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Understanding Exercise Motivation:
Examining the Revised Social-Cognitive Model of Achievement Motivation

Sarah J. Stevenson & Marc R. Lochbaum
Texas Tech University

Two studies were conducted to examine the utility of the revised social-cognitive model of achievement motivation to explain leisure-time exercise motivation. The core antecedent constructs in the model are implicit self-theories and perceived competence. The 2 X 2 achievement goal framework replaces the classic task and performance goal orientation approach. In the main study, 386 participants completed measures assessing the revised social-cognitive model of achievement motivation constructs as well as motivation for leisure-time exercise. A second study (N = 148) was conducted to determine whether the main study results could be replicated. Mediation and suppression analyses were conducted. The results of both investigations were very similar and supported several theoretical predictions of the revised model. Specifically, mastery-approach and performance-avoidance goals consistently processed entity and incremental theory as well as confidence with regard to exercise motivation. Future directions examining the utility of the revised model compared to the original model are discussed.

Address Correspondence To: Sarah J. Stevenson, Department of Health, Exercise and Sport Sciences, Box 43011 Texas Tech University, Lubbock, TX 79407-3011, Phone: (480) 326-7912, Fax: (806) 742-1688 Email: sarah.stevenson@ttu.edu

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Despite the numerous proven physical and psychological benefits associated with regular physical activity, current statistics suggest that over 50% of the adult population in the United States do not engage in the recommended levels of physical activity (Centers for Disease Control, 2007). Worldwide, the World Health Organization (WHO) estimates that 2 million deaths can be attributed to physical inactivity (WHO, 2007). Hence, it is important to increase adult physical activity participation. To better understand achievement motivation, competence and achievement goals have dominated the study of physical activity motivation (Duda, 2005). These constructs originate from several similar achievement goal-based social-cognitive models (Ames, 1992; Dweck, 1986; Dweck & Leggett, 1988; Nicholls, 1984, 1989).

Dweck and Leggett’s (1988) social cognitive model of achievement motivation has been adapted from psychology and education based research to explain, and hopefully increase, leisure-time physical activity participation in adults as well as adolescents (e.g., Kasimatis, Miller, & Marcussen, 1996; Lochbaum, Bixby, Lutz, Parsons, & Akerhielm, 2006; Wang, Chatzisarantis, Spray, & Biddle, 2002). This model relies on three main constructs: implicit theories of ability, achievement goals and perceived competence. Recently, researchers have revised this model (Curry, Elliot, Da Fonseca, & Moller, 2006). Hence, the purpose of the present series of investigations was to examine the viability of the revised-social cognitive model of motivation to understand motivation for leisure time physical activity.

The Social-Cognitive Model of Achievement Motivation

The social-cognitive model of achievement motivation differentiates between the way an individual interprets ability and success (Dweck, 1986; Dweck & Leggett, 1988). This theoretical approach allows researchers to explain the specific terms which underlie motivational processes and to characterize behaviors as adaptive or maladaptive. Within this model, challenge seeking, high persistence, exerted effort, enjoyment and task mastery characterize adaptive achievement striving behaviors. In contrast, maladaptive behavior is described as avoidance of challenging situations, low persistence when faced with obstacles, low enjoyment, and a performance orientation. Education based research strongly suggests that differences in adaptive and maladaptive behaviors do not imply differences in innate or learned ability for the task at hand (e.g., Dweck & Leggett, 1988). Instead, research over the last 20 years supports the fact that performance and motivational differences between individuals with the same innate or learned ability differ based on their implicit self-theory, perceptions of competence, and adopted achievement goal orientation (Dweck & Molden, 2005).

Historically, the implicit self-theory construct, the foundation of the original social-cognitive model, was proposed to understand learning and performance of cognitive tasks of
Individuals are theorized to differ in the degree to which they perceive intelligence as malleable. If an individual views intelligence as fixed, they are an entity theorist. If an individual views intelligence as malleable, they are an incremental theorist. An important aspect of the social-cognitive model of achievement motivation is the processing of the two self-theories on motivational outcomes. Specifically, individuals holding an entity theory of intelligence are more likely to endorse a performance goal orientation, whereas individuals holding an incremental theory of intelligence are most likely to endorse a mastery goal orientation. Both of these pathways may be motivationally adaptive, except when individuals holding an entity theory, a performance orientation, and low perceptions of their competence are theorized to exhibited learned helplessness behaviors.

