

The Behavioral Regulation in Sport Questionnaire (BRSQ): Instrument Development and Initial Validity Evidence

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The purpose of the four studies described in this article was to develop and test a new measure of competitive sport participants' intrinsic motivation, extrinsic motivation, and amotivation (self-determination theory; Deci & Ryan, 1985). The items for the new measure, named the *Behavioral Regulation in Sport Questionnaire* (BRSQ), were constructed using interviews, expert review, and pilot testing. Analyses supported the internal consistency, test-retest reliability, and factorial validity of the BRSQ scores. Nomological validity evidence was also supportive, as BRSQ subscale scores were correlated in the expected pattern with scores derived from measures of motivational consequences. When directly compared with scores derived from the Sport Motivation Scale (SMS; Pelletier, Fortier, Vallerand, Tuson, & Blais, 1995) and a revised version of that questionnaire (SMS-6; Mallett, Kawabata, Newcombe, Otero-Forero, & Jackson, 2007), BRSQ scores demonstrated equal or superior reliability and factorial validity as well as better nomological validity.

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To examine the tenets of self-determination theory (SDT; Deci & Ryan, 1985) in the sport context, a conceptually and psychometrically sound measure of behavioral regulation is necessary. Thanks to the pioneering efforts of Pelletier, Fortier, Vallerand, Tuson, and Blais (1995), the development of the Sport Motivation Scale (SMS) provided a tool for researchers to create an extensive knowledge base regarding sport motivation from the perspective of SDT. However, recent concerns about the SMS have prompted considerable debate regarding the psychometric properties of this popular measure (Mallett, Kawabata, Newcombe, Otero-Forero, & Jackson, 2007; Pelletier, Vallerand, & Sarrazin, 2007). Thus, the purpose of the four studies outlined in this article was to develop an alternative measure of sport motivation, as conceptualized in SDT. Our efforts parallel recent work by Mallett, Kawabata, Newcombe, Otero-Forero, and Jackson (2007), who revised the SMS, to create the SMS-6. In contrast to Mallett and his colleagues, who decided to modify SMS items

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demand. Over time, external regulations may be partially internalized such that external controls are no longer needed to maintain behavior. Rather, the athlete participates to avoid feelings such as guilt or shame, or to enhance ego and feelings of self-worth. This form of regulation is known as *introjected regulation*. Although more internalized than external regulation, introjected regulation is still considered to be controlled because behavior is still *enforced*, only now by internal pressures. Thus, Ryan and Deci (2002) suggested that it is possible to internalize a regulation such that external contingencies are not needed to maintain the behavior, but this regulation still lacks congruence with a person's values and sense of self.

In contrast to external and introjected regulations, identified and integrated regulations are considered to be autonomous forms of EM. Identified regulation exists when an athlete values and judges the separable outcomes of sport as being personally important. If the athlete came to view sport not only as important, but also in congruence with deeply held values and his or her sense of self, then the behavior would be regulated by the most autonomous (i.e., self-determined) form of EM—integrated regulation. This regulatory style is considered highly self-determined (Ryan & Deci, 2002), but rather than for the inherent pleasure derived from the activity (IM), behaviors are still performed to obtain extrinsic benefits.

Ryan and Deci (2002) also posited a state of amotivation, which is characterized as a lack of motivation. They suggested that amotivated people lack a sense of intention to participate and feel as though they are “going through the motions.” These individuals are considered to lack self-determination, and, in the sporting context, amotivated athletes are likely to question their continued participation.

According to Deci and Ryan (1985), the extent to which motivation emanates from the self will influence the psychological consequences that an individual experiences. Autonomous motivation is predicted to result in more adaptive psychological consequences (e.g., flow—Kowal & Fortier, 1999; well-being, concentration—Vansteenkiste, Zhou, Lens, & Soenens, 2005), whereas controlled motivation is hypothesized to lead to maladaptive outcomes (e.g., burnout—Lemyre, Treasure, & Roberts, 2006; poor coping and anxiety—Ryan & Connell, 1989; see Vallerand, 1997, for an extensive review of motivational consequences).

The Sport Motivation Scale (SMS)

Originally developed in French (Briere, Vallerand, Blais, & Pelletier, 1995), the SMS was translated for use with English-speaking athletes and comprised subscales to measure amotivation, external regulation, introjected regulation, identified regulation, IM-to know, IM-toward accomplishments, and IM-to experience stimulation. The SMS did not include a subscale to measure integrated regulation.

Despite initial indications that were largely supportive (Pelletier et al., 1995), Mallett, Kawabata, and Newcombe (2007) argued that there is substantial recent evidence suggesting that the SMS is in need of revision. They reviewed work that called into question the internal consistency (e.g., Martin & Cutler, 2002; Pelletier et al., 1995; Raedeke & Smith, 2001; Vlachopoulos, Karageorghis, & Terry, 2000) and factorial validity (Hodge, Allen, & Smellie, in press; Mallett, Kawabata, Newcombe, Otero-Forero, et al., 2007; Riemer, Fink, & Fitzgerald, 2002; Shaw, Ostrow, & Beckstead, 2005) of the SMS subscale scores. Other researchers (Cresswell & Eklund, 2005; Nien & Duda, in press) have also reported problems with the SMS

factor structure and felt compelled to merge scores from the three EM subscales. Consequently, there is increasing evidence that the SMS may not produce scores that conform to its proposed seven-factor structure.

In responding to Mallett, Kawabata, Newcombe, Otero-Forero, et al.'s paper (2007), Pelletier et al. (2007) argued that some intersample variation in the reliability and validity of SMS subscale scores should be expected, but that meta-analytic evidence (Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003) showed that the SMS has "good psychometric properties" (Pelletier et al., 2007, p. 618). Chatzisarantis and colleagues (2003) examined evidence from studies that included a number of different SDT-based measures in a variety of physical activity contexts, including education, sport, and leisure-time physical activity. Although their results supported the ordering of physical activity behavioral regulations along a continuum in a manner outlined in SDT, they noted that the power of their analysis to detect a contextual moderating effect was poor and "the conclusion that context does not explain variability in the study results must be treated with caution" (p. 297). This lack of statistical power means that Chatzisarantis et al.'s results cannot provide compelling evidence to support *or* refute the validity of the SMS scores; their results can only be cited as evidence to support the presence of a continuum of self-determined motives more generally (i.e., across physical activity contexts). As a result, the validity of SMS scores remains a concern.

