An Evaluation of Barrier Efficacy and Cognitive Evaluation Theory as Predictors of Exercise Attendance

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The purpose of this study was to evaluate the barrier efficacy and cognitive evaluation theory with regard to predicting exercise attendance. Participants consisted of 189 undergraduates attending not-for-credit fitness classes at a regional comprehensive university in the Midwest. A revised 17-item version of the Intrinsic Motivation Inventory was used to assess exercise enjoyment and the three components of self-determination theory (competence, autonomy, and relatedness). A modified version of the Self-Efficacy Scale was used to assess self-efficacy. Attendance was significantly correlated with competency and self-efficacy. Regression results revealed that class, relatedness, and competence accounted for a significant amount of variance in attendance. Future research should examine the effects of competence-enhancing strategies on exercise adherence.

Although the physical and psychological benefits of regular exercise are well documented, close to 50% of those who begin an exercise program will drop out within the first 6 months (Dishman, 1982). Additionally, physical activity involvement continues to decline each year. According to the Centers for Disease Control and Prevention (CDC), "more than 50% of American adults do not get enough physical activity to provide health benefits. Twenty-five percent of adults are not active at all in their leisure time" (CDC, 2004a, ¶ 3). Further, the percentage of the population who do not get sufficient exercise or who are inactive exceeds 70% (CDC, 2004a). Further evidence of the critical need for increased physical activity is the alarming increase in obesity prevalence rates occurring in the United States. Specifically, "In 2002, 18 states had obesity prevalence rates of 15–19 percent; 29 states had rates of 20–24 percent; and 3 states had rates over 25 percent" (CDC, 2004b, ¶ 1). Therefore, it is essential to understand which factors are the strongest predictors of exercise adherence in order for the next step to be taken to investigate physical activity interventions. Despite a substantial amount

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of research in the area, the problem of uncovering the optimum determinants of exercise adherence still prevails.

A number of factors have consistently been shown to have an effect on exercise adherence. Self-efficacy is among these well-documented factors. More recently, evidence has been uncovered suggesting that intrinsic motivation and the components of the self-determination theory (SDT) may also impact exercise adherence (Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2004). No research was found that included a self-efficacy and intrinsic motivation or SDT comparison. The purpose of this study was to evaluate self-efficacy, intrinsic motivation, and the SDT with regard to predicting exercise attendance. Note that attendance is often used as a measure of adherence and, therefore, studies using attendance/frequency are included in the literature review.

Self-Efficacy

Self-efficacy refers to an individual's belief in his or her ability to successfully execute a course of action under a certain circumstance (Bandura, 1977). The self-efficacy theory posits that psychological and behavioral change comes as a result of the alteration of one's self-efficacy (Bandura, 1977). Further, it has been suggested that there are subtypes of self-efficacy. Among the various subtypes are exercise efficacy, barrier efficacy, and task self-efficacy. Task self-efficacy refers to one's perceived ability to execute a behavioral task (Maddux, 1995). Exercise efficacy refers to beliefs about one's capability to engage in physical activity successfully (Duda, 1998). Exercise efficacy may be thought of as a type of task self-efficacy. On the other hand, barrier efficacy, also referred to as self-regulatory efficacy, refers to one's belief about one's ability to complete a task while overcoming difficulties to successful behavioral performance (Bandura, 1997). Although there is already a strong body of research on diverse populations consistently supporting self-efficacy as an important predictor of exercise adherence, recent research continues to solidify the relationship. Wininger (2004) surveyed 71 female participants in not-for-credit aerobics classes and found *barrier* self-efficacy to be a significant predictor of exercise attendance, whereas retrospective report of exercise enjoyment was not. Dishman et al. (2004) found that increased *exercise* self-efficacy resulted in increased physical activity in a population of 24 Black and White adolescent girls. Guillot, Kilpatrick, Herbert, and Hollander (2004) conducted a study in which a stepwise multiple regression analysis indicated *barrier* self-efficacy to be a significant predictor of adherence to a cardiac or pulmonary exercise rehabilitation program, accounting for 28% of the variance in adherence.

