

UNIVERSITY STUDENTS' EXERCISE BEHAVIORAL REGULATION, MOTIVES, AND PHYSICAL FITNESS¹

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Summary.—This study examined relationships between exercise motives, exercise behavioral regulations, and physical fitness in college students. It was hypothesized that more intrinsic motives and more self-determined regulations would be associated with better fitness. Exercise motives of students participating in physical activity classes ($N = 194$) were assessed using the Motives for Physical Activity Measure–Revised (MPAM–R) and behavioral regulations were assessed with the Behavioral Regulation in Exercise Questionnaire 2 (BREQ–2). Aerobic fitness was assessed using the PACER run test, and body composition was assessed using hand-held, bio-electric impedance analyzers. MPAM–R and BREQ–2 subscales were regressed onto the two fitness measures. For the MPAM–R, stronger competence and fitness motives predicted better fitness and stronger appearance motives predicted worse fitness. For the BREQ–2, higher intrinsic motivation predicted better aerobic fitness, and stronger, introjected regulation predicted higher body fat composition. These findings have implications for fitness professionals and physical educators.

Participation in physical activity has been shown to provide numerous health benefits, including reduced mortality, decreased risk of coronary disease, stroke, some cancers, type 2 diabetes, osteoporosis, depression, decreased blood pressure and cholesterol, improved mental health, increased functional capacity, and improved physical fitness (U.S. Department of Health and Human Services, 2008). Current physical activity guidelines for adults are to engage in at least 30 minutes of moderate physical activity at least 5 days per week (Haskell, Lee, Pate, Powell, Blair, Franklin, *et al.*, 2007). However, it appears many young adults (and older adults, as well) are not getting this message. Over 31% of college students are overweight or obese (American College Health Association, 2007), and only 10.8% of adults age 20-29 engage in the recommended amount of daily physical activity (Tucker, Welk, & Beyler, 2011). These physical activity patterns established in college can remain constant for up

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to six years post-graduation (Sparling & Snow, 2002). Given the trends for inactivity in college-age individuals and the likelihood that these activity patterns may persist into adulthood, gaining an increased understanding of the motivational determinants of exercise behavior in this population is a valuable objective.

Physical fitness is an exercise-related outcome variable that has rarely been assessed in the exercise motivation research literature. Improved physical fitness is the desired, health-enhancing outcome resulting from participation in physical activity, in that, in large part, it is enhanced cardiovascular fitness that leads to decreased all-cause mortality, cardiovascular disease, and cancer (Blair, Kohl, Paffenbarger, Clark, & Gibbons, 1989). Physical inactivity, low cardiorespiratory fitness, and overweight/obesity have all been found to be of roughly equal importance as predictors of mortality (Blair & Brodney, 1999). Additionally, physical fitness is an objective indicator of both health and healthy behavior, and it is not subject to the biases inherent in self-report measures of physical activity. While it is typically understood that physical fitness is a goal or reason for exercising, very few studies on exercise motivation have actually assessed fitness (Wilson, Rodgers, Blanchard, & Gessell, 2003). Fitness is both an outcome of physical activity and an inter-individual characteristic that could influence cognitions and behaviors. Therefore, the purpose of this study was to use a theoretically grounded approach to examine the relationships amongst exercise motivation, exercise participation motives, and directly assessed physical fitness.

Self-determination Theory

Self-determination theory (SDT) provides a viable theoretical framework for examining exercise behavior (Hagger & Chatzisarantis, 2007). It is assumed in SDT that humans are active organisms motivated toward growing, mastering challenges, and integrating new experiences into their sense of self (Deci & Ryan, 2000). Motivation is driven by three basic psychological needs: competence, autonomy, and relatedness. The extent to which these three needs are satisfied will determine how people are motivated in a given setting. Moreover, it provides an explanation regarding their overall capacity to function effectively and experience wellness.