Pelletier et al. (2007) also suggested that there is substantial evidence that the SMS scores have shown theoretically predicted relationships with scores derived from measures of theoretically related constructs. This aspect of construct validity is often termed *nomological validity* (e.g., Li, 1999; Messick, 1980) and is often assessed as part of an ongoing program of validity testing (e.g., Crocker & Algina, 1986; Li, 1999; Wilson, Rodgers, & Fraser, 2002). We agree with Pelletier and his colleagues (2007) that there is some evidence to support the nomological validity of the SMS scores. For example, amotivation scores were negatively related to effort and intention to continue sport (Pelletier et al., 1995) and negatively correlated with positive affect scores (e.g., Martin & Cutler, 2002; Raedeke & Smith, 2001). Similarly, controlled motivation scores have been positively associated with dropout from competitive sport (Pelletier, Fortier, Vallerand, & Briere, 2001), whereas IM subscale scores have been positively related to adaptive motivational outcomes such as enjoyment (Raedeke & Smith, 2001, Study 3). However, there is also less supportive nomological validity evidence. For example, Raedeke and Smith (2001) found a positive correlation between external regulation and enjoyment scores ($r = .15, p < .05$) and also reported that anxiety scores showed stronger correlations with introjected regulation scores than with external regulation scores. Results regarding relationships between EM and athlete burnout have also been largely inconsistent with SDT-based hypotheses (see Eklund & Cresswell, 2007, for a review).

In summary, there is some evidence to support the nomological validity of the SMS subscale scores. However, there is also evidence that SMS scores, especially those associated with the EM subscales, have, at times, not been related in a predictable manner to scores derived from measures of motivational consequences. Nomological validity evidence relies on the assumptions that (a) the measures of theoretically related constructs produce valid scores and (b) that the tenets of the theory hold in the circumstances in which the study is being conducted (Crocker & Algina, 1986). As a result, it would be premature to discard the SMS on the basis

of some less than convincing nomological validity evidence. Indeed, it is possible that the unexpected results were found because the scores derived from some of the other measures in these studies lacked construct validity. It is also possible that the tenets of SDT do not apply in some circumstances. However, when combined with the largely unsupportive evidence concerning internal consistency and factorial validity, as well as concerns raised over the content validity of some of the EM items (Standage, Duda, & Ntoumanis, 2003), the somewhat variable nomological validity findings provide evidence that the psychometric properties of the SMS may not be adequate.

The purpose of the four studies outlined in this report was to construct an alternative measure of intrinsic motivation, extrinsic motivation, and amotivation. We named this new measure the *Behavioral Regulation in Sport Questionnaire* (BRSQ).

In contrast to Mallett, Kawabata, Newcombe, Otero-Forero, et al. (2007), who decided to modify SMS items based on statistical evidence from their study involving Australian athletes, we chose to begin the scale development process by developing a pool of items from which a new measure could be developed. We then sought feedback from leading SDT experts and eliminated items that they believed were not acceptable. Following pilot testing with a small group of athletes, we collected data to examine the psychometric properties of the BRSQ. In Study 1, we generated a pool of potential items and then used factor analytic procedures to eliminate items that appeared to cross-load on unintended factors. In Study 2, we sought evidence regarding the factorial validity and reliability of the BRSQ scores. We also examined the nomological validity of the BRSQ scores by examining correlations among the factors. In Study 3, we provided further nomological validity evidence by examining relationships between BRSQ subscale scores and athlete burnout and flow scores. Furthermore, in Study 3 we directly compared the internal consistency, factorial validity, and nomological validity of scores derived from the BRSQ, the SMS (Pelletier et al., 1995), and the revised version of the SMS created by Mallet et al. (the SMS-6). Finally, in Study 4 we evaluated the test-retest reliability of the BRSQ scores.

Study 1

We began by creating a pool of items that we believed not only reflected the behavioral regulations outlined by Ryan and Deci (2002) and the three forms of IM identified by Vallerand (1997), but also held meaning for competitive athletes. Following DeVellis's (2003) suggestions, we avoided lengthy items, items that require a high level of reading comprehension, and double-barreled items.

To initiate item creation for the BRSQ, we evaluated the applicability of items from measures of SDT-based motivation used in exercise (Li, 1999; Mullan, Markland, & Ingledew, 1997), work (Blais, Briere, Lachance, Riddle, & Vallerand, 1993), and sport (Pelletier et al., 1995).¹ We also interviewed 15 athletes from the New Zealand Academy of Sport (NZAS; mean age = 24.20 years) regarding their sport motivation to generate further items and help us word items in a way that would have meaning for competitive athletes. These sources produced 80 items that were ready for evaluation.

We then sought expert opinions to ensure content relevance of the proposed items (DeVellis, 2003). Seven reviewers who had published research concerning SDT in sport or exercise in an internationally recognized, peer-reviewed journal participated in the item review process. After agreeing to the proposed conceptual definitions for each of the eight subscales (see definitions outlined in introduction), experts were sent a survey designed to solicit their blind review of the 80 proposed items. We considered asking the experts to rate the degree to which each item corresponded with each of the eight subscales (e.g., Dunn, Bouffard, & Rogers, 1999); however, we were concerned that making 640 ratings might be overly burdensome. Instead, we asked the reviewers to identify the subscale to which each item corresponded most strongly. They could also indicate if the item did not correspond to any of the subscales or if it corresponded with more than one subscale. In addition, experts were asked to indicate any potential problems (e.g., item length, reading level) with each item. Forty-two items received unanimous endorsement from the seven reviewers, meaning that all experts believed the item tapped the intended construct, did not correspond to another subscale, and was worded clearly. Six subscales contained five items, whereas the external and introjected regulation subscales each contained six items.

In the final stage of item development, 10 athletes from the NZAS (mean age = 24.00 years) pilot-tested the initial 42-item BRSQ. We asked participants to indicate how well each statement reflected a reason why they participated in their sport. The item stem was "I participate in my sport. . . ." Given that the BRSQ was intended to be a contextual measure of motivation, this stem was considered more appropriate than the SMS stem, "Why do you practice your sport?" (Pelletier et al., 1995, p. 52), which could be interpreted as referring only to reasons to be involved in training/practice rather than motives for participation in sport as a whole. Participants responded using 7-point Likert scales. When constructing the SMS, Pelletier et al. (1995) chose labels involving the verb *to correspond* (1 = *does not correspond at all*, 4 = *corresponds moderately*, 7 = *corresponds exactly*). In line with DeVellis's (2003) recommendations, we chose simpler terms (1 = *not true at all*, 4 = *somewhat true*, 7 = *very true*). The 10 athletes completed the questionnaire and reported that the BRSQ instructions and items were easy to understand; thus, we deemed the 42-item BRSQ ready for psychometric evaluation with a larger sample of athletes.

Study 1 had two aims: (i) to eliminate low and cross-loading items and (ii) to investigate the internal consistency and factorial validity of scores derived from the resultant version of the questionnaire.