Researchers have examined implicit self-theories for sport as stand alone constructs (Kasimatis et al., 1996; Ommundsen, 2003) as well as examining the entire model (Biddle, Soos, Chatzisarantis, 1999; Lochbaum et al., 2006; Spray, Wang, Biddle, Chatzisarantis, & Warburton, 2006; Wang & Biddle, 2003). Ommundsen (2003) examined the relationships among implicit self-theories and metacognitive self-regulation strategies with regard to learning in physical education classes in a sample of 343 adolescents. Ommundsen reported that an incremental theory positively related to adaptive metacognitive strategies while the stable aspect of an entity theory was negatively related to adaptive metacognitive strategies. Kasimatis and colleagues (1996) reported in 50 college students that those being given an incremental framework reported increased motivation, self-efficacy, and less negative affect to viewing a difficult exercise routine compared to the participants in the entity theory condition.

Investigations examining the entire social-cognitive model of achievement motivation have been more mixed in their support of the implicit theories (Biddle et al., 1999; Lochbaum et al., 2006; Wang & Biddle, 2003). For instance, Biddle and colleagues (1999) examined the ability of the social-cognitive model of achievement motivation to predict physical activity intentions in a large ($N = 723$) sample of Hungarian adolescents. Their results indicated a good fit for the model as it accounted for 20.8% of the variance in intentions, but implicit theory beliefs were not strongly associated with goal orientations ($r$ range for ego = .01 to .17; $r$ range for task = .04 to .32). Wang and Biddle (2003) tested the ability of the social-cognitive model to explain variance in intrinsic motivation in a moderately sized sample ($N = 155$) of undergraduate and graduate students in Singapore. Though they reported overall that their data fit the social-cognitive model well, they also reported a very weak correlation ($r = .18$) between entity theory and an ego orientation. The correlation between incremental theory and a task orientation was strong ($r = .54$).
Most recently, Lochbaum et al. (2006) examined the social-cognitive model of achievement motivation with regards to explaining self-reported participation in strenuous and moderate intensity physical as well as affect for engagement in physical activity in a large sample (N = 539) of university undergraduates. Participants were split on their perceptions of physical ability, high or low. The models accounted for 29.5% and 21.1% of affect and 15.3% and 7.0% in strenuous and moderate intensity exercise for high and low perceived ability participants, respectively. Unfortunately, in the initial stages, the social-cognitive model was not a good fit for the data in a smaller sample (n = 100). As with Biddle et al. (1999) and Wang and Biddle (2003) the relationship between an entity theory and ego orientation was very weak. Only Spray et al. (2006) have demonstrated more conclusive support for the social-cognitive model in an examination of sport ability beliefs and achievement goals in 123 English adolescents. With failure feedback experimentally manipulated, the entity group was more orientated towards ego goal while the incremental group was more orientated towards a task goal. In summary, besides Spray and colleague (2006), it appears that original social-cognitive model has not been fully supported because the entity theory-ego goal orientation relationship has been weak to non-existent.

The Revised Social-Cognitive Model of Achievement Motivation

Educational researchers have also noted various weaknesses in the original social-cognitive model of achievement motivation (Cury et al., 2006; Elliot & Dweck, 2005). Specifically, Elliot and Dweck (2005) suggested one major weakness involving the competence construct. Competence has long been viewed as a moderator of consequences in achievement settings (Dweck, 1986; Elliot & Church, 1997) as it provides an evaluation that energizes or directs behavior. Elliot and Dweck (2005) suggested that research in achievement motivation literature should emphasize perceived competence as a central tenet to any social-cognitive framework. Thus, within the revised social-cognitive model of achievement motivation, competence is represented as an antecedent to achievement motivation, not as a moderator of the ensuing effects (Elliot & Church, 1997; Cury et al., 2006).

In addition to reexamining the placement of competence in social-cognitive models, Cury et al. (2006) strongly suggested the need for the 2 X 2 achievement goal framework (Elliot, 1999; Elliot & McGregor, 2001; Elliot & Thrash, 2002). The 2 X 2 framework revises the classic mastery and performance goal dichotomy to incorporate valence (approach, avoidance). The 2 X 2 framework incorporates the following two dimensions based relative to perceived competence: how competence is defined (mastery or performance) and how it is valued (approach or avoid). Hence, in the 2 X 2 goal framework there are four types of goals: mastery-approach, mastery-avoid, performance-approach, and performance-avoid as these represent the most prevalent goal orientations (Conroy & Elliot, 2004; Elliot, 1999; Elliot & Thrash, 2001; 2002).
In mastery goals, an individual is concerned with mastery of a skill or task, and is self-referenced. A performance based goal is one in which the outcome of the goals is the focal point, and is other referenced. An approach valence indicates a behavior, which is initiated by a positive or desirable event or possibility. In contrast, an avoidance valence indicates a behavior, which is initiated by a negative or undesirable event or possibility (Elliot, 1999). Conducting two investigations on school achievement in French adolescent with the above discussed modifications to the social-cognitive model of achievement motivation, Cury and colleagues (2006) supported the placement of competence as an antecedent to goal adoption as well as the 2 X 2 achievement goal framework as a useful substitution for the classic dichotomous goal framework. Hence, this new model may hold promise for understanding leisure-time exercise motivation.