Results of a study conducted by Gyurcsik, Estabrooks, and Frahm-Templar (2003) revealed that *task* self-efficacy was significantly correlated with aquatic exercise attendance ($r = .33$) for 216 participants with arthritis. In a study con-

ducted by DeBourdeaudhuij and Sallis (2002), results revealed that *barrier* self-efficacy accounted for a significant amount of variance in self-reported physical activity over the course of a year in participants ranging in age from 16 to 65 years (betas ranged from .13 to .19 across age groups and gender).

Dawson and Brawley (2000) conducted a study in which discriminant function analysis indicated that self-efficacy (the measure used contained questions that assessed both exercise and barrier efficacy) was one of two variables that contributed to classifying adherers and dropouts. Research including follow-up assessments indicated that the influence of self-efficacy on exercise adherence is long lasting. Oliver and Cronan (2002) conducted hierarchal logistic regression analyses examining the exercise behavior of patients with fibromyalgia syndrome at different points in time: baseline, 6 months, 1 year, and 18 months. *Exercise* self-efficacy was significantly related to engaging in physical activity at all time points. McAuley, Lox, and Duncan (1993) found that self-efficacy was significantly related to exercise maintenance ($r = .43$) at a 9-month follow-up of an exercise program. Another study conducted showed high self-efficacy (the measure was a combination of barrier and exercise efficacy) to be associated with greater exercise adherence when participants were surveyed at the end of a 6-month exercise program and at an 18-month follow-up (standardized path coefficient = .25; McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003).

SDT

SDT (Deci & Ryan, 1985) posits that motivation exists as a continuum along which different types of behavioral regulations are located. In SDT, motivation ranges along the continuum from amotivation to intrinsic motivation. Perceived self-determination (or autonomy) increases along the continuum with intrinsic regulation comprising the greatest perceived autonomy. There are six distinct types of behavioral regulation along the SDT continuum. At the far left of the continuum is amotivation, which exists when there is no intention to engage in the behavior. The behavior is often not valued or the individual has low perceived competence for the task (Ryan & Deci, 2000).

Additionally, there are four types of extrinsic motivation, each increasingly more internalized, although still driven, toward some instrumental outcome (Ryan & Deci, 2000). External regulation is the least autonomous or most controlling form of regulation and occurs when behavior is controlled by external rewards or punishment. In this case, internalization of the behavior is almost nonexistent. Next is introjected regulation, which occurs when internal pressures such as avoiding guilt or attaining pride direct behavior. Although external aspects are the main motivation for the behavior, introjected regulations are somewhat internalized. Further along the continuum is identified regulation, which takes place when the individual takes on the regulation as his or her own

through identifying with the personal importance of the task. Identified regulation is more internalized because it indicates that the individual has identified the value of the activity. Integrated regulation occurs when a person engages in a behavior because it has been fully incorporated into the self. Even though integrated regulation is highly autonomous, it is still considered extrinsic because the behavior is driven by some instrumental value associated with an outcome separate from engaging in the behavior itself.

Finally, the most internalized form of regulation is intrinsic motivation. Individuals who are intrinsically motivated tend to engage in activities because of interest, enjoyment, or the challenge of the activity. Aspects inherent to the activity itself, not external factors, drive intrinsically motivated behavior.

Cognitive evaluation theory (CET; Deci & Ryan, 1985), a subtheory of SDT, hypothesizes that humans have three innate psychological needs: competence, autonomy, and relatedness (research on CET mainly focuses on the importance of competence and autonomy). The purpose of the development of CET was to "specify the factors in social contexts that produce variability in intrinsic motivation" (Ryan & Deci, 2000, p. 58). More specifically, in order for one to be intrinsically motivated to engage in an activity one needs to feel competent (e.g., the activity offers optimal challenges and relevant feedback) to carry out the activity and feel that the reason they engaged in the activity was not because of external pressure or control (autonomy). The concept of relatedness refers to a sense of belongingness and connectedness to person(s) working toward a common goal (Ryan & Deci). Additionally, feelings of relatedness, accompanied by feelings of competence and autonomy, can also facilitate intrinsic motivation.