Method

Participants

Athletes ($N = 382$) from the NZAS completed the 42-item version of the BRSQ. The mean age of the participants was 25.9 years (range 18–58 years); 206 were male and 176 were female. Twenty different sports were represented. Almost

three-quarters of the sample (73.04%) had represented New Zealand at the senior national level.

Procedure

We sent questionnaires to 729 athletes and 382 (52.40%) participated in the study. Athletes responded via online ($n = 219$) or postal versions of the survey. A thorough investigation of other data collected from this sample indicated that online and postal responses were similar (see Lonsdale, Hodge, & Rose, 2006, for details). As a result, online and postal data were merged before the analyses.

Analysis

Mahalanobis distances were calculated to check for the presence of multivariate outliers. Missing data were replaced using an expectation maximization algorithm. In keeping with the strategy advocated by Jöreskog (1993) and employed by Mullan, Markland, and Ingledew (1997), we conducted confirmatory factor analyses (CFA) in three stages. In all stages, items were allowed to load on only one hypothesized factor, factors were allowed to correlate freely, factor variances were set to one, and error terms were not allowed to correlate.

In Stage 1, each subscale was analyzed separately using CFA. Items that appeared to be adequate indicators of the latent variable were retained for the next stage of analyses. In Stage 2, each subscale was paired with each of the other subscales in a series of two-factor CFAs. Measurement models in the first two stages were specified a priori, and, when model fit was poor, items were considered for deletion if they displayed large standardized residuals (>2), if modification indices suggested that the error term of an item correlated with that of another item, if an item had a low factor loading ($<.40$; Mullan et al., 1997), or if modification indices suggested that an item cross-loaded on an unintended latent variable.

In the third and final stage, the resultant 32-item BRSQ model was evaluated according to four criteria. First, in keeping with convention, overall model fit was assessed using multiple goodness-of-fit indexes. Two incremental indexes, the CFI (normed) and the TLI (non-normed), as well as one absolute fit index, the RMSEA, were chosen. Traditionally CFI and TLI scores $>.90$ and RMSEA scores $<.08$ represent good model fit, whereas RMSEA scores between $.08$ and $.10$ suggest marginal fit. More recently, Hu and Bentler (1999) have proposed alternative standards (CFI and TLI, $>.95$; RMSEA, $<.06$); however, Marsh, Hau, and Wen (2004) have warned against the blanket use of these higher cut-off criteria. Therefore, the traditional criteria were adopted as indicators of good fit with Hu and Bentler's (1999) criteria as evidence of very good fit. Second, the factorial validity of the scores derived from the 32-item BRSQ was assessed by examining the item-factor loadings. Factor loadings lower than $.40$ were considered small and indicated the need for further item development. Third, the discriminant validity of the factor scores was assessed by examining the 95% confidence intervals ($\pm 1.96 \times$ standard error of the point estimate) of the interfactor correlations (Φ matrix). Finally, the internal consistency of scores from each subscale was assessed by examining Cronbach's alpha coefficients.

Results

No significant multivariate outliers ($p < .001$) were identified. Scores from all but one of the BRSQ items had univariate normal distributions (skewness, <2 ; kurtosis, <7). However, there was evidence of multivariate non-normality in the data (Mardia's normalized skewness coefficient = 66.73); therefore, we employed maximum likelihood (ML) estimation using a Satorra–Bentler correction to the χ^2 statistic and standard errors for all CFAs (Satorra & Bentler, 1994). There were few missing data points, with no more than two missing values on any of the BRSQ items. These data points were estimated using an EM algorithm.

In Stage 1, the series of single subscale CFAs resulted in the deletion of six items. Poor model fit and low factor loadings indicated that one identified regulation (“because it is a good way to maintain friendships that are important to me”) and two external regulation (“because I receive material rewards [e.g., money, scholarships, or free clothing]” and “in order to win medals, trophies, and awards”) did not correspond with the other items from the intended factors. These items were deleted, and as a result the external regulation subscale contained only items that referred to participation to satisfy an external demand (e.g., “because I feel pressure from other people to play” and “in order to satisfy people who want me to play”). Although the operational definition of external regulation does include the notion of being motivated to obtain rewards, our items likely did not convey the necessary controlling nature of the rewards administration (Ryan, Mims, & Koestner, 1983). We decided not to create new “rewards” items because Ryan and Deci (2002, p. 17) have noted that “more generally, external regulation is in evidence when one’s reason for doing a behavior is to satisfy an external demand or socially constructed contingency.” We believed that the four remaining items tapped the general conception of external regulation and that athletes’ motivation relating specially to externally controlled rewards administration would be tapped with the more general reference to pressure from others. For example, a professional athlete who participated because it was the only way to obtain his or her salary would “feel pressure from other people.” The item would also be relevant to amateur athletes who did not receive monetary rewards, but may have been pressured to continue participation by, for example, parents, coaches, and teammates. As such, we avoided specifying particular goal content and focused instead on the regulations underlying motivation (see Smith, Ntoumanis, & Duda, 2007, for more on the distinction between goal content and behavioral regulations).

Our analyses of the six items intended to tap introjected regulation indicated that the item-factor loadings for scores derived from three items pertaining to “guilt,” “obligation,” and “feeling ashamed” were substantially higher than the loadings for the scores associated with three items that referred to “ego enhancement” (e.g., “because I must do sports to feel good about myself”). Follow-up exploratory factor analysis suggested the presence of two factors. “Guilt,” “obligation,” and “ashamed” item scores loaded strongly only on the first factor (48.00% of variance explained). “Ego enhancement” item scores loaded strongly only on the second factor (20.94% of variance explained). The two factors were weakly correlated ($r = .12$), which further emphasized that the six items did not reflect a unitary construct. Mullan and her colleagues (1997, p. 748) encountered a similar problem when constructing the Behavioral Regulation in Exercise Questionnaire and argued that one group of their

items “was considered to best capture the true meaning of introjected regulation.” Although the expert reviewers in our study indicated that all six items tapped the introjected regulation construct, Deci and Ryan (1985, p. 137) have suggested that “shame and guilt are the most common hallmarks of introjected regulation.” The first grouping of items best represented these concepts, and we therefore decided to retain these three items (“guilt”, “obligation,” and “feeling ashamed”), but revisited this issue in the next stage of scale development (see Study 2).