Behavioral regulations.—According to self-determination theory, motivation can be intrinsic, extrinsic, or non-existent (amotivation). These types of motivations, which address why an individual engages in a behavior, are termed *behavioral regulations* in the self-determination theory vernacular. *Intrinsic regulation* means an individual engages in an activity completely for its own sake. That is, participating in an activity for fun, enjoyment, curiosity, or the experience in and of itself. Intrinsic regulation

is fully autonomous and self-determined—there are no outside influences affecting the individual's desire to participate in the activity. Extrinsic motivation occurs when one participates in an activity for reasons external to the activity itself. There are subcategories of extrinsic motivation that range from that which is fully externally controlled to that which is relatively self-determined. *External regulation* is the least autonomous, most externally controlled form of extrinsic motivation, in which the participant engages in the activity to gain some external reward, such as money, prizes, or a scholarship. *Introjected regulation* is the next most externally controlled form of motivation. In this case, the individual participates in the activity in order to gain the approval from external sources and/or to avoid feelings of guilt, as in when a youth athlete exercises in order to avoid feeling like he let his father down, or when a person attends an exercise class because she would feel bad about herself if she skipped it. *Identified regulation* is relatively self-determined and occurs when an individual engages in an activity because it contributes to some internally held value. An example would be an individual who values his physical health, and therefore chooses to engage in exercise. *Integrated regulation* means a behavior has been integrated into an individual's definition of self—this is the most self-determined type of extrinsic motivation. Lastly, *amotivation* is when an individual has no motivation to participate in an activity.

It has been suggested in the literature that intrinsic regulation and more-internalized extrinsic regulations lead to greater exercise behavior and more positive attitudes and emotions towards exercise. According to Ryan and Deci (2007), "If [individuals] do not enjoy the activity or discover its inherent satisfactions they are unlikely to persist at it... sustained exercise is most likely when a person has both intrinsic motivation *and* well-internalized extrinsic motivation" (p. 5). Research supports that more autonomous forms of motivation are linked to greater self-reported exercise (Wilson, Rodgers, Fraser, & Murray, 2004; Gillison, Standage, & Skevington, 2006), positive attitudes towards exercise (Edmunds, Ntoumanis, & Duda, 2007), exercise adherence (Russell & Bray, 2009), and objectively assessed physical activity (Standage, Sebire, & Loney, 2008). It is also important to note that the above-referenced quote indicates that people can have multiple motives for exercising, and it is therefore important to assess multiple types of motivation and motives when examining this topic.

Participation motives.—Participation motives are the reasons that individuals give for engaging in physical activity (Markland & Ingledew, 2007). Whereas behavioral regulations describe, in general, a person's internalized motivations, participation motives describe specific reasons or goals for exercising. Participation motives for exercise can range from the relatively intrinsic, such as interest and enjoyment, or gaining compe-

tence, to the relatively extrinsic, such as improving physical appearance. Drummond and Lenes (1997) examined exercise participants' reasons for joining a fitness facility, and found that both intrinsic motivation (enjoyment) and extrinsic motivation (praise from others) were among the most highly ranked factors, compared to things like equipment, facilities, and socialization.

Research on exercise participation motives has indicated that more intrinsic motives are linked to more positive exercise outcomes. Frederick and Ryan (1993) found that interest/enjoyment and competence were positively linked to time spent exercising per week. Ryan, Frederick, Lepes, Rubio, and Sheldon (1997) also found that interest/enjoyment and competence were positively associated with fitness center attendance and duration of exercise sessions, but that physical appearance-related motives were not associated with adherence. In a study of 252 office workers, Ingledew and Markland (2008) reported that appearance motives were linked to external regulation and decreased physical activity participation, and that health/fitness motives were linked to identified regulation and increased participation.

While various physical activity participation measures and exercise-related cognitive and affective outcomes have been studied, utilizing the self-determination theory framework, very few studies in the SDT and exercise motivation literature have examined physical fitness as an outcome variable. Wilson, *et al.* (2003) examined the relationships between psychological needs, behavioral regulation, exercise attitudes, and physical fitness. They found that identified and intrinsic regulation were the only significant predictors of physical fitness and, as the previously reviewed research on exercise adherence and physical activity participation would suggest, that these relationships were positive. However, only a single fitness variable was assessed in this study—aerobic capacity via a maximal oxygen consumption treadmill test—and the study sample size was small ($n = 53$). This study also utilized a "slightly older" (p. 2,377) sample (M age = 41.8 yr.) than typically seen in SDT research. It is possible that motivations may differ amongst other age groups, such as the younger college-age sample examined in the current study.