Researchers have begun to investigate the relationship between factors of CET and exercise adherence. Although the identified body of literature on this topic is small, it provides evidence that further examination is necessary. Ryan, Frederick, Lepes, Rubio, and Sheldon (1997) found that motives for competence (assessed by the Motivation for Physical Activities Measure) was significantly correlated ($r = .26$) with exercise adherence. Chatzisarantis, Biddle, and Meek (1997) found that intentions to exercise were more likely to be translated into behavior when they were uncontrolled (or autonomous; beta = .21). Oman and McAuley (1993) found perceived competence to be significantly related to exercise program attendance ($r = .23$). In a study conducted by Chatzisarantis, Hagger, Biddle, and Karageorghis (2002), correlations indicated that perceived behavioral control (or lack of autonomy) was associated with physical activity ($r = .34$). Additionally, studies have shown that failure to satisfy the need for relatedness (along with the needs for autonomy and competence) can be linked to sport drop out (Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002).

Another approach to examining SDT research has looked at studies that examine the effects of different types of motivation (primarily intrinsic motivation or enjoyment) on exercise adherence (Chatzisarantis et al., 2002; Oman &

McAuley, 1993; Ryan et al., 1997). Oman and McAuley showed that intrinsic motivation was significantly associated ($r = .27$) with attendance to an 8-week exercise program. Frederick and Ryan (1993) conducted a study comparing persons whose principal activity was sport and those whose principal activity was fitness/exercise. Results indicated that for sport participants, interest/enjoyment was significantly associated with the number of hours of participation ($r = .32$). Also, for fitness participants, interest/enjoyment was significantly associated with activity hours ($r = .32$) and days per week of exercise ($r = .15$). Ryan et al. (1997) also found mean enjoyment scores over a period of workouts to be positively associated with exercise adherence ($r = .28$). In Chatzisarantis et al. (2002), correlational results suggested that intrinsic motivation was associated with physical activity ($r = .35$).

Summary and Hypotheses

Past research has shown extensive support for the positive influence of self-efficacy in diverse populations on exercise adherence. In recent research, self-efficacy has been shown to account for up to 28% of the variance in exercise adherence (Guillot et al., 2004). Although the body of literature on SDT and intrinsic motivation with regard to adherence is small, some influential results have been rendered. The SDT research has revealed that motives for competence accounted for approximately 7% of the variance in exercise adherence (Ryan et al., 1997), autonomy tended to have a small effect of roughly 4% (Chatzisarantis et al., 1997), and relatedness has been shown to explain approximately 1% of the variance in exercise adherence (Sarrazin et al., 2002). There have been some consistent results on intrinsic motivation/enjoyment with most studies indicating an effect between 7% and 10% in terms of variance explained (Chatzisarantis et al., 2002; Frederick & Ryan, 1993; Oman & McAuley, 1993; Ryan et al., 1997).

The purpose of this study was to evaluate barrier efficacy and CET with regard to predicting exercise attendance. Following from previous research, it is expected that self-efficacy will be the strongest predictor of exercise attendance. Additionally, it is expected that enjoyment will be a stronger predictor of exercise attendance than all three SDT factors. For the three SDT factors, it is expected that competence will account for a larger amount of variance in attendance than autonomy and relatedness.

Method

Participants

Participants were 189 undergraduate students from a comprehensive regional university in the Midwest. Participants attended not-for-credit fitness classes at

the university fitness center. Fitness center fees are included in tuition; therefore, students did not pay for each class attended but rather one overall fitness center fee. The mean age of the sample was 20.67 years (standard deviation = 4.11) and ranged from 18 to 47 years.