In Stage 2, a series of CFAs with two factors in each analysis resulted in an additional four items being removed owing to cross-loading on unintended factors. These items included one item from amotivation, two items from integrated regulation, and one item from the IM-accomplishment factors. The resultant eight-factor, 32-item CFA model produced a significant χ^2 statistic (scaled $\chi^2[436, N = 382] = 854.62, p < .01$), although it should be noted that this statistic is sensitive to minor discrepancies between observed and implied variance–covariance matrices (Byrne, 1998). The other indices suggested very good fit: RMSEA = .05, RMSEA 90% CI = .04–.05, CFI = .96, TLI = .96. Item-factor loadings ranged from .58 to .91 (see Table 1, mean factor loading = .75). None of the 95% confidence intervals of the interfactor correlations encompassed ± 1.0 , range = .01 to .77). This result provided evidence for the discriminant validity of the factor scores (Anderson & Gerbing, 1988). Cronbach’s alpha coefficients for scores associated with the eight subscales were amotivation = .87, external regulation = .85, introjected regulation = .87, identified regulation = .73, integrated regulation = .71, IM–Knowledge = .91, IM–Stimulation = .78, IM–Accomplishment = .80.

Discussion

The purpose of Study 1 was to investigate the validity and reliability of scores derived from a new measure of behavioral regulation in sport. The 32-item BRSQ model fit the data very well, displayed strong factor loadings, and produced internally consistent subscale scores. This form of the BRSQ was subsequently named the *BRSQ-8* to reflect the eight forms of regulation that it was designed to measure. Given the exploratory use of CFA in this study, further testing was needed to confirm the scores’ factor structure (Jöreskog, 1993). Furthermore, the initial BRSQ included subscales designed to measure three types of IM as suggested by Vallerand (1997), but did not include a general IM subscale. Some researchers may wish to test specific hypotheses concerning separate aspects of IM, and others may prefer a single subscale that measures IM more generally (e.g., Mullan et al., 1997; Ryan & Connell, 1989); therefore, there was a need to create a general IM subscale.

Study 2

The purpose of the second study was to examine the reliability and validity of scores derived from two modified versions of the BRSQ. As in Study 1, the fit of the data to a model with eight subscales (*BRSQ-8*), including three IM subscales was examined using CFA. The fit of the data to a model with a single IM construct was also tested. This form of the BRSQ was named the *BRSQ-6*. Nomological validity was assessed by examining the relationships between the factor scores. According to

Table 1 BRSQ-6 Items, Standardized Factor Loadings (λ), and Error Terms (θ)

Factors and items	Study 1 (<i>n</i> = 382)		Study 2 (<i>n</i> = 343)		Study 3 (<i>n</i> = 316)	
	λ	θ	λ	θ	λ	θ
Amotivation						
but I question why I continue.	.83	.31	.81	.34	.90	.19
but I question why I am putting myself through this.	.70	.51	.84	.30	.82	.32
but the reasons why are not clear to me anymore.	.77	.41	.78	.39	.76	.42
but I wonder what's the point.	.90	.19	.88	.22	.89	.21
External regulation						
because people push me to play.	.83	.32	.88	.23	.84	.30
to satisfy people who want me to play.	.81	.34	.88	.22	.85	.27
because I feel pressure from other people to play.	.88	.23	.89	.20	.85	.28
because if I don't other people will not be pleased with me.	.78	.39	.86	.27	.82	.32
Introjected regulation						
because I would feel guilty if I quit.	.87	.25	.90	.19	.88	.24
because I would feel ashamed if I quit.	.82	.32	.86	.26	.84	.30
because I feel obligated to continue.	.81	.34	.72	.48	.78	.40
because I would feel like a failure if I quit.	—	—	.78	.19	.88	.22

Identified regulation

because the benefits of sport are important to me.	.77	.41	.74	.45	.80	.37
because I value the benefits of my sport.	.60	.64	.67	.55	.82	.32
because it teaches me self-discipline.	.73	.46	.73	.47	.57	.67
because it's a good way to learn things which could be useful to me in my life.	.58	.67	.79	.38	.53	.72

Integrated regulation

because it's an opportunity to just be who I am.	.65	.57	.66	.57	.77	.41
because it's a part of who I am.	.64	.59	.63	.60	.73	.47
because what I do in sport is an expression of who I am.	.74	.45	.79	.37	.70	.51
because it allows me to live in a way that is true to my values.	—	—	.74	.45	.59	.69

IM-General

because I enjoy it.	—	—	.81	.29	.81	.35
because I like it.	—	—	.94	.17	.85	.28
because it's fun.	—	—	.88	.22	.82	.33
because I find it pleasurable.	—	—	.83	.31	.63	.61

Note. All factor loadings significant at $p < .05$. Single dashes indicate items were added after Study 1. Details concerning factor loadings and error terms for the multidimensional IM items from the BRSQ-8 are available from the first author.

Deci and Ryan (1985), behavioral regulations can be ordered on a continuum from least to most self-determined. Correlations among the factor scores are expected to show support for the presence of this continuum by displaying a simplex structure (Ryan & Connell, 1989). This pattern occurs when factors that are closer together on the continuum show stronger correlations than factors that are further apart. Many researchers investigating the nomological validity of SDT-based motivation measures have examined the degree to which correlations among factor scores fit this hypothesized pattern (e.g., Mullan et al., 1997; Pelletier et al., 1995).

Method

Participants and Procedures

New Zealand Academy of Sport (NZAS) athletes ($N = 571$) were sent an e-mail inviting them to complete the questionnaire via an online survey; 343 athletes (60.01%) responded. The mean age was 24.47 years (range 14–57 years); 183 were female and 160 were male. Twenty-three different sports were represented. Over three-quarters of the sample (77.26%) had represented New Zealand at the senior national level. Two hundred thirty-nine of the 382 athletes (62.57%) from Study 1 also participated in the follow-up study.

Measures

The four new items for the general IM subscale (IM-G) were adapted from the IM subscales of the Behavioral Regulation in Exercise Questionnaire (Mullan et al., 1997) and the Self Regulation Questionnaire (Ryan & Connell, 1989). The IM-G items were “because I enjoy it,” “because it’s fun,” “because I find it pleasurable,” and “because I like it.”

We also added a new item to the introjected regulation subscale. As outlined in Study 1, three items that were intended to specifically tap feelings of ego enhancement (e.g., “because I must do sports to feel good about myself”) were eliminated from the introjected regulation subscale and items concerning “guilt,” “obligation,” and “feeling ashamed” were retained. Deci and Ryan (1985) have argued that shame and guilt are the central features of introjection; however, it would clearly be preferable to measure the “guilt” and “ego” aspects of the introjection construct. It could be argued that *feeling ashamed* refers not only to “guilt,” but also to “feeling inferior” and therefore may tap ego-involving aspects of motivation. However, we believed that adding another item (“because I would feel like a failure if I quit”) would ensure that the ego aspect of introjected regulation was more fully represented in the subscale. We also added one item (“because it allows me to live in a way that is true to my values”) to the integrated regulation subscale to help ensure that the subscale not only tapped the extent to which sport participation was integrated into the individual’s sense of self, but also the degree to which participation was in line with deeply held beliefs (Ryan & Deci, 2002).