Given the relevance of physical fitness as an outcome variable of exercise participation, further investigation into the relationships between exercise motivation and physical fitness is warranted. Positive associations between certain types of motivation and fitness would indicate which motivations should be encouraged in university physical activity settings. Conversely, negative associations would indicate motives and motivations that could lead to maladaptive exercise behaviors. Consideration of exercise participants' current physical fitness and the associated motives

would inform health and exercise professionals how to best inspire their clients to exercise. Therefore, the purpose of this study was to examine the relationships of exercise participation motives and exercise behavioral regulation with physical fitness in a sample of healthy, college-age individuals. It was hypothesized that, consistent with the tenets of self-determination theory described above, more intrinsic motives and more self-determined behavioral regulations (intrinsic and identified regulation) would be associated with better physical fitness (i.e., higher aerobic fitness and lower percent body fat).

METHOD

Participants

Participants ($N = 194$; 124 women, 70 men) were undergraduate students enrolled in university fitness-based physical activity classes (weight training $n = 50$, 25 men, 25 women; jogging and conditioning $n = 82$, 44 men, 38 women; and aerobics $n = 62$, 1 man, 61 women). University requirements dictate that students enroll in two semester hours of physical activity class work, and they are allowed to choose from a variety of fitness, sport, and lifetime/outdoor pursuits courses. Students self-selected into the classes utilized in this study, and all students in these classes were invited to participate. Age ranged from 18 to 31 years ($M = 19.9$, $SD = 1.7$).

Measures

Motives for Physical Activity Measure-Revised (MPAM-R).—The MPAM-R (Ryan, *et al.*, 1997) is a 30-item questionnaire intended to assess the strength of five motives for participating in physical activities. The five motives are: (1) Fitness, which refers to being physically active out of the desire to be physically healthy and to be strong and energetic (5 items); (2) Appearance, which refers to being physically active in order to become more physically attractive, to have defined muscles, to look better, and to achieve or maintain a desired weight (6 items); (3) Competence/Challenge, which refers to being physically active because of the desire to improve at an activity, to meet a challenge, and to acquire new skills (7 items); (4) Social, which refers to being physically active in order to be with friends and meet new people (5 items); and (5) Enjoyment, which refers to being physically active just because it is fun, makes you happy, and is interesting, stimulating, and enjoyable (7 items). Each questionnaire item was scored on a 7-point, Likert-type scale, with each subscale being the average score from five to seven test items. Participants were instructed that the measure includes “A list of reasons why people engage in physical activities, sports and exercise”, and that “Keeping in mind your primary physical activity/sport, respond to each question on the basis of how true that response is for

you.” Frederick and Ryan (1993) provided evidence of both the validity and reliability of the original MPAM, showing clear factor structure and differential relations with both choice of sport/exercise activities and associated outcomes. The MPAM-R has been shown to yield an appropriate five-factor structure, have adequate internal consistency (Cronbach’s alpha range .78 to .92), and to account for 66% of variance in a relevant sample (Ryan, *et al.*, 1997). The internal consistency estimates in the current sample ranged from .78 to .92 (see Table 1 for Cronbach’s alphas).

TABLE 1
CORRELATIONS AND RELIABILITY ESTIMATES FOR MPAM-R,
BREQ-2, PACER TEST, AND PERCENT BODY FAT.

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. MPAM-R: Fitness	.83											
2. MPAM-R: Appearance	.52	.87										
3. MPAM-R: Competence	.52	.19	.89									
4. MPAM-R: Social	.28	.35	.42	.78								
5. MPAM-R: Enjoyment	.48	.27	.74	.55	.92							
6. BREQ-2: Amotivation	-.26	-.12	-.16	.05	-.16	.89						
7. BREQ-2: External regulation	-.07	.19	-.13	.17	-.18	.22	.85					
8. BREQ-2: Introjected regulation	.21	.38	.25	.24	.23	.01	.36	.83				
9. BREQ-2: Identified regulation	.46	.26	.49	.27	.47	-.31	.00	.56	.76			
10. BREQ-2: Intrinsic regulation	.43	.15	.64	.39	.73	-.28	-.13	.26	.66	.88		
11. PACER Test	.17	-.10	.34	.16	.24	-.11	-.12	.10	.26	.32	--	
12. Percent body fat	-.11	.17	-.23	-.05	-.14	.02	.21	.13	-.10	-.17	-.50	--

Note.—Cronbach’s alphas are reported on the diagonal in boldface. Correlations above .14 were significant at $p < .05$; above .18, $p < .01$; above .23, $p < .001$.

Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2).—The BREQ-2 is one of the most widely used measures of the continuum of behavioral regulation in exercise psychology research (Wilson, 2012). It is an extension of the original BREQ instrument developed by Mullan, Mark-

land, and Ingledew (1997), which includes a measure of amotivation. The BREQ-2 includes 19 items that are divided into 5 subscales designed to measure amotivation, external regulation, introjected regulation, identified regulation, and intrinsic regulation. Participants were instructed to indicate how true each item is for them, in a list of reasons that underlie peoples' decisions to engage or not engage in physical exercise. For example, the item, "I value the benefits of exercise," assesses identified regulation and, "I feel like a failure when I haven't exercised in a while," assesses introjected regulation. Items were scored on a 5-point, Likert-type scale, and the subscale scores were the average of items in each category. In a recent review of exercise motivation instruments, Wilson (2012) found that the evidence supporting the construct validity of the BREQ and BREQ-2 is impressive both in depth and scope, and concluded that these measures are "...the instruments of choice for research assessing the regulation of exercise in line with [SDT]" (p. 299). The measure has been shown to have adequate internal consistency (Cronbach's range .73 to .86; Markland & Tobin, 2004) with the internal consistency estimates in the current sample ranging from .78 to .89 (see Table 1 for Cronbach's alphas).

FitnessGram PACER Test.—The FitnessGram PACER Test® (Welk & Meredith, 2008) was used to measure aerobic fitness. The PACER is a multi-stage, paced, 20 m shuttle-run test. Beeps on a sound track indicate the pace at which each 20 m length must be completed. Participants run until they are no longer able to continue (defined as failing to complete a length to the set pace twice). The score is the number of 20 m lengths completed. Validity coefficients correlating FitnessGram PACER test performance with VO_2max ($\text{ml} \times \text{kg}^{-1} \times \text{min}^{-1}$) have ranged from .83 to .93 (Paliczka, Nichols, & Boreham, 1987; Leger, Mercier, Gadoury, & Lambert, 1988; Ramsbottom, Brewer, & Williams, 1988; Leger & Gadoury, 1989), and reliability estimates range from .64 (Beets & Pitetti, 2006) to .93 (Liu, Plowman, & Looney, 1992).

Body composition (%BF).—Body composition is a component of physical fitness (Garber, Blissmer, Deschenes, Franklin, Lamonte, Lee, *et al.*, 2011) that expresses a person's percentage of body mass that is fat. Body composition was measured using an Omron Fat Analyzer model HBF-360 (Omron Healthcare, Inc., Vernon Hills, IL, USA), which is a digital, hand-held, bioelectrical impedance analyzer (BIA). Jensky-Squires, Dieli-Conwright, Rossuello, Erceg, McCauley, and Schroeder (2008) found the Omron BIA had good concurrent validity in men and women with dual-energy, x-ray absorptiometry (DEXA; $r = .78, .74$) and good repeatability ($\text{CV} < 3.0$). Erceg, Dieli-Conwright, Rossuello, Jensky, Sun, and Schroeder (2010) also found that hand-held, BIA had good, concurrent validity with DEXA in both men and women ($r = .85, .88$) and had good reliability ($\text{CV} < 3.0$).

Procedure

All procedures were approved by a university institutional review board and all participants provided informed consent prior to participating in the study. Questionnaires were distributed to participants on the first day of class by each course instructor. Participants were given time in class to complete them, and then the questionnaires were collected by the instructors. Fitness testing was then completed on the second and/or third days of class. Course instructors had previously received training on testing procedures for both the PACER and body composition measures. The FitnessGram PACER was administered in a group format, with either the whole class or half of the class running simultaneously. Body composition was assessed individually during class time.

