

## Construct validity of college students' responses to the Behavioral Regulation in Exercise Questionnaire (BREQ-2)

By: Michelle L. D'Abundo, Cara L. Sidman, [Jeffrey Milroy](#), [Muhsin Orsini](#), and Kelly Fiala

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### **Abstract:**

The purpose of this study was to assess the construct validity and reliability of college students' responses to the Behavioral Regulation in Exercise Questionnaire (BREQ-2) to be used in campus recreation programs and physical activity and wellness courses. The BREQ-2 is a 19-item questionnaire used to assess exercise motivation through the application of five subscales. Five hundred eighty-nine students completed the BREQ-2. Using SPSS 20.0 and AMOS 20.0, a confirmatory factor analysis was conducted. A review of reliability coefficients indicated the internal consistency of factors would not be improved by removing survey items. The standardized parameter estimates of the five-factor model indicated the BREQ-2 is an adequate fit for measuring exercise motivation factors among this sample of American college students.

**Keywords:** measurement | motivation | self-determination theory

### **Article:**

Campus recreation programs and physical activity and wellness courses are popular approaches to increasing physical activity among college populations. With 36.2% of U.S. adults ages 18–24 failing to meet the *2008 Physical Activity Guidelines for Americans*, which include both aerobic and muscle-strengthening activities (Centers for Disease Control & Prevention, 2011), such programs are important for promoting lifelong physical activity. Cooper, Schuett, and Phillips (2012) noted numerous health and physical activity benefits associated with campus recreation programs. Researchers have also found lifelong physical activity and wellness courses have positive effects on students' knowledge, attitudes, and physical activity behaviors (Adams & Brynteson, 1992, 1995; Carlson, DeJong, Robison, & Heusner, 1994; DeVoe et al., 1998; Robbins, Powers, & Rushton, 1992; Slava, Laurie, & Corbin, 1984).

One notable determinant of physical activity is exercise motivation, which research has shown plays a role in long-term adherence to physical activity (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). Self-determination theory (SDT), which includes the constructs of autonomy, competence, and relatedness (Deci & Ryan, 1985), explains behavior along a motivation

continuum and has been applied to exercise contexts. In SDT, there are several forms of behavioral regulation, ranging from non-self-determined to completely self-determined motivation (Deci & Ryan, 1985). Assessment of the various forms of exercise motivation has been abundantly researched across populations, and is expressed in terms of behavioral regulation (Markland & Tobin, 2004).

The concept of exercise motivation is relevant to both campus recreation programs as well as physical and wellness courses. Cooper, Schuett and Phillips (2012) note that understanding what motivates college students to participate in physical activity, such as intramural sports, is important to campus recreation program development and the promotion of lifelong physical activity. For physical activity and wellness courses with the goal of instilling lifetime physical activity and healthy behaviors, SDT (including exercise motivation) has provided guiding principles for course content and methods.

The Behavioral Regulation in Exercise Questionnaire (BREQ) was developed to better understand the exercise behaviors of individuals. The BREQ was used to measure the continuum of behavioral regulation in exercise contexts (Mullan, Markland, & Ingledew, 1997) through the application of four scales: External Regulation, Introjected Regulation, Identified Regulation, and Intrinsic Regulation. In the BREQ continuum, External and Introjected Regulation were classified as controlled motivation, while Identified and Intrinsic Regulation were classified as autonomous motivation. Nonautonomous (or controlled) motivation instigates behavior for reasons based on external rewards or the avoidance of punishment and has not been associated with successful adherence to physical activity (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). Sustained engagement in exercise behaviors is associated with autonomous or intrinsic motivation (Ryan et al., 1997). Examples of autonomous motivation are exercising because it is fun, interesting, or inherently satisfying to the individual.

In SDT, the concept of non-self-determined behavioral regulation is called amotivation, which means lacking any intention to engage in a behavior (Markland & Tobin, 2004). The original confirmatory factor analysis of the BREQ (Mullan, Markland, & Ingledew, 1997) indicated amotivation items were not relevant for the sample of attendees from a local sports club, but the other scales supported a gradient of autonomy in exercise behavior. Wilson, Rodgers, and Fraser (2002) examined the psychometric properties of the BREQ without the amotivation items and found good construct validity that supported the psychometric integrity of the BREQ as a four-factor model of exercise motivation.

The BREQ scale was modified to become the BREQ-2 with the addition of the Amotivation scale (Markland & Tobin, 2004). Markland and Tobin (2004) theorized the reason amotivation was not relevant in the Mullan, Markland, and Ingledew (1997) study was because the sample consisted of participants already attending a fitness center and therefore were not amotivated to exercise. Markland and Tobin (2004) added amotivation items to the BREQ subscales and conducted a confirmatory factor analysis with a sample of UK adults. The addition of the Amotivation subscale produced a model that had a good fit and improved the factorial validity of the BREQ (Markland & Tobin, 2004).

