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Hope and Exercise: The Integration of Hope Theory

with the Transtheoretical Model

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Abstract

The purpose of the present study was to examine cognitive variables that predicted an individual's relationship with exercise and to obtain the self-reported activity levels of Whites and Latinas. Self-efficacy for exercise, hope, the pros and cons of change, and attitude towards exercise were tested as possible predictor variables and the stages of change from the transtheoretical model was the primary dependent variable. Of specific interest was whether hope theory explained unique variance across the stages of change. A cross-sectional design compared White and Latina female college students (N=112), and two versions of the stages of change measure in the same population. Whites had lower body-mass-index than Latinas ($d = .62$) and Whites were more active than Latinas ($d = .41$). Close to half of the study's participants (41%) did not meet the national guidelines for regular exercise. Goal specific hope's agency factor, affective-attitude towards exercise and ethnicity explained 41% of the variance across the stages of change. Although both stages of change measures discriminated between those who were more active and those who were less, the ladder form of measurement better described those in various stages of intention. For individuals not currently exercising regularly, but considering starting, cognitive constructs such as goal-specific hope could be effectively targeted in interventions. The motivational underpinnings of healthy behaviors are difficult to describe and theory integration offers much promise.
Hope and Exercise: The Integration of Hope Theory to the Transtheoretical Model

There is substantial evidence supporting the benefits of regular exercise (Manson et al., 2002; Sesso, Paffenbarger, Ha, & I-Min, 2000; Warburton, Nicol, & Bredin, 2006). However, there is an alarming shortfall in adherence to exercise (Harrison, Roberts, & Elton, 2004; King et al., 1997). Current guidelines recommend that adults participate in moderate-intensity cardiovascular activity for a minimum of 30 minutes a day, five days a week (United States Department of Health & Human Services, 2008). Yet, national survey data estimates that 40% of American adults do not exercise regularly and that youth exercise with significantly less regularity than in past decades (United States Department of Health & Human Services, 2009). This widespread lack of physical activity significantly contributes to the high percentage of overweight Americans: Almost 66% of American adults are overweight (body-mass-index; BMI ≥ 25) or obese (BMI ≥ 30) and 16% of American children aged 2-19 are overweight. The data also suggest that by 2015, 75% of adults will be overweight or obese (Wang & Beydoun, 2007).

The link between activity levels and health status is well understood. Individuals not meeting the minimum criteria for energy expenditure per day (35 kcal/kg) are often overweight/obese or at risk for weight gain (King et al., 2006). These individuals are at increased risk of serious medical conditions such as Type II diabetes, high blood pressure, heart disease and high cholesterol (Flegal, Carrol, Ogden, & Johnson, 2002). Additionally, an individual’s mental health may be at risk...
as research has found a link between obesity and common mental disorders such as depression (Kivimäki et al., 2011). Furthermore, the prescription of regular exercise is known to reduce levels of depression or anxiety (Craft & Perna, 2002; Goodrich, & Kilbourne, 2010; Moor, Beem, Stubbe, Boomsma, & De Geus, 2006; Salmon, 2001).

Regular exercise has even been found to improve brain function (Colcombe et al., 2004). For example, overweight children who exercised regularly for 3 months saw improvement on a math achievement test as well as optimal brain region activation in a task that required self-regulatory behavior (Davis et al., 2011). Recent research has also uncovered a link between overweight/obese status and lower life satisfaction (Ogbeide, Neumann, Sandoval, & Rudebock, 2010). The general public is well aware of the benefits of regular exercise but, unfortunately, this knowledge is not powerful enough to foster consistent exercise behavior (Harrison et al., 2004; Warburton et al., 2006).

Engaging in regular exercise is difficult for many individuals for several reasons. First, in general terms, maintaining long-term positive health behaviors is difficult (King et al., 2006; Prochaska & DiClemente, 1983). Recurring barriers and insufficient motivation often hinder one’s ability to achieve consistency. Second, many individuals set goal intentions such as “I am going to get fit this year!” but fail to specify the behaviors they will engage in to meet this goal and the situational contexts in which they will carry out these behaviors (Gollwitzer & Schaal, 1998). Third, there is often a discrepancy between stated intentions and subsequent behavior
(Dibonventura & Chapman, 2008). For example, an individual may formulate the intention to exercise after work but then fail to implement the intention by deciding other priorities are more important. Finally, people are known to struggle with competing cognitions such as wanting to pursue leisure time goals other than exercise (e.g., watching television; Rhodes & Blanchard, 2008).

In consideration of these common challenges, one could look to cognitive or motivational states to explain the underlying mechanisms driving engagement or intention to engage in exercise behavior. The present research investigated the role of these internal states by incorporating cognitive variables from several theoretical frameworks into a predictive model. The following discussion first explains what exercise is and provides evidence to support the need to study the exercise habits of young adults. A special case is then made for why young women, in particular, ought to be investigated and data on various socioeconomic and ethnic differences in exercise behavior is presented. A brief review of BMI and the importance of considering the general healthiness of a population are also discussed. Finally, a review of some possible theories to explain exercise behavior is critiqued. The literature review concludes with the hypotheses of the present study.

**Exercise**

Exercise behavior and physical activity are most frequently measured via retrospective self-report. This can be problematic for the integrity of the data due to inherent difficulties in recalling and reporting behavioral autobiographical
information (Durante & Ainsworth, 1996). However, researchers and healthcare providers recognize that with reliable measurement tools (e.g., the 7-day Physical Activity Recall; Blair et al., 1985), this cost-effective approach is acceptable (Ainsworth, 2009; Miller, Freedson, & Kline, 1994). The alternative to self-report is the objective assessment of activity levels, which has only recently been introduced on a large scale (Center for Disease Control & Prevention, 2007). Objective data is most frequently obtained with accelerometers which are small pedometer like devices worn on the hip using an elasticized fabric belt. These devices record minute-by-minute steps, depicting movement and acceleration of movement, which is then translated into various indicators of physical activity/inactivity. The data, which is also time-stamped, allows researchers to create individual accelerometer profiles. National data provided by this objective monitoring was first published in 2008 (Troiano et al., 2008) and although these data shed new light on exercise adherence rates, the feasibility and cost-effectiveness of using accelerometers is limiting and, therefore, most studies still use self-report.

Part of the complication in self-reporting exercise behavior is due to the fact that exercise has numerous behavioral subcomponents. To illustrate these subcomponents, consider the activity “playing tennis” and what it actually means when one says, “I play tennis regularly for exercise.” In breaking down the subcomponents of such a behavior, one can see how playing tennis on a regular basis entails much more than simply swinging a racket at a ball while standing on a court.
It requires scheduling the activity into the week, physically getting to the court, and keeping in touch with tennis partners.

The many subcomponents of exercise behavior lead to further complexity when consideration is given to who is engaging in them. For example, a young female college student in her freshman year may encounter several difficulties as she considers engaging in regular exercise. If she cannot afford a gym membership, does not like how she looks in her workout clothes or is too stressed from course work to exercise, she is said to be experiencing unique barriers to exercise that are specific to her demographic. In this vein, exercise behavior and the intention to engage in exercise is experienced differently among different populations. Therefore, studying homogenous populations may lead to a better understanding of population-specific attitudes/beliefs towards exercise.

**Exercise and Youth/Young Adults**

Looking closely at the population prevalence of those not meeting the national guidelines for physical activity, two pronounced shifts in activity levels occur. Children ages 6-11 years drop from a 42% average adherence rate to 8% between the ages of 12-15 years and to 7.6% by the ages of 12-19 years. A second decrease in physical activity is seen during the transition to adulthood when the average adherence rate drops to 3.5% for ages 20-59 years old (Center for Disease Control & Prevention, 2007). These data show significantly lower rates of exercise than self-
report national survey data, which can suggest that up to 62% of adults exercise regularly, because they are based on accelerometer data.

The sharp decrease in young children’s activity levels can be understood in terms of social-cognitive variables that predict children’s physical activity behavior such as parental modeling (Hebestreit et al., 2010). Young children are limited in their ability to make personal choices, to discern from among numerous activities to engage in, and are not yet cognitively mature enough to understand their own motivational states. Therefore, young children do not represent a good population of study in the examination of cognitive predictors of exercise behavior. Conversely, young adults engage in personal choice decisions regularly. They are also in the process of shaping their cognitive orientations and personal preferences for some behaviors over others. As such, research can examine the cognitive and motivational states of young adults and seek to understand how these factors contribute to their decision to engage in regular exercise or not.

There are also unique characteristics of the young adult population that suggest it is important to study these individuals. The transition from adolescence to adulthood is a time of significant change wherein many new health habits are formed and old ones are broken. Longitudinal research has shown that this transition not only marks an age related decline in physical activity (Anderssen et al., 1996; Nelson, Gordon-Larsen, Adair, & Popkin, 2005) but also a time of experimentation with
potentially health-impairing behaviors such as regular alcohol use (Palmer, McMahon, Rounsaville, & Ball, 2010).

Sedentary behavior is an especially distressing problem for the younger generations as youth and young adults require more daily physical activity than older adults (Pate et al., 2005) and sedentary activities generate very low energy expenditures (Ainsworth et al., 2000; Chinapaw, Proper, Brug, van Mechelen, & Singh, 2011). Today’s youth spend an ever-increasing amount of time engaging in sedentary activities (Healy & Owen, 2010), such as interfacing with computers (Liou, Liou, & Chang, 2010), and this can impede the adoption and maintenance of an active lifestyle. In addition, many youth today are afforded less structured active time, as seen through the lessened focus on gym class in schools (Faulkner et al., 2007; Dwyer et al., 2006).

The link between physical inactivity, sedentary behavior and technology use (e.g., video games; Nelson et al., 2005) highlights the importance of an individual’s psycho-social environment. Another type of environment drawing increasing attention is the individual’s built environment (Frank, Kerr, Sallis, Miles, & Chapman, 2008). The built environment consists of the neighborhoods, recreational facilities, and spaces in which people are educated, live, work and play (Sallis & Glanz, 2006). Research has shown that having access to resources such as exercise equipment/classes is important for regular exercise behavior (Sallis & Glanz, 2006).
By increasing both the amount of time spent in an inactive state and decreasing the availability of environmental resources that foster activity, an individual has less opportunity to participate in physical activities (Biddle, Gorely, Marshall, Murdey, & Cameron, 2003). These barriers to activity are especially problematic for women given that this segment of the population is known to be less active on average than their male counterparts.

**Women and Exercise**

Research has shown that girls are more inactive than boys beginning at a young age and that this difference persists through adolescence (Sallis, Prochaska, & Taylor, 2000). In addition, objective accelerometer data has shown that men tend to occupy the more highly active categories whereas women the low or limited activity categories (Tudor-Locke, Brashear, Johnson, & Katzmarzyk, 2010).

Other, more general health and wellness differences across the lifespan also suggest that men and women ought to be considered separately. For example, young American adult women often feel cultural pressure to achieve thinness (Myers & Crowther, 2007) and make frequent comparisons of themselves to peers (Silberstein, Striegel-Moore, & Rodin, 1988). These body image issues lend themselves to women having higher rates of eating disorders than males (Striegel-Moore & Bulik, 2007) and having generally lower body satisfaction (Grogan, 2010). Some research has even made a link between unfavorable social comparisons in a workout facility and women decreasing their exercise output (Wasilenko, Kulik, & Wanic, 2007).
Women also carry the unique burden of pregnancy and postnatal periods as potential risk factors for long-term overweight/obese status. Research has consistently found that postnatal women are less active than women of the same age who do not have children (Verhoef, Love, & Rose, 1992). Further results have suggested that women with demanding obligations such as work and family may face significant obstacles when attempting to meet health behavior recommendations (Sanchez, Norman, Sallis, Calfas, Rock, & Patrick, 2008).

Although some of these risk factors of childbearing and work/family combinations may not yet be operating in a young female adult population, it is important to understand the current relationship women have with exercise. Interventions may be able to inform young women of risk factors unique to them. Tailored interventions could focus their efforts on engaging young women in exercise early and help them maintain this behavior through adulthood. Recent research suggests that such interventions may also need to target the demographic variables of ethnicity and socioeconomic status (SES) as they are known to interact with gender to increase obesity risk or inactivity status (Sanchez et al., 2008). However, the relationship among gender, ethnicity and SES is complex, dynamic, and not yet fully understood (Wang & Beydoun, 2007).

**Exercise, Ethnicity and Socioeconomic Status**

Multiple risk factors often combine to create inter-dependent correlates of both weight status and activity levels. Therefore, it is important that demographic
variables such as ethnicity and SES are not viewed as stand-alone correlates. For example, minorities that live with low SES are at risk for inactivity and overweight status due to inadequate availability of resources such as time to exercise (Frank et al., 2008) as well as access to physical environments conducive to active living (Yen & Kaplan, 1998). Although the present research is not focused on untangling the reasons behind ethnic and socioeconomic differences in exercise behavior, it acknowledges that such differences do exist. As such, both of these demographic variables were investigated in the present study.

Ethnicity was controlled for by design in that only Caucasian and Latina women were sampled. The comparison of these two ethnic groups on exercise behavior is supported by the abundance of literature that cites Whites as exercising more regularly than Latino men and women (Adabonyan, Loustalot, Kruger, Carlson, & Fulton, 2010; Delva, O’Malley, & Johnston, 2006; Dowda, Ainsworth, Addy, Saunders, & Riner, 2003; Macera et al., 2005; Sallis et al., 2000). However, it may be that this difference is inflated due to the heavy reliance on the self-reporting of exercise. The most recent objective assessments of activity levels bring into question differences among ethnic groups. For example, it has traditionally been found that Whites exercise more than non-Whites and that minority groups are at highest risk for inactivity (Macera et al., 2005). Yet accelerometer profiles of U.S. adults have recently shown that moderate to vigorous levels of physical activity were highest among Mexican-Americans (Center for Disease Control & Prevention, 2007). A
recent study used these data to compare physical activity levels from both self-report and accelerometer profiles and found that although Mexican-Americans self-report the lowest levels of activity, their accelerometer profiles were the highest (Tucker, Welk, & Beyler, 2011). Therefore, it may be that these long-standing “known differences” are at least in part attributable to differences in how various ethnic groups respond to survey questions.

