

# Imagery Use and Self-Determined Motivations in a Community Sample of Exercisers and Non-Exercisers<sup>1</sup>

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This study examined the patterns of imagery use and motivational self-determination, and the relationships between them in regular exercisers (RE), non-exercisers who intend to exercise (NE-I), and non-exercisers who do not intend to exercise (NE-N). A survey was conducted through the random sampling of a large population. The NE-N group reported using the same amount of imagery as the other 2 groups. NE-N participants were the least and RE participants the most self-determined, with NE-I participants in between. The patterns of association among imagery and self-determination were different for the NE-N participants than the other 2 groups. It was concluded that imagery interventions that might be successful with RE and NE-I participants are unlikely to be effective with NE-N participants.

While it is well established that exercise has significant physical and psychological benefits (Blair & Connelly, 1996), most people do not exercise or do not exercise enough (Cameron, Craig, Stephens, & Ready, 2002; Katzmarzyk, Gledhill, & Shephard, 2000) to accrue these benefits. Public-health-promotion campaigns typically focus on encouraging non-exercisers to begin exercise (e.g., Bauman, Madill, Craig, & Salmon, 2004). However, we know very little about the motivation of people who do not exercise and have no intention of doing so.

The majority of what we know about exercise motivation is based on samples of either current exercisers (e.g., Wilson, Rodgers, Hall, &

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Gammage, 2003); or exercise intenders, who may not be active at the time of study, but who intend to exercise or are at least willing to consider starting to exercise (e.g., Mullan & Markland, 1997). It is important to investigate exercise motivation and cognitions among individuals who do not exercise and who have no intention to exercise if we are to develop interventions to encourage non-exercisers to start exercising.

Mental simulation has been shown to be an effective technique in a variety of tasks and situations (Hall, 2001; Taylor & Schneider, 1989). Mental simulations (i.e., images) are known to have powerful effects on behavior, as well as self-concept and other cognitions (Hall, 2001; Johnson & Lutgendorf, 2002; Paivio, 1986; Taylor, Pham, Rivkin, & Armor, 1998). Vivid images underpin various fears and even phobias, while pleasant images may act as distractors from unpleasant tasks (e.g., dental procedures) and are helpful in inducing relaxation (Paivio, 1986; Taylor et al., 1998). Desirable images are also known to motivate behaviors, such as the image of winning an important swimming race sustaining oneself through long hours of practice (Munroe, Giacobbi, Hall, & Weinberg, 2000).

How can the power and influence of imagery be harnessed to improve health behaviors? In a seminal paper, Taylor et al. (1998) demonstrated the importance of imagery on motivation, behaviors, and general expectations. For example, considerable empirical evidence has suggested that people's beliefs that a hypothetical event or outcome will actually take place increases after imagining the event or outcome (for a review, see Koehler, 1991). Furthermore, imagery can be used effectively both to develop coping strategies for stressful situations and to manage affect (Taylor & Schneider, 1989). In certain contexts (e.g., sport), it has been well documented that imagery can be employed to develop, maintain, and even regain the motivation to train and compete (Hall, Mack, Paivio, & Hausenblas, 1998; Harwood, Cumming, & Hall, 2003; Paivio, 1985). While imagery has been examined in exercise contexts (e.g., Gammage, Hall, & Rodgers, 2000; Hausenblas, Hall, Rodgers, & Munroe, 1999), the extent to which mental simulations (i.e., imagery) can be used to produce specific health behavior change (e.g., increasing physical activity levels) has yet to be considered.

Exercisers employ imagery for a variety of functions (Kossert & Munroe-Chandler, 2007), but only the three originally identified by Hausenblas et al. (1999) will be considered here, since they are the ones that have been employed in previous research examining exercise imagery and motivation (Wilson et al., 2003). First, appearance imagery is used by exercisers to imagine the appearance goals they want to achieve, such as becoming leaner and firmer and looking better. Second, energy imagery is employed to become more energized or to relieve stress. Third, exercisers use technique

imagery to rehearse the execution of proper body positioning and form while exercising.

Appearance and energy imagery are hypothesized to serve motivational functions, whereas technique imagery serves a cognitive function. Of these three types of imagery, appearance imagery is used the most, followed by technique imagery and energy imagery (Hausenblas et al., 1999). In addition, Gammage et al. (2000) reported that low-frequency exercisers (i.e., 1 to 2 times per week) reported significantly less imagery use than did high-frequency exercisers (i.e., 3 or more times per week). However, little is known about what non-exercisers think and imagine about exercise.

It is possible that differences in imagery use reflect different types of motivation. For example, exercisers using appearance imagery may be more extrinsically motivated (i.e., they want to look good by exercising), while exercisers using energy imagery may be more intrinsically motivated (i.e., they want to feel energized by exercising). One theory that might be useful in understanding the observed differences in imagery use and in examining a mechanistic role of imagery is self-determination.

