< .001**
	Maintenance SOC	0.59	0.44	0.79	**< .001**
	PA Confidence	0.97	0.95	0.99	**< .001**
	PA Minutes Typical Day	0.90	0.86	0.93	**< .001**
High School	Female	0.71	0.46	1.08	0.11
	Maintenance SOC	0.56	0.35	0.90	**0.02**
	PA Pros	0.95	0.89	1.02	0.17
	PA Confidence	0.94	0.90	0.98	**.005**
	PA Minutes Typical Day	0.84	0.77	0.92	**< .001**
College	*No significant predictors to include.*				

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