The complicated relationship between ethnic status and exercise behavior also involves SES. Specifically, ethnic minority groups are known to have lower SES than Whites and this can confound the relationship with health behaviors such as exercise and ethnicity (Marshall, Jones, Ainsworth, Reis, Levy & Macera, 2007). The present research was interested in accounting for this relationship and, therefore, examined family household income as a proxy for SES. Health behavior studies commonly use single item indices such as income to measure SES (Frank et al., 2008; Sanchez et al., 2008). Although multi-item indices can provide a richer perspective on SES (Shavers, 2007) this option was a poor fit for the present study’s population. For example, the composite measure known as Hollingshead’s Index (Bornstein, Hahn, Suwalsky, & Haynes, 2003) combines factors such as individual education level attained and current occupation to create a composite score. Within a college student population there is not enough variability across such variables to yield a meaningful score.
Exercise, BMI and a Population’s Health

Another variable that has been correlated with an individual’s current exercise behavior is body-mass-index (BMI). However, using self-reported exercise behavior, BMI has not been found to be a consistent predictor of an individual’s activity level (Baumen, Sallis, Dzewaltowski, & Owen, 2002; Sallis et al., 2000). It appears that this relationship becomes significant when looking at clinically sedentary, overweight or obese populations (King et al., 2006). Given that young adult women are currently experiencing the highest rates of mean BMI increases relative to other age and gender combinations and that minority groups have higher rates of obesity than Whites (Weng & Beydoun, 2007), BMI was examined in the present study.

Lastly, it is also important to consider the general healthiness of the population. A common means of obtaining such information is seen in The Behavioral Risk Factor Surveillance System (BRFSS). One of the items in this survey is a self-report question asking respondents to rate their general health as excellent, very good, good, fair or poor (Center for Disease Control, BRFSS). This single response item has been well validated in studies that rely on subjective reporting of personal health status (Robins & Hezler, 1988; Niaura, Britt, Borrelie, Shadel, Abrams, & Goldstein, 1999; Shea, Stein, Lantigua, & Basch, 1991) and was used for descriptive purposes in the present study.

Large scale community health studies have employed similarly brief questions to assess whether the sample being investigated has existing limiting factors such as
long-term illness, injury or handicap that could preclude them from exercising. The present study probed for existing limitations and removed individuals presenting contraindications to exercise from the main analyses. In non-clinical, middle aged adult populations the prevalence of such factors is estimated to be between 3.7% and 11.8% for long-term illness and 6.1% and 7.2% for long-term injury/handicap (Armstrong, Sallis, Hovell, & Hofstetter, 1993; Sallis et al., 1989). These questions may not illuminate specifics on disease prevalence (e.g., community rates of heart disease) but they are able to uncover current limiting factors that likely influence the exercise behavior or intention to exercise of individuals who endorse them.

Individual health status, age, gender and environment are just a few of the many variables that are correlated with an individual’s exercise behavior. In order to better understand the myriad of inter-dependent relationships that can explain exercise behavior, the latest research pulls from an array of fields such as epidemiology, physiology and psychology. For example, disease prevention research examines caloric intake, maladaptive stress responses and sedentary behaviors (Charansonney & Després, 2010). These newer paradigms are akin to ecological models (Sallis & Glanz, 2006) and are believed to be best suited to deconstruct the complexities of health behaviors.

**Predicting Exercise Behavior**

The most popular theories for modeling health-behaviors are built upon social-cognitive frameworks and focus on the individual’s attitudes towards and
beliefs about the behavior in question (Rhodes & Plotnikoff, 2005). One of the most widely used theoretical frameworks is the transtheoretical model (TTM; Prochaska & Velicer, 1997). This model is particularly effective for research interested in studying the entire spectrum of possible relationships with a given health-behavior.

**The Transtheoretical Model**

The transtheoretical model (TTM) was originally established by Prochaska and DiClemente (1983) for use in smoking cessation research. In looking closely at smoking cessation programs, it had become evident that smokers immersed in formal treatment programs were not having success remaining abstinent. It was acknowledged that not all individuals who enter a formal treatment program are ready to take the action necessary to successfully change (Prochaska & DiClemente, 1983). As a modifiable health behavior, smoking is similar to exercise in that the behavior is difficult to change. Indeed, the difficulty of making long-term changes to health habits has been discussed by behavioral scientists (Ory, Jordan, & Bazzarre, 2002). Although non-optimal health behaviors are often recognized by the individual, and a desire to change may be formulated, efforts to sustain lasting change are often unsuccessful. Frequent efforts to change behavior are said to fail due to differences between behavior initiation and behavior maintenance (King, Rothman, & Jeffery, 2002). This distinction is highlighted and described by the TTM.

Since its formulation, the TTM has been one of the most heavily researched health-behavior models (Bauman et al., 2002; Dijkstra, De Vries, & Bakker, 1996;
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Hausenblas, Dannecker, & Downs, 2003; Mullan & Markland, 1997; Pinto, Lynn, Marcus, DePue, & Goldstein, 2001; Slavet et al., 2006; Spencer, Adams, Malone, Roy, & Yost, 2010). Its popularity largely rests on the consistency with which its key constructs have been correlated across a wide range of health behaviors. For example, variables from the TTM have explained adolescent sedentary behavior (Norman et al., 2004) and women’s mammography screening (Rakowski, Dube, Marcus, Prochaska, Velicer, & Abrams, 1992). Furthermore, as a stage model, it carries a certain intuitive appeal (Herzog & Blagg, 2007; Weinstein, Sutton, & Rothman, 1998). For example, tailored health-behavior interventions based on stage membership can be viewed as preferable to a one size fits all approach (Anatchkova, Velicer, & Prochaska, 2004; Slavet et al., 2006).

The central construct of the TTM is its temporal organizing dimension – the stages of change. These temporal levels classify individuals according to their “readiness” to make a health-related behavior change. Both intention to engage in the behavior and actual participation in the behavior are explained by the following five stages: precontemplation (not intending to make changes); contemplation (considering a change in the near future); preparation (making small changes); action (actively engaging in the behavior); and maintenance (sustaining the behavior over time).

Although the semantics of the construct are written as “readiness to change,” this really only applies to those still in the intention to change stages (i.e., in the...
contemplation or preparation stage). Conversely, behavior engagement best
describes those individuals already endorsing the behavior (i.e., in the action or
maintenance stages). Perhaps because of this difference, more recent research has
articulated the five stages of change as stages of “motivational readiness” (Lee, Nigg,
DiClemente, & Courneya, 2001). The present study refers to the stages as simply the
stages of change in an effort to maintain consistency across all of the research.
However, it should be made clear that those not intending to change their exercise
behavior constitute the lowest stage of the construct (precontemplation), those
contemplating a change in their exercise behavior in the near future the next stage
(contemplation), those currently making small changes in their exercise behavior the
third stage (preparation), and those currently engaging in exercise the fourth and fifth
stages (action and maintenance respectively). A critical analysis of these five stages
follows. Next, the remaining variables of interest from the TTM and other theories of
interest are discussed.

**Critical inconsistencies of the TTM’s stages of change.**

Despite the TTM’s success in explaining health-related behaviors such as
smoking and exercise, many studies have strongly questioned its theoretical
coherence (Bandura, 1997; Brug, Conner, Harre, Kremers, McKeller, & Whitelaw,
2004; Hausenblas et al., 2003; Herzog & Blagg, 2007; Lippke & Plotnikoff, 2009;
Weinstein et al., 1998). Researchers have called attention to the fact that the TTM
needs standardization of measurement (Dishman, 1994; Hall & Rossi, 2008; Marshall
& Biddle, 2001) and the strongest debate focuses on the stages of change. For example, variation in the placement of individuals among stages is regularly found in smoking research. Some studies require a behavioral condition be met (i.e., a quit attempt) in order for the smoker to move from the second (contemplation) to the third (preparation) stage of change (Herzog & Blagg, 2007), whereas others do not mandate a prior quit attempt (Dijkstra et al., 1996). Research has also had a difficult time consistently describing individuals’ progression upwards, through the stages, questioning whether qualitatively different stages exist or behavior change occurs along an underlying continuum (Marshall & Biddle, 2001). For the present research’s investigation of exercise behavior, three critical inconsistencies are especially pressing: one, measurement form, two, categorization post-hoc, and three, the defining of exercise behavior.

_The inconsistency of measurement form._ The first inconsistency, measurement form, is problematic because different forms may be interpreted quite differently. For example, the stages of change for exercise has been measured with a visual analog scale (Marcus, Rakowski, & Rossi, 1992; Mullan & Markland, 1997), an algorithm based questionnaire (Nigg et al., 2005), or by several questions along a Likert scale (Armstrong et al., 1993). It remains unclear which version of the measure is most accurate in describing an individual’s relationship with exercise or if they are simply alternate forms.
The visual analog stages of change measure takes the shape of a ladder containing numbered rungs (see Figure 1). Participants are asked to choose a rung on the ladder that best describes their orientation towards and status of exercise behavior.

This design was first conceived of by Biener and Adams (1991) for use in smoking research with the intention that the ladder would yield continuous data.

Figure 1 - Stages of Change Ladder

- 10: I currently exercise and have been doing so for more than 6 months.
- 9: I currently exercise, but I have been doing so only for the last 6 months.
- 8: I currently exercise but not regularly.
- 7: I do not currently exercise but I am thinking about starting in the next 6 months.
- 6: I do not currently exercise and I do not intend to start in the next 6 months.

The number of rungs on the ladder is either 11, with anchor statements next to 5 of them (Mullan & Markland, 1997), or five, with an anchor statement adjacent to each (Wyse, Mercer, Ashford, Buxton, & Gleeson, 1995). When the longer ladder is
used, coding instructions take individuals who endorse rungs in between anchor statements and collapse them back to the previous stage. This is because their response did not meet the minimum requirement for stage membership (Marcus et al., 1992). For example, an individual endorsing rung number four will be categorized as a contemplator because she does not meet the minimum requirement for preparation, which is rung number five.

Like the stages of change ladder, the stages of change algorithm can be presented in two different forms. Sometimes respondents are asked to indicate which of the five stages best describe their current exercise behavior (Hausenblas et al., 2003; Lee et al., 2001) whereas other times they are asked to answer a series of yes/no staging questions (Figure 2; Nigg et al., 2005). The stages of change algorithm that utilizes a yes/no, dichotomous format, includes four questions and is considered by some researchers to be the best format (Nigg et al., 2002; Reed, Velicer, Prochaska, Rossi, & Marcus, 1997).

**Figure 2 – Stages of Change Algorithm**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you currently engage in <strong>regular exercise</strong>?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>1. Do you intend to engage in <strong>regular exercise</strong> in the next 6 months?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Do you intend to engage in <strong>regular exercise</strong> in the next 30 days?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Have you been <strong>regularly exercising</strong> for the past 6 months?</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
An advantage of this format is that the responses and corresponding categorizations made from the algorithm are unambiguous; answers and subsequent stage classifications are clearly defined. However, a disadvantage is that this is a forced-choice format. For example, the third question asks, "Do you intend to engage in regular exercise in the next 30 days," with the participant being forced to choose between yes or no. There is no evidence to support the anchor point of 30 days and its usage may obscure the true intentions of the respondent.

The present study used both the ladder and the algorithm in order to compare how they differentially operated within the same population. Furthermore, the ladder was evaluated as both a continuous variable and as a discrete variable.

**The inconsistency of stage categorization post-hoc.** The second inconsistency, stage categorization post-hoc, is problematic because variations in how stages are determined easily leads to differences in conclusions drawn across studies. Stage categorization is dependent upon several factors: the form of measurement used; the researcher’s plan of analysis; and the number of individuals endorsing each stage. Both measurement selection and plan of analysis are under the control of the researcher, but the number of individuals endorsing each stage is not. Many studies use a reactive recruitment strategy which often leads to a greater ratio of individuals endorsing the later stages (Marshall & Biddle, 2001). For example, studies may draw a sample from individuals already in the healthcare system and these individuals are likely be slightly healthier than the true population, engaging in some exercise or at
least professing a commitment to start soon. A result of reactive recruitment is that there is rarely adequate power to test direct differences between stages, such as between the second stage (contemplation) and the third stage (preparation). It is usually only those studies that sample a very large number of individuals that are able to make comparisons between adjacent stages (Plotnikoff, Hotz, Birkett, & Courneya, 2001).

Due to this limitation, two or more of the stages are often combined. For example, sometimes the first two or three stages are collapsed into one (Armstrong et al., 1993; Rhodes & Plotnikoff, 2005) and sometimes both the first three and the last two stages are combined (Wyse et al., 1995). This strategy is not ideal for a true stage model (Weinstein et al., 1998) however the creation of a dichotomous split from among the stages does make conceptual sense. The result is two distinct groups: the “intentional group” and the “behavioral group” (Bulley, Donaghy, Payne, & Mutrie, 2007). This split highlights the differences in motivation to change between those not actively engaged in the behavior, or in the pre-adoption stages, and those actively engaged, or in the post-adoption stages (Marcus, Pinto, Simkin, Audrain, & Taylor, 1994; Prochaska & Marcus, 1994). These two groups were compared in the study’s main hypotheses.

The inconsistency of defining the behavior. The final difficulty with the stages of change model is how the health-behavior in question is defined by the
researcher. In discussing exercise/physical activity research, there are two nested issues within this difficulty.

The first nested issue is that a distinction between physical activity and exercise is warranted, yet they are often treated as the same construct. A recent meta-analysis (Hellsten et al., 2008) highlighted the important conceptual differences between exercise and physical activity by examining nine, large-scale physical activity studies from the Behavior Change Consortium (Ory et al., 2002), each of which used a common stages of change algorithm. Their definition of physical activity was distinct from those most commonly used for exercise because it was sensitive to light activity and also lessened the focus on the planning component of exercise which is believed to be central to the difference between the two. For example, the definition of physical activity included the following: “Physical activity includes such activities as walking briskly... line dancing... or any other activities where the exertion is similar to those activities. Your heart rate and/or breathing should increase, but there is no need to exhaust yourself,” (Nigg et al., 2005). Conversely, exercise studies commonly use definitions that include wording such as “exercise...at least 20 minutes without stopping...hard enough to make your heart rate/breathing increase a large amount” (Armstrong et al., 1993; Sallis et al., 1989). Hellsten et al.

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1 The present study investigated exercise behavior and, as such, all further references are stated as exercise behavior, not exercise/physical activity behavior. Although every effort was made to consistently pull from empirical studies using the construct “exercise behavior,” a good deal of research fails to distinguish between the two. Therefore, some of the research still to be discussed has been conducted using physical activity as the behavioral criterion.
(2008) stated that the conceptual differences between physical activity and exercise warrant the use of different tools to assess them.

The second nested issue with defining the health-behavior in question is specific to the study of exercise. The definition of exercise requires that measures of intensity, duration and frequency are addressed as well as clearly stated. Additionally, this definition should remain consistent across studies. Unfortunately, this definition is known to vary substantially. For example, 20 minutes per day (duration), three to five times per week (frequency) is frequently used to define the behavioral criterion of being *active* (i.e., the action stage; Reed et al., 1997; Schumann et al., 2002). However, some studies fail to state what criteria was used to define *active* (Lippke & Plotnikoff, 2009) while still others fail to define exercise at all (Mullan & Markland, 1997). It has been mentioned how these lapses, when combined with the knowledge that most current research in psychology uses less stringent criteria than that used in related fields (e.g., epidemiological research) are highly problematic (Marshall & Biddle, 2001). Furthermore, current variations in how exercise is defined across studies may account for significant differences in effect sizes with variables such as the pros and cons of change from the TTM. In fact, a recent meta-analysis Hall and Rossi (2008) suggests that this variation makes the true predictive strength of some TTM variables difficult to know.