Finally, we eliminated the lowest loading items from the IM-Knowledge (“because of the intense emotions I feel while I am doing my sport”) and IM-Stimulation (“because I learn interesting things while doing my sport”) subscales from Study 1, leaving four items per each subscale. We believed that these more

parsimonious IM subscales would not diminish the construct representation and would slightly reduce participant burden.

Results

BRSQ Model with a Single IM Subscale (BRSQ-6)

Item scores were univariately normally distributed (skewness, <2 ; kurtosis, <7), but the data were multivariately non-normal (Mardia's normalized skewness coefficient = 72.24). Consequently, we employed ML estimation with a Satorra–Bentler correction. There were no multivariate outliers ($p < .001$).

The BRSQ-6 model (scaled $\chi^2[237, N = 343] = 385.44, p < .01$) with a single IM subscale (IM-General) fit the data very well according to the approximate fit indices: RMSEA = .04, RMSEA 90% CI = .03–.05, CFI = .99, TLI = .99. Standardized loadings on the six factors ranged from .63 to .91 (see Table 1) and none of the 95% confidence intervals of the interfactor correlations encompassed ± 1.0 (see Table 2). Alpha coefficients exceeded .78 (see Table 2).

Overall, participants appeared to be motivated by largely self-determined regulatory forces. Specifically, mean scores on the subscales intended to represent self-determined motivation were above the midpoint on each scale. Mean scores for the three non-self-determination motivation subscales were all relatively low, but the entire range of scores (1–7) was represented. Furthermore, on all three of the subscales a substantial number of participants reported a mean score above the scale midpoint (12.97% of participants had a mean score ≥ 4.00 on the amotivation subscale, 15.51% for external regulation, and 23.73% for introjected regulation).

The low mean scores on the non-self-determined motivation subscales were not surprising. Ryan and Deci (2002) have suggested that humans have an innate tendency to integrate their regulations and therefore one would expect that participants in a voluntary activity (e.g., sport) would report low scores on measures of non-self-determined motivation. These non-self-determined forms of regulation are expected to be negatively associated with long-term persistence and it is likely that athletes who were high in these forms of regulation had already discontinued their participation in sport (Ntoumanis, 2005) or chosen a new sport for which their motivation was more self-determined.

Examination of the 95% confidence intervals surrounding the interfactor correlations (see Table 2) revealed that scores from factors that were predicted to be closer together on the proposed self-determination continuum were generally more strongly correlated than those predicted to be more distal. For example, amotivation scores had strong positive correlations with controlled EM scores (external and introjected regulation factors), moderate negative correlations with autonomous EM scores (identified and integrated regulation factors), and strong negative correlations with IM-G factor scores. Each of these sets of correlations was significantly different ($p < .05$) from the others. However, not all hypotheses were supported. Within the category of controlled EM, there was no difference between external and introjected regulations scores in terms of their relationships with amotivation, autonomous EM, or IM-G scores. A similar situation was evident within the autonomous EM category, in which identified and integrated regulation factor scores had similar correlations with the other factors.

Table 2 BRSQ Factor Correlations in Study 2

Subscale	AM	EX	IJ	ID	IG	IM-G	IM-K	IM-S	IM-A
Amotivation (AM)	<i>.90</i>								
External Reg. (EX)	.70 (.04)	<i>.93</i>							
Introjected Reg. (IJ)	.70 (.04)	.77 (.03)	<i>.88</i>						
Identified Reg. (ID)	-.33 (.06)	-.19 (.06)	-.14 (.07)	<i>.82</i>					
Integrated Reg. (IG)	-.25 (.06)	-.11 (.06)	<u>-.02</u> (.06)	.74 (.04)	<i>.79</i>				
IM-General (IM-G)	-.64 (.04)	-.50 (.05)	-.50 (.05)	.54 (.05)	.55 (.05)	<i>.92</i>			
IM-Knowledge (IM-K)	-.39 (.05)	-.27 (.05)	-.27 (.05)	.71 (.04)	.58 (.05)	—	<i>.91</i>		
IM-Stimulation (IM-S)	-.45 (.06)	-.41 (.07)	-.32 (.07)	.58 (.06)	.65 (.05)	—	.47(.06)	<i>.80</i>	
IM-Accomplish (IM-A)	-.41 (.07)	-.42 (.06)	-.29 (.07)	.53 (.07)	.53 (.06)	—	.55 (.05)	.84 (.05)	<i>.83</i>
Mean	2.33	2.03	2.71	5.52	5.55	6.14	5.23	5.86	6.46
SD	1.36	1.21	1.60	1.10	1.06	.92	1.24	.87	.69

Note. Factor correlations (Φ matrix) with standard errors in parentheses are displayed below the diagonal. The underlined correlation was not significant. All other correlations were significant at $p < 0.05$ level. Cronbach alpha coefficients are displayed in italics on diagonal. Regulations were measured on a 7-point scale.

BRSQ Model With Three IM Subscales (BRSQ-8)

The CFA of the BRSQ-8 data (scaled $\chi^2[436, N = 343] = 593.55, p < .01$) displayed very good fit according to the approximate fit indices: RMSEA = .03, RMSEA 90% CI = .03–.05, CFI = .97, TLI = .97. Standardized factor loadings ranged from .63 to .90. None of the 95% intervals of the interfactor correlations encompassed ± 1.0 (see Table 2). Cronbach alpha coefficients for the multifaceted IM subscale scores ranged from .80 to .91 (see Table 2). As expected, scores from scales based on a tripartite conceptualization of IM were negatively correlated with amotivation and controlled EM scores and positively related to autonomous EM scores (see Table 2).

Alternative Models

Thompson and Daniel (1996) have suggested that testing alternative plausible models can provide additional validity evidence for a hypothesized CFA model. Analyses of the data suggested that the first-order six-factor BRSQ-6 model fit the data very well and none of the confidence intervals surrounding interfactor correlations encompassed unity; however, there were strong correlations between external and introjected regulation factor scores as well as between identified and integrated regulation factor scores. Therefore, we decided to test two alternative nested models. In the first model, the covariance of the external and introjected regulation factors was set to 1.0, which, in essence, created a single controlled EM factor. The amotivation, identified regulation, integrated regulation, and intrinsic motivation items and factors were retained from the original BRSQ-6 model. The fit of this alternative nested model was significantly worse than that of the original BRSQ-6: $\Delta\chi^2(1) = 240.92, p < .001, \Delta CFI = -.02$. In the second model, the covariance of the identified and integrated factors was set to 1.0, but the covariance between the external and introjected regulation factors as well as all other interfactor correlations were estimated. This model also resulted in significantly worse fit compared with the original six-factor model: $\Delta\chi^2(1) = 97.68, p < .001, \Delta CFI = -.02$.