In the current form, the BREQ-2 is a five-factor model consisting of a 19-item questionnaire that has been used to explore the relationships between behavioral regulation and a variety of psychological constructs (Wilson & Rodgers, 2004; Wilson, Rodgers, Fraser, & Murray, 2004; Gillison, Standage, & Skevington, 2006; Markland & Ingledew, 2007; Edmunds, Ntoumanis, & Duda, 2008). The results of the BREQ-2 can be reported as scores for each subscale or as the relative autonomy index (RAI), a single score derived from the subscales expressed in an index of the *degree* that respondents feel self-determined (Markland & Ingledew, 2007).

Research has focused on motivations associated with physical activity among campus recreation programs and physical activity and wellness courses. However, less research has focused on determining if instruments used are actually valid and reliable measures for college populations. In previous research, we assessed the construct validity and reliability of student responses to instruments commonly used with college populations, which disclosed unacceptable fits (D'Abundo, Orsin, Milroy, & Sidman, 2011; Fiala, D'Abundo, & Marinaro, 2010). As both practitioners and researchers, it is important that we use valid and reliable measures to assess our fitness and recreation programs on campus. Therefore, we are invested in assessing the appropriateness of the instruments used with college students on our campus.

In our literature review, there were no articles found that detailed the validation of responses to the BREQ-2 for college students in the United States. In addition, no published studies of the validation of participant responses to the BREQ-2 were conducted in the United States with an English-speaking population. Best practice in psychometric testing dictates the assessment of construct validity and reliability of responses for each population. Therefore, the purpose of this study was to assess the psychometric properties of college students' responses to the BREQ-2.

## **Methods**

### **Recruitment and Data Collection**

*Physical Activity & Wellness (PED 101)* is a university studies physical activity and wellness course. During the spring semester of 2009, and following Institutional Review Board approval, 1,422 students enrolled in PED 101 were sent an initial e-mail invitation to participate in the research by accessing and completing an online survey. Principal investigators provided participant volunteers a two-week window for survey completion. The e-mail invitation contained informed consent language as well as a direct link to the survey. Participants were informed using the direct link to enter the survey implied their consent to participate. For those who chose not to participate, an alternative assignment was offered. Over the course of the two-week implementation window, two e-mail reminders were sent with the intent to increase participation.

### **Instrumentation**

Following demographic questions, participants were directed to complete items of the BREQ-2, a 19-item questionnaire designed to measure five subscales of physical activity motivation: Amotivation, External Regulation, Introjected Regulation, Identified Regulation, and Intrinsic

Regulation (see Table 1). All BREQ-2 items used a five-point Likert response scale representing the following options: 0 = Not true for me, 2 = Sometimes true for me, 4 = Very true for me.

**Table 1.** BREQ-2 Factors and Respective Survey Items

Factor (No. of Items)	Item #	Item description
Amotivation (5)	5	I don't see why I should have to exercise.
	9	I can't see why I should bother exercising.
	12	I don't see the point in exercising.
	19	I think exercising is a waste of time.
External Regulation (4)	1	I exercise because other people say I should.
	6	I take part in exercise because my friends/family/partner say I should.
	11	I exercise because others will not be pleased with me if I don't.
	16	I feel under pressure from my friends/family to exercise.
Introjected Regulation (3)	2	I feel guilty when I don't exercise.
	7	I feel ashamed when I miss an exercise session.
	13	I feel like a failure when I haven't exercised in a while.
Identified Regulation (4)	3	I value the benefits of exercise.
	8	It's important to me to exercise regularly.
	14	I think it is important to make the effort to exercise regularly.
	17	I get restless if I don't exercise regularly.
Intrinsic Regulation (4)	4	I exercise because it's fun.
	10	I enjoy my exercise sessions.
	15	I find exercise a pleasurable activity.
	18	I get pleasure and satisfaction from participating in exercise.

## Participants

All students enrolled in PED 101 were invited to participate in this study ( $N = 1,422$ ). Forty-one percent ( $n = 589$ ) of students agreed to participate and completed a confidential online survey.