To address the above mentioned inconsistencies, Reed et al. (1997) published recommendations for what constitutes a good stages of change for exercise measure.
They suggested that researchers select: a discrete behavior; a behavioral criterion that includes frequency, duration and intensity; and the best format to measure the stages of change. The present research has not only followed these but also added the following recommendation: research using self-report methodology should anchor the criterion *regular exercise* to moderate-intensity cardiovascular activity for a minimum of 30 minutes a day, five days a week (United States Department of Health & Human Services, 2008). The present research was interested in determining how this more thorough and targeted definition of regular exercise may influence established relationships among predictive variables. If the relationships can be replicated using the above exercise criterion, this will extend the validity evidence for the stages of change and the TTM.

In spite of the inconsistency issues with the stages of change measure, the TTM’s conceptualization of an individual’s orientation towards specific health behaviors is powerful for two predominant reasons. First, it can describe the linear progression of change while also accounting for its cyclical nature. That is, individuals can “relapse” back to an earlier stage (Marcus et al., 1992). Second, it has valid relationships with variables known to predict stage membership such as the pros and cons of change.

**The Pros and Cons of Change from the TTM.**

The pros and cons of change are known as the decisional balance dimension of the TTM, originally adapted from Janis and Mann’s decisional balance sheet of
incentives (1977). This two factor construct represents a personal schema comprised of both motivational and cognitive features of decision making (Velicer, DiClemente, Prochaska, & Brandenburg, 1985). The schema then creates a sort of “balance sheet” of potential gains versus potential losses. Placing more weight on the pros of the behavior conveys a willingness to make and sustain changes based on motivation and outcome beliefs of engaging in the behavior. For example, an individual will more strongly endorse pro-behavior statements such as “exercising makes me less stressed at the end of the day” as she begins to engage in the behavior or moves closer to behavior-initiation. Conversely, placing more weight on the cons of the behavior indicates a greater reluctance to incur perceived losses that follow from engaging in the behavior. For example, an individual will more strongly endorse con-behavior statements such as “I feel too selfish when I exercise regularly” if she is not actively considering the behavior nor currently engaged in it.

Numerous studies have found convergent validity evidence for the decisional balance scale with the stages of change (Jordan, Nigg, Norman, Rossi, & Benisovich, 2002; Norman et al., 2004; Pinto et al., 2001; Plotnikoff et al., 2001; Williams et al., 2008). A motivational shift in thinking is known to occur between the first/second stage and the final stages (Hall & Rossi, 2008). The exact location of this shift has not shown to be a consistent marker of behavior change but rather generally occurs in conjunction with contemplating change (Marshall & Biddle, 2001). Contemplating
change is evidenced by individuals anticipating fewer cons with regard to changing their behavior and expecting more pros as they progress upward through the stages.

A more in-depth look at this motivational shift, however, has uncovered some important differences between the strength of the pro factor versus the con factor. Specifically in reference to exercise research, it appears that the relationship between the stages of change and decisional balance may be mostly driven by significant increases in the pros of exercise and that a substantially weaker relationship holds for the con factor (Pinto et al., 2001; Plotnikoff et al., 2001). In fact, the magnitude of the increase in the pros of change is known to be approximately twice the decrease in the cons of change as an individual moves from precontemplation to action. This pattern of change has been termed the strong and the weak principles of change (Prochaska, Velicer, Rossi, Goldstein, Marcus, & Rakowski, 1994). A recent meta-analysis has confirmed that the average effect size for the pros of change is significantly higher than that for the cons of change ($M_{ES} = 1.45$ and $M_{ES} = .54$ respectively; Hall & Rossi, 2008). In light of the differences between these two factors, the present study focused on the pros and cons of exercise as two related but independent factors. A decisional balance score then, that subtracts the pros from the cons, was not utilized; rather the two factors were looked at independently.

A construct similar to decisional balance that is also sensitive to progress across the stages of change is self-efficacy. Unlike the pros and cons of decisional balance however, self-efficacy generally has a steadily increasing pattern of strength
from the earliest stages to the latter stages. The established relationship between self-efficacy and exercise is the strongest of all of the constructs and demographic variables discussed up to this point as several reviews and meta-analyses indicate (Bulley et al., 2007; Baumen et al., 2002; Marshall & Biddle, 2001).

Self-efficacy Theory

Originally defined by Bandura (1977), self-efficacy is defined as having the self-belief or conviction that a specific task can be accomplished. This self-belief is at least partially based on previous experience and often translates into whether or not the present demands of the task are met. Self-efficacy contains two dimensions: efficacy expectations and outcome expectations. Efficacy expectations are the beliefs that the behavior may/may not be performed. They are believed to be responsible for driving behavior change as they determine whether or not the behavior is attempted in the first place (Bandura, 1977; Sallis, Pinski, Grossman, & Nader, 1988). For example, if someone has repeatedly set the goal to start an exercise regime but never successfully followed through, she will have lower self-efficacy for exercise than someone who has found success. Her efficacy expectations are low, due to her previous experience, and she is unsure of her ability to carry out the task.

Different from this then are outcome expectancies which are defined as the conviction that specific courses of action will produce specific outcomes. That is, individuals learn that certain behaviors lead to certain outcomes but this is distinct from their belief or doubts in their own abilities to perform the necessary actions to
complete the behavior. For example, an individual may know that exercising regularly for six months will help her lose weight but she harbors serious doubts about her ability to achieve such consistency. The present research investigated the efficacy expectations dimension of self-efficacy theory as this self-evaluation is most relevant to behavior change and task orientation. From here forward efficacy expectations is simply referred to as self-efficacy.

A substantial body of literature has demonstrated the behavior-specificity of self-efficacy and it has been found to be one of the strongest correlates of numerous health-behaviors (Hofstetter, Sallis & Hovell, 1990; Rodgers & Sullivan, 2001; Sallis et al., 1988; Sullum, Clark, & King, 2000; Williams et al., 2008). Although general self-efficacy scales are relevant to some fields such as positive psychology and personality research, the study of health psychology and behavior change has overwhelmingly indicated that self-efficacy is domain (i.e., behavior) specific. For example, an individual may have high self-efficacy for exercise behavior but low self-efficacy for performing regular self-mammography screenings. Over the past several decades, self-efficacy’s utility in describing movement through the stages of change as well as in predicting stage membership has been established. For example, in both smoking research (Dijkstra et al., 1996) and in exercise research (Rhodes & Plotnikoff, 2005; Sallis et al., 1989; Sallis et al., 1988; Sallis, Calfas, Alcaraz, Gehrman, & Johnson, 1999; Williams et al., 2008; Wyse et al., 1995) those in later stages of change have higher self-efficacy as compared to those in the earlier stages.
Additionally, there is evidence that individuals scoring high on self-efficacy for exercise measures are less likely than those scoring low to drop out of their exercise program even in the face of perceived barriers (Sallis, Hovell, Hofstetter, & Barrington, 1992). Notably, self-efficacy for exercise is most frequently measured as confidence to overcome common barriers to exercise and is therefore sometimes referred to as *barrier efficacy* (Rhodes & Blanchard, 2007).

Self-efficacy and the pros and cons of change are just two of the many psychosocial predictors of an individual's orientation towards and status of exercise behavior. The present study is intent on elaborating beyond these traditional constructs to provide a more holistic picture of what predicts an individual's relationship with exercise. It is believed that similar social-cognitive theoretical constructs are sensitive to stage movement and even exhibit predictable patterns in relation to the stages. Hope theory (Snyder et al., 1991) has the potential to help build a more complete model of exercise behavior because it incorporates not only a self-efficacy type component but also a planning component.

**Hope Theory**

Hope possesses many similarities to other social cognitive constructs, but it has been shown to add unique contributions to the literature. Hope is distinct from self-efficacy (Magaletta & Oliver, 1999) and other expectancy constructs such as optimism (Gallagher & Lopez, 2009). Hope can be measured as a general construct, transcending specific situations (i.e., trait hope), as related to a specific time and place.
(i.e., state hope) or as domain-specific (e.g., goal-specific hope for exercise). These three hope constructs are independent from one another but are correlated (Snyder, 2002).

Hope theory purports two interconnected components as the foundation of goal-directed thought: pathways and agency (Snyder et al., 1991). Pathways thinking is defined as the perceived ability to uncover productive means to reach desired goals. In contrast, agency thinking explains how an individual perceives her ability to initiate and sustain movement along these pathways. High hope individuals possess both the willpower to follow through on goal-directed thinking and are able to follow numerous pathways to achieve their goals. Furthermore, hope operates in a feedback loop whereby positive event outcomes increase hope, and pathways and agency thinking reciprocally influence one another (Cheavens, Feldman, Gum, Michael, and Snyder, 2006).

As there are clear similarities between hope theory and self-efficacy theory, it is important to explain how they differ. Snyder (2002) purports that what distinguishes the two theories is the can component of self-efficacy theory versus the will component of hope theory: He has discussed how self-efficacy is focused on the capacity to act while hope is centered on a more willful component.

A more targeted question may be how self-efficacy differentially relates to the two components of hope theory – agency and pathways. Both agency-related hope thoughts and self-efficacy speak to an individual’s capability or confidence to execute
the behavior. Therefore, it may be that self-efficacy is most similar to agency. However, pathways-related hope thoughts appear to be most closely related to the expectations component of self-efficacy. For example, self-efficacy theory suggests that an individual must not only have the confidence to execute the behavior (agency) but be able to navigate the necessary courses of action to ensure the behavior is completed (pathways). In this instance, it may be that self-efficacy is most similar to pathways. The present study examined the relationships among these constructs and attempted to shed light on how they differentially operate as predictors of exercise behavior. Similar to research looking at implementation intentions and self-regulation (Stradler, Oettingen & Gollwitzer, 2010), it is believed that both agency-related thoughts and pathways-related thoughts are needed for the realization and maintenance of goal-directed behavior.

A key component of hope theory is that agency and pathways feed off of one another – they are said to be both iterative and additive as one is engaged in goal-pursuit (Snyder et al., 1991). For example, a brief hope intervention can increase agency thinking by activating a positive attitude toward goal-setting (Cheavens et al., 2006). Berg, Snyder, and Hamilton (2008) also found that pain coping skills can be enhanced with a brief hope intervention and that moderate physical pain is better handled by those high in hope. This is similar to motivational interviewing in clinical research or motivational fitness instructors who can help their clients persist through discomfort (e.g., complete a challenging aerobics class).
Hope has also been shown to be predictive of goal-related activities (Anderson, 1998; Feldman, Rand, & Kahle-Wrobleski, 2009). Curry, Snyder, Cook, Ruby, and Rehm (1997) found that athletes had higher hope than non-athletes and that hope predicted athletic performance even better than training, self-esteem, confidence or mood. Also, Snyder (2002) describes evidence of young girls attending a sports camp wherein those with higher hope were less likely to consider quitting their sport(s) than their lower hope counterparts. However, outside of athletics, there has been limited research on hope and exercise. There are only two known studies that have examined hope theory and exercise behavior and the findings are mixed. Berg, Ritschel, Swan, An, and Ahluwalia (in press) recently examined hope and health behaviors such as exercise and limiting dietary fat among college students. The authors found that those higher in state hope reported greater frequency of exercise behavior. Higher state hope individuals were also more likely to be exercisers than their lower hope counterparts.

Conversely, Norwood (2000) did not find support for a relationship between hope and exercise. Specifically, trait hope was not able to predict exercise adherence, commitment or fitness improvement. However, a limitation of this research may be that a state or goal-specific hope measure was not utilized. State and/or goal specific hope may be more sensitive measures because they examine hope in the here and now. It is also likely that hope operates similarly to self-efficacy such that it is domain specific when trying to predict a goal-directed behavior such as exercise.
This may be especially true for those that do not already self-identify as being an "exerciser." Goal-specific or state measures of hope are then expected to be the best fit for research assessing current behaviors and intention to engage in certain behaviors because they are both anchored to targeted or extant levels of hope.

As can be seen from the literature review thus far, the interconnectedness among constructs suggests a multi-pronged approach: key relationships among variables are yet to be fully understood and many constructs appear to overlap. Theory integration, such as that of hope theory and the TTM, can help explain the mechanisms behind these relationships. Furthermore, the unification of variables from multiple social-cognitive frameworks has been successfully carried out in previous research. For example, with the aim of theory integration, Lippke and Plotnikoff (2009) uncovered meaningful relationships among variables from protection motivation theory (a continuum health behavior model) and the TTM (a stage model) in the prediction of physical activity behavior.

The present research also utilized theory integration by bringing in the construct attitude toward exercise from the theory of planned behavior (Ajzen, 1991). Similar to the relationship between hope and self-efficacy, attitude and the pros and cons of change have been found to be closely related. For example, Jordan et al. (2002) demonstrated how explained variance in predicting an individual's relationship with exercise increased from 32.2%, with the pros and cons of exercise alone, to 55.6%, by adding attitude towards exercise to the prediction model. As the
present study further demonstrates, combining cognitive variables, that are involved in the decision making process behind health behavior engagement, is an effective strategy.

**Attitude toward Exercise from the Theory of Planned Behavior**

Attitude research and theory has a long and rich history, beyond the scope of the present study. However, it is important to define attitude and briefly review its relationship to exercise behavior. According to the theory of planned behavior (TPB), attitude is defined as a central belief that guides an individual’s decision to either perform or not perform a behavior (Ajzen & Cote, 2008). It is a positive or negative evaluation of a person, object or idea, such as exercising, and is often used to explain the decision-making process underlying behavior (Fishbein & Ajzen, 2010). Specifically, evaluative judgments summarize reactions to an object and these reactions are known to vary in strength.

The TPB considers attitude, subjective norms and perceived behavior control as the subcomponents of intention, which in turn is said to be the best predictor of behavior (Ajzen, 1991). In general terms, attitude describes the relevant advantages and disadvantages an individual feels when considering performing certain behaviors and carries predictive value due to the valence ascribed by individuals to these behaviors. For example, an individual may feel that exercising is good for her body (cognitive belief) and that she enjoys doing it (positive valence), which in turn suggests she is likely to exercise regularly.
In looking at the subcomponents of attitudes towards certain behaviors, it is important to distinguish between the affective and cognitive dimensions. Different properties of each dimension are believed to exemplify distinct contributions to the individual’s attitude towards a given behavior (Jordan et al., 2002). For example, the adjective pair wise/foolish can represent a cognitive dimension of an individual’s attitude toward exercise. As such, one can endorse the statement “I feel my participation in exercise at the present time is...” along a Likert scale from wise to foolish. This represents both the valence of one’s attitude and the strength. The present study assessed both the cognitive and affective dimensions of attitude toward exercise, and examined the relative predictive power of each in explaining an individual’s orientation toward or status of exercise behavior.