Self-determination theory (SDT; Deci & Ryan, 2000, 2002; Ryan & Deci, 2000, 2001) makes specific propositions about non-intenders that other social cognitive theories do not. SDT posits a continuum of motivation from amotivation through external motivation, introjected motivation, identified motivation, and intrinsic motivation. The latter two forms of motivation are considered self-determined in the sense that they are undertaken volitionally and represent core aspects of the self. Conversely, external and introjected forms of motivational regulation represent controlled processes that can motivate behavior, but elicit negative feelings (e.g., contingent self-esteem, guilt, shame) concerning participation or lack of participation. *Amotivation*, as conceptualized in SDT, is the state of lacking the intention to act (Deci & Ryan, 2002).

There is considerable research demonstrating that people who report more self-determined motives also report more regular physical activity, as well as more positive physical and psychological outcomes of physical activity participation (e.g., Landry & Solmon, 2004; Mullan & Markland, 1997; Wilson & Rodgers, 2002, 2004; Wilson, Rodgers, Fraser, & Murray, 2004). In contrast, there is minimal evidence concerning the motivational regulation of non-exercisers, although one might expect non-exercisers—particularly non-intenders—to exhibit low levels of self-determination, and possibly amotivation toward exercise. People who are amotivated would be expected not to exercise because they do not value the activity, do not feel competent to do it, or do not believe that exercise would produce some valued outcome, such as improved appearance (Deci & Ryan, 2002).

Self-determined motives are hypothesized to be underpinned by valuing (identified) and enjoying (intrinsic) activities, as opposed to performing them for reasons of self-imposed pressure (introjected) or rewards (extrinsic; Deci & Ryan, 2002). The exercise imagery that is associated with each of these motivations is likely to be different. For example, appearance imagery may be related to more extrinsic exercise motivations, whereas energy imagery and technique imagery are likely to be related to more self-determined motivations. We have preliminary evidence (Wilson et al., 2003) that this is the case.

In this study, we examine the relationships between different types of imagery use and different types of exercise motivation, as outlined in SDT (Ryan & Deci, 2000). In a sample of female undergraduates participating in exercise classes, we found that higher levels of appearance imagery and lower levels of technique imagery were associated with higher levels of introjected regulation (a less self-determined form) and with lower levels of intrinsic motivation. We do not know, however, whether these relationships between different types of imagery use and motivations varying in self-determination are the same in exercisers and non-exercisers.

As already noted, imagery has been identified by Taylor et al. (1998) as an effective intervention tool to change belief systems that are associated with performance of specific health-related behaviors. If the observed patterns of association in exercisers and non-exercisers are the same, then practitioners can have confidence that the relationships observed among exercisers can be applied to the promotion of exercise to non-exercisers. If, however, the observed relationships are not the same, then this would be evidence that interventions based on data generated from exercising samples are unlikely to be effective for non-exercisers, particularly those who do not intend to exercise.

In the present study, a survey was conducted through random sampling of a large population base. The survey was intended to (a) examine the patterns of imagery use reported by regular exercisers (RE), non-exercisers who intend to exercise (NE-I), and non-exercisers who do not intend to exercise (NE-N); (b) examine the patterns of self-determined motivation among RE, NE-I, and NE-N; and (c) examine the relationships between motives varying in self-determination and imagery use among the three groups.

## Method

### *Participants and Procedure*

Truly sedentary people seldom volunteer to participate in exercise research (e.g., Marshall & Biddle, 2001). One way of identifying non-

exercisers is through random sampling of a large population base (e.g., a large western city). In order to ensure the representativeness of the present study sample and to recruit a sample of non-exercisers (both intenders and non-intenders), a survey was conducted using random-digit dialing, with criterion selection by a facility that specializes in sampling and computer-assisted data collection by telephone. This process ensured random selection of possible respondents from within the city. Initial questions were used as a screen to apply the selection criteria.

The sample included employed men and women between the ages of 25 and 65 years ( $M = 43.7$  years,  $SD = 11.6$ ), in order to ensure that they were representative of the general working population (see Table 1). Also, participants reported no health conditions that would preclude exercise. The survey took about 20 min for each respondent to complete over the phone.

The final sample included the following participants: RE = 202, NE-I = 138, and NE-N = 130. The RE participants were individuals who exercised three or more times per week, while NEs were individuals who exercised once per week or less and who intended to begin exercising more in the next 4 weeks (NE-I) or had no intention to change (NE-N). These two criteria were chosen partly on the basis of the Canadian Physical Activity Guide (CPAG). Additional information on how the groups were classified is provided in the *Exercise behavior and intention* section.

Sampling proceeded until sufficient numbers had been reached in each of the physical activity groups. This took approximately 6 weeks and was completed during the fall season. Of 1536 eligible persons contacted, 948 refused to participate, 7 provided incomplete interviews, and 111 had language problems, yielding a final sample of 470 (218 men, 252 women).

Table 1

*Demographic Characteristics of Participant Groups*

	Male			Female			Total		
	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>
RE	41.19	12.22	101	45.79	14.22	101	44.39	13.21	202
NE-I	44.25	12.94	59	44.58	14.33	79	44.42	13.65	138
NE-N	46.76	12.51	58	48.08	16.62	72	47.43	14.57	130
Total	44.07	12.54	218	46.16	15.04	252	44.88	14.00	470

*Note.* *M* and *SD* refer to participant age. RE = regular exerciser; NE-I = non-exerciser who intends to exercise; NE-N = non-exerciser who does not intend to exercise.