The Present Research and Hypotheses

Our purpose was to examine the revised social-cognitive model of achievement motivation to explain leisure time exercise motivation. Leisure time exercise motivation has been linked to self-reported engagement in leisure time physical activity; thus, it is a very important construct in attempting to fight worldwide inactivity. For instance, Hagger Chatzisarantis, Culverhouse, and Biddle (2003) examined several motivational constructs as well as self-reported leisure time physical activity in 295 high school students. Results indicate that intrinsic motivation for leisure time physical activity was significantly correlated with current self-report (r = .28) and past self-report (r = .37) of leisure time physical activity. More recently, Hagger, Chatzisarantis, Barkoukas, Wang and Baranowski (2005) examined similar motivational constructs and self-reported leisure time physical activity in four distinct cultures (British, Greek, Polish, and Singaporean). Results indicated that relative autonomy was significantly correlated with self-reported leisure time exercise behavior across all four cultures (British, r = .23; Greek, r = .41; Polish, r = .35; and Singaporean, r = .50). Hence, the examination of leisure time motivation is a worthy pursuit as it is related to motivation for engagement in leisure time physical activity.

A series of specific hypotheses based on the revised social-cognitive model were examined. Support of these hypotheses was based on a series of process analyses. Specifically, we tested the following hypotheses. The mastery-approach and mastery-avoidance goals would mediate the influence of incremental theory and perceived competence upon autonomy for leisure-time exercise. The performance-approach goal would suppress the influence of entity theory and would mediate the influence of confidence on autonomy for leisure-time exercise. Last, the performance-avoidance goal would mediate the influence of entity theory while suppressing the influence of perceived confidence on autonomy for leisure-time exercise. We
examined these hypotheses in two data sets as one important aspect in the scientific method is replication (Tuckman, 1978).

Method

Participants
Three hundred eighty six (215 male, 164 female, 7 unreported) individuals volunteered for this study. Participants were recruited via personal communication from a variety of sources such as university classes, community churches, and community fitness centers. Participants reported being in the following age categories: 18-24 (79.3%), 25-34 (8.0%), 35-44 (1.8%), 45-64 (5.4%), and 65 and older (0.5%). In addition, 4.9% of the participants failed to check an age category. Concerning educational attainment, 6.7% reported only completing high school, 72.0% reported some college education, 14.0% reported already having obtained an undergraduate degree, 4.9% reported having an advanced degree, and 2.3% failed to report their educational attainment. As for race, participants were primarily Caucasian (75.6%) with the remainder of the sample being Hispanic (14.2%), African American (3.9%), Native American/ American Indian (0.3%), Asian American (0.5%), other (3.1%), and 2.1% not reporting any race. Last, based on body mass index calculated from self-reported height and weight, 1.1% of our participants were underweight, 57.7% were within normal weight range, 30.3% were overweight, 7.8% were obese, 2.5% were seriously obese, and 0.6% was morbidly obese.

Procedures
Permission was granted from several fitness center employers, church leaders near the university, and instructors of a variety of university courses to approach potential participants. The participants were presented with a questionnaire packet approved by the authors’ University Human Subject’s Institutional Review Board. All measures were completed at the time of administration with a research assistant or the authors available to answer questions. Packets were completed in groups of no more than 30 participants.

Measures
Autonomy for leisure-time exercise. Autonomy for exercise was measured by the Exercise Motivation Scale (EMS; Li, 1999). This scale includes 31 potential reasons or lack of reasons for engaging in exercise participation. Participants were asked to indicate their agreement with each statement as a reason why they exercise on a Likert-type scale ranging from 1 (strongly disagree) to 6 (strongly agree). This measure (Li, 1999) has demonstrated adequate levels of internal consistency (α = 0.71 to 0.90) and test-retest reliability (r = 0.78 to 0.88). The EMS includes eight dimensions (amotivation, external regulation, intrinsic regulation, identi-
fied regulation, introjected regulation, intrinsic motivation to learn, intrinsic motivation to accomplish, and intrinsic motivation to experience) along the self-determination continuum. For the present investigation, motivation was represented by the relative autonomy score that was calculated from all of the eight subscales. To quantify the participants' degree of relative autonomy, Vallerand's (1997) formula was utilized as follows to calculate relative autonomy index (RAI) for leisure-time exercise: RAI = (amotivation * -3) + (external regulation * -2) + (internal regulation * -1) + (identified regulation) + (integrated regulation * 2) + (intrinsic motivation * 3). By using Vallerand's formula, higher levels of participants' autonomy are reflected as positive scores, whereas lower levels of participants' autonomy are reflected as negative scores.