Analyses

A series of ordinary least squares (OLS) multiple regression analyses were first conducted to assess the ability of exercise motives and motivation type to predict fitness measures. These regression analyses were used to identify which MPAM-R or BREQ-2 subscales contributed to the prediction of an outcome beyond the other subscales in the regression model and which subscales offered only redundant information to the prediction.

First, two OLS regressions analyses were performed by regressing the five exercise motives and the five motivation types separately on the FitnessGram PACER scores. The significant predictors from the MPAM-R and BREQ-2 regressions were then used in a single, follow-up regression predicting the aerobic fitness. In this follow-up regression, the relative importance of each of the predictors was examined using a relative-importance analysis (RIA; Johnson, 2000). Relative importance analysis is a procedure that computes: (1) a raw, relative weight (RW) for each predictor, which sums to the overall model R^2 , and (2) a relative-importance (RI) score, which is the percentage of R^2 value accounted for by the predictor, and sums to 100%. These steps were then repeated for body composition. In all analyses, fitness scores were normalized for gender by calculating gender-based, z-scores for FitnessGram PACER and body composition.

RESULTS

Preliminary Analyses

Given that one of the general assumptions of regression is that data are normally distributed, the skewness and kurtosis of the study's variables were first examined. While there is no complete agreement

on how far normality indices must deviate before they can be regarded as problematic for regression based analyses (Drummond & Lenex, 1997), absolute values that exceed ± 2 are taken as indication of departures from normality (e.g., Cash, Novy, & Grant, 1994). In the current study, only three values exceeded this threshold: BREQ amotivation skewness (3.14), BREQ amotivation kurtosis (11.80), and FitnessGram PACER kurtosis (4.00). Given the effect that the non-normal kurtosis can have on tests of covariance (DeCarol, 1997), regression analyses employed a non-parametric bootstrap (Efron & Tibshirani, 1993) that drew 2,000 bootstrap samples and derived standard errors using a bias-corrected percentile method (Stine, 1989).

Next, the mean level differences of gender and course type were examined. The results of a 2x3 (gender by course type) multivariate analysis of variance (MANOVA) revealed only one significant mean-level difference. Specifically, female participants ($M = 5.67$, $SD = 1.03$) had higher ($F_{1,190} = 9.58$, $p = .009$, $\eta^2_p = .04$), average scores on the MPAM-R appearance subscale compared with male participants ($M = 4.97$, $SD = 1.39$). Given this was the only variable in which a significant mean-level difference was found, gender was not controlled in the regression analyses. Variable intercorrelations and internal reliability estimates are presented in Table 1.

Regression Results

FitnessGram PACER test.—The overall regression model that used exercise motives from the MPAM-R as predictors was found to significantly predict the Fitnessgram PACER test ($F_{5,188} = 7.12$, $p < .001$, $R^2 = .16$). However, only the motives of fitness, appearance, and competence were found to be significant predictors of aerobic fitness (see Table 2). The appearance motive had a negative relationship with the Fitnessgram PACER test, which suggests that motivation to enhance physical appearance predicts poorer aerobic fitness. Conversely, fitness and competence had a significant, positive relationship with FitnessGram PACER scores, indicating motivation to be physically healthy and to enhance skills correlate with improved aerobic fitness.

The BREQ-2 regression model, which used the five types of exercise motivation as predictors, was also found to significantly predict aerobic fitness ($F_{5,188} = 4.89$, $p < .001$, $R^2 = .12$), with intrinsic regulation being the only significant predictor (see Table 3). The positive relationship between this exercise motivation and the PACER test suggests that individuals who exercise for fun, challenge, and/or excitement have higher aerobic fitness.