The present study is the first of its kind to unite self-efficacy, hope, the pros and cons of change, and attitude to predict an individual’s status of/orientation towards exercise behavior. The study is also novel in its comparison of two stages of change measures within the same population. Before the present study’s goals and hypotheses are discussed, findings from a pilot study are summarized.

Pilot Study Findings

A pilot study was undertaken in the Fall 2009 semester with the goals of examining the stages of change distribution of the college student population and evaluating the characteristics of the SOC ladder (Figure 1, p. 20). A survey packet examining a range of health behaviors was administered to 52 participants (80%
female and 20% male). The sample distribution among the stages was 10% in contemplation, 50% in preparation, 10% in action and 19% in maintenance. This distribution is similar to other studies that have examined college populations (Hausenblas et al., 2003; Lee et al., 2001; Wyse et al., 1995).

The most relevant finding from the pilot study was that when provided with the opportunity to select from all 11 rungs on the ladder, 26 of the 52 participants chose between anchor statements and consequently impacted the categorization post-hoc. This opportunity was again provided to participants in the main study, allowing for the full range of this continuous measure to be utilized.

The pilot study was also instructive because it highlighted the importance of reactive sampling. The research project was titled “Health Survey” which may have resulted in the underrepresentation of less healthy and/or less active individuals. The present study addressed this potential bias by generalizing the description and title of the project.

Goals of the Present Research

Primary goal

The primary goal of the present research was to uncover the best prediction model of orientation towards/status of exercise behavior. Three separate regression models serviced this goal, all using the stages of change ladder, left continuous, as the dependent variable.
Hypothesis one. The first hypothesis stated that hope adds incremental validity to the variance explained by self-efficacy.

Hypothesis two. The second hypothesis stated that attitude adds incremental validity to the variance explained by the pros and cons of change.

Hypothesis three. It was hypothesized that self-efficacy, hope, pros and cons of change, and attitude toward exercise would combine to create the strongest prediction model. It was believed that this final regression model would use all of the cognitive predictor variables to explain an individual’s orientation towards/status of exercise behavior.

Secondary goal

The secondary goal of the present study was to evaluate the consistency of the stages of change measurement. To this end, the SOC ladder (collapsed into five stages) and SOC algorithm were compared within the same population: differences among stage membership between these two forms were evaluated.

Hypothesis four. It was hypothesized that a positive correlation between the two SOC measures exists. However, differences in stage membership within subjects were anticipated due to differences in coding instructions between the two measures. Descriptive statistics illuminated differences among stage membership within subjects.
Tertiary goal

A tertiary goal of the present study was to highlight the importance of standardization of measurement and subsequently expand the validity and reliability evidence of the stages of change. To this end, exercise was consistently defined across the two SOC measures and two self-reported measures of current exercise behavior were used to check concurrent validity. One of these was a survey measure whereas the other was a brief interview. Both of these measures are anchored to seven day reference periods and address frequency, duration and intensity of exercise. Godin’s Leisure Time Activity Questionnaire was used for descriptive purposes and exploratory post-hoc testing, whereas data from the 7-day Physical Activity Recall were used for the fifth and final hypothesis.

**Hypothesis five.** After participants were classified into stages, they were further split into two groups: the intentional group (precontemplation, contemplation and preparation) and the behavioral group (action and maintenance). It was hypothesized that those in the intentional group would report less than the recommended 150 minutes per week of physical activity. Conversely, it was expected that those in the behavioral group would meet the recommended 150 minutes per week.

To recapitulate, for the present study’s main hypotheses (i.e., Hypotheses one, two, and three) the Stages of Change (SOC) Ladder was the dependent variable and it was left as a continuous measure with a range of zero to ten. In this way, the ladder
described an individual’s relationship with exercise, from intention to behavior engagement, but did not correspond to exact stages. Conversely, for hypothesis four, wherein the SOC Ladder was compared with the SOC Algorithm, the ladder was collapsed to make the same five stages of change as the algorithm. For the fifth and final hypothesis, the dependent variable was minutes of activity per week as reported in the 7-day Physical Activity Recall and both the ladder and algorithm were used, as five-stage, ordinal measures.

Method

Participants

White and Latina female participants were recruited from a moderate-size university in California ($N = 139$). Recruitment specified that individuals be of White or Latina descent and almost all study participants met this criterion (93%). Individuals whom indicated their ethnic background as “other” were not included in the final sample ($N = 8$). In addition, 10 participants were removed from the final sample due to invalid interview data. These participants had difficulty accurately describing their past week’s physical activity. This was mostly attributable to the participants’ insistence that they did moderate to strenuous activity for many hours while working. Their average minutes per week of activity was greater ($M = 520$) than the 5 varsity athletes sampled ($M = 456$). Conceptually, it was determined that these data were not valid. This conclusion is supported by the fact that a significant percentage of study participants worked (65%) and it was only these 10 working individuals who struggled following the interviewer’s prompts. If work-related
activity was consistently leading to an inflation of minutes of activity, it would be
evident across all individuals who worked. This was not the case.

Another three individuals were excluded based on interview data due to their
reporting of significant recent illness (pneumonia), and injury (arm in sling, chronic
back injury only recently returning to walking) that was not revealed in the survey.
Lastly, six participants were excluded from the final sample due to the pre-
determined exclusions of long-term illness ($N = 1$), long-term injury/handicap ($N =
3$), pregnancy ($N = 1$) and full-time caretaker ($N = 1$). This final exclusion was based
on the question “Do you need to limit your physical activity because you are a parent
of a young child or a primary caretaker of an older adult/handicapped individual?”
Although not a physical limitation, being a primary caretaker for dependent(s) while a
college student was believed to be a significant time limitation, thereby limiting
leisure time activity such as exercise.

The final sample consisted of 112 White (51%) and Latina (42%) participants
with no contraindications to exercise.

**Procedures**

Participants first completed the survey packet which took between 15 and 25
minutes. Surveys were administered in a small research room, with one participant
per room. Participants were randomly assigned to receive either survey packet A ($N
=59$) or packet B ($N =53$), which differed based on the ordering of the two SOC
measures. The demographic questions and the predictor variable measures remained
in the same order for both conditions. There was no significant difference between
the two groups on the SOC ladder measure $F(1,109) < 1, p = .45$ or on the SOC
algorithm $F(1,110) = 2.84, p = .10$.

Upon completion of the survey participants took part in a brief (10-15 minute)
interview that assessed their past week’s activities. Participants were weighed and
their height was measured following the interview. This was done in a separate room
from where the participants completed the survey and the interview. All participants
received course credit for their participation.

Three female researchers ran an approximately equal number of participants
and there was no main effect for minutes per week of activity by researcher $F(2, 109)
= 1.13, p = .33$.

Measures

Control variable.

*The Marlowe-Crowne Social Desirability Scale (M-C SDS).* A short form of
the original Marlowe-Crowne scale was used (Strahan & Gerbasi, 1972) to check for
social desirability in the reporting of current exercise behavior and intention to
engage in exercise. Previous research using the stages of change as the outcome
variable has not examined social desirability as a potential control variable.

Total scores ranges from 0 (low) to 10 (high social desirability). The present
study’s sample had a mean of 4.83 ($SD = 2.13$). The M-C SDS has two factors:
attrition and denial. Five items make up the attribution subscale ($M = 1.82, SD =
1.35), which addresses an individual's propensity to endorse items depicting socially approved but uncommon behaviors. A sample item is “I'm always willing to admit when I make a mistake.” Five items make up the denial subscale ($M = 3.01, SD = 1.20$), which addresses the tendency to deny socially disapproved but common behaviors. A sample item is “I like to gossip at times.” Individuals indicate whether they believe each item is true or false for them.

The Marlowe-Crowne full scale (Crowne & Marlowe, 1960) has shown strong test-retest reliability (coefficient = .89; Beretvas, Myers, & Leite, 2002), concurrent validity (Tatman, Swogger, Love, & Cook, 2009) and good internal consistency ($\alpha = 0.85$; Tatman et al., 2009). The short version has shown adequate internal consistency in the past ($\alpha = .70$; Strahan & Gerbasi, 1972) but was low in the present study with .63 for the total scale (attribution =.52 and denial =.45). No significant correlation was found between the M-C SDS and the stage of change ladder ($r = .05; p = .60$). In fact, a correlation in the opposite direction as expected was found with minutes of weekly activity ($r = -.23; p < .05$). That is, research examining social desirability has shown that responding in a more socially desirable manner is correlated with self-reporting more exercise behavior (Warnecke et al., 1997). Yet the present finding suggests that individuals answering in a more socially desirable manner engage in less regular exercise. This is likely due to the low reliability of the measure.
There was no significant main effect of the stages of change classification, determined by the stages of change algorithm measure, $F(4,107) = 1.02 \ (p = .40)$. Given a lack of association with the outcome variables of interest and the poor reliability of the measure in the present sample, social desirability was not included in the analyses.

**Demographic predictor variables.**

**Socioeconomic status.** Socioeconomic status (SES) was probed for in the demographic portion of the survey with seven possible responses. This range of responses is similar to those used in other health behavior studies (Sanchez et al., 2008) and was created based on an average of the median household incomes in the surrounding area. Twelve participants reported less than $20,000 for annual household income, 15 participants reported $20,000-36,000, 21 participants reported $37,000-56,000, 18 participants reported $57,000-73,000, 11 participants reported $74,000-99,000, 12 participants reported $100,000-149,000, and 11 participants reported $150,000 and greater. For differences by ethnicity, see Table 1 (p. 58).

**Body-mass-index.** Body-mass-index (BMI) is a heuristic proxy for human body fat based on an individual’s weight (in pounds) and height (in inches). Weight ($M = 144.93, SD = 28.47$) and height ($M = 63.58, SD = 2.58$) were assessed using an electronic scale that had a retractable metal tape measure. Participants took their shoes off to be weighed and measured. BMI ($M = 25.28, SD = 4.87$) was calculated using the standard formula: multiply an individual’s body weight in pounds by 703...
and dividing this product by her height in inches squared (Billewicz, Kemsley, & Thomson, 1962). Using the World Health Organization's BMI classifications (WHO, 2004) four participants were underweight (BMI < 18.49), 51 participants were of normal weight (BMI = 18.50 – 24.99), 30 participants were overweight (BMI ≥ 25), and 15 participants were obese (BMI ≥ 30). For differences by ethnicity, see Table 1 (p. 58).

**Predictor variables.**

**Decisional balance measure.** This measure contains two subscales that present positive (i.e., pros) and the negative (i.e., cons) aspects of the decision to exercise (O’Connell & Velicer, 1988). In the present study, a 20 item measure asked individuals to consider statements with respect to their decision to exercise (Jordan et al., 2002). A sample item pro statement is “I would feel less stressed if I exercised.” A sample con statement is “I am afraid to find out that I am not good at exercising.” Participants were asked to indicate the importance of each statement using a 5-point Likert scale from 1 = *not at all important* to 5 = *extremely important*. The mean for the 10 item pro subscale was 41.80 (SD = 7.18) and the mean item for the 10 item con subscale was 14.23 (SD = 4.40). For the present study reliability was adequate at .85 (pros = .91 and cons = .74). Previous research shows strong internal reliability for the pros subscale ( = .95) and for the cons subscale ( = .94; Jordan et al., 2002).

Test-retest reliability and predictive validity of the pros and cons has been demonstrated (Rhodes & Plotnikoff, 2005). Convergent validity with the SOC for
exercise has also been supported. Across 48 different health behaviors, including exercise, a recent meta-analysis found that the average increase from the precontemplation stage to the action stage of change is one standard deviation for the pros and one-half standard deviation increase in the cons of change (Hall & Rossi, 2008). Also in this meta-analysis, the principal moderator of effect size for the pros and cons of change was found to be the behavior under investigation. For the pros, exercise consistently displayed the largest effect size ($M_{\text{effect size}} = 1.45$) and although smaller, the cons was still found to be large ($M_{\text{effect size}} = .54$).

*Attitude toward exercise.*

Attitude toward exercise is measured using six semantic differential scales (Jordan et al., 2002). Three of the differential scales tap cognitive attitudes (harmful-beneficial; wise-foolish; useful-useless) and three tap affective attitudes (enjoyable-unenjoyable; pleasant-unpleasant; stressful-relaxing). The statement that precedes each adjective pair is, “I feel my participation in exercise at the present time is...” (e.g., enjoyable 3 - 2 - 1 - 0 - 1 - 2 - 3 unenjoyable). A score is derived by converting the scale to ordinal (i.e., 7 to 1) whereby high scores indicate a more positive attitude toward exercise. The mean for the affective subscale was 18.17 ($SD = 3.56$) and 15.98 ($SD = 4.40$) for the cognitive subscale.

Measures of internal consistency from the present study were strong with a total scale alpha of .88 (cognitive = .87 and affective = .89). Previous research has
demonstrated convergent validity with a modest correlation with the pros and cons of exercise ($r = .29$; Jordan et al., 2002).

**Self-efficacy for exercise.** This eight item measure (Rhodes & Plotnikoff, 2005) asks individuals to indicate their level of confidence in exercising regularly from (1) *not at all confident* to (5) *extremely confident*. Participants were asked to rate the confidence with which they could exercise when: tired, in a bad mood, has to do it by one’s self, finds it boring, cannot notice any improvements in fitness, has other demands on one’s time, feels stiff or sore, and perceives the weather to be poor ($M = 22.39$, $SD = 5.59$). Internal reliability in the present study was sufficient ($\alpha = .78$). Self-efficacy for exercise has consistently demonstrated strong convergent validity with the stages of change for exercise (Marshall & Biddle, 2001).

**Trait hope.** The Trait Hope Scale consists of 12 items measured along an 8-point scale from 1 = *definitely false* to 8 = *definitely true* (Snyder et al., 1991). Four of the items tap agency (e.g., “I meet the goals that I set for myself”) and four of the items tap pathways (e.g., “I can think of many ways to get out of a jam”). The remaining four items are distracter items (e.g., “I worry about my health.”) In the present study, the agency subscale had a mean of 26.71 ($SD = 3.12$) and the pathways subscale had a mean of 24.69 ($SD = 3.54$). Evidence for internal reliability of the total scale was sufficient ($\alpha = .75$) whereas the agency subscale was more reliable ($\alpha = .75$) than the pathways subscale ($\alpha = .67$).
Test-retest reliability has ranged from 0.85 (3 weeks) to 0.83 (10 weeks; Snyder, 2002). Trait hope has also shown convergent validity with optimism and self-esteem and divergent validity with hopelessness and depression (Snyder et al., 1991). Trait hope has shown incremental validity in previous studies – e.g., hope scores predicted semester grades beyond other academic measures such as GPA (Curry, 1997).