*Implicit theories of ability.* Implicit theories of ability were measured by the Conception of the Nature of Athletic Ability Questionnaire-2 (CNAAQ-2; Biddle et al., 2003). This 12-item measure was developed to account for the psychometric weaknesses in the original version of the questionnaire including the removal of general and specific subscales, as well as other problematic items (Biddle et al., 2003). The revised version explains the relationship between ability and motivational variables. The questionnaire assesses beliefs regarding incremental and entity beliefs about sport/athletic ability. For the present investigation, the items in the questionnaire were rephrased to indicate beliefs about exercise and physical activity, rather than about sport given the purpose was to investigate and not confuse sport participation with leisure-time exercise participation. In the questionnaire, entity and incremental theories are represented by two subscales with three items per subscale. The entity subscales are labeled Stable, "You have a certain level of ability to exercise and you cannot really do much to change that level" and Natural Gift, "You need to have certain 'gifts' to be good at exercise". The incremental subscales are labeled Learning, "To be successful in exercise you need to learn techniques and skills and practice them regularly" and Improvement, "How good you are at exercise will always improve if you work at it". The entity score was computed by summing together the natural gift and stable subscales while the incremental score was computed by summing together the learning and improvement subscales. Participants responded on a scale from 1 (strongly disagree) to 5 (strongly agree) to each item after reading the following statement stem, "Following are several questions concerning your view of exercise. Please circle the choice that best represents your view". Biddle and colleagues demonstrated an acceptable level of internal consistency for the entity and incremental scales, $\alpha = 0.74$ and $0.80$, respectively.

We conducted a CFA on the four subscales to verify that the change from sport to exercise did not detract from the subscale meanings. This analysis was conducted on the covariance matrix; and by using maximum likelihood estimation, the solution was generated.
The four factor model outlined by Biddle and colleagues (2003) provided a good fit for the data, \( \chi^2(48, N = 386) = 83.62, p < .001; \) CFI = .97; RMSEA = .04; all items displayed acceptable factor loadings (.37 to .80).

**Perceived competence.** A modified version of Dweck's (1999) three-item confidence measure was utilized to determine participants' perceived confidence for exercise. The items were rephrased to make them applicable to exercising. Participants responded to the items on a scale ranging from 1 (**very true of me**) to 6 (**sort of true for me**) depending upon their response to their primary choice. The statement stem for all three questions read, “The following questions concern your confidence for exercise. Please read carefully and mark the answer that is most true for you.” The questions include, (1) I usually think I’m good at exercising or I wonder if I am good at exercising; (2) When I am faced with changing my exercise routine, I’m usually sure I will be able to do it or when I am faced with changing my exercise routine, I often think I may not be able to do it; and (3) I’m not very confident about my exercise ability or I feel pretty confident about my exercise ability. Past research in math achievement has reported very high internal consistency (\( \alpha = .90 \)) for this measure (Cury et al., 2006).

**Achievement goals.** Achievement goals were assessed by adapting Elliot and McGregor’s (2001) Achievement Goal Questionnaire. This 12-item instrument was designed to assess the four achievement goals (mastery-approach: “It is important to me to exercise as well as I possibly can”; performance-approach: “It is important for me to do well as compared to others”; mastery-avoidance: “I worry that I may not exercise as well as I possibly can”; and performance-avoid: “I just want to avoid exercising worse than others”). The questionnaire required individuals to specify how true each item was on a scale from 1 (**not at all**) to 7 (**completely**) after reading the following statement stem, “Please think about your thoughts and feelings when engaging or thinking about engaging in exercise. Please read each question and respond as to how like the statement if about you.” Three items assessed each of the achievement goals. Past research has reported displayed strong psychometric properties (e.g., Elliot & McGregor, 2001).