TABLE 2
REGRESSION ANALYSES FOR PARTICIPATION MOTIVES PREDICTING
PACER PERFORMANCE AND BODY COMPOSITION

Predictor	PACER Test			Percent Body Fat		
	<i>b</i>	95%CI	β	<i>b</i>	95%CI	β
MPAM-R: Fitness	.20*	.01, .41	.14*	-.21	-.52, .08	-.15
MPAM-R: Appearance	-.22†	-.39, -.07	-.26†	.24‡	.12, .37	.30‡
MPAM-R: Competence	.26†	.07, .49	.29†	-.21*	-.44, -.01	-.23*
MPAM-R: Social	.09	-.05, .22	.11	-.03	-.16, .11	-.04
MPAM-R: Enjoyment	-.03	-.17, .12	-.03	.04	-.17, .25	.05

Note.—Confidence intervals (CI) in the table represent 95% bias-corrected bootstrapped confidence intervals for the unstandardized *b* weight. * $p < .05$. † $p < .01$. ‡ $p < .001$.

Finally, the significant predictors from the two regression models were entered into a regression model to predict FitnessGram PACER scores. While the overall model was significant ($F_{4,189} = 9.52$, $p < .001$, $R^2 = .17$), the motive of fitness was not found to be a significant predictor ($b = .15$, bias-correct 95%CI = $-.04, .40$). Thus, the fitness motive was dropped and the regression rerun with the three remaining predictors. This second model was also significant ($F_{3,190} = 12.23$, $p < .001$, $R^2 = .16$), with all three predictors significantly contributing to the prediction of aerobic fitness (see Table 4). Results from the second regression and relative importance analysis indicated that the competence motive was the most important predictor, followed by intrinsic regulation and the appearance motive.

TABLE 3
REGRESSION ANALYSES FOR BEHAVIORAL REGULATIONS PREDICTING
PACER PERFORMANCE AND BODY COMPOSITION

Predictor	PACER Test			Percent Body Fat		
	<i>b</i>	95%CI	β	<i>b</i>	95%CI	β
BREQ-2: Amotivation	.01	-.30, .28	.01	-.17	-.47, .32	-.09
BREQ-2: External regulation	-.12	-.27, .02	-.10	.17	-.04, .39	.14
BREQ-2: Introjected regulation	.01	-.13, .17	.01	.18*	.01, .35	.20*
BREQ-2: Identified regulation	.14	-.12, .35	.10	-.22	-.52, .08	-.16
BREQ-2: Intrinsic regulation	.31†	.12, .52	.24†	-.16	-.42, .08	-.13

Note.—Confidence intervals (CI) in the table represent 95% bias-corrected bootstrapped confidence intervals for the unstandardized *b* weight. * $p < .05$. † $p < .01$.

Body composition.—The MPAM-R regression model that used exercise motives as predictors, significantly predicted body composition ($F_{5,188} = 4.93$, $p < .001$, $R^2 = .12$), with the motives of appearance and competence being the only be significant predictors (see Table 2). These findings indicate that stronger appearance motives were associated with higher body fat percentages, while stronger competence motives were associated with lower body fat measures.

The BREQ-2 regression model was also found to significantly predict body composition ($F_{5,188} = 3.66, p = .003, R^2 = .09$), with introjected regulation being the only significant predictor (see Table 3). The positive relationship between this motive and body composition suggests that individuals who exercise out of a desire to gain the approval of others or avoid feelings of guilt have a higher percentage of body fat.

TABLE 4
REGRESSION AND RELATIVE IMPORTANCE RESULTS IN PREDICTING
PACER PERFORMANCE AND BODY COMPOSITION

Predictors	PACER Test				
	<i>b</i>	95%CI	β	RW	RI
MPAM-R: Appearance	-.15†	-.28, -.03	-.18†	.021	13.1%
MPAM-R: Competence	.23†	.07, .42	.25†	.078	48.1%
BREQ-2: Intrinsic regulation	.23†	.02, .46	.18*	.063	38.9%
Percent Body Fat					
MPAM-R: Appearance	.15*	.04, .25	-.18*	.031	26.3%
MPAM-R: Competence	-.27‡	-.42, -.16	-.30‡	.069	59.0%
BREQ-2: Introjected regulation	.12*	.01, .24	.13*	.017	14.8%

Note.—Confidence intervals (CI) in the table represent 95% bias-corrected, bootstrapped confidence intervals for the unstandardized *b* weight. RW = a raw, relative weight for each predictor (RW), which sum to the overall model *R*²; RI = Relative importance or percentage of the total explained variance contributed by each variable, which is computed by dividing the RW for each predictor by the model *R*². Rounding error may result in these values not summing to unity. * *p* < .05. † *p* < .01. ‡ *p* < .001.