**State hope.** The State Hope Scale contains six items (Snyder et al., 1996) and mirrors the Trait Hope Scale in its assessment of both pathways (3 items) and agency thinking (3 items) but differs in that it asks respondents to describe themselves “right now” (instead of “in general.”) The scale uses a 4-point scale and a sample agency item is “At the present time, I am energetically pursing my goals,” and a sample pathways item is “There are lots of ways around any problem that I am facing now.” In the present study, the agency subscale had a mean of 9.72 ($SD = 1.69$) and the pathways subscale had a mean of 9.26 ($SD = 1.31$).

The scale has demonstrated construct validity from its positive correlations with self-esteem ratings and positive affect and negative correlations with negative affect (Snyder et al., 1996). In the present study, evidence for internal reliability of the total scale was adequate ($ = .73$) and similar to the Trait Hope Scale, the agency subscale was more reliable ($ = .79$) than the pathways subscale ($ = .54$).

**Goal-specific hope.** The Goal-Specific Hope Scale is used for assessing a specific goal at a particular time (Feldman et al., 2009). For the present study,
participants were asked to consider the goal of exercising on a regular basis. Regular exercise was defined as “at a moderate intensity (or greater) at a minimum of 150 minutes per week. This is an amount of time that is often put in five days a week for a duration of 30 minutes per day.”

This scale contains three items tapping agency and three tapping pathways. Two items were not carried over from the trait hope scale because it was difficult to retain their original meaning when modifying them to address a specific goal. A sample agency item is “I energetically pursue this goal.” Participants use the same 8-point scale to rate the truthfulness of the statements as they apply to them. The agency subscale had a mean of 18.14 (SD = 4.53) and the pathways subscale had a mean of 18.38 (SD = 4.19).

Of the three hope measures assessed in the present study, goal-specific hope had the strongest internal consistency with a total scale alpha of .91 (agency = .87 and pathways = .84). Previous research has shown adequate internal reliability (Cronbach’s alpha from 0.74 to 0.88; Feldman et al., 2009) with more important goals showing greater internal consistency.

**Outcome variables.**

**Stage of change for exercise-ladder.** This measure was originally designed by Marcus et al. (1992) to assess the readiness to change exercise behavior. Regular exercise was defined as “done at a moderate intensity (or greater) at a minimum of 150 minutes per week. For example, this amount of time could work out to exercising
five days a week for a duration of 30 minutes each time.” The SOC ladder contained 11 rungs, and the rungs were numbered 0-10. Anchor statements were placed adjacent to rungs 0, 2, 5, 8 and 10 (see Figure 1, p. 20). Participants were asked to circle the number on the ladder that best described their current exercise behavior and were reminded that “the number you choose does not have to correspond directly to the description provided (i.e., you can pick any number between 1 and 10).” Similar to the pilot study, approximately half of the participants chose from rungs without anchor statements (N = 54).

The ladder can be analyzed in one of two ways. The first way uses the traditional coding instructions and groups individuals into one of the five discrete stages of change. This approach does not allow for the continuous data to be utilized. Specifically, the coding instructions state that if an individual does not meet the minimum requirement for a stage by selecting the rung with an anchor statement adjacent to it, then she is collapsed back to the previous stage. Looking at the five stages of change discretely, the ladder categorized 4.5% into precontemplation, 26.8% into contemplation, 46.4% into preparation, 8.9% into action and 12.5% into maintenance.

The second way to analyze this measure is to utilize the continuous data, keeping the range of possible scores from zero to ten. Although this does not categorize individuals into qualitatively different stages, participants can still be discussed in terms of their orientation towards and status of exercise behavior.
engagement. Kept continuous, the mean from the present study was \(5.52 (SD = 2.52)\).

When collapsed into five discrete stages, Kappa reliability for the SOC ladder has been found to be .78 over a 2 week test-retest period (Marcus et al., 1992). Concurrent validity with self-report measures of exercise have been found (Rhodes & Plotnikoff, 2005; Wyse et al., 1995).

**Stage of change for exercise-algorithm.** The algorithm was originally put forth by Reed et al. (1997). It contains four questions with a dichotomous yes/no answer format. An algorithm then scores (i.e., categorizes) individuals’ response patterns into one of the five stages (Figure 2, p. 21). The algorithm categorized 4.5% into precontemplation, 11.6% into contemplation, 46.4% into preparation, 17.9% into action and 19.6% into maintenance.

Concurrent validity studies have shown that the algorithm is positively associated with self-reported exercise behavior (Hausenblas et al., 2003). The algorithm has also demonstrated strong convergent validity with self-efficacy (Armstrong et al., 1993) and other social-cognitive variables (Lippke & Plotnikoff, 2009).

**Seven-day physical activity recall (7-day PAR).** The 7-day PAR is a brief interview that obtains an estimate of an individual’s activity and energy expenditure by recording intensity of activities over the past seven days (Blair et al., 1985). Starting from yesterday and working backward, the interviewer probes for activities
performed during three segments of the day: morning, afternoon, and evening. These are anchored by statements such as, “Morning is considered from the time you wake up in the morning to the time you have lunch.” (Sarkin, Campbell, & Gross, 1997). The interview is concerned with intensity of activity rather than type, and therefore records time spent in moderate, hard, and very hard activity each day. Moderate activity is defined as “How you feel when you are walking at a brisk pace.” All increasing intensities are based on this anchor, and running is always recorded as very hard. Light activity was not probed for in the present study. Activity must be done for at least 15 minutes consecutively to be counted. In the present study, participants engaged in approximately 177.19 minutes of activity each week ($SD = 160.91$). The final question that the interviewees were asked was “Compared to the past 3 months, was last week’s activity more, less or about the same?” Most participants said the past week’s activity was about the same (48.2%) followed by 38.4% saying it was less, whereas 13.4% said it was more.

Time spent in moderate, hard and very hard intensity activities were multiplied by their corresponding metabolic equivalent (MET): 4 METs, 6 METs and 10 METs respectively. METs are a common way to the energy expenditure and intensity of physical activity among persons of different ages and weights (Ainsworth et al., 2000). Total weekly energy expenditure is calculated as hours multiplied times METs to equal kilocalories (kcal) per kilogram (kg) per week. For example, 3.5
hours of moderate and 2.5 hours of hard activity over the past seven days equates to 29 kcal/kg/wk \[ (3.5 \text{ hrs} \times 4 \text{ METs}) + (2.5 \text{ hrs} \times 6 \text{ METs}) = 29 \text{ kcal}. \]

In the present study, weekly energy expenditure was divided by seven for an average daily energy expenditure and then multiplied by the participants’ weight in kilograms (kg) to yield a final average of kilocalories (kcal) burned per participant per day (kcal/kg/day). Participants had an average of 153.06 kcal/kg/day (SD = 139.73). Individuals were also asked about their sleep \( (M = 8.52 \text{ hours/night}, SD = .84) \) and work/volunteer schedule. Over half of the participants worked/volunteered in the past week (65.2%) an average of 12.29 hours (SD = 12.59).

The reliability and validity of the 7-day PAR is well established (Sarkin et al., 1997). Test-retest reliability is strong (correlation coefficients of 0.81, \( p < 0.05 \); Sallis, Buono, Roby, Micale, & Nelson, 1993). Concurrent validity with measures of self-reported exercise such as a diary has been found to be high \( (r = 0.81, P < 0.01) \) and with objective measures such as maximal oxygen consumption (VO\(_2\) max) testing \( (r = 0.61, P < 0.05; \) Dishman & Steinhartd, 1988).

**Godin’s leisure time activity questionnaire (GLTQ).** This measure is also anchored to a 7-day recall period and a leisure time activity score is created by estimating total METS across levels of intensity (Godin & Shepard, 1985). Individuals are asked to anchor their responses to a “typical week.” Specifically, the number of times per week engaging in strenuous (heart beats rapidly), moderate (not exhausting), and mild activity (minimal effort) is endorsed and this number is then
multiplied by three, five, and nine respectively. Scores can be analyzed within levels of intensity or by examining the total weekly score (which is the multiplied endorsements summed). In the present study, the mean strenuous score was 16.47 ($SD = 16.29$), the mean moderate score was 13.02 ($SD = 10.36$), and the mean mild score was 11.11 ($SD = 7.61$). The mean total score was 40.79 ($SD = 24.42$).

However, this score is an arbitrary number and, unlike the PAR, an estimate of time spent in physical activity cannot be determined from this measure. This is because the prompt at the top of the measure is stated as, “During a typical 7-Day period, how many times (on average) do you do the following kinds of physical activity for more than 15 minutes during your free time? Please write the number of times on each line.” Therefore, it remains unknown whether the participant engaged in 16 minutes of leisure time activity or upwards of 60 minutes of activity.

Test-retest reliability coefficients are known to be dependent on degree of exercise intensity endorsed: $mild = 0.24$, $moderate = 0.36$, $strenuous = 0.84$ while the test-retest reliability of the total weekly score is 0.62 (Jacobs et al., 1993). Concurrent validity with the SOC has also been demonstrated (Wyse et al., 1995).

Results

Preliminary analyses examined the relationships among possible demographic predictor variables, hypothesized predictor variables and the outcome variables. Pearson product-moment correlation was used when both variables being correlated were continuous whereas Spearman’s correlation coefficient for ranked data was used
when at least one of the variables was discrete (e.g., SES). Due to the complexity of these often interdependent relationships, several of the variables were examined both descriptively and through significance testing (e.g., moderation). In a correlation matrix, the hope scale that demonstrated the strongest positive correlation with the stages of change for exercise ladder was selected for the regression models. Given that hope-agency and hope-pathways are conceptually distinct, they were examined separately. The same holds for the two attitude subscales, affective-attitude and cognitive-attitude. The SOC ladder measure was used as the outcome variable for the hierarchical regression models because the ladder yields continuous data. Exploratory analyses were conducted when appropriate.

**Preliminary Analyses**

**Ethnicity, SES, and health.**

Demographic, health and activity descriptive statistics are presented in Tables 1 and 2 below. Whites had higher socioeconomic status (SES; Median$^2 = $57,000 - $99,000) than Latinas (Median = $37,000 - $56,000) and this difference was statistically significant $t(6) = 33.09, p<.001$. On average, Whites were also healthier than Latinas. Whites had lower body-mass-index (BMI; $M = 23.93, SD = 4.08$) than Latinas ($M = 26.87, SD = 5.43$) and this difference was significant $t(89) = -3.18, p<.05, d=.62$. In addition, Whites rated themselves as healthier ($Median = 2^\text{Median was 4.5 from the ordinal data. This represents the $57,000 - $73,000 range and the $74,000 - $99,000 range.}$}
Very Good) than Latinas (Median = Good) and this difference was statistically significant \( t(4) = 17.11, p < .01 \).

Looking at the stages of change for exercise ladder as a continuous variable, Whites \( (M = 5.90, SD = 2.53) \) staged themselves higher than Latinas \( (M = 5.06, SD = 2.45) \). Similarly, results from the Godin’s Leisure Time Activity Questionnaire (GLTQ) showed that Whites report spending more leisure time on physical activities during a typical week \( (M = 44.16, SD = 24.00) \) than Latinas \( (M = 36.44, SD = 24.52) \) although this difference was not statistically significant \( t(108) = 1.66, p = .10 \). Before comparisons along weekly minutes of activity from the Physical Activity Recall (PAR) interview could be examined, the data were transformed. This is because the raw data had a standard deviation proportional to the mean \( (M = 177.19, SD = 160.91) \). Following the recommendations of Howell (2010) a square root transformation was undertaken \( (M_{\text{transformed}} = 12.01, SD_{\text{transformed}} = 5.94) \). Using this transformed data, Whites \( (M = 13.07) \) were more active than Latinas \( (M = 10.70) \) and this difference was significant \( t(110) = 2.13, p < .05, d = .41 \).
## Table 1 - Demographic and Health Characteristics

<table>
<thead>
<tr>
<th>Age (Mean, SD)</th>
<th>Full sample (N = 112)</th>
<th>Whites (N = 62)</th>
<th>Latinas (N = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20,000</td>
<td>12</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>$20,000 - $36,000</td>
<td>15</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>$37,000 - $56,000</td>
<td>21</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>$57,000 - $73,000</td>
<td>18</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>$74,000 - $99,000</td>
<td>11</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>$100,000 - $149,000</td>
<td>12</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>$150,000 or more</td>
<td>11</td>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>

**Socioeconomic status (%)**

<table>
<thead>
<tr>
<th>Health rating (EVGFP) (%)</th>
<th>Full sample (N = 112)</th>
<th>Whites (N = 62)</th>
<th>Latinas (N = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>8</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Very good</td>
<td>37</td>
<td>26</td>
<td>11</td>
</tr>
<tr>
<td>Good</td>
<td>43</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>Fair</td>
<td>9</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Poor</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**BMI principal cut-off points (%)**

<table>
<thead>
<tr>
<th>Body mass index (BMI)*</th>
<th>Full sample (N = 112)</th>
<th>Whites (N = 62)</th>
<th>Latinas (N = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Normal weight</td>
<td>51</td>
<td>36</td>
<td>15</td>
</tr>
<tr>
<td>Overweight</td>
<td>30</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Obese</td>
<td>15</td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>

**BMI additional cut-off points (%)**

| Lower range, normal    | 35                    | 24              | 11               |
| Upper range, normal    | 15                    | 11              | 4                |
| Overweight             | 21                    | 10              | 11               |
| Pre-obese              | 9                     | 3               | 6                |
| Obese class I          | 10                    | 3               | 7                |
| Obese class II         | 5                     | 1               | 4                |

* * p < .05

** ** p < .01
Table 2 - Activity Data by Ethnicity (as Percentages/Mean SD)

<table>
<thead>
<tr>
<th>Physical Activity Recall (PAR)</th>
<th>Whites (N = 62)</th>
<th>Latinas (N = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly activity minutes (untransformed)*</td>
<td>208.06 (186.1)</td>
<td>138.90 (113.30)</td>
</tr>
<tr>
<td>Past week representative of past 3 months?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>About the same</td>
<td>45</td>
<td>52</td>
</tr>
<tr>
<td>More</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>Less</td>
<td>44</td>
<td>32</td>
</tr>
<tr>
<td>Worked/volunteered last week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>65</td>
<td>66</td>
</tr>
<tr>
<td>No</td>
<td>35</td>
<td>34</td>
</tr>
<tr>
<td>Hours worked/volunteered last week</td>
<td>13.23 (13.08)</td>
<td>11.13 (11.99)</td>
</tr>
<tr>
<td>Hours slept last week</td>
<td>60.20 (6.28)</td>
<td>58.95 (5.38)</td>
</tr>
<tr>
<td>Godin’s Leisure Time Activity Questionnaire (GLTQ)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strenuous score</td>
<td>18.44 (16.25)</td>
<td>14.04 (16.18)</td>
</tr>
<tr>
<td>Moderate score</td>
<td>12.90 (9.52)</td>
<td>13.16 (11.44)</td>
</tr>
<tr>
<td>Mild score*</td>
<td>12.82 (7.69)</td>
<td>8.94 (7.00)</td>
</tr>
<tr>
<td>Total GLTQ score</td>
<td>44.16 (24.00)</td>
<td>36.44 (24.52)</td>
</tr>
</tbody>
</table>

* p < .05

The main outcome variables of the present study, the stages of change ladder (collapsed into 5 discrete stages) and weekly activity in PAR minutes, were correlated with one another (Spearman’s rho = .44, N = 111, p < .001), as were minutes and the stages of change algorithm (Spearman’s rho = .49, N = 112, p < .001) Both measures of the stages of change also had significant correlations with SES. The higher the individual’s SES, the higher she was staged by the ladder (Spearman’s rho = .25, N = 111, p < .05) and the algorithm (Spearman’s rho = .24, N = 112, p < .05). In addition, the higher her SES, the more minutes of activity she engaged in each week (Spearman’s rho = .22, N = 112, p < .05). However, in splitting the file by ethnicity, it becomes apparent that the relationship between SES and activity was significant for Latinas (Spearman’s rho = .36, N = 50, p < .01) but not for Whites (Spearman’s rho = .01, N = 62, p = .91).
To more closely examine the relationship among ethnicity, activity and SES, a moderation model was tested (Figure 3). Specifically, SES was tested as a moderator of the relationship between ethnicity and activity. The final regression model was significant $F(3, 108) = 3.69, p < .05$, $R^2_{\text{adjusted}} = .07$ and there was a main effect for ethnicity ($b = -6.27, t = -2.30, p < .05$) but not SES ($b = -1.35, t = -1.35, p = .18$). However, the interaction between SES and ethnicity was significant, evidenced by the multiplicative term in the final model, ethnicity*SES, ($b = 1.42, t = 1.98, p = .05$). To examine how the relationship between ethnicity and activity differs by SES, simple slopes were calculated. In plotting the simple slopes, it can be seen that Latinas were more strongly impacted by SES $\text{low} = -3.49x + 16.38$ than Whites $\text{high} = 1.77x + 11.39$.