We conducted a CFA on the achievement goal items. The CFA was conducted on the achievement goal items because the questions were rephrased to indicate an exercise context, not an educational context. This analysis was conducted on the covariance matrix. By using maximum likelihood estimation, the solution was generated. The four factor model outlined by Elliot and McGregor (2001) provided a good fit for the data, \( \chi^2(48, N = 386) = 148.56, p < .001; \) CFI = .95; RMSEA = .07; all items displayed acceptable factor loadings (.54 to .90).
Results

Overview of Main Analyses

Prior to conducting our main analyses, descriptive data, Cronbach’s reliabilities, and intercorrelations were examined (see Table 1). In addition, sex differences were examined with several MANOVAs. No differences were found; hence, sex was excluded in the analyses. To examine our hypotheses concerning the achievement goals as process variables, a series of multiple regressions based on Baron and Kenny’s (1986) work were conducted. Baron and Kenny (1986) outlined the steps required to examine process models for both mediation and suppression (for a visual representation, see Figure 1). Mediation is a statistical process, which produces a decrease in the beta for a direct relation (e.g., incremental theory to intrinsic motivation is mediated by mastery-approach goals). Conversely, suppression produces an increase in the beta for a direct relation (e.g., entity theory to intrinsic motivation is suppressed by performance-approach goals). The two processes work in contrast to one another. This contrast is only detected through separate examination; hence, when necessary the achievement goal orientations were examined separately.

The following are the steps to examine these processes: (a) an independent variable must directly predict a dependent variable; (b) an independent variable must predict a process variable; and (c) a process variable must predict a dependent variable, and the indirect relation between the independent variable and the dependent variable must increase or decrease when the process variable is controlled. The basic regression model or the independent variables used in the analyses consisted of confidence, incremental theory, and entity theory.

Basic Model Predicting Motivations for Exercise

To examine the influence of our basic model variables upon our dependent variable, relative autonomy was regressed on the basic model (see Table 3). The analysis yielded an overall significant effect, \( F(3, 382) = 49.65, p < .001, R^2 = .28 \). Entity was a significant negative predictor of relative autonomy. Both incremental theory and confidence were positive predictors of relative autonomy.

Basic Model Predicting Achievement Goals

Mastery goals. The two mastery goals were regressed individually on two of the basic model variables: incremental theory and confidence (see Table 3). For the mastery-approach goal, the overall model was significant, \( F(2, 383) = 78.93, p < .001, R^2 = .29 \). Incremental theory and confidence were significant positive predictors of mastery-approach goals. For the mastery-avoidance goal, the overall model was significant, \( F(2, 383) = 8.84, p < .001, R^2 = .04 \).
Confidence was a significant negative predictor of the mastery-avoidance goal while incremental theory was not a significant predictor.

**Performance goals.** The two performance goals were regressed individually on entity theory and confidence (see Table 3). For the performance-approach goal, the overall model was significant, $F(2, 383) = 3.41, p < .05, R^2 = .02$. Confidence was the only significant predictor of the performance-approach goal. For the performance-avoidance goal, the overall model was significant, $F(2, 383) = 17.49, p < .001, R^2 = .08$. Entity theory was a positive predictor of performance-avoidance goals, whereas confidence was a significant negative predictor.

**Achievement Goal Process Models.**

As previously described, Baron and Kenny (1986) outlined three distinct steps to examine process models. The first two steps have been examined. It has been established which independent variables predicted the dependent variable. In that, all of our basic model variables were significant predictors. The second step of the process model is the determination of which independent variables predict the process variables or the achievement goals. The results established incremental and confidence were significant predictors of the mastery-approach goal, whereas confidence was the only significant predictor of the mastery-avoidance goal. For the performance goals, only confidence was a significant predictor of the performance-approach goal, whereas both confidence and entity theory were significant predictors of the performance-avoidance goal.

The last step in Baron and Kenny’s (1986) process model is the determination of whether any of the goals serve as process variables between the basic model variables and relative autonomy for leisure-time exercise. The variables chosen for the process analysis depend upon significance in the first two steps as well. In this preliminary process analysis, relative autonomy was regressed on the basic model with the four goals included to determine which goals were significant and needed more precise regression analyses. Only the mastery-approach goal and the performance-avoidance goal were significant predictors of relative autonomy; hence, all subsequent analyses were only conducted with these process variables.

For the mastery-approach process analyses, a regression was run to test whether this goal mediated the influence of confidence and incremental theory on relative autonomy. The overall model was significant, $F(3, 382) = 67.85, p < .001, R^2 = .35$ (see Figure 2 for a visual representation). Incremental theory, confidence, and the mastery-approach goal were significant positive predictors of relative autonomy. The decrease in betas ($c$ to $c’$) for incremental theory and confidence on relative autonomy were .11 or 38.7% and .13 or 60%, respectively. To test the significance of the mediated effect, Kenny, Kashy, & Bolger’s (1998) method to calculate a $z$ score was followed. If the calculated $z$ score is greater than 1.96, then this value is significant.
at the \( p < .05 \) level. The \( z \)-score for both mediation models (\( z \) incremental theory model = 6.78; \( z \) confidence model = 6.47) were much greater than 1.96; hence, the mastery-approach goal significantly mediated the influence of both incremental theory and confidence on relative autonomy.