As with the Fitnessgram PACER test, the significant predictors from the two body composition regression models were entered into a regression model to predict body composition. The overall model was significant ($F_{3,190} = 8.40, p < .001, R^2 = .12$), with all three predictors significantly contributing to the prediction of body composition (see Table 4). Results from the relative importance analysis indicated that the competence motive was again the most important predictor, followed by appearance and introjected regulation.

DISCUSSION

The purpose of this study was to examine the relationships of exercise participation motives and exercise behavioral regulations with physical fitness in a sample of healthy, college-age individuals. Support was found for the hypothesis that more intrinsic motives and intrinsic forms of motivation would be associated with healthier levels of physical fitness.

With the FitnessGram PACER aerobic fitness test, stronger intrinsic motivation and competence-related participation motives were associated with greater performance. This finding is consistent with what previous research has found regarding positive exercise outcomes being asso-

ciated with more intrinsic motives and self-determined motivation (see discussion below). If autonomous motivation leads to more exercise behavior, better exercise adherence, and greater self-reported physical activity, it follows that it should also lead to better physical fitness due to the training effects imparted by these activities. This finding does, however, contrast with those of Wilson, *et al.* (2003), who found that identified regulation predicted physical fitness. Identified regulation occurs when an individual partakes in a behavior because it contributes to some other internally held value. When referring to exercise motivation, good health is frequently the internally held value to which exercise contributes (Thøgersen-Ntoumani & Ntoumanis, 2006; Duncan, Hall, Wilson, & Jenny, 2010). It may be that for college-age individuals, health-related motives (and thereby identified regulation) are less relevant compared to the older population examined in the Wilson *et al.* study (2003). Indeed, Cash, *et al.* (1994) found that college-age women ranked weight management and appearance as more salient motives for exercise than health or fitness. Additionally, while the fitness motive on the MPAM-R was found to have a significant zero-order relationship with aerobic fitness, it was not a significant predictor when controlling for the other significant exercise motives and regulations in this study, which seems to confirm this notion.

The finding that stronger competence-related motives also best predicted healthier aerobic fitness aligns neatly to the relationship with intrinsic motivation. According to Cognitive Evaluation Theory, a sub-theory of SDT, satisfaction of an individual's basic psychological need for competence (as well as autonomy and relatedness) will lead to greater feelings of intrinsic motivation (Ryan & Deci, 2007). If individuals with higher aerobic fitness are more intrinsically motivated, it makes sense that they would view the exercise context as one in which their need for feelings of competence is satisfied. That is, part of what motivates them to exercise is that they feel competent doing so, or at least that their competence is increasing, and they enjoy the challenge presented by the activity. Conversely, individuals with lower fitness are more likely to experience physical discomfort during exercise, thereby leading them to not feel competent when exercising and to not enjoy the physical challenge presented.

It was also found in this study that a higher percentage of body fat was associated with a relatively external form of motivation: introjected regulation. Introjected regulation means an individual participates in an activity to gain the approval of others, to avoid feelings of guilt, or to enhance self-esteem. A commonly-cited example of this in the exercise domain is individuals who exercise to improve their physical appearance (i.e., to appear more attractive to others and/or enhance their ego;

Thøgersen-Ntoumani & Ntoumanis, 2006). The results for participation motives support this notion: stronger appearance-related motives were associated with higher percent body fat and lower aerobic fitness. Also, individuals who scored higher in competence-related motives had a significantly lower percentage of body fat. Following the same logic as that presented for aerobic fitness, these findings suggest that individuals motivated by reasons that are more extrinsic are less successful in their exercise endeavors, and therefore display lower fitness.