Procedures

Prior to data collection, all procedures were approved by the university's Institutional Review Board. Questionnaires were administered following the first fitness class of the semester. It was important for the questionnaires to be completed following the first fitness class so the participants had experience on which to base their self-efficacy judgments. Because the purpose of the study was to predict exercise attendance, measures of enjoyment and self-determination were only completed following the first fitness class and not at any later time-points. The participant names and questionnaire information were entered into a database. Attendance was tracked over a 16-week semester by matching names on the sign-in sheets to those in the database.

The fitness classes were held in a large mirrored dance studio at the university fitness center. The classes consisted of a 5–7 min warm-up, followed by a 30–40 min workout, and ended with a 5–7 min cool down. The class types included abdominal (abs; $n = 69$), kickboxing ($n = 33$), step aerobics ($n = 39$), and yoga ($n = 48$). Each class was taught by a different instructor. Music selected by each instructor accompanied each workout.

Measures

Barrier efficacy. Barrier efficacy for exercise attendance was used to assess the participants' confidence that they could attend the class regularly throughout the semester under specific conditions (e.g., "When you are tired"). A modified version of the Self-Efficacy Scale (Marcus, Selby, Niaurs, & Rossi, 1992) was used as the measure of self-efficacy. The questionnaire consisted of six self-report items. For each item with a different stem, participants were asked to "circle the number that indicates how confident you are that you could attend this class . . . ." on a percent scale ranging from 0% (*I'm sure I can't*) to 100% (*I'm sure I can*). The six different item stems were as follows: when you are tired, when you are feeling sad, when you are feeling pressed for time, when you are feeling sick, when the weather is bad, and regularly for the entire semester. Item analyses and reliability estimation were conducted. The coefficient alpha estimate of internal consistency for the six questions was .82.

Enjoyment and SDT. A revised 17-item version of the Intrinsic Motivation Inventory (IMI; McAuley, Wraith, & Duncan, 1991) was used to assess the

participants' exercise enjoyment and three components of SDT (competency, autonomy, and relatedness). Participants were asked to indicate how strongly they agreed with each item on a Likert scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*).

The enjoyment subscale of the IMI consisted of items 1, 5, 9, 13, and 17. The observed coefficient alpha (with item 9 excluded to bring alpha to an acceptable level) was .88. An example enjoyment item is, "I enjoyed participating in this class very much." The competency subscale consisted of IMI items 2, 6, 10, and 14. The observed coefficient alpha (with item 14 excluded to bring alpha to an acceptable level) was .87. An example perceived competence item is, "I think I am pretty good at the activities we engaged in for this class." The autonomy subscale of the IMI consisted of items 3, 7, 11, and 15. The autonomy subscale had questionable internal consistency with an observed coefficient alpha (with items 7 and 15 excluded) of .72. An example autonomy item is, "I attend this class because I want to, rather than because I feel I have to." Finally, the relatedness subscale of the IMI consisted of items 4, 8, 12, and 16. The relatedness subscale had poor internal consistency with an observed coefficient alpha (with items 4 and 8 omitted) of .57. An example relatedness item is, "I'd like a chance to interact with other participants in this class more often."

Attendance. Each fitness class met once a week. Attendance was tracked for each of the four exercise classes over a period of 17 weeks, with 3 weeks excluded. Two weeks were excluded for spring break and final examinations. One week was excluded because the classes were moved to an area where attendance could not be tracked. Attendance scores, therefore, could range from 0 to 14. Attendance was tracked by having the participants sign in before each class. The researcher matched the names on the sign-in sheets to the names in the original database of participants. Participants were not compensated in any way for completing the exercise class; therefore, there was no incentive for the participants to sign in and leave.