Amotivation, external regulation, and introjected regulation scores were all negatively correlated with identified regulation, integrated regulation, and intrinsic motivation scores, suggesting that there was a split in the data between non-self-determined and autonomous forms of motivation (Table 2). As a result, we decided to test two further models. In the third alternative model, covariances for amotivation, external regulation, and introjected regulation were fixed to 1.0, effectively forming a single non-self-determined motivation factor. The fit of this model was significantly worse than the original six-factor BRSQ-6 model: $\Delta\chi^2(3) = 624.89, p < .001, \Delta CFI = -.04$. In the fourth model, covariances for identified regulation, integrated regulation, and intrinsic motivation were fixed to 1.0, effectively forming a single autonomous motivation factor. The fit of this model was also significantly worse than the original BRSQ-6 model: $\Delta\chi^2(3) = 740.87, p < .001, \Delta CFI = -.05$. In summary, these four additional analyses indicated that the originally hypothesized six-factor first-order CFA model fit the data better than any of the models that specified factor merging and therefore provided additional validity evidence for the factor structure of the BRSQ-6 scores.²

Discussion

The purpose of Study 2 was to examine the reliability and validity of scores derived from the two BRSQ versions. Confirmatory factor analyses of the BRSQ-8 verified the acceptable model fit found in Study 1. Analyses of the BRSQ-6 data indicated that a six-factor model fit the data well and was superior to alternative models which specified factor merging. However, the results did not fully support our SDT-based hypotheses. Indeed, the six factors did not appear to be ordered at six levels along a continuum. Rather, the six factors appeared to represent four levels of self-determined motivation, namely, amotivation, controlled EM, autonomous EM, and IM.

Study 3

In Studies 1 and 2, we examined the reliability and validity of BRSQ scores gathered from samples of elite athletes. Results largely supported the psychometric properties of the questionnaire in this population. However, we intended the questionnaire to be employed as a measure of behavioral regulations among all competitive sportspeople, not just those at the elite level. Therefore, our first objective for Study 3 was to examine the reliability and validity of the BRSQ scores in a nonelite sample of athletes.

Our second objective was to further investigate the nomological validity of the BRSQ scores by examining correlations with scores derived from measures of hypothesized motivational consequences. We chose to examine correlations with scores derived from measures of athlete burnout (Raedeke & Smith, 2001) and flow (Jackson & Eklund, 2002) because researchers employing a SDT perspective (e.g., Kowal & Fortier, 1999; Lemyre et al., 2006) have considered these constructs to be important motivational consequences. In addition, there is substantial evidence indicating that commonly employed measures of flow and athlete burnout produce valid scores (e.g., Jackson & Eklund, 2002; Raedeke & Smith, 2001)—a key issue in any attempt to examine the nomological validity of a new scale such as the BRSQ (Crocker & Algina, 1986).

Deci (2002, p. 50) suggested that “autonomous and controlled motivation are differentially associated with effective functioning and well-being.” Thus, we predicted that amotivation and non-self-determined (i.e., controlled) EM scores would be negatively related to flow and positively correlated with athlete burnout scores. We also hypothesized that IM and self-determined (i.e., autonomous) EM scores would be positively correlated with flow and negatively related to athlete burnout scores. Scores derived from measures of motivational constructs closer to the ends of the self-determination continuum were expected to show stronger relationships with the motivational consequence scores (e.g., Wilson et al., 2002). For example, the magnitude of correlations between burnout and external regulation scores was expected to be greater than those between burnout and introjected regulations scores.

Our final objective was to directly compare the psychometric properties of the BRSQ, the original SMS (Pelletier et al., 1995), and the SMS-6 (Mallett et al., 2007). We accomplished this goal by collecting data using all three sport motivation questionnaires from the same participants and then comparing Cronbach's alpha coefficients (reliability), CFA results (factorial validity), interfactor correlations (nomological validity), and correlations with scores derived from measures of motivational consequences (nomological validity).

Method

Participants and Procedure

Sport participants ($N = 386$) who were also undergraduate students at a New Zealand university volunteered to participate following a lecture. Students who had only participated at a social/recreational level of sport ($n = 53$) or who competed at an elite level (senior national representative, $n = 17$) were excluded. The remaining participants ($n = 316$, mean age = 19.4, age range = 17–43 years, 173 female, 141 male, 2 participants did not report their gender) included athletes from 38 different sports (mean participation time per week = 9.45 hr, $SD = 5.30$ hr).

Measures

One item from the BRSQ's IM-accomplishment subscale employed in Study 2 was modified from "because I enjoy the feeling of success when I achieve something important" to "because I enjoy the feeling of success when I am working towards achieving something important." We made this change to ensure that participants focused on enjoyment of the process itself, rather than the product of the process. In addition to the BRSQ, participants completed the SMS with all original instructions and items. The eight items that Mallett, Kawabata, Newcombe, Otero-Forero, et al. (2007) developed for the SMS-6 were interspersed within the original SMS items.

Participants also responded to the 15-item Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001). The ABQ includes three subscales whose scores can be summed to obtain a total burnout score (e.g., Lemyre et al., 2006). Participants responded to all ABQ items using a 5-point Likert rating scale ranging from 1 = *Almost never* to 5 = *Almost always*. Raedeke and Smith (2001) provided strong initial validity evidence and subsequent studies (e.g., Lemyre et al., 2006) have supported the internal consistency of the subscale scores. Finally, participants completed the Dispositional Flow Scale-2 (DFS-2; Jackson & Eklund, 2002), which is intended to measure the frequency of flow experiences. The DFS-2 has nine subscales with four items each and utilizes 5-point Likert scales (1 = *never*, 5 = *always*). Subscale scores can be summed to obtain a global flow score (Jackson & Eklund, 2002). In previous investigations, the DFS-2 scores have demonstrated adequate reliability and factorial validity (e.g., Jackson & Eklund, 2002).

Results

All of the SMS items and all but one of the BRSQ items produced scores which were univariately normally distributed (skewness, <2 ; kurtosis, <7). However, inspection of Mardia's multivariate statistics indicated that the data were multivariately non-normal (contact the first author for complete details). We therefore employed ML estimation with a Satorra–Bentler correction to the χ^2 statistic and standard errors. No multivariate outliers were identified ($p < .001$). Inspection of the alpha coefficients indicated that the BRSQ and original SMS produced scores with acceptable internal consistency (see Tables 3, 4, and 5). Identified regulation scores from the SMS-6 ($\alpha = .66$) were somewhat lower than those derived from the other subscales.