*Instruments*

The survey contained demographic information including age, type of job, and whether or not the respondent was responsible for childcare. It also contained the following measures that have been employed in previous research examining exercise behavior (e.g., Gammage et al., 2000; Wilson et al., 2003).

*Exercise behavior and intention.* Participants completed the Leisure Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985), a three-item self-report measure of exercise behavior that assesses the frequency of mild, moderate, and strenuous exercise performed for at least 20 min per session during a typical week. Participants were provided with definitions of mild (minimal effort, does not cause you to sweat; e.g., walking, bowling), moderate (not exhausting but may produce light perspiration; e.g., brisk walking, cycling), and strenuous (exhausting, makes you sweat, makes your heart beat faster; e.g., running, aerobics classes) exercise.

Participants were asked the frequency with which they performed each type of activity for at least 20 min, in accordance with Godin and Shephard (1985). They were asked to indicate whether they had been at the reported level of activity for more than 6 months. They were then asked how many exercise sessions of at least 20 min they planned to do in the next 4 weeks. Those who reported being active a minimum of three times per week for a minimum of 6 months and intending to maintain at least that level of activity were coded as RE. Those who reported exercising fewer than once per week (< four times per month) were coded as NE. Among non-exercisers, the intention to exercise a minimum of two times per week in the next 4 weeks or not was used as the criterion to determine group classification as intender (NE-I) or non-intender (NE-N).

A total exercise score was calculated by weighting, then summing each frequency dimension by its associated MET value (i.e., a unit representing the metabolic equivalent of physical activity in multiples of resting oxygen consumption) using the following equation:  $[\text{Strenuous} \times 9] + [\text{Moderate} \times 5] + [\text{Mild} \times 3]$ . Previous researchers have demonstrated that the LTEQ (Godin & Shephard, 1985) is easy to understand, reports stability coefficients over 1 month ranging from .24 to .86, and demonstrates evidence of convergent validity based on positive associations with objective indexes of exercise behavior (Jacobs, Ainsworth, Hartman, & Leon, 1993).

Responses to the LTEQ (Godin & Shephard, 1985) were used as a check for our categorization of participants into the three activity-based groups of interest. It was found using a one-way ANOVA that the three groups of participants significantly differed on their LTEQ responses as

expected,  $F(2, 464) = 175.18$ ,  $p < .0001$ ,  $\eta^2 = .430$ . RE reported the highest levels of energy expenditure ( $M_{\text{METS}} = 37.35$ ,  $SD = 31.53$ ). NE-I and NE-N reported significantly lower overall energy expenditure (almost none), which we would expect from non-exercisers (NE-I:  $M_{\text{METS}} = 0.66$ ,  $SD = 1.17$ ; NE-N:  $M_{\text{METS}} = 0.95$ ,  $SD = 1.91$ ). Post hoc Student-Newman-Keuls tests confirm that the total exercise of the exercisers was significantly different from the NE-N and the NE-I, who were not different from each other.

A one-way ANOVA examined behavioral intention (BI; i.e., frequency of intended exercise sessions in the next 4 weeks) among the groups, revealing a significant effect,  $F(2, 467) = 92.38$ ,  $p < .0001$ ,  $\eta^2 = .28$ . Post hoc Student-Newman-Keuls tests reveal that all three groups were significantly different from each other. The RE intended to exercise the most ( $M = 13.89$  sessions in the next month,  $SD = 9.22$ ), and the NE-I had significantly higher intentions to exercise than did the non-intenders ( $M_s = 5.94$  and  $0.17$ , respectively;  $SD_s = 6.71$  and  $0.12$ ).

*Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2)*. The BREQ-2 is a 19-item self-report measure that was developed to assess exercise motives varying in self-determination in a manner consistent with SDT (Deci & Ryan, 2002). The BREQ-2 is an extension of the Behavioral Regulation in Exercise Questionnaire (BREQ; Mullan, Markland, & Ingledew, 1997). The BREQ contains four subscales that measure external, introjected, identified, and intrinsic regulation of exercise behavior, while the BREQ-2 includes an additional subscale that assesses amotivation.

Sample items characterizing each BREQ subscale are as follows: "I do not see why I should bother to exercise" (amotivation; 4 items); "I exercise because other people say I should" (external regulation; 4 items); "I feel guilty when I don't exercise (introjected regulation; 3 items); "I value the benefits of exercise (identified regulation; 4 items); "I enjoy my exercise sessions" (intrinsic regulation; 4 items). Participants responded to each item, following the stem, "Why do you exercise?" on a 5-point Likert-type scale ranging from 1 (*not true for me*) to 5 (*very true for me*). Previous research has reported internal consistency (Cronbach's  $\alpha$ ) reliability coefficients for each BREQ subscale ranging from .76 to .90 (Mullan et al., 1997) and indicating that BREQ scores are useful in predicting one's current stage of exercise adoption (Mullan & Markland, 1997). Previous research has supported the multidimensional structure and composition of the BREQ and BREQ-2 scores in both British (Markland & Tobin, 2004; Mullan et al., 1997) and Canadian (Wilson & Rodgers, 2004) samples, and suggests that the BREQ can discriminate between adults reporting varied physical activity status (Mullan & Markland, 1997). Cronbach's alphas in



the current study ranged from .71 to .91, indicating acceptable internal consistency.<sup>3</sup>