As mentioned in the introduction, there is a substantial body of research to support the line of reasoning that exercise motivation should predict physical fitness in this manner. Fortier and Grenier (1999) found that autonomous exercise motivation was an important predictor for exercise adherence for people who joined a fitness center and had their activity and minutes of exercise tracked for one month. Wilson, *et al.* (2004) also found that autonomous exercise regulations (identified and intrinsic) were the strongest correlates for exercise adherence among college students. In addition, their study found that identified regulation was the most important predictor of exercise behavior among participants. Two studies investigating the effects on leisure time physical activity found that participants who were more autonomously motivated were more likely to persist in their activities over time as opposed to those that were not autonomously motivated (Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003; Wilson, *et al.*, 2003). Lastly, Russell and Bray (2009) investigated self-determined motivation as a predictor of exercise behavior, at 3 and 6 weeks following completion of cardiac rehabilitation. It was found that greater self-determined forms of motivation to exercise relates to subsequently greater independent exercise behavior.

Despite the research support for the notion of exercise motivation predicting exercise behavior and therefore subsequent fitness levels, it must be acknowledged that *this* study was correlational in nature, and, therefore, direction of causality cannot be inferred. Indeed, using current physical fitness to predict exercise motivation is a concept that makes sense, as well. Individuals who have lower fitness and higher percent body fat are likely to be dissatisfied with their physical appearance, and therefore may primarily be motivated to exercise to improve their self-esteem or their attractiveness to others. Simultaneously, individuals who have attained higher fitness are less likely to be concerned with their appearance and might be motivated by more intrinsic factors, such as the inherent challenge of physical exercise. As Mullan and Markland (1997) pointed out, "....there is likely to be a shift in an individual's motivational focus from extrinsic to intrinsic between initial exercise adoption and adherence to a program of regular exercise" (p. 350). This would suggest

then that participants who adhere to exercise behavior over time, and in the process attain better fitness, internalize their reasons for involvement into more self-determined regulations. In the present study, participants' *current* motives and regulations were assessed, so it may very well be the case that for the participants who exercise regularly, their motivations were different prior to attaining their current level of fitness. Both directions of causality are certainly plausible, and it may be that there is an ongoing interaction between physical fitness and exercise motivation.

With either direction of causality, there are real-world implications for these findings. Assuming motivation predicts fitness, these findings can be viewed as confirmation that more autonomous forms of motivation are more effective in promoting exercise adherence and ultimately affecting physical fitness. Fitness leaders and physical educators should emphasize more intrinsic motives for exercise, such as improving skills and having fun. Additionally, these exercise leaders should make an effort to enhance participants' feeling of autonomy (control and volition), competence (efficacy and capability), and relatedness (having meaningful relationships with others) to develop more autonomous types of exercise motivation. If fitness also influences motivation type, there are some additional implications. The current findings suggest that less physically fit individuals are likely to be motivated by a desire to enhance their self esteem or make a positive impression on others (introjected regulation), in particular by improving their physical appearance. Fitness leaders should recognize this motive for these individuals and provide information on how exercise can help them to achieve physique-related goals. However, given the evidence that more autonomous forms of exercise are related to more adaptive exercise behaviors, leaders should encourage more autonomous motives in these individuals, in order to sustain their exercise engagement past physique enhancement.

There are limitations of the current study that should be noted: participants were only recruited from intact, university weight training, jogging, and conditioning and aerobics classes, because it was believed that this population would display the greatest motivation for exercise. However, this makes the findings less applicable to the entire student population; for example, students amotivated to exercise may select physical activity classes that they perceive to be less vigorous. Additionally, it should be noted that the current sample had more women (63%). Some previous research has found differences in exercise motivation between the sexes (Drummond & Lenes, 1997; Duncan, *et al.*, 2010), and, while it was found that men and women differed in the present study on the appearance motive, overall this sample was not well-suited for examining gender differences.

There are multiple avenues for future research on this topic. Longitudinal research, assessing both fitness measures at motivation at pretest and post-test, would provide clarification as to the direction of causality between physical fitness and behavioral regulation/participation motives. Additionally, the concept of participation motives has been refined in recent research. *Goal contents* (Deci & Ryan, 2000) more clearly delineate the “what” of goal pursuits (i.e., what you hope to accomplish) from the “why” (i.e., why you exercise) than do participation motives, which tend to mix the what and why (Sebire, Standage, & Vansteenkiste, 2008, 2009). Measuring goal content will better help fitness professionals to understand exercise participants’ goals, how these goals relate to fitness levels, and how to best enhance participants’ motivation.

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