## Data Analysis

Using SPSS 20.0, descriptive statistics were calculated to summarize demographic data elicited from participants and to assess the suitability of data for factor analysis. Afterward, internal consistency of subscales was assessed using Cronbach's Alpha reliability coefficient. Finally, Confirmatory Factor Analyses were conducted using AMOS 20.0 to assess the five-factor model. As suggested by Hooper, Coughlan, and Mullen (2008), model fit was assessed using chi-square ( $\chi^2$ ),  $\chi^2/df$ , Goodness of Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and the Root Mean Square Residual (RMR), the most commonly reported fit indices. Although there is no consensus regarding criteria to determine a good or adequate model fit, a review of the relevant literature suggests use of the following standards (Hooper, Coughlan, & Mullen, 2008). A good model fit would yield a nonsignificant  $\chi^2$ ,  $\chi^2/df \leq 2.0$ , GFI and CFI  $\geq .95$ , RMSEA  $\leq .06$ , and RMR  $\leq .05$ ; and an adequate model fit would yield a nonsignificant  $\chi^2$ ,  $\chi^2/df \leq 5.0$ , GFI and CFI  $\geq .90$ , RMSEA  $\leq .07$ , and RMR  $\leq .08$ .

## Results

### Descriptive Statistics

Although ages of participants ranged from 17–57 years, most were between 17–20 years of age ( $M = 20.04$ ,  $SD = 3.59$ ). The sample was predominantly female and the most commonly reported race was White or Caucasian. Please see Table 2 for a summary of participant demographic information.

**Table 2.** Participant Demographic Information

Demographic Information	<i>n</i>	Percentage
Gender		
Male	230	39.0
Female	358	60.8
Missing	1	0.2
Age		
17–20	449	76.2
21–25	108	18.3
26–29	13	2.2
30–35	11	1.8
≥ 36	7	1.1
Missing	1	0.2
Race		
American Indian or Alaska Native	7	1.2
Asian	11	1.9
Black or African-American	28	4.8
White or Caucasian	512	86.9
Native Hawaiian or Other Pacific Islander	4	0.7
Other	26	4.4
Missing	1	0.2

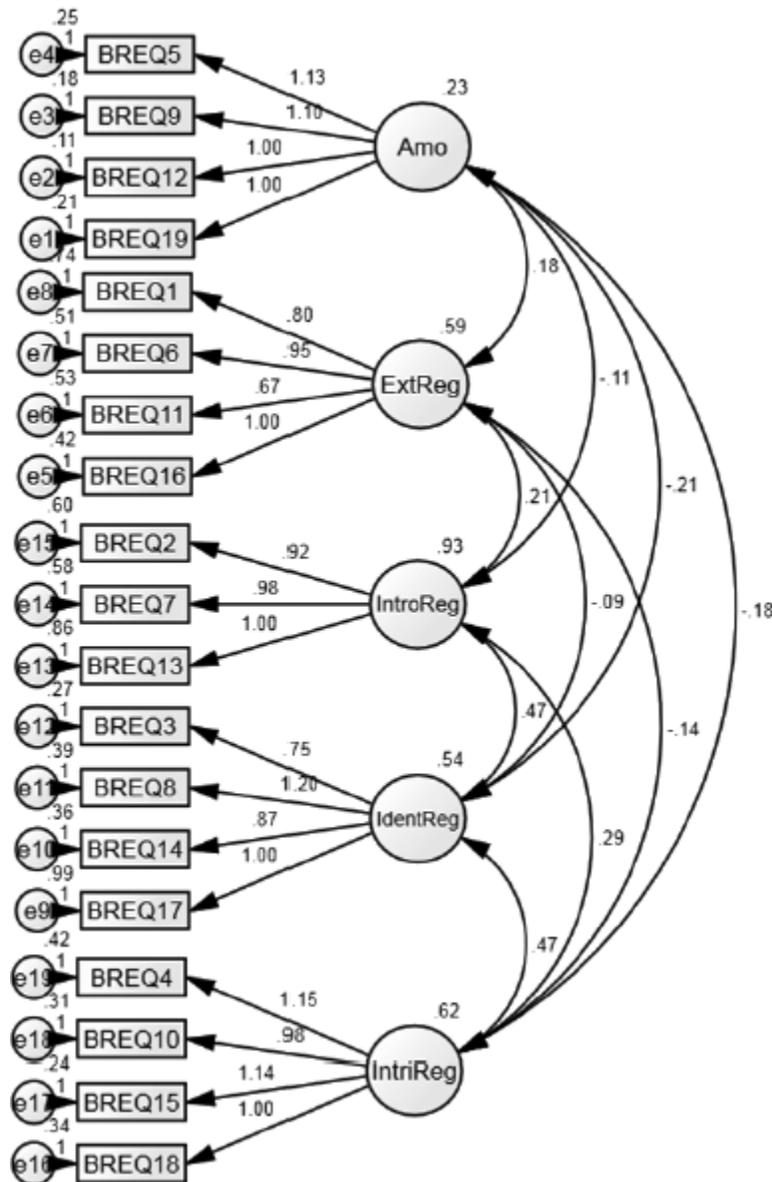
### Reliability

A review of reliability coefficients indicated that the internal consistency of factors would not be improved by removing survey items, suggesting modification of the instrument would not improve its construct validity. Table 3 illustrates the factors, associated number of survey items, and internal consistency of the proposed five-factor model.