*Exercise Imagery Questionnaire (EIQ)*. The EIQ (Gammage et al., 2000; Hausenblas et al., 1999; Rodgers, Hall, Blanchard, & Munroe, 2001) is a nine-item measure on which participants rate their frequency of imagery use on a 9-point scale ranging from 1 (*never*) to 9 (*always*). It is comprised of three 3-item subscales: appearance (e.g., “I imagine a leaner me from exercising”), energy (e.g., “To get me energized, I imagine exercising”), and technique (e.g., “When I think about exercising, I imagine my form and body position”).

The factor structure and reliability of the EIQ have been supported (Hausenblas et al., 1999; Rodgers et al., 2001). Confirmatory factor analysis fit indexes suggest excellent model fit (RMSEA = .05; adjusted goodness-of-fit index = .93; comparative fit index = .99). The factors have been shown to be moderately correlated: appearance and energy,  $r = .42$ ; appearance and technique,  $r = .50$ ; and energy and technique,  $r = .68$ . Finally, Cronbach’s alphas for the subscales have been acceptable ( $\alpha = .81 - .86$ ). Alphas in the present study ranged from .74 to .89, indicating adequate internal consistency.

## Results

An ANOVA was conducted to examine the patterns of imagery use reported by RE, NE-I, and NE-N participants, treating type of imagery as a repeated measure. Group was the independent variable, and the subscales of the EIQ were the dependent variables.<sup>4</sup> Significant main effects were found for imagery type,  $F(2, 466) = 285.69$ ,  $p < .0001$ ,  $\eta^2 = .551$ ; and for exercise

<sup>3</sup>The extent to which group classification impacts the interpretation of BREQ-2 item wording was tested using structural equation modeling procedures on participant responses. A sequential multigroup covariance analysis (SMCA) was conducted to determine the degree of invariance between the subgroups classified herein as regular exercisers and non-exercisers (NE-I plus NE-N). Using the criteria set forth by Cheung and Rensvold (2002), no marked reduction ( $\geq -.01$ ) was evident in the comparative fit index until constraining for equivalence of error variances, which is considered an overly restrictive test of measurement invariance that is rarely observed in practice (Vandenberg & Lance, 2000). Combined with the minimal deviation in root mean square error of approximation (RMSEA) across increasingly restrictive models (90% confidence interval values around the RMSEA point estimate ranged from .037 to .064 across models tested for invariance), the available evidence suggests minimal concerns associated with BREQ-2 item interpretation across exercise and non-exercise subgroup classifications in the present study. Further details of the SMCA, including detailed tables, are available upon request from the first author.

<sup>4</sup>To determine whether gender influenced responses on the EIQ and BREQ-2, two separate MANOVAs were conducted, with gender being the independent variable in both cases. There proved to be no significant gender differences for either the EIQ or the BREQ-2. Therefore, gender was collapsed in the subsequent analyses.



Table 2

*Means for the EIQ for Participant Groups*

Subscale	RE		NE-I		NE-N	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Appearance imagery	6.39	2.12	6.55	2.11	5.81	2.60
Energy imagery	3.95	2.19	3.74	2.18	3.28	2.23
Technique imagery	5.32 <sub>a</sub>	2.45	4.84	2.29	4.51 <sub>b</sub>	2.61

*Note.* EIQ = Exercise Imagery Questionnaire (Gammage et al., 2000); RE = regular exerciser; NE-I = non-exerciser who intends to exercise; NE-N = non-exerciser who does not intend to exercise. Row means with different subscripts are significantly different from each other.

group,  $F(2, 467) = 5.11, p < .006, \eta^2 = .021$ . The Group  $\times$  Imagery Type interaction was not significant. Means and standard deviations for the three subscale scores based on group membership are presented in Table 2. It can be seen that all three groups reported using appearance imagery the most, followed by technique imagery, and then energy imagery. Furthermore, Scheffé post hoc tests show that the RE reported using significantly more imagery than did the NE-N, although no other contrasts were significantly different. This pattern of results suggests a shallow decline in imagery across the three groups of exercisers, with the pattern of imagery use being the same in all three groups.

Using a Bonferroni adjustment ( $p < .016$ ) for imagery type, significant univariate effects were found for appearance,  $F(2, 467) = 4.05, p = .018, \eta^2 = .017$ ; energy,  $F(4, 467) = 3.71, p = .025, \eta^2 = .016$ ; and technique,  $F(2, 467) = 4.51, p = .012, \eta^2 = .019$ . However, the Scheffé post hoc tests for group show only one significant difference: RE participants used more technique imagery than did NE-N participants.