Figure 3 - Activity level differences by SES and Ethnicity

Next, BMI was examined with SES and ethnicity, and the main outcome variables. Although BMI was uncorrelated with the stages of change ladder (ladder
as a continuous variable; *Spearman’s rho* = -.02, *N* = 111, *p* = .81) it trended toward
a significant relationship with weekly activity (*r* = -.17, *N* = 111, *p* = .08).

The relationship between BMI and activity appeared to be dependent at least
in part on SES (see Figure 4, p. 62). SES was divided into three levels: low
(≤$36,000), middle ($37,000-73,000) and high (≥$74,000) and was compared by
BMI group (normal, overweight and obese) on minutes of activity. There were too
few participants in the underweight group (*N* = 5) for meaningful comparisons, so
this group is not discussed here. For low SES individuals (*N* = 33), an increase in
BMI did not correspond to a substantial drop in activity level. Rather, it appeared to
increase slightly from the normal weight group (*N* = 11) to the overweight group (*N* =
11) and then dropped slightly for the obese, low SES group (*N* = 7). Conversely, for
middle (*N* = 46) and high SES individuals (*N* = 41), the relationship between BMI
and activity followed a more expected pattern: overweight and obese individuals were
less active than normal weight individuals. Unfortunately, there were too few
participants in each group to make any firm conclusions based on these comparisons.
To examine more closely how SES and activity level may interact with BMI, the relationship between BMI and SES was examined. The higher the participant’s SES, the lower her BMI (Spearman’s rho = -.25, N = 112, p < .05; Figure 5).

Figure 5 - BMI Differences by SES and Ethnicity
In consideration of the above stated correlations between: BMI and activity; SES and BMI; and, SES and activity, a mediation model tested whether the relationship between SES and activity was mediated by BMI. Using the four step procedure recommended by Baron and Kenny (1986), it was first confirmed that SES predicted activity ($c = .71$, $t = 2.37$, $p < .05$). Next, it was found that SES predicted BMI ($a = -.64$, $SE_a = .25$, $t = -2.58$, $p < .05$). The third step examined whether BMI predicted activity when controlling for SES which – this was not supported ($b = -.15$, $SE_b = .12$, $t = -1.28$, $p = .19$). Therefore, the fourth step is not applicable and the data were not consistent with the hypothesis that BMI mediates SES and activity. This is likely due to the relatively weak correlation between BMI and activity.

Given the significant associations and trends, BMI, SES and ethnicity were entered into the regression models, as demographic variables, to test the present study’s main hypotheses. The implications of these complex inter-dependent relationships are elaborated on in the discussion.

**Preliminary correlation matrices.**

Zero order correlations examined the relationships among predictor variables (Table 3). Trait hope and state hope did not show robust correlations with the predictor variables$^3$. Therefore, the only hope measure presented in the final correlation table is goal-specific hope. However, all three hope measures were positively correlated with one another. Goal-specific hope showed a medium correlation with cognitive-attitude ($r = .20$, $p < .05$) and self-efficacy ($r = .22$, $p < .05$). State hope had a small positive correlation with cognitive-attitude ($r = .21$, $p < .05$) and a medium correlation with self-efficacy ($r = .35$, $p < .01$). All other correlations were NS.

---

$^3$ Trait hope had a small positive correlation with cognitive-attitude ($r = .20$, $p < .05$) and self-efficacy ($r = .22$, $p < .05$). State hope had a small positive correlation with cognitive-attitude ($r = .21$, $p < .05$) and a medium correlation with self-efficacy ($r = .35$, $p < .01$). All other correlations were NS.
correlation with state hope \( (r = .38, N = 112, p < .001) \) and trait hope \( (r = .36, N = 112, p < .001) \), whereas the correlation between trait hope and state hope \( (r = .53, N = 112, p < .001) \) was large.

As expected, goal-specific hope and self-efficacy showed a strong positive relationship \( (r = .62, N = 112, p < .001) \). However, because both subscales of goal-specific hope were correlated almost equally with self-efficacy, hope-agency \( (r = .60, N = 112, p < .001) \) and hope-pathways \( (r = .58, N = 112, p < .001) \), it remains unclear which is most similar to self-efficacy. Goal-specific hope was also positively correlated with the attitude total scale and the pros of change. However, the cons of change and goal-specific hope were not significantly correlated; although, there was a trend towards significance \( (p = .08) \).

Table 3 - Inter-correlations among predictors

<table>
<thead>
<tr>
<th></th>
<th>Hope</th>
<th>Agency</th>
<th>Pathways</th>
<th>Self-efficacy</th>
<th>Pros</th>
<th>Cons</th>
<th>Attitude</th>
<th>Affect. attitude</th>
<th>Cog. attitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal hope</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agency</td>
<td>.95**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathways</td>
<td>.94**</td>
<td>.80**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>.62**</td>
<td>.60**</td>
<td>.58**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pros</td>
<td>.30**</td>
<td>.28**</td>
<td>.30**</td>
<td>.34**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cons</td>
<td>-.17</td>
<td>-.16</td>
<td>-.16</td>
<td>-.12</td>
<td>.17</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>.45**</td>
<td>.43**</td>
<td>.42**</td>
<td>.38**</td>
<td>.24**</td>
<td>.04</td>
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<td></td>
</tr>
<tr>
<td>Affective</td>
<td>.26*</td>
<td>.23*</td>
<td>.26**</td>
<td>.23*</td>
<td>.23*</td>
<td>.05</td>
<td>.90**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive</td>
<td>.50**</td>
<td>.49**</td>
<td>.46**</td>
<td>.39**</td>
<td>.20*</td>
<td>.03</td>
<td>.84**</td>
<td>.52**</td>
<td>1</td>
</tr>
</tbody>
</table>

* \( p < .05 \)

** \( p < .01 \)

As predicted, goal-specific hope had the largest correlation with the stages of change ladder (collapsed into 5 discrete stages; \( \text{Spearman's rho} = .50, N = 112, p < .001 \)) as compared with state hope \( (\text{Spearman's rho} = .27, N = 112, p < .01) \) and trait
hope which was not significant (Spearman’s rho = .14, N = 109, p = .15). Goal-specific hope-agency (Spearman’s rho = .50, N = 112, p < .001) showed a slightly larger correlation than pathways (Spearman’s rho = .46, N = 112, p < .001). Also, goal-specific hope was the only measure of hope to be significantly correlated with PAR minutes (r = .25, N = 112, p < .001). These findings suggest that goal-specific hope should be used as the hope measure in the regression models for hypothesis one, two and three.

Goal-specific hope had a larger correlation with the PAR calculation of daily energy expenditure than minutes (r = .32, N = 112, p < .001). The PAR measures energy expenditure based on the level of intensity of the activity as described by the participant. This suggests that participants’ energy expenditure score may be more illuminating than minutes of activity; therefore, hypothesis five was tested twice, using both energy expenditure and minutes as separate dependent variables.

A final correlation matrix presents PAR minutes, PAR weekly energy expenditure (kcal), PAR daily energy expenditure (kcal/kg/dy), stages of change ladder and GLTQ total score with the predictor variables (Table 4). The correlations confirm that agency and pathways, and affective-attitude and cognitive-attitude ought to be considered separately in the hypothesis testing. Also, as was found when compared with other predictor variables, the cons of change were not significantly related to the present study’s outcome variables.
Table 4 – Correlations among predictor and outcome variables

<table>
<thead>
<tr>
<th></th>
<th>SOC ladder</th>
<th>PAR weekly minutes</th>
<th>PAR weekly kcal</th>
<th>PAR daily kcal/kg</th>
<th>GLTQ total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal hope</td>
<td>.53**</td>
<td>.25**</td>
<td>.30**</td>
<td>.32**</td>
<td>.46**</td>
</tr>
<tr>
<td>Agency</td>
<td>.53**</td>
<td>.29**</td>
<td>.35**</td>
<td>.36**</td>
<td>.44**</td>
</tr>
<tr>
<td>Pathways</td>
<td>.48**</td>
<td>.17 (p=.07)</td>
<td>.22*</td>
<td>.23**</td>
<td>.44**</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>.47**</td>
<td>.25**</td>
<td>.30**</td>
<td>.28**</td>
<td>.40**</td>
</tr>
<tr>
<td>Pros</td>
<td>.37**</td>
<td>.32**</td>
<td>.32**</td>
<td>.34**</td>
<td>.38**</td>
</tr>
<tr>
<td>Cons</td>
<td>-.11</td>
<td>.12</td>
<td>.12</td>
<td>.05</td>
<td>-.03</td>
</tr>
<tr>
<td>Attitude</td>
<td>.42**</td>
<td>.19*</td>
<td>.23*</td>
<td>.26**</td>
<td>.30**</td>
</tr>
<tr>
<td>Affective</td>
<td>.39**</td>
<td>.23*</td>
<td>.26**</td>
<td>.30**</td>
<td>.28**</td>
</tr>
<tr>
<td>Cognitive</td>
<td>.35**</td>
<td>.12</td>
<td>.15</td>
<td>.17 (p=.07)</td>
<td>.25**</td>
</tr>
</tbody>
</table>

* \(p < .05\)
** \(p < .01\)

Hypothesis Testing

Regression models predicting the stages of change.

Before regression models were run, the assumptions of regression and correlation were tested. Of all of the potential predictor variables self-efficacy, hope-pathways, BMI, and the pros of change were normally distributed (One sample K-S tests \(p > .05\)). Histograms with normal curves were also inspected and both hope-pathways and pros of change were somewhat negatively skewed, whereas BMI was positively skewed. The remaining potential predictor variables of hope-agency, cons of change, affective-attitude and cognitive-attitude were all non-normal (One sample K-S tests \(p < .05\)). Upon inspection of histograms, both attitude subscales and hope-agency were found to be negatively skewed. Cons of change was positively skewed with several prominent outliers. It is likely that this distribution truncated the correlation coefficient and suppressed this variable’s effect. SES and ethnicity were
not tested for normality as they are categorical variables. SES was dummy coded for the regression models into low, middle and high SES.

Homoscedasticity and linearity were assumed for self-efficacy, hope-agency, hope-pathways, SES, pros of change, affective-attitude and cognitive-attitude due to significant correlation coefficients. Upon inspection of a scatter-plot, regressing the stages of change ladder onto ethnicity, it was determined that ethnicity met the assumptions of homoscedasticity and linearity. However, both BMI and the cons of change violated these assumptions. Therefore, these variables were transformed using a square root transformation (Howell, 2010) and were tested in all of the regression models as both transformed and untransformed. The transformation had no impact on the results; therefore, only the results on untransformed data are reported. Also, none of the models showed problems with collinearity (betas < .80) and their tolerances were acceptable (> .20).

_Hypothesis one._ In order to assess the incremental validity of hope on self-efficacy in predicting the stages of change, hierarchical regression was used. The demographic variables (ethnicity, SES and BMI) were entered on the first block, followed by self-efficacy on the second, and hope-agency and hope-pathways on the third. The final model was significant ($F (7, 102) = 8.57, p < .001, R^2_{adjusted} = .33$) and used ethnicity ($beta = -.22, t = -2.42, p < .05$), self-efficacy ($beta = .20, t = 2.02, p < .05$) and hope-agency ($beta = .34, t = 2.45, p < .05$). As predicted, goal-specific hope-agency added incremental validity to self-efficacy for exercise, explaining an
additional 12% of the variance ($R^2_{\text{change}} = .12$). Against what was hypothesized, goal-specific hope-pathways did not contribute unique variance to the prediction of the stages of change.

**Hypothesis two.** In order to assess the incremental validity of attitude on the pros and cons of change in predicting the stages of change, hierarchical regression was again used. The demographic variables (ethnicity, SES and BMI) were entered on the first block, followed by the pros and cons of change on the second, and affective-attitude and cognitive-attitude on the third. The final model was significant ($F (8, 101) = 6.09, p < .001, R^2_{\text{adjusted}} = .27$) and used the pros of change ($beta = .28, t = 3.15, p < .01$) and affective-attitude ($beta = .26, t = 2.62, p < .05$). As predicted, affective-attitude added incremental validity to the pros of change, explaining an additional 14% of the variance ($R^2_{\text{change}} = .14$). Although not included in the final model, cognitive-attitude was marginally significant ($beta = .19, t = 1.92, p = .06$). Against what was hypothesized, the cons of change did not contribute unique variance to the prediction of the stages of change.

**Hypothesis three.** In order to test the best predictive model of the stages of change, an exploratory regression using the enter method was run. SES, BMI, ethnicity, hope-agency, hope-pathways, self-efficacy, affective-attitude, cognitive-attitude and the pros and cons of change were all entered on one block.