For the performance-avoidance process models, two separate regressions were run because the performance-avoidance process model with entity theory is mediation, whereas the performance-avoidance process model with confidence is suppression. For the suppression analysis, the overall model was significant, \( F(2, 383) = 34.27, p < .001, R^2 = .15 \) (see Figure 3). Confidence was a significant positive predictor, whereas the performance-avoidance goal was a significant negative predictor of relative autonomy for leisure-time exercise. The increase in beta for confidence on relative autonomy was .04 or 12.9%. The \( z \) score was 2.15; hence, the performance-avoidance goal significantly suppressed the influence of confidence upon relative autonomy.

For the mediation analysis, the overall model was significant, \( F(2, 383) = 25.58, p < .001, R^2 = .12 \) (see Figure 4). Entity theory and the performance-avoidance goal were significant negative predictors of relative autonomy for leisure-time exercise. The decrease in beta for entity theory on relative autonomy was .05 or 21%. The absolute value of the \( z \) score was 2.18; hence, the performance-avoidance goal significantly mediated the influence of entity upon relative autonomy.

**Replication Study**

**Method**

**Participants**

One hundred forty eight (58 male, 90 female) individuals volunteered for this study. Participants were recruited via personal communication from a variety of university classes. A fair amount of descriptive information was collected on the participants. Participants reported being in the following age categories: 18-24 (96%), 25-34 (2.8%), 35-44 (0.7%), and 45-64 (1.4%). Concerning educational attainment, 2.7% reported only completing high school, 81.3% reported some college education, 14.0% having already obtained an undergraduate degree, 1.3% reported having an advanced degree, and 0.7% did not report their educational attainment. Participants were primarily Caucasian (79.3%) with the rest of the sample reported being Hispanic (12.0%), African American (3.3%), Asian American (1.3%), and other (2.7%). Last, 1.3% of the sample did not indicate their race.
Procedures

For the current study, the same procedures as in our main study were followed.

Measures

All of the measures were identical to those in study one.

Results

Replication Study

Overview of Main Analyses

Prior to conducting our main analyses, descriptive data, Cronbach’s reliabilities, and intercorrelations are presented in Table 2. Our main analyses were identical to those in study one.

Basic Model Predicting Motivations for Exercise

As with the first study, relative autonomy for leisure-time exercise was regressed on the basic model variables (entity theory, incremental theory, and confidence). The analysis yielded an overall significant effect, $F(3, 145) = 18.74, p < .001, R^2 = .28$. Entity theory was a significant negative predictor of relative autonomy. Both incremental theory and confidence were positive predictors of relative autonomy. These results were consistent with our main study.

Basic Model Predicting Achievement Goals

Mastery goals. The two mastery goals were regressed separately on incremental theory and confidence. For the mastery-approach goal, the overall model was significant, $F(2, 146) = 30.08, p < .001, R^2 = .29$. Incremental theory and confidence were significant positive predictors of the mastery-approach goal (see Table 3). For the mastery-avoidance goal, the overall model was significant, $F(2, 146) = 3.13, p < .05, R^2 = .04$, but only incremental theory was a significant predictor of the mastery-avoidance goal (see Table 3).

Performance goals. The two performance goals were regressed separately on entity theory and confidence. For the performance-approach goal, the overall model was significant, $F(2, 146) = 8.17, p < .001, R^2 = .10$. Only entity theory was a significant positive predictor of the performance-approach goal (see Table 3). For the performance-avoidance goal, the overall model was significant, $F(2, 146) = 14.37, p < .001, R^2 = .08$. Entity theory was the only significant predictor of this goal (see Table 3).
Achievement Goal Process Models

As with the main study, the same progression based on Baron and Kenny's (1986) three steps were followed and are again described to detail the replication study. There was a slight difference from our main study when confidence but not incremental theory was the significant predictor of the performance-approach goal. In the main study, confidence and not entity was the significant predictor. For the performance-avoidance goal, entity theory again was the significant predictor. In the main study, both basic model variables were statistically significant.