To examine the patterns of self-determination in the three groups (i.e., RE, NE-I, NE-N), a second ANOVA was conducted, with group as the independent variable and the subscales of the BREQ-2 (treated as repeated measures) as the dependent variables. A significant interaction of exercise group by form of self-determined regulation was found,  $F(8, 930) = 15.83, p < .0001, \eta^2 = .12$ , along with main effects for each of these two variables,  $F(2, 467) = 24.79, p < .0001, \eta^2 = .096$ ; and  $F(4, 464) = 529.57, p < .0001, \eta^2 = .82$ , respectively. The interaction reveals that the levels of motivation reported varied across the three groups. Means and standard deviations for the five subscale scores based on group membership are presented in Table 3.

Table 3

*Means for the BREQ-2 for Participant Groups*

Subscale	RE		NE-I		NE-N	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Amotivation	1.34 <sub>a</sub>	0.05	1.58 <sub>b</sub>	0.06	1.80 <sub>c</sub>	0.06
External	1.56	0.06	1.75	0.07	1.65	0.07
Introjected	2.50 <sub>a</sub>	0.07	2.42	0.09	2.12 <sub>b</sub>	0.09
Identified	4.36 <sub>a</sub>	0.06	3.79 <sub>b</sub>	0.07	3.27 <sub>c</sub>	0.07
Intrinsic	4.10 <sub>a</sub>	0.08	3.41 <sub>b</sub>	0.09	3.10 <sub>b</sub>	0.09

*Note.* BREQ-2 = Behavioral Regulation in Exercise Questionnaire-2; RE = regular exerciser; NE-I = non-exerciser who intends to exercise; NE-N = non-exerciser who does not intend to exercise. Row means with different subscripts are significantly different from each other.

Using a Bonferroni adjustment to control for Type I errors when using multiple comparisons ( $p < .01$ ), significant univariate effects were found for amotivation,  $F(2, 467) = 18.04$ ,  $p = .001$ ,  $\eta^2 = .072$ ; introjected,  $F(2, 467) = 5.66$ ,  $p = .004$ ,  $\eta^2 = .024$ ; identified,  $F(2, 467) = 72.25$ ,  $p = .001$ ,  $\eta^2 = .236$ ; and intrinsic,  $F(2, 467) = 39.20$ ,  $p < .001$ ,  $\eta^2 = .144$ ; but not for external,  $F(2, 467) = 2.25$ ,  $p > .05$ . Scheffé post hoc tests reveal significant differences, as noted by different subscripts in Table 3.

Considering each type of motivation in turn, the RE group reported lower levels of amotivation than the NE-I group, which had lower levels than the NE-N group. The three groups did not differ with respect to external motivation; whereas for introjected motivation, RE was higher than NE-N. The RE group reported higher levels of identified motivation than the NE-I group, which had higher levels than the NE-N group. Finally, for intrinsic motivation, the RE group was higher than both the NE-I and NE-N groups that did not differ.

Correlations between subscales of the BREQ-2 and the EIQ for each group are shown in Table 4. After applying a Bonferroni correction for multiple comparisons, the criterion  $p$  value was set at .003. In the RE group, imagery use was unrelated to amotivation and external motivation. Introjected motivation was positively correlated with all forms of imagery use, while identified and intrinsic motivation were positively correlated with the use of energy imagery and technique imagery. In the NE-I group, imagery use was again unrelated to amotivation and external motivation. Introjected motivation was positively correlated with appearance imagery and technique

Table 4

*Correlations Between the BREQ-2 and EIQ for Participant Groups*

	Appearance imagery	Energy imagery	Technique imagery
RE			
Amotivation	-.144	-.056	-.165
External	.102	.021	.040
Introjected	.219*	.252*	.318*
Identified	.196	.308*	.355*
Intrinsic	.185	.358*	.318*
NE-I			
Amotivation	-.189	-.016	-.045
External	-.038	.059	.072
Introjected	.335*	.233	.317*
Identified	.350*	.370*	.448*
Intrinsic	.219	.336*	.390*
NE-N			
Amotivation	-.332*	-.218	-.248*
External	.299*	.281*	.192
Introjected	.326*	.352*	.381*
Identified	.419*	.428*	.436*
Intrinsic	.313*	.512*	.565*

*Note.* BREQ-2 = Behavioral Regulation in Exercise Questionnaire-2; EIQ = Exercise Imagery Questionnaire (Gammage et al., 2000); RE = regular exerciser; NE-I = non-exerciser who intends to exercise; NE-N = non-exerciser who does not intend to exercise.

\* $p < .003$ .

imagery use, while identified and intrinsic motivation were again positively correlated with the use of energy imagery and technique imagery. In both the RE and NE-I groups, greater use of imagery was associated with more self-determined motivation, but unrelated to amotivation and external motivation. In the NE-N group, however, the pattern in relationships between imagery use and the various forms of motivation were clearly different than for the other two groups. That is, appearance imagery use was found to have strong correlations with all forms of motivation, energy imagery was related

to all forms of motivation except amotivation, and technique imagery was related to all forms of motivation except external motivation.