Results

Descriptive data are reported in Table 1. Correlations among study variables are reported in Table 2. Results indicated that enjoyment was positively correlated with competency ($r = .46$), relatedness ($r = .28$), and self-efficacy ($r = .32$). Also, attendance was positively correlated with competence ($r = .27$) and self-efficacy ($r = .17$). A regression analysis using the "enter" method was used to determine the optimal set of predictors of exercise attendance. The categorical class variable was dummy coded into four variables. Class 1 represents a comparison of the kickboxing class with all other classes, Class 2 represents a comparison of the step class with all other classes, and Class 3 represents a

Table 1

Descriptive Data

	Minimum	Maximum	Mean (*SD*)
Attendance	1	12	3.20 (2.67)
Self-efficacy	50	600	397.40 (108.67)
Enjoyment	5	24	21.13 (3.28)
Autonomy	2	12	11.34 (1.70)
Competence	3	18	13.04 (3.26)
Relatedness	2	12	7.16 (2.26)

comparison of the yoga class with all other classes. Results of the regression analysis revealed that class type, relatedness (6%), and competence (6%) were significant predictors of attendance. The overall model accounted for 28.6% of the variance in attendance. Results of the three class variable predictors indicated that predicted attendance was different for participants in the kickboxing, step, and yoga classes when each was compared with all other classes. The individual standardized beta coefficients, R^2, t values, and p values for all independent variables are listed in Table 3.

Results of a three-way analysis of variance revealed a main effect of class for attendance, $F(3, 184) = 12.37$, $p < .001$. Post hoc analyses using Bonferroni's correction indicated that participants in the abs ($M = 4.43$) class attended significantly more classes than those in the step ($M = 1.79$) and yoga ($M = 2.31$) classes. Also, participants in the kickboxing ($M = 3.69$) class attended significantly more classes than those in the step ($M = 1.79$) class.

Discussion

It was expected that self-efficacy would be the best predictor of participant's attendance for aerobics classes, that enjoyment would be a better predictor of attendance than all components of SDT, and that competence would be the strongest predictor of attendance out of the three components of SDT. These hypotheses were partially supported. Regression analyses revealed that perceived competence was a significant predictor of attendance, accounting for approximately 6% of the variance. The competence finding is consistent with the study conducted by Oman and McAuley (1993), in which results revealed that perceived competence accounted for roughly 6% of the variance in attendance to an 8-week

Table 2

Correlation Coefficients for All Variables

	Attendance	Enjoyment	Autonomy	Relatedness	Competence	Self-efficacy
Attendance	—					
Enjoyment	.075	—				
Autonomy	.024	.049	—			
Relatedness	−.112	.280**	−.177**	—		
Competence	.269**	.464**	.022	.302**	—	
Self-efficacy	.171*	.324**	−.036	.155*	.324**	—

$n = 189$.
*$p < .05$. **$p < .01$.

Table 3

Standardized Beta Coefficients, t *Values, and* p *Values From the Regression Analyses for Predicting Exercise Adherence*

	Beta	R^2	*t* Value	*p* Value
Class 1	–.150	.02	–2.08	.039
Class 2	–.416	.17	–5.80	<.001
Class 3	–.344	.12	–4.61	<.001
Competence	.248	.06	3.23	.001
Relatedness	–.242	.06	–3.50	.001
Self-efficacy	.131	—	1.92	.057
Enjoyment	.018	—	.232	.817
Autonomy	.036	—	.556	.579

Note. Class 1 = kickboxing class versus all other classes; Class 2 = step class versus all other classes; Class 3 = yoga class versus all other classes.

exercise program. Relatedness was also shown to be a significant predictor of attendance, accounting for approximately 6% of the variance. However, the implications of this finding are questionable considering relatedness is negatively correlated with attendance. Although the correlation was not significant, it is important to consider that this unexpected finding may be a result of the psychometric weaknesses of the relatedness subscale (i.e., two items, low reliability).