The last step in Baron and Kenny's (1986) process model again is the determination of whether any of the goals serve as process variables between the basic model variables and relative autonomy for leisure-time exercise. The variables chosen for the process analysis depend upon significance in the first two steps as well as a preliminary analysis. In this preliminary process analysis, relative autonomy was regressed on the basic model with the four goals included to determine which goals were significant and needed more precise regression analyses. Replicating our finding in our main study, only the mastery-approach goal and the performance-avoidance goal were significant predictors of relative autonomy; hence, all subsequent analyses were conducted with these process variables.

For the mastery-approach process analyses, a regression was run to test whether this goal mediated the influence of confidence and incremental theory on relative autonomy for leisure-time exercise. The overall model was significant, $F(3, 145) = 30.42, p < .001, R^2 = .39$ (see Figure 2). Confidence and the mastery-approach goal were significant positive predictors of relative-autonomy. Incremental theory was no longer a significant predictor. In fact, the new beta was nearly zero, which is consistent with full mediation. The decrease in betas for incremental theory and confidence on relative autonomy were .17 or 85.0% and .11 or 50%, respectively. To test the significance of the mediated effect, Kenny, Kashy, & Bolger's (1988) method to calculate a z score was again followed as in our main study. The z score for both mediation models were both greater than 1.96 ($z$ incremental theory model = 3.92; $z$ confidence model = 3.98); hence, the mastery-approach goal significantly mediated the influence of both incremental theory and confidence on relative autonomy for leisure-time exercise.

For the mediation analysis, the overall model was significant, $F(2, 146) = 20.29, p < .001, R^2 = .22$ (see Figure 4). Entity theory and the performance-avoidance goal were significant negative predictors of relative-autonomy. The decrease in beta for entity theory on relative autonomy was -.04 or 13.7%. The absolute value of the z score of 2.92; hence, the performance-avoidance goal significantly mediated the influence of entity theory upon relative autonomy.
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Note. *p < .05.
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*Note. *p < .05.
Table 3: Basic model regression results for both studies with only significant (p < .05) results reported.

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Note: *p < .05.
Figure 1. Baron and Kenny's steps for examining process models.

Predictor

Variable (X)
(e.g., Competence)

Path c

Outcome

Variable (Y)
(e.g., RAI)

Outcome

Path c'

Predictor

Variable (X)
(e.g., Competence)

Mediator

Variable (M)
(e.g., Mastery-approach)

Outcome

Variable (T)
(e.g., RAI)
Figure 2: Standardized beta coefficients for the mastery-approach process model with the first data set values on top and the second data set on the bottom.

```
Incremental Theory
  .20
  .38
  .38
  .35  Mastery-Approach Goal .42 Relative Autonomy
    .35
    .35
    .31
    .29
```

Figure 3: Standardized beta coefficients for the confidence-performance-avoidance process model for only the first data set.

```
Confidence -.17 Performance-Avoidance -.13 Relative Autonomy
  c = .31
  c' = .35
```
**Figure 4.** Standardized beta coefficients for the entity-performance-avoidance process model with the first data set values on top and the second data set on the bottom.

![Diagram of beta coefficients]

**Discussion**

The purpose of the present investigation was to examine the revised social-cognitive model of achievement motivation (Cury et al., 2006). This revised model utilizes Elliot's (1997) 2 X 2 achievement goal framework as well as placing competence as an antecedent to goal adoption. Dweck and Leggett's (1988) original social-cognitive model of achievement motivation was centered on the dichotomous goal orientation framework as well as competence or confidence importance based on goals adoption. Both the original and revised social-cognitive model of achievement motivation purport that implicit self-theories dictate goal adoption (incremental to mastery based goals and entity to performance based goals). Past research has not supported all aspects of the original model. In addition, Cury and colleagues (2006) provided a great deal of empirical support as to why the original model had not been supported in education based investigations.

Based on theory and findings in the extant literature, we tested whether mastery goals mediated the influence of incremental theory, as well as competence on motivation or autonomy for leisure-time exercise. Our results strongly supported our hypothesis that the mastery-approach goal significantly mediates the influence of incremental theory and confidence on leisure-time exercise motivation. In fact, the models accounted for 30% of leisure-time exercise autonomy. Shrout and Bolger (2002) provide a formula for estimating the percentage of mediation or suppression. This formula is based on using one of the unstandardized regres-
sion coefficients in each of Baron and Kenny’s (1986) three steps for testing mediation. Shrout and Bolger (2002) stated that a sample of at least 500 is needed for an accurate variance estimate. Our investigation total exceeds the required 500 participants. For this post hoc analysis, 48.9% and 61.5% of confidence and incremental theory were mediated by the mastery-approach goal. Given the high percentage of variance accounted for in motivation overall and the high percentages of mediation accounted for the mastery-approach goal, our findings are clear and consistent with past literature stressing the importance of a mastery goal (for reviews see Duda, 2005; Roberts, 1992) over many years and numerous investigations.