### Discussion

How do we get people to start exercising? Most people do not exercise or do not exercise enough (Katzmarzyk et al., 2000), yet the benefits of exercise are well known (Blair & Connelly, 1996). There is a dearth of information about the motivation of people who do not exercise; most of what we know about exercise motivation is based on samples of either current exercisers or exercise intenders (Mullan & Markland, 1997; Wilson et al., 2003). Yet, it is important to investigate exercise motivation and cognitions among people who do not exercise and who have no intention to exercise if we are to develop interventions to encourage non-exercisers to start exercising. Therefore, the purpose of the present research was threefold: to examine the patterns of (a) imagery use and (b) self-determination among regular exercisers (RE) and intending (NE-I) and non-intending (NE-N) non-exercisers, and (c) to examine the relationships between imagery and self-determination among these three groups.

Exercisers use imagery for three main functions: appearance, energy, and technique (Hausenblas et al., 1999). Furthermore, appearance imagery is employed the most, followed by technique imagery and energy imagery (Gammage et al., 2000). The present results show the typical and expected pattern of relationships for the exercisers and those intending to start exercising. That is, they reported using considerable amounts of exercise imagery and used appearance imagery the most and energy imagery the least. What was unexpected was that the non-intenders reported using almost the same amount of imagery and had the same pattern of use as did the other two groups. There was only a significant difference between the RE and NE-N groups for technique imagery, with a very small effect size (.02), and this difference simply may be a result of the RE group being familiar with more types of exercises to image.

In sum, we find it very surprising that non-exercisers, especially non-intenders, reported the same levels of imagery use as did regular exercisers. It may be that while non-exercisers imagine exercising, their imagery is more negative in nature than is that of exercisers (Short, Hall, Engel, & Nigg, 2004). In a qualitative study, Milne, Gregg, Hall, and Hardy (2005) reported that when female non-exercisers think about exercising, they focus on how difficult and boring it is. They also report having what they describe as unpleasant images associated with exercising (e.g., wearing ugly-looking clothing, sweating, being tired).

It is worth mentioning that previous research (Gammage et al., 2000) has found that gender influences the use of exercise imagery, yet no gender differences were found in the present study. This discrepancy between the present study and past research is not viewed as a concern, since previous research only examined exercisers' use of imagery (NE-I and NE-N were not considered), the effect sizes for gender have tended to be very small, and Gammage et al. raised the possibility that gender may be confounded with activity type (e.g., aerobics, which has more female participants vs. weight training, which has more male participants).

While there is limited evidence concerning the motivational regulation of non-exercisers, SDT (Deci & Ryan, 2002; Ryan & Deci, 2001) would posit that non-exercisers should exhibit low levels of self-determination—and possibly amotivation—toward exercise, and that this relationship should be more pronounced among non-exercisers who do not intend to exercise, as compared to those who do intend to exercise. The present results were broadly consistent with SDT. In general, NE-N participants were the least self-determined and RE participants were the most self-determined, with NE-I participants in between. Furthermore, the patterns of motivation reported within each group were not consistent, suggesting that the forms of regulation may develop independently, and consequently might also be expected to influence behavior independently.

It was expected that imagery use and self-determination would be associated with one another. More specifically, based on research by Rodgers et al. (2001), it was hypothesized, at least for exercisers, that appearance imagery would be associated with less self-determined motives, while energy imagery and technique imagery would be associated with more self-determined motives. In RE participants, we found this expected pattern of relationships. More energy imagery and technique imagery use were associated with more self-determined motivation, whereas more appearance imagery use was only weakly associated with more self-determined motivation. This is consistent with previous research (Rodgers et al., 2001), which showed that whereas appearance imagery is the most frequently used imagery among avid exercisers, it tends not to be most strongly associated with exercise behavior. The strongest associations are seen with energy imagery and technique imagery.

These results are congruent with the tenets of SDT that the outcomes more implicitly associated with the performance of the behavior should be most strongly associated with the behavior itself. That is, outcomes that are separable from the behavior itself (e.g., rewards or non-behavior-related outcomes, such as weight loss from exercise) should be more associated with less self-determined motives. Outcomes that are not separable from the behavior (e.g., inherent enjoyment, satisfaction) should be more associated

with motives that are more self-determined. To the extent that energy imagery and technique imagery are inherent to the actual performance of exercise behavior, they should be associated to a greater extent with more self-determined motives. Appearance, on the other hand, reflects an outcome separable from exercise (and that can be achieved other ways) and should be more associated with less self-determined forms of regulation.

We were uncertain as to whether the patterns of association among imagery and self-determination would be the same in non-exercisers as in exercisers. In the NE-I group, there was a similar pattern of association as for the exercisers. This suggests that imagery might be a useful vehicle for instigating a motivational change—that we still see a more intrinsic form of imagery associating with exercise motivation in exercising intenders—giving us a target for intervention. It remains unknown whether changing the content of the imagery might produce desirable changes in self-determination, or even whether this change might naturally occur if exercise behavior can be sustained long enough.

In contrast, there was a very different pattern in the relationships between the two sets of variables for the NE-N group; all three types of imagery use were associated with most forms of motivation. These results seem to suggest that whereas the NE-N report using exercise imagery as often as NE-I and RE (the one exception being NE-Ns use less technique imagery than REs), there is no specific association of the imagery to desirable forms of motivation. These results suggest that for NE-N participants, imagery is less likely to be a useful vehicle for producing desirable motivational states unless the imagery also addresses the motivation. As long as imagery is supportive of external motivation, for example, it is unlikely that regular exercise behavior will be produced, regardless of the content of the imagery. In other words, both sets of cognitions are clearly present in the NE-N group; but there are no meaningful patterns of association among them that might catalyze a change in behavior.