The final regression equation was significant ($F (11, 97) = 7.58, p < .001, R^2_{\text{adjusted}} = .41$). The strongest predictor was hope-agency ($beta = .33, t = 2.47, p <$
.05) followed by affective-attitude (\( \beta = .30, t = 3.22, p < .01 \)) and ethnicity (\( \beta = -.21, t = -2.34, p < .05 \)). Against what was hypothesized, self-efficacy, hope-pathways, cognitive-attitude, and the pros and cons of change did not contribute to the final model.

Against what was hypothesized, only two of the seven predictor variables were used. The total variance explained by this final model was the largest of all three tested at 41%.

**Differences Among Stages of Change.**

*Hypothesis four.* As hypothesized, there was a strong positive relationship between the two stages of change measures (Spearman’s rho = .76, \( N = 111, p < .001 \)). Also as hypothesized, there were critical differences in how the two measures staged individuals. Using the Wilcoxon’s signed rank test, the nonparametric analogue of the matched samples \( t \) test (Howell, 2010), it was found that the algorithm staged participants in significantly higher stages than the ladder (\( z = -5.23, p < .001 \)). As can be seen in table 5, the algorithm staged more individuals in the behavioral group (38%), comprised of action and maintenance, than the ladder (21%). The algorithm correspondingly staged fewer individuals in the intentional group (62%), comprised of precontemplation, contemplation and preparation, than the ladder (78%).
Table 5 – Activity in PAR minutes (transformed) by Stage of Change (SOC) Measure

<table>
<thead>
<tr>
<th></th>
<th>SOC Ladder  M (SD)</th>
<th>%</th>
<th>SOC Algorithm  M (SD)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intentional Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precontemplation</td>
<td>7.77 (5.32)</td>
<td>4</td>
<td>8.39 (2.88)</td>
<td>4</td>
</tr>
<tr>
<td>Contemplation</td>
<td>9.05 (5.85)</td>
<td>27</td>
<td>7.59 (6.10)</td>
<td>12</td>
</tr>
<tr>
<td>Preparation</td>
<td>12.36 (5.60)</td>
<td>47</td>
<td>10.83 (5.71)</td>
<td>46</td>
</tr>
<tr>
<td><strong>Behavioral Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td>14.89 (5.24)</td>
<td>9</td>
<td>14.26 (4.21)</td>
<td>18</td>
</tr>
<tr>
<td>Maintenance</td>
<td>16.02 (4.35)</td>
<td>13</td>
<td>16.18 (5.16)</td>
<td>20</td>
</tr>
</tbody>
</table>

Figure 6 – Stages of change classifications by measure
No mean differences on minutes of activity were hypothesized between adjacent stages. However, after reviewing the mean differences descriptively, it appeared a significant difference may exist between the contemplation stage and the preparation stage (Table 5, p. 70). This conjecture was supported for the ladder ($t(80) = -2.53, p < .05$) with those in the contemplation stage ($M = 9.05, SD = 5.85$) less active than those in the preparation stage ($M = 12.36, SD = 5.6$). Yet, this difference only trended toward significance for the algorithm ($t(63) = -1.81, p = .08$). The algorithm appears to struggle classifying the earlier stages (Figure 6, p. 70).

In consideration of the results from the final prediction model in hypothesis three, the predictor variables goal-specific hope-agency and affective-attitude were visually inspected at each level of the stages of change. Differences by ethnicity were observed when looking at both the stages of change ladder classifications (Figure 7a & 7b, p. 72) as well as the stages of change algorithm classifications (Figure 8a & 8b, p. 73). Specifically, differences between Whites and Latinas appeared to exist within the intentional stages. However, only the preparation stage was adequately powered for significance testing; therefore, only Whites and Latinas in this stage were directly compared.
Figure 7a & 7b – Ladder as staging measure

**SOC Ladder Affective-attitude**

- X-axis: Precontemplation, Contemplation, Preparation, Action, Maintenance
- Y-axis: Affective-attitude
- Line styles: Solid for White, dashed for Latina

**SOC Ladder Agency**

- X-axis: Precontemplation, Contemplation, Preparation, Action, Maintenance
- Y-axis: Goal-specific Agency
- Line styles: Solid for White, dashed for Latina
In the preparation stage, a significant difference was found on agency ($t(50) = -2.18, p < .05$) with Whites ($N = 30; M = 16.03, SD = 3.99$) expressing less self-belief in their ability to meet the goal of exercising regularly than Latinas ($N = 22; M = 18.64, SD = 4.60$). This significant difference held when the ladder was used as the staging measure ($t(50) = -3.36, p < .05$) and the effect was large ($d = .78$). Previous
research has suggested that the preparation stage is the most difficult to describe (Plotnikoff et al., 2001). The findings thus far have supported this conjecture, and to test it further, the preparers from the ladder and the algorithm were compared. Only a small correlation was found between the measures ($r = .22, N = 111, p < .05$), casting doubt on the equivalence of these two forms of measurement as well as the consistency of the preparation stage.

**Hypothesis five.** The hypothesis that those in the intentional group would not meet the national recommendation for regular exercise (i.e., 150 minutes per week), whereas those in the behavioral group would meet the recommendation, was partially supported. Left untransformed, those in the intentional group ($M_{algorithm} = 131.57, SD = 148.08 \& M_{ladder} = 152.07, SD = 157.06$) were at just under or right around 150 minutes of weekly activity. Conversely, those in the behavioral group ($M_{algorithm} = 253.21, SD = 154.01 \& M_{ladder} = 260.63, SD = 163.83$) were well above an average of 150 minutes. (See Table 5, p. 70 for comparisons by stages of change measure).

In order to examine the differences on minutes of exercise between the intentional and behavioral groups more closely, box-plots and descriptive data were evaluated. The range of minutes was large across both measures and there was substantial overlap between the two groups. It was thought possible that the variable **typical week** asked at the end of the PAR could be related to the extreme values in the intentional group. (To recapitulate, participants were asked whether their past week's activity was "more, less or about the same" as compared to the past 3 months). It
was plausible that individuals in the intentional group who reported doing more activity could have had an inflated minutes per week score, relative to individuals who reported doing less or about the same. However, only a small number of individuals stated that they did more \( N_{\text{algorithm}} = 7 \) & \( N_{\text{ladder}} = 1 \) and it was not these participants’ data that was inflating the range within the intentional group; rather, it was a problem with staging.

Looking at the algorithm’s box plot, the intentional group had one outlier and six adjacent values. Yet five of these seven extreme values had a corresponding typical week response of less. Therefore, it was not that these individuals were more active than usual. More telling was that six out of seven of these extreme values were from participants in the preparation stage. The ladder’s box plot also brought into question the accuracy of the preparation stage as four of the six extreme values were in the preparation stage.

Across the two measures, four participants overlapped resulting in a total of nine extreme values – eight of which were in the preparation stage. Taken together, these findings suggest that the preparation stage may be less reliable than the other stages of change.

In order to try to make a clearer comparison between the intentional and behavioral group on minutes of weekly activity, the outliers were replaced with the next legitimate score plus one: the first outlier was originally 930 minutes and this was replaced with 466 minutes (Tabachnick & Fidell, 2007) and the second,
originally 750 minutes, was replaced with 467 minutes. This changed the means across both intentional groups to below 150 minutes of activity ($M = 129.94$, $SD = 119.43$). However, even after replacing the outliers, the range of scores for both groups still suggested that the staging mechanism did not translate uniformly to self-reported minutes per week of activity: intentional range = 0 – 466 and behavioral range = 45 – 555. That is, a large amount of overlap between the two groups remained.

In order to test whether the intentional and behavioral groups differed by minutes of activity and energy expenditure, independent samples $t$ tests were run. Like minutes of activity, the energy expenditure data were not normal and had to be transformed. Given that the data had a standard deviation proportional to the mean ($M = 153.06$, $SD = 139.73$), a square root transformation was undertaken (Howell, 2010). Using the transformed energy expenditure data as the predictor variable and the ladder groupings as the dependent variable, the intentional group ($M_{\text{transformed}} = 1.87$, $SD_{\text{transformed}} = 1.75$) had lower daily energy expenditure than the behavioral group ($M_{\text{transformed}} = 4.28$, $SD_{\text{transformed}} = 2.94$) and this difference was significant $t (27.66) = -3.83$ ($p < .01$). Further, the two groups differed by minutes of activity $t (109) = -3.54$ ($p < .01$) with the intentional group ($M_{\text{transformed}} = 10.95$, $SD_{\text{transformed}} = 5.87$) less active than the behavioral group ($M_{\text{transformed}} = 15.55$, $SD_{\text{transformed}} = 4.66$). These differences held when the algorithm was used to compare groups on energy expenditure $t (59.68) = -5.07$ ($p < .001$) and minutes $t (110) = -4.94$ ($p < .001$).
These results suggest that the stages of change can discern between those who are more active and those who are less but has a more difficult time discerning from among qualitatively different stages. This issue may be exacerbated by the self-report nature of the present study.

**Exploratory Analyses.**

**Comparing the PAR and the GLTQ.**

Given the inconsistencies with the *typical week* question asked at the end of the PAR and the stages of change classifications, data from the GLTQ were compared with the PAR. Specifically, the following analyses sought to determine if those who said their past week’s activity was *about the same* showed the highest correlation with the GLTQ’s total leisure time activity score. This would be expected because the GLTQ’s prompt is anchored to a “*typical week*” whereas during the PAR interview, the participant is prompted to recall what they did last week and explicitly asked not to provide “*a history of what you usually do.*” Participants who reported that their week was *about the same* showed the strongest positive correlation between their PAR minutes and GLTQ total score ($r = .40, N = 56, p < .001$) followed by those who said they were *more active* ($r = .38, N = 15, p < .001$) and those who did less ($r = .36, N = 43, p < .001$).

When the light activity score was removed from the GLTQ total score, this pattern of relationships was even clearer. This finding is as would be expected because light activity was probed for in the GLTQ but was purposely not included in
the PAR interview. Those who replied about the same showed the largest positive correlation \( (r = .57, N = 56, p < .001) \) followed by those who replied more \( (r = .54, N = 15, p < .05) \) and those who replied less \( (r = .36, N = 43, p < .05) \). The differences between participants who replied more and those who replied less is likely explained by participants’ anchoring their responses on the GLTQ to the past week, instead of a “typical week.”

Discussion

The findings from the present study demonstrate the utility of cognitive and demographic variables as explanatory mechanisms behind an individual’s relationship with exercise. The regression models showed that goal-specific hope-agency, affective-attitude, and ethnicity can predict an individual’s intention to engage in exercise or current exercise behavior. In particular, the finding that goal-specific hope predicted an individual’s relationship with exercise, both beyond and ahead of self-efficacy, suggests that hope theory be incorporated into models predicting exercise behavior. The present study’s comparison of the stages of change ladder and the stages of change algorithm within the same population showed that the two measures are not equivalent and that the preparation stage is difficult to define.

The present study’s operationalization of regular exercise was effective. For example, participants’ daily energy expenditure score had more robust associations with all of the cognitive variables, and the stages of change measures, than their minutes of activity score – highlighting the importance of using intensity, duration,
and individual factors (e.g., weight) in assessing exercise behavior. The present study also illuminated the complex relationships among socioeconomic status (SES), ethnicity and activity level. Recent work in this domain provides a backdrop from which the present findings can be interpreted.

**Hope Theory and Goal-directed Thinking**

The present study anchored goal-specific hope to the goal of “exercising on a regular basis” which was then elaborated on by defining the duration, intensity and frequency required to meet this goal. Although trait hope and state hope were also used, it was only goal-specific hope that demonstrated a robust relationship with other predictor and the outcome variables. It is difficult to compare these findings with those of Berg et al. (*in press*), who found that state hope predicted exercise behavior, and Norwood (2000), who found that trait hope was not predictive of exercise behavior, given that these previous studies only assessed one type of hope. However, taken together, these three studies suggest that hope as measured in the here and now (i.e., state or goal-specific hope) is more predictive of health behaviors than a dispositional measure of hope (i.e., trait hope). Indeed, recent research found that goal-specific hope was a better predictor of goal-attainment than trait hope (Feldman et al., 2009).

These findings have implications for individuals initiating an exercise program or looking to maintain one. They suggest that a general positive self-belief that one can achieve the goals she sets for herself does not determine success at health
behavior change. Rather, an individual’s specific belief in her ability to meet the goal of exercising regularly is most relevant. This domain specificity of cognitive constructs has been widely supported by self-efficacy theory (Hofstetter et al., 1990; Rodgers & Sullivan, 2001; Sallis et al., 1988; Sullum et al., 2000; Williams et al., 2008) but is newer to the study of hope.

The present study also found hope-agency to be the driving force behind this relationship. One explanation for this finding is that goal-specific hope-agency prevented goal-specific hope-pathways from demonstrating its predictive power in the final regression models, as -agency and -pathways and were highly correlated with one another (Table 3, p. 64). However, previous research has suggested the two constructs operate independently and do not measure the same thing (Chang, 2003; Snyder 2002); further, the present study tested for the problem of multicollinearity (Howell, 2010) which was not found to be significant.

A second possible explanation for this finding is that cross-sectional research may limit the ability of pathways thinking to exert its influence. Whereas agency explains an individual’s perception of her ability to motivate to achieve goals, pathways thinking explains an individual’s belief she can generate many ways to reach these goals. Individuals likely require experience facing barriers to specific goals, and the resultant triumph or failure to overcome these barriers, before pathways thinking can be influential. This interpretation is in line with other research that found short study duration (i.e., 3 months) limited the predictive power of pathways...
thinking (Feldman et al., 2009). A second explanation may be that women are more capable of channeling goal-directed energy (i.e., agency-thinking) than in conceptualizing alternate routes to goal-achievement (i.e., pathways-thinking). Previous research has found that men and women are similar on agency-thinking but men engage in significantly more pathways-thinking (Chang, 2003). Given that women are less active than men on average across the lifespan (Tucker et al., 2011) and they face unique barriers to exercise such as balancing new motherhood and the postnatal years (Fjeldsoe et al., 2010), this subgroup could benefit from interventions that emphasize pathways thinking; teaching women how to generate different routes to achieve their goal of exercising regularly.