In addition to our mastery based findings, several findings concerning the performance goals are worthy of discussion. As previously discussed, the entity-performance or ego goal relationship has not been supported in past research (Biddle et al., 1999; Lochbaum et al., 2006; Wang & Biddle, 2003). In the original social-cognitive model of achievement motivation, an entity theory is purported to lead one to adopt a performance goal orientation. The impact of perceived competence then interacts with this performance orientation to determine adaptive or maladaptive achievement behaviors (Dweck & Leggett, 1988). Our results did fail to consistently support the entity and performance-approach relationship. The correlations were not consistent ($r = .07$, main study; $r = .29$, replication study).

In contrast and unique to the extant literature, the confidence and performance-avoidance goal model accounted for 15% of the variance in the main study. Confidence was not a significant predictor of the performance-avoidance goal in our replication study. The alpha value in our replication study did approach significance ($p = .07$). Hence, this analysis suffered more from sample size than from a lack of a relationship. Also, in our replication study, the entity and performance-avoidance regression accounted for 16% of the variance in motivation for leisure-time exercise. When the data sets were combined post hoc, this performance-avoidance goal suppressed 13.5% of confidence’s influence and mediated 21.0% of entity theory’s influence upon leisure-time exercise motivation. Thus, though the performance-approach goal was not prominent in the present study, the performance-avoidance goal was prominent.

Conceptually, the importance of the performance-avoidance goal in such an apparent difficult task, physical exercise (given the current low rates across the world), is logical. When behaviors are oriented around avoiding normative or public displays of incompetence, then physical exercise in a population that is quickly becoming overweight as current estimates suggest that 64% of our adult population is overweight (Center for Disease Control, 2007) to obese would be potentially embarrassing in front of the few who are physically fit. The performance-approach goal in an exercise setting may not be as intuitively important. Exercise or physical in and of itself does not have a performance or normative based standard, whereas
Limitations, Future Directions, and Summary

As with most investigations, the present investigation contained limitations or areas of theoretical concern. These limitations or concerns viewed in light of the reported results assist in detailing future directions. A few of these are worthy of discussion. First, the present investigation is limited in participants sampled. For the most, the participants were college students. It is unknown whether our results would generalize to older samples. No theoretical limitations exist or have been hypothesized concerning age within the original (Dweck & Legget, 1988) or revised (Cury et al., 2006) social-cognitive model of achievement motivation. Given the present investigation concerned motivation for physical exercise, an achievement behavior, the results should generalize to all age groups. The present results were somewhat puzzling in that the performance-approach goal was simply not correlated strongly either positively or negatively with exercise motivation (r’s = .14 and .06). Whether motivation based on normative standards for exercise are simply best described as avoidance orientated across all age groups is a worthy future research pursuit. The results are also limited in that it is unknown whether leisure time motivation for physical activity was strongly correlated with actual engagement in physical activity. Future research should measure both motivation as well as actual physical activity behavior to best gain an understanding of the relationship.

One major conceptual concern is that the 2 X 2 achievement goal framework has been suggested (Cury et al., 2006; Elliot & Church, 1997) to be an improvement upon the classic dichotomous framework though some would dispute this claim (Smith, Duda, Allen, & Hall, 2002). In the present investigation, only two of the achievement goals provided significant processing of the implicit theories and competence or confidence. In essence, this study provided support for a dichotomous framework that was mostly in line with classic achievement goal frameworks (mastery-approach = mastery and performance-avoidance goals = performance with low perceived ability). Though subtle differences do exist between high perceived ability participants with either a mastery or ego orientation, the major achievement motivation difference exists between mastery orientated individuals and low perceived ability participants holding an ego or performance orientation (Ames, 1992; Dweck & Legget, 1988; Nicholls, 1984, 1989). It appears that more work examining the conceptual overlap or convergence of classic goal orientations and the 2 X 2 achievement goal framework is needed in an exercise context.

In summary, the present investigation was unique in that it was the first to test several of the predictions of the revised social-cognitive model of motivation in an exercise context. Several of the predictions were supported in the main study and again in the replication study. It is very important to remember that replication is an important step in the research process (Tuckman, 1978). This study also demonstrated that perhaps not all of the 2 X 2 achievement...
goals are prominent in an exercise context. It appears that exercise leaders, teachers, and specialists should be very careful in promoting any type of comparison standards as they are negatively related and damaging to exercise motivation. As always, mastery and incremental theory views should be promoted to enhance and maintain exercise motivation.

References