CET suggests that satisfying needs for competency and autonomy will facilitate engagement in an activity solely for the enjoyment of the activity itself (or intrinsic motivation). Relatedness may play, at best, a modest role in exercise enjoyment. Results of the current study partially support CET. Perceived competence and relatedness were positively related to exercise enjoyment, accounting for 8% and 21% of the variance, respectively. Autonomy was not significantly related to enjoyment, possibly because of the low reliability of the autonomy measure. The implications of these findings are that the instructors should attempt to increase feelings of perceived competence and relatedness possibly by incorporating some type of small group activity in which group members are of a similar skill level.

Class type also was shown to be a significant predictor of exercise attendance. Kickboxing, step, and yoga all differently predicted attendance when compared against all other classes. Participants in the abs class attended significantly more classes than those in the step and yoga classes. Also, participants in the kickbox-

ing class attended significantly more classes than those in the step class. This difference may be attributable to the fact that the types of movements performed in the classes are drastically different.

Surprisingly, self-efficacy for attendance (barrier efficacy) was not a significant predictor of attendance for aerobics classes. Self-efficacy was significantly related to attendance, yet only accounted for roughly 2% of the variance in attendance. This is a considerably smaller effect compared with the effects found in previous studies. For example, Wininger (2004) found self-efficacy to account for 14% of the variance in attendance to aerobics classes. Additionally, results from a study conducted by Gyurcsik et al. (2003) indicated that self-efficacy accounted for approximately 11% of the variance in attendance to aquatic exercise classes.

Enjoyment was not shown to be a significant predictor of attendance to aerobics classes. Similarly, Oman and McAuley (1993) also found that reporting enjoyment at the beginning of a program did not significantly predict program attendance. Although enjoyment has frequently been listed as a reason for exercise adherence at the onset of a program (Frederick & Ryan, 1993), it appears as though enjoyment is not an effective predictor of adherence. It may be possible that initial enjoyment levels may decline as one continues participating in an activity. The novelty of the activity may influence one's enjoyment but the activity may eventually feel monotonous and dull and therefore less enjoyable. Accordingly, initial levels of enjoyment would not be an adequate predictor of continued attendance. Therefore, future research should consider tracking enjoyment across time. It may be beneficial for the instructors to keep the activities fresh.

In sum, it appears as though feelings of perceived competence in an activity are more important than feelings of self-efficacy, enjoyment, autonomy, and relatedness with regard to adhering to the activity. Conclusions of this study provide evidence for the need for further investigation of the effects of the components of SDT on exercise adherence. Future research should be conducted to strengthen the psychometric properties of the measures of autonomy and relatedness. Additionally, the effects of self-efficacy, SDT, and CET on other aspects of exercise adherence such as intensity and duration should be examined. Finally, future research should be done to determine successful ways of facilitating perceived competence in order to enhance exercise adherence. Instructors can work to improve perceived competence by beginning each semester with class activities that require little skill, building in difficulty as the semester progresses. This will help the exerciser build confidence in his or her ability and therefore facilitate further participation.

Limitations and Future Research

There were a number of limitations of the current study. The main limitation was the weak psychometric properties of the scales. There were problems with the

reliabilities of the subscales of the IMI, specifically with the autonomy and relatedness subscales. Not only did each subscale only contain two items (in the final analysis) but the reliabilities were low, with the autonomy subscale containing approximately 30% measurement error ($\alpha = .72$) and the relatedness subscale almost 40% measurement error ($\alpha = .57$). Future research needs to be done to strengthen the psychometric properties of selected scales and reexamine their abilities to predict exercise attendance. Also, it was problematic to use a non-credit fitness class. Extremely low attendance made it difficult to uncover underlying effects. Further, lack of attendance cannot be assumed to be solely a result of deficient intrinsic motivation or self-efficacy. Because exercise history was not assessed in the study, it was not possible to know if the exercise class attendance was the sole exercise for the participant or part of a larger exercise regimen. Future research should include assessment of exercise history and current exercise habits in order to determine whether participants were exercising outside of the class. This information will give more insight into the motivation of the participants.

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