Factorial Validity

The BRSQ and SMS models were non-nested and derived from different datasets. Therefore, it was not possible to directly compare the fit of the models. However, according to the approximate fit indices (Table 6), all four BRSQ and SMS models fit the data well (RMSEA $< .08$, CFI $> .95$, TLI $> .95$).

Examination of the factor correlations indicated that in the SMS-6 model the 95% CI of the point estimate ($\Phi = .99$ – 1.11) for the correlation between the identified and integrated regulation factor scores encompassed unity. Problems with the discriminant validity of the identified and integrated regulation factor scores were also reported by Mallett, Kawabata, Newcombe, Otero-Forero, et al. (2007).

To investigate the discriminant validity of the scores from each questionnaire more closely, we conducted factor merging analyses for the BRSQ-6, BRSQ-8, SMS, and SMS-6 in the manner described in Study 2 (i.e., constraining relevant covariance terms to 1.0). The analyses included (a) merging external and introjected regulation factors, (b) merging all non-self-determined motivation factors, (c) merging identified and integrated factors (not including the SMS model which did not include integrated regulation subscale), and (d) merging all autonomous motivation factors. In all analyses, the model with merged factors produced a significantly larger χ^2 statistic than the originally hypothesized model. However, $\Delta\chi^2$ can be overly sensitive to minor changes in model fit, and Cheung and Rensvold (2002) have argued that a value of ΔCFI smaller than or equal to -0.01 indicates that a substantial decrease in fit has not been demonstrated. Four models did not show a ΔCFI that exceeded this criterion. These four models included the BRSQ-6 model in which identified and integrated regulations factors were merged ($\Delta\text{CFI} = -.006$), the SMS model in which external and introjected regulation factors were merged ($\Delta\text{CFI} = -.002$), the SMS-6 model in which external and introjected factors were merged ($\Delta\text{CFI} = -.010$), and the SMS-6 model in which identified and integrated regulation factors were merged ($\Delta\text{CFI} < .001$). In sum, there appeared to be substantial evidence that the identified and integrated factors from the SMS-6 were not empirically distinguishable. The discriminant validity of the identified and integrated factors from the BRSQ, as well as the external and introjected factors from both versions of the SMS, was also not universally supported.³

Table 3 BRSQ Factor Correlations in Study 3

Subscale	AM	EX	IJ	ID	IG	IM-G	IM-K	IM-S	IM-A
Amotivation (AM)	.91								
External Reg. (EX)	.81 (.04)	.91							
Introjected Reg. (IJ)	.76 (.03)	.85 (.03)	.91						
Identified Reg. (ID)	-.25 (.08)	-.16 (.07)	<u>-.03</u> (.08)	.77					
Integrated Reg. (IG)	-.26 (.07)	-.16 (.07)	<u>.00</u> (.07)	.65 (.05)	.76				
IM-General (IM-G)	-.64 (.05)	-.54 (.05)	-.47 (.05)	.42 (.06)	.49 (.06)	.85			
IM-Knowledge (IM-K)	.31 (.07)	-.24 (.07)	-.13 (.07)	.48 (.07)	.52 (.05)	—	.89		
IM-Stimulation (IM-S)	-.42 (.07)	-.39 (.07)	-.21 (.07)	.65 (.06)	.63 (.05)	—	.65 (.05)	.78	
IM-Accomplish (IM-A)	-.34 (.08)	-.30 (.07)	-.16 (.07)	.76 (.05)	.53 (.05)	—	.47 (.06)	.72 (.05)	.83
Mean	2.42	2.57	3.00	5.71	5.55	6.31	5.72	6.23	6.18
SD	1.43	1.50	1.66	.93	.94	.79	1.04	.72	.88

Note. Factor correlations (Φ matrix) with standard errors in parentheses are displayed below the diagonal. Underlined correlations were not significant. All other correlations were significant at $p < 0.05$ level. Cronbach alpha coefficients are displayed in italics on diagonal. Regulations were measured on a 7-point scale.

Table 4 SMS Factor Correlations in Study 3

Subscale	AM	EX	IJ	ID	IM-K	IM-S	IM-A
Amotivation (AM)	.85						
External Reg. (EX)	.49 (.07)	.73					
Introjected Reg. (IJ)	.50 (.06)	.83 (.04)	.77				
Identified Reg. (ID)	<u>-.04</u> (.08)	.56 (.07)	.46 (.07)	.74			
IM-Knowledge (IM-K)	-.27 (.07)	.19 (.07)	<u>.08</u> (.07)	.62 (.06)	.87		
IM-Stimulation (IM-S)	-.36 (.08)	.17 (.07)	<u>.09</u> (.07)	.52 (.07)	.66 (.05)	.84	
IM-Accomplish (IM-A)	-.33 (.07)	.20 (.08)	.15 (.07)	.57 (.06)	.88 (.04)	.82 (.04)	.76
Mean	2.37	4.10	4.16	4.86	5.07	5.54	5.60
SD	1.34	1.22	1.33	1.11	1.16	.93	1.00

Note. Factor correlations (Φ matrix) with standard errors in parentheses are displayed below the diagonal. Underlined correlations were not significant. All other correlations were significant at $p < 0.05$ level. Cronbach alpha coefficients are displayed in italics on diagonal. Regulations were measured on a 7-point scale.

Table 5 SMS-6 Factor Correlations in Study 3

Subscale	AM	EX	IJ	ID	IG	IM-G
Amotivation (AM)	.88					
External Reg. (EX)	.32 (.07)	.73				
Introjected Reg. (IJ)	.45 (.06)	.70 (.05)	.77			
Identified Reg. (ID)	<u>-.09</u> (.08)	.55 (.07)	.47 (.07)	.66		
Integrated Reg. (IG)	-.16 (.08)	.52 (.07)	.50 (.07)	1.05 (.03)	.76	
IM-General (IM-G)	-.44 (.07)	.22 (.07)	<u>.09</u> (.07)	.63 (.06)	.68 (.05)	.81
Mean	2.35	4.10	4.16	5.03	4.89	5.69
SD	1.42	1.24	1.33	1.00	1.11	.94

Note. Factor correlations (Φ matrix) with standard errors in parentheses are displayed below the diagonal. Underlined correlations were not significant. All other correlations were significant at $p < 0.05$ level. Cronbach alpha coefficients are displayed in italics on diagonal. Regulations were measured on a 7-point scale. The reader will note that the correlation between identified and integrated regulation factor scores exceeded the theoretical maximum (1.0). However, the lower bound of 95% CI of this point estimate was below 1.0, and therefore this improper solution was likely due to sampling fluctuation and not a mis-specified model (see Chen, Bollen, Paxton, Curran, & Kirby, 2001, for a more complete discussion of this issue). The correlation indicates that the identified and integrated regulation factors were empirically indistinguishable.