Goal-directed behavior is predicated upon both what an individual feels her behavior will generate (i.e., outcome expectations) and her conviction or doubt that she can execute the behavior (i.e., efficacy expectations). Previous research has focused on self-efficacy theory (Bandura, 1977) in explaining the cognitive mechanisms behind these expectations. However, the present study found that hope theory and self-efficacy theory have independent predictive power in explaining an individual’s goal-directed behavior and behavioral intentions. Further, the final results showed that goal-specific hope-agency predicted an individual’s exercise behavior and intention whereas self-efficacy did not. It may be that hope-agency best explains the goal-setting component of behavior execution because it is what propels individuals along their goal paths (Snyder et al., 2001; Snyder, 2002).
Despite the emergence of goal-specific hope as predictive of exercise behavior and intention, the importance of self-efficacy theory remains. One strength of self-efficacy is its ability to be further parsed down into specific goal domains; for example, self-efficacy for scheduling. Regular exercise programs require time management and diligence by the individual to carve out time within the day to make room for exercise. Indeed, research studying different types of self-efficacy has demonstrated that coping self-efficacy and scheduling self-efficacy mediate (Shields, Brawley, & Lindover, 2006) and predict (Rodgers & Sullivan, 2001) an individual’s exercise behavior. In this vein, goal-specific hope could operate as a more overarching construct whereas self-efficacy functions differentially according to various goal sub-requirements. Interventions could then help individuals achieve consistency in their exercise regimes by increasing their self-efficacy on the many tasks required to meet the goal of regular exercise, as well as their general self-belief that they can execute the specific type of exercise they are asking of themselves. Research has found that once individuals have had some success exercising regularly, they are more likely to meet this goal in the future (Baumen et al., 2002; Sallis et al., 2000). In addition, research has demonstrated that social support is particularly important for women to transition from sedentary to physically active (Eyler et al., 1999). Interventions that use multiple social-cognitive theories to build their intervention framework are therefore likely to be the most effective. This assertion is well
supported by clinical health psychologists (Baum & Posluszny, 1999) and is further supported by the present study’s findings on attitude and decisional balance.

Akin to the findings on hope and self-efficacy, the present study showed that affective-attitude added incremental validity to the pros of change and that attitude was a more robust predictor of an individual’s relationship with exercise than the pros and cons of change. A possible explanation for why affective-attitude was a stronger predictor, and ultimately the only predictor from among cognitive-attitude, and the pros and cons of change to make the final model, is that the present sample engages in leisure time decision making based more on affective considerations than cognitive ones. For example, the semantic differential scales for attitude measured cognitive adjectives such as useless-useful and affective dimensions such as unpleasant-pleasant. The present sample was comprised of young female students, likely with active social lives, many of whom worked, and they may have placed a greater emphasis on how exercise made them feel as opposed to judged the utility of it when responding to the survey questions.

A similar line of thinking may hold for why the cons of change did not show as strong as expected of a relationship with individuals’ relationship with exercise. The cons of change may not be weighted as heavily within the decisional balance scale because this factor focuses on the relative disadvantages of behavior engagement such as losses one may incur. In this population, a more consistent cognitive focus may be on the advantages and anticipated gains of exercise. Those
who openly endorse the costs of exercise may not be in as uniform of agreement as to what those costs are and how exactly they operate. Previous research has also found less overall support for the cons of change factor when examining exercise behavior and suggested this may be partially attributed to the inconsistency with which the behavior has been defined across studies (Hall & Rossi, 2008).

Taken together, the findings on attitude and the pros and cons of change suggest that interventions targeting this demographic should focus on the affective component of regular exercise, such as how it can relieve stress, as opposed to the costs of exercising, such as how time spent exercising could burdens one’s friends and family. Interestingly, research has found that individuals enjoy exercise more than they predict that they will and that this is largely due to an overestimation of the perceived difficulty of exercise initiation (Ruby, Dunn, Perrino, Gillis, & Viel, 2011). Therefore, interventions could further teach individuals how to make better predictions about what will make oneself happy (i.e., affective forecasting; Ruby et al., 2011).

The Stages of Change

In addition to determining which cognitive predictors best described an individual’s relationship with exercise, the present study had a secondary goal of evaluating the outcome variable, the stages of change for exercise. To this end, the stages of change (SOC) ladder and SOC algorithm were compared within the same population and it was determined that the two measures differentially explain
participants’ motivational readiness to engage in exercise. The results suggest that the stages of change algorithm best describes those already engaged in regular exercise but the ladder best describes those in various stages of intention.

In line with what previous research has shown, the present study’s findings suggest that the algorithm struggles describing those who experience varying degrees of intention to engage in exercise (Herzog & Blagg, 2007) and may overestimate the number of individuals currently exercising regularly (Marshall & Biddle, 2001). The algorithm staged more individuals in the behavioral group than the ladder and the algorithm showed a non-linear increase in minutes of activity across the intentional stages. Specifically, participants in the algorithm’s contemplation stage were found to be less active than those in the pre-contemplation stage.

The difficulty in accurately describing those in the preparation stage may be in part attributable to the subjective language used by the algorithm (“No, I don’t currently exercise regularly [but] yes; I intend to start in the next 30 days.”) However, issues with this stage extended to the ladder given the extreme (i.e., out of range) values that operated in the preparation stage across both measures. To recapitulate, eight of the nine extreme values of minutes of weekly activity were from the preparation stage. This is problematic because the majority of individuals were classified as preparers and, as post-hoc testing showed, the participants categorized as preparers by both measures showed only a small correlation with one another. Previous research has suggested that the preparation stage is the most difficult to
describe (Plotnikoff et al., 2001) and in fact, it was not added to the staging framework until 1991 (DiClemente et al., 1991). One of the reasons for this may stem from the fact that there is no evidence to suggest that individuals anchor themselves to the six month and thirty day timeframes used by both measures. Future research should attempt to determine whether common time points anchor goal-setting for exercise behavior across different populations of individuals. It is important to accurately describe those prepared to engage in regular exercise, but not currently achieving this goal, because they are at the juncture between mere behavioral intention, and consistent behavioral engagement.

Although the algorithm struggles to delineate among those in various stages of intention, it is the algorithm that shows a larger correlation with the physical activity recall’s (PAR) minutes of weekly activity and energy expenditure data. However, the substantial amount of overlap that existed between the intentional and behavioral groups across both of the measures suggests that the staging mechanism does not uniformly translate into activity level. A possible explanation for the overlapping ranges is due to a key difference between the operationalization of activity in the PAR, and the operationalization of exercise in the stages of change. Specifically, the PAR data included work related physical activity whereas the stages of change oriented participants to their goal of exercising. Goal-directed behavior such as exercising is clearly distinct from activity undertaken as a by-product of a different goal (e.g., getting paid). Although participants who appeared unable to accurately
break apart their work related activity were removed from the main analyses, this added dimension to the PAR’s criteria likely muddled the differences across the stages.

As past research has stated, an inherent difficulty in assessing the validity of the staging framework is that no external criterion covers the full range of stages (Marttilla & Nupponen, 2003). However, when collapsing the intentional and behavioral stages into two groups, this problem is mitigated. Using this split, the present research provided ample support for the ability of both stages of change measures to differentiate between those who are more active versus those who are less active.

Yet given the importance of the staging framework’s ability to accurately describe both intention and behavior, the ladder may be the better measure of the two. Despite the algorithm’s popularity and wide-spread endorsement (Hellsten et al., 2008) previous research has underscored the algorithm’s underestimation of individuals’ motivation levels and suggested that the ladder may be a better measure in this regard (Herzog & Blagg, 2007). Specifically, the forced choice (yes/no) format of the algorithm may limit its descriptive power and therefore lead to the inaccurate staging of some individuals. It is suggested that the larger range of response options and the visual analog nature of the ladder measure may give it more robust measurement capabilities. Furthermore, in consideration of the ladder’s ability to be used as a continuous measure, it could be argued that the ladder provides
a more exhaustive snapshot of individuals' relationship with exercise. Yet critics of this idea point out that this concept is more representative of a continuum theory as opposed to a stage theory (Weinstein et al., 1998).

**Exercise, Ethnicity, and SES**

Some of the validity problems with the stages of change are likely due to the self-report nature of the measure, and this may vary by ethnic group (Cole, Stevenson, & Rodgers, 2009). Self-report instruments for complex health behaviors such as exercise demand special considerations when interpreting the results. For example, in what is termed the “response generation stage,” respondents are required to convert their memory of the behavior, such as a kick-boxing class, into the behavioral criteria described by the form (Durante & Ainsworth, 1996). In addition to format and memory considerations in self-reporting exercise behavior, other research has declared a need to focus on differences by ethnicity (Tucker et al., 2011). In the present study, differences between the two stages of change measures showed that the algorithm classified an additional 14% of Whites and an additional 18% of Latinas in the behavioral stages as compared to the ladder. This finding suggests that Whites and Latinas who were already regular exercisers responded to the stages of change measures similarly. However, ethnicity did emerge as a predictor of participants’ relationship with exercise; and further, Whites self-reported as being more active than Latinas.
Although previous research has also shown that Whites self-report exercising more than Latinas (Macera et al., 2005), recent accelerometer data has found opposing evidence, with Latinas being more active than Whites (Tucker et al., 2011). One explanation for these contradictory findings is a language barrier; English as a second language participants may struggle interpreting the operational definition of regular exercise. It is also possible that incidental work-related activity is not surfacing in self-report tools which is more common among ethnic minority groups such as Mexican-Americans, as they are employed in more labor-intensive work than Whites (Ramirez & Hondagneu-Sotelo, 2009).

In consideration of the present population's demographic makeup however, it is unlikely that the ethnic differences across activity level were due to language barriers or type of employment. Rather, differences were likely attributable to socioeconomic (SES) and cultural explanations. For example, it was found that Latinas are more significantly impacted by low SES as compared to Whites. This is in line with previous research that has found socioeconomic status to be predictive of exercise status and activity levels (Marshall et al., 2007). Importantly, this finding holds across studies assessing self-reported exercise (Frank et al., 2008) and objective markers of activity levels (Sanchez et al., 2008). Women of Hispanic decent also face distinct cultural barriers to exercise. For example, Martinez et al. (2009) conducted focus groups with Latinas and identified specific sociocultural barriers to exercise including family obligations (familismo), gender roles (machismo) and social
perceptions of weight. These cultural norms likely vary based not only degree of acculturation but degree of SES.

The present research used a single indicator of SES, as it was deemed most appropriate for the population being investigated, but recent research has highlighted the importance of understanding how multiple indicators of SES interact, such as education level, family income, employment status and marital status (Marshall et al., 2007). Indeed, ethnicity emerged as a significant predictor in two of the three regression models predicting an individual’s relationship with exercise but other research has found that when controlling for SES, differences across ethnicity are significantly tempered. This same research has also explained that multiple indicators of SES are necessary to understand because they are both independent and interdependent and their relative degree of conceptual relevance across population subgroups is yet to be determined (Marshall et al., 2007).

Limitations

The present study’s main limitation is its use of self-report to assess exercise behavior. Self-report measures are problematic not only due to the issue of reporting a complex behavior such as exercise (Maurer et al., 2006) but also due to what has been termed the consistency bias problem (Rhodes & Plotnikoff, 2005) and memory inaccuracies (Durante & Ainsworth, 1996). Consistency bias is a threat to internal validity that describes the inflated correlation coefficients found in cross-sectional design studies using self-reported exercise behavior. Specifically, when behavioral
measures and social-cognitive measures that assess the same constructs are administered simultaneously, study respondents strive for consistency between measures so that they can match their beliefs/attitudes and their behavior (Rhodes & Plotnikoff, 2005). Problems of recall and memory bias have been studied extensively but two factors in particular are believed to threaten the reliability and validity of the self-reporting of exercise behavior: the characteristics of the activity and the characteristics of the respondent (Durante & Ainsworth, 1996). For example, individuals vary widely in their ability to recall autobiographical information and engage in thoughtful introspection. In addition, the social desirability component of endorsing a positive health behavior may be problematic. Unfortunately, the present study’s measure of social desirability proved unreliable. Previous research on social desirability and self-reported exercise is limited but some studies have found it predicts frequency of activity (Warnecke et al., 1997) whereas others have found it does not (Motl et al., 2005).

A second limitation of the present research is that nothing is known about the participant beyond what data was requested of her. Although the present study screened participants for contraindications to exercise, the method of assessment provided limited details about the contraindications. For example, what were the long-term illnesses operating in the present sample? Given that Blacks and Hispanics have disproportionate prevalence rates of diabetes and heart disease as compared to Whites (Gee & Payne-Surges, 2004) it could be that these chronic diseases drove
such responses. This level of specificity was not probed for in the present study and it is unclear whether there is extant research that has evaluated how these familial or ethnicity specific risk factors may operate as part of individuals’ decision making processes.

A final limitation is that all women of Latina descent were grouped together. Although most of the women sampled are likely of Mexican-American descent due to the geographic region sampled – up to 84% identify as “of Mexican origin” in the greater San Diego region (United States Census Bureau, 2005) – differences among countries of origin such as between Mexicans and Cubans have been found to exist and should be recognized (Elder, Ayala, Parra-Medina, & Talavera, 2009).

**Future Research**

Future research should not only focus on using objective measures of exercise behavior such as accelerometers but also continue to make measurement standardization a priority in self-report tools. The importance of assessing frequency, duration and intensity of exercise or activity cannot be understated. For example, as the present study suggests, measuring intensity of activity describes stronger relationships with cognitive predictors of an individual’s relationship with exercise than duration and frequency alone. This is supported by much of the current research that discusses how the health benefits incurred from activity are primarily realized through total energy expenditure (Healy & Owen, 2010). Walking and other less intense forms of activity are still lauded as means of obtaining regular exercise but the
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The overall volume of lower intensity activities that must be completed weekly to meet recommended levels, as compared to that from moderate to vigorous intensity activities, is substantial.

Future studies should also seek to replicate the findings of goal-specific hope as a predictor of the stages of change. The strength of hope theory as being above and beyond that of self-efficacy is at the present time conjectural. Although the inclusion of hope was based on theory, this is the first study to demonstrate the power of goal-specific hope in predicting individuals' status of/orientation toward exercise and therefore study replication is warranted.

The present study found that 41% of participants were not meeting the national guidelines for regular exercise. This is indistinguishable from what recent national data suggests (41%; National Center for Health Statistics, 2007). In terms of percent of overweight individuals the present study's sample is also remarkably similar to the estimated national average (34%; National Health & Nutrition Examination Survey, 2010) as 30% met the criterion for overweight status. Overweight and inactivity both pose serious health risks and therefore the cognitive underpinnings that help explain them require ongoing investigation. Recent data suggest that individuals underestimate the benefits and enjoyment of exercise because they make incorrect predictions about the unpleasant beginnings of exercise (Ruby et al., 2011). Future health interventions could assist individuals in correcting this thinking and thereby increase their intention to engage in exercise. The present
findings provide additional evidence that specific population subgroups such as women and minority groups are at heightened risk and suggest that these groups should receive specific attention.

In summary, the findings from the present study demonstrate the importance of investigating additional cognitive variables in conjunction with known correlates from established health behavior models. In particular, the application of hope theory's agency construct to the transtheoretical model appears especially promising. Future research needs to attempt to replicate these findings to determine whether the prediction models of the present research operate similarly in different populations. Further, the findings on ethnicity suggest that future research should look to uncover mediators of ethnicity's relationship with exercise (such as level of acculturation; Ayala, Mickens, Galindo, & Elder, 2007). In addition, more work needs to be done to determine the utility of the stages of change for exercise ladder and assess how the preparation stage functions longitudinally. Finally, the present validation of the stages of change for exercise requires replication using objective means of assessing an individual's activity level.
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