**Table 3.** BREQ-2 Factors Structure and Reliability

Factor	Domain	No. of Items	Survey Items	$\alpha$
1	Amotivation	4	Q5, Q9, Q12, Q19	.847
2	External Regulation	4	Q1, Q6, Q11, Q16	.749
3	Introjected Regulation	3	Q2, Q7, Q13	.793
4	Identified Regulation	4	Q3, Q8, Q14, Q17	.780
5	Intrinsic Regulation	4	Q4, Q10, Q15, Q18	.894

Reliability coefficients indicated the internal consistency of Factor 2 would improve from .749 to .753 if item 11 was removed. In addition, the internal consistency of Factor 4 would increase from .780–.806 if item 17 was removed. In both cases, this negligible improvement of the internal consistency and the degree to which this item loaded on their respective factors suggested that these items be retained.



**Figure 1.** Illustrated model of the relationships among BREQ-2 survey items and respective factors.

### Confirmatory Factor Analysis

First, the suitability of the data for factor analysis was assessed. Comrey and Lee (1992) state that 100 is a poor sample size, 300 is good, and 1,000 is excellent. Thus, the sample size of the

data set used in this research study is sufficient ( $n = 589$ ). According to Tabachnick and Fidell (2007), the factor analysis solution is improved with normally distributed data. However, nonnormal distributions of data do not significantly affect the solution. The data set in this research study was slightly skewed,  $D(589) = 0.089-0.368$ ,  $p \leq .001$ .

CFA was conducted to assess the goodness-of-fit of this data with the five-factor model as prescribed by the BREQ-2. A statistically significant  $\chi^2$  value (639.166;  $p < .001$ ), suggested a bad fit. The goodness-of-fit indices,  $\chi^2/df = 4.501$ , GFI = .893, CFI = .912, and RMR = .058 suggested an adequate fit. However, RMSEA = .077 suggested a less than adequate fit. Figure 1 presents the standardized parameter estimates.

## Discussion

Based on the findings reported in this study, the BREQ-2 has adequate construct validity and reliability for an American college student population. When compared with psychometric properties of the BREQ-2 as presented by the developers (Markland, 2013), reliabilities of Factors 4 and 5 were higher in the present sample (0.780 vs. 0.730 and .894 vs. 0.860 respectively). In addition, when comparing validity findings of this study with those of the original standardized parameter estimates presented by the developers of the BREQ-2, findings appear to be similar. As presented in Figure 1, the standardized parameter estimates of the five-factor model indicate the BREQ-2 is an adequate fit for measuring various motivational factors for exercise among American college students.

These findings are consistent with previous validations of the BREQ-2. Moustaka, Vlachopoulos, Vazou, and Markland (2010) deemed the Greek translation of the BREQ-2 to have psychometric value. An additional variation of the BREQ-2 (Spanish) was validated among a Spanish-speaking population (Murcia, Gimeno, & Camacho, 2006). To our knowledge, this study represents the first time the BREQ-2 has been validated using an American college student population.

## Limitations

A limitation of this study was the self-report nature of the instrument. Self-reported responses to survey items could have potentially elicited socially desirable responses. The potential negative impact of socially desirable responses was minimized by informing participants that their responses were confidential.

The student participants were enrolled in a required physical activity and wellness university studies course, which could be considered a limitation. Students were invited to participate in the study after exposure to the wellness topics and physical activities included in PED 101. However, participation in PED 101 did not seem to impact the validity of the BREQ-2 subscales, including the amotivation subscale. As indicated by the earlier review of the literature, this is the first investigation of the construct validity and reliability of American college student responses to the BREQ-2. The originality of this research is both a strength and limitation, in that the findings are not supported by previous literature. Therefore, the results warrant additional research.

## Conclusions

Many universities have goals of teaching students the knowledge, attitudes and behaviors that lead to lifelong well-being. Valid and reliable measures of the BREQ-2 may provide insight to what hinders or enriches lifelong well-being in college populations. In this study, participant responses to the BREQ-2 have been shown to have adequate reliability and construct validity regarding exercise motivation. Therefore, the BREQ-2 appears to be an adequate instrument to administer within campus recreation programs and university health and wellness courses that promote lifelong physical activity and wellness. In addition, the use of the BREQ-2 within such programs may contribute to improvements in students' learning experiences specifically related to exercise motivation.

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