The present findings would suggest that imagery may be a useful intervention for those people already exercising or intending to exercise since imagery use—especially technique imagery use and energy imagery use—is related to more self-determined motives for exercise. As noted previously, these results are congruent with the tenets of SDT that the outcomes more implicitly associated with the performance of the behavior should be most strongly associated with the behavior itself. These results also support the proposals of various researchers that imagery might be an effective exercise intervention (Giacobbi, Hausenblas, Fallon, & Hall, 2003; Hausenblas et al., 1999). However, the present results also indicate that the imagery of non-intenders is not reliably associated with more or less self-determined motives. Therefore, imagery interventions designed on the basis of information

collected from REs or NE-Is are unlikely to be effective with non-exercisers who have no intention of starting to exercise. For NE-Ns, the focus of the imagery should probably be on altering their negative attitudes toward physical activity (Milne et al., 2005), instead of exercise-based per se. Clearly, the content of imagery interventions would need to be tailored to the intention status of the non-exerciser.

Whereas these data are theoretically promising, there are some limitations to consider. First, the data are cross-sectional. Thus, firm directional conclusions regarding the influence of the two sets of variables on each other cannot be drawn. Second, the data are self-report, but the measures employed have shown acceptable reliability and validity in all research to date. Third, the EIQ may not tap into all possible functions of imagery. Finally, the pattern of responses evident in the BREQ-2 scores (see Table 3) suggests a more self-determined than controlled motivational profile, irrespective of the exercise status criterion used in our sampling approach. Future studies would do well to investigate further the sensitivity of BREQ-2 item responses to variation in physical activity status, perhaps by considering characteristics of exercise bouts other than mere frequency of participation.

Despite these limitations, we believe that the present data do present important information about a seldom studied segment of the population, non-exercisers, who are the primary targets of exercise interventions. The relationships observed are sufficiently strong to warrant future attention to this group, with special consideration being directed to the nature of relationships among theoretical variables in non-intenders.

Previous research typically has not represented non-exercisers who do not intend to exercise; we therefore, we have limited evidence of the nature of their cognitions about exercise and how theory-based cognitions relate to each other among people not engaged in the behavior comprising the subject of the cognitions. It is possible that they do not think about the behavior at all, or that they think about it in completely different ways than persons who do engage in the behavior. Our results offer preliminary evidence that, in the case of exercise, NE-Ns do entertain exercise-relevant imagery about as much as their exercising or intending counterparts, but the expected patterns of relationships between the content of the imagery and the motivation for exercise are not observed. These results are encouraging in terms of determining whether or not imagery might be a useful vehicle to begin changing exercise-related cognitions, because the NE-Ns are engaging in imagery. However, it appears that the focus of the imagery should probably be on altering their attitudes about physical activity, rather than exercise-based per se. Future research is needed to determine what specific imagery content would be most useful in producing desirable changes in exercise behavior among NE-Ns.



## References

- Bauman, A., Madill, J., Craig, C., & Salmon, A. (2004). Participation: This mouse roared, but did it get the cheese? *Canadian Journal of Public Health, 95*(Suppl. 2).
- Blair, S. N., & Connelly, J. C. (1996). How much exercise should we do? The case for moderate amounts and intensities of exercise. *Research Quarterly for Exercise and Sport, 67*, 193–205.
- Cameron, C., Craig, C. L., Stephens, T., & Ready, T. A. (2002). *Increasing physical activity: Supporting an active workforce*. Ottawa, Ontario, Canada: Canadian Fitness and Lifestyle Research Institute.
- Cheung, G. W., & Rensvold, R. B. (2002). Evaluation of goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233–255.
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227–268.
- Deci, E. L., & Ryan, R. M. (2002). *Handbook of self-determination research*. Rochester, NY: University of Rochester.
- Gammage, K., Hall, C., & Rodgers, W. (2000). More about exercise imagery. *Sport Psychologist, 14*, 348–359.
- Giacobbi, P., Hausenblas, H., Fallon, E., & Hall, C. (2003). Even more about exercise imagery: A grounded theory of exercise imagery. *Journal of Applied Sport Psychology, 15*, 160–175.
- Godin, G., & Shephard, R. (1985). A simple method to access exercise behavior in the community. *Canadian Journal of Applied Sport Science, 10*, 141–146.
- Hall, C. (2001). Imagery in sport and exercise. In R. N. Singer, H. A. Hausenblas, & C. M. Janelle (Eds.), *Handbook of sport psychology* (pp. 529–549). New York: John Wiley & Sons.
- Hall, C. R., Mack, D. E., Paivio, A., & Hausenblas, H. A. (1998). Imagery use by athletes: Development of the Sport Imagery Questionnaire. *International Journal of Sport Psychology, 29*, 73–89.
- Harwood, C., Cumming, J., & Hall, C. (2003). Imagery use in elite youth sport participants: Reinforcing the applied significance of achievement goal theory. *Research Quarterly for Exercise and Sport, 74*, 292–300.
- Hausenblas, H. A., Hall, C. R., Rodgers, W. M., & Munroe, K. J. (1999). Exercise imagery: Its nature and measurement. *Journal of Applied Sport Psychology, 11*, 171–180.
- Jacobs, D. R., Ainsworth, B. E., Hartman, T. J., & Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine and Science in Sports and Exercise, 25*, 81–91.

- Johnson, E. L., & Lutgendorf, S. K. (2002). Contributions of imagery ability to stress and relaxation. *Annals of Behavioral Medicine, 23*, 273–281.
- Katzmarzyk, P. T., Gledhill, N., & Shephard, R. J. (2000). The economic burden of physical activity in Canada. *Canadian Medical Association Journal, 163*, 1435–1440.
- Koehler, D. J. (1991). Explanation, imagination, and confidence in judgment. *Psychological Bulletin, 110*, 499–519.
- Kossert, A. L., & Munroe-Chandler, K. (2007). Exercise imagery: A systematic review of the empirical literature. *Journal of Imagery Research in Sport and Physical Activity, 2*. Retrieved January 8, 2008, from [www.bepress.com/jirspa/vol2/iss1/art2](http://www.bepress.com/jirspa/vol2/iss1/art2)
- Landry, J. B., & Solmon, M. A. (2004). African American women's self-determination across the stages of change for exercise. *Journal of Sport and Exercise Psychology, 26*, 457–469.
- Markland, D., & Tobin, V. (2004). A modification to the Behavioral Regulation in Exercise Questionnaire to include an assessment of amotivation. *Journal of Sport and Exercise Psychology, 26*, 191–196.
- Marshall, S., & Biddle, S. (2001). The transtheoretical model of behavior change: A meta-analysis of applications to physical activity and exercise. *Annals of Behavioral Medicine, 23*, 229–246.
- Milne, M., Gregg, M., Hall, C., & Hardy, J. (2005). An examination of female nonexercisers' thoughts and images about exercise [Abstract]. *Supplement to Journal of Sport and Exercise Psychology, 27*, S107.
- Mullan, E., & Markland, D. (1997). Variations in self-determination across the stages of change for exercise in adults. *Motivation and Emotion, 21*, 349–362.
- Mullan, E., Markland, D., & Ingledew, K. D. (1997). A graded conceptualization of self-determination in the regulation of exercise behavior: Development of a measure using confirmatory factor analysis procedures. *Personality and Individual Differences, 23*, 745–752.
- Munroe, K. J., Giacobbi, P. R., Jr., Hall, C., & Weinberg, R. (2000). The four W's of imagery use: Where, when, why, and what. *Sport Psychologist, 14*, 119–137.
- Paivio, A. (1985). Cognitive and motivational functions of imagery in human performance. *Canadian Journal of Applied Sport Sciences, 10*, 22S–28S.
- Paivio, A. (1986). *Mental representation: A dual coding approach*. New York: Oxford University Press.
- Rodgers, W. M., Hall, C. R., Blanchard, C. M., & Munroe, K. J. (2001). Prediction of obligatory exercise by exercise-related imagery. *Psychology of Addictive Behaviors, 15*, 152–154.

- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*, 68–78.
- Ryan, R. M., & Deci, E. L. (2001). To be happy or to be self-fulfilled: A review of research on hedonic and eudaimonic well-being. In S. Fiske (Ed.), *Annual review of psychology* (pp. 141–166). Palo Alto, CA: Annual Reviews.
- Short, S. E., Hall, C. R., Engel, S. R., & Nigg, C. R. (2004). Exercise imagery and stages of change. *Journal of Mental Imagery*, *28*, 61–78.
- Taylor, S. E., Pham, L. B., Rivkin, I. D., & Armor, D. A. (1998). Harnessing the imagination: Mental simulation, self-regulation, and coping. *American Psychologist*, *53*, 429–439.
- Taylor, S. E., & Schneider, S. K. (1989). Coping and the simulation of events. *Social Cognition*, *7*, 174–194.
- Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organisational research. *Organisational Research Methods*, *3*, 4–70.
- Wilson, P. M., & Rodgers, W. M. (2002). The relationship between exercise motives and physical self-esteem in female exercise participants: An application of self-determination theory. *Journal of Applied Biobehavioral Research*, *7*, 30–43.
- Wilson, P. M., & Rodgers, W. M. (2004). The relationships between autonomy support, exercise motives, and behavioral intentions in females. *Psychology for Sport and Exercise*, *5*, 229–242.
- Wilson, P. M., Rodgers, W. M., Fraser, S. N., & Murray, T. C. (2004). The relationship between exercise regulations and motivational consequences in men and women. *Research Quarterly for Exercise and Sport*, *75*, 81–91.
- Wilson, P. M., Rodgers, W. M., Hall, C. R., & Gammage, K. L. (2003). Do autonomous exercise regulations underpin different types of exercise imagery? *Journal of Applied Sport Psychology*, *15*, 294–306.