Table 6 Confirmatory Factor Analysis Fit Statistics for the BRSQ-6, BRSQ-8, SMS, and SMS-6 in Study 3

Model	df	Scaled χ^2	RMSEA	RMSEA 90% CI	CFI	TLI
BRSQ-6	237	601.44	.07	.06–.08	.97	.97
BRSQ-8	436	982.15	.06	.06–.07	.97	.97
SMS	329	759.38	.06	.05–.07	.96	.96
SMS-6	237	534.43	.06	.06–.07	.96	.95

Nomological Validity: Interfactor Correlations

The pattern of BRSQ-6 interfactor correlations observed in this nonelite sample was similar to that observed in the elite sample in Study 2. Correlations generally showed a simplex ordering, with scores from factors that were predicted to be closer together on the proposed self-determination continuum generally showing stronger positive correlations than those predicted to be more distal. For example, when compared with introjected regulation scores, external regulation scores showed significantly stronger negative correlations with the integrated regulation and IM factors. However, in line with the results from Study 2, there was no difference between external and introjected regulations scores in terms of their relationships with amotivation and identified regulations. In addition, as found in Study 2, identified and integrated regulation factor scores had similar correlations with the other factors. Despite these similarities within the two EM categories, none of the correlations deviated substantially from the expected pattern. Indeed, none of the

correlations between factors expected to be more distal on the self-determination continuum were stronger than a correlation between factors expected to be closer on the continuum.

Correlations between the tripartite IM factor scores (BRSQ-8) and the amotivation, external regulation, and introjected regulation factor scores conformed to the expected pattern. Contrary to expectations, the correlation between IM-Accomplish and identified regulation scores was stronger than the relationship between IM-Accomplish and integrated regulation scores. IM-Stimulation showed similar correlations with identified and integrated regulation scores. IM-Knowledge also showed similar correlations with both self-determined EM scores.

Correlations among SMS amotivation, identified regulation, and IM factor scores were ordered in the expected pattern. All eight correlations associated with external and introjected regulation scores appeared to be misordered; however, none of these apparent correlational differences were statistically significant.

The SMS-6 factor scores showed problems with respect to the hypothesized simplex ordering of correlations. The SMS-6's external and introjected regulation scores had correlations that deviated from the hypothesized simplex pattern. The two scores had similar relationships with identified and integrated regulation scores, but more worryingly, the correlation between amotivation and introjected regulation scores ($\Phi = .45$) was significantly stronger ($p < .05$) than the correlation between amotivation and external regulation scores ($\Phi = .32$). In addition, the correlation between external regulation and IM scores ($\Phi = .22$) was stronger ($p < .05$) than the relationship between introjected regulation and IM scores ($\Phi = .09$).

In summary, there was some evidence that the BRSQ scores represented four points on a continuum, including amotivation, controlled EM, autonomous EM, and IM. However, there was also some evidence to suggest that, within the controlled EM category, external regulation scores represented less self-determined regulation than the introjected regulation scores. Overall, interfactor correlations associated with the BRSQ scores largely conformed to a simplex structure. There was also some evidence to support the ordering of the SMS scores, but the external and introjected regulation scores were consistently out of simplex order. This problem appeared most serious in the revised version of the questionnaire (SMS-6).

Nomological Validity: Correlations With Athlete Burnout and Flow Scores

Confirmatory factor analyses produced significant χ^2 statistics, but according to the approximate fit indices, both the ABQ (scaled $\chi^2[87, N = 316] = 225.06, p < .01$, RMSEA = .07, RMSEA 90% CI = .06–.08, CFI = .96, TLI = .95) and DFS-2 (scaled $\chi^2[558, N = 316] = 885.07, p < .01$, RMSEA = .04, RMSEA 90% CI = .04–.05, CFI = .97, TLI = .98) scores fit their respective hypothesized models well. Furthermore, global flow ($\alpha = .91$) and total burnout ($\alpha = .82$) scores both demonstrated acceptable internal consistency. These results supported the reliability and validity of scores derived from these questionnaires and their use as measures of motivational consequences in our study.

Correlations between the BRSQ scores and composite scores from the ABQ and DFS-2 are presented in Table 7 (complete results regarding relationships with separate ABQ and DFS-2 subscale scores are available from the first author). As

hypothesized, BRSQ subscale scores intended to represent controlled (i.e., non-self-determined) motivation showed negative correlations with flow scores and positive relationships with burnout scores. Also as expected, BRSQ scores intended to represent autonomous forms of motivation (IM and self-determined EM) had positive relationships with flow scores and negative correlations with burnout scores. In general, correlations with flow and burnout scores were strongest for scores intended to tap regulations closer to the ends of the self-determination continuum. One exception to this clear ordering of correlations was observed; namely, integrated regulation and IM scores showed similar correlations with flow scores.

There was little difference between SMS and SMS-6 scores in terms of their relationships with scores derived from measures of motivational consequences (see Table 7). As hypothesized, scores intended to represent non-self-determined motivation showed positive relationships with athlete burnout scores. The relationships between amotivation and flow scores were negative, whereas correlations between flow and non-self-determined EM scores were not significantly different from zero. Identified regulations scores were not significantly associated with burnout scores, but showed positive relationships with flow scores. As expected, integrated regulation scores (SMS-6 only) and IM scores were positively related to flow scores and had negative correlations with athlete burnout scores.

Regarding the ordering of correlations, the SMS and SMS-6 produced amotivation and IM scores that generally showed the strongest relationships with flow and burnout scores. However, external and introjected regulation scores had similar correlations with flow scores. Furthermore, compared with external regulation, introjected regulation scores showed stronger positive relationships with athlete burnout scores. These results were contrary to the SDT-based hypotheses. The SMS-6 identified and integrated regulation scores also had similar relationships with athlete burnout scores. Finally, integrated regulation and IM scores from the SMS-6 showed similar relationships with flow scores.

Table 7 Correlations Between Scores Derived From Measures of Behavioral Regulations and Hypothesized Consequences in Study 3

Subscale	Flow			Athlete burnout		
	BRSQ	SMS	SMS-6	BRSQ	SMS	SMS-6
Amotivation	-.31	-.38	-.38	.65	.63	.66
External regulation	-.25	<u>-.02</u>	<u>.00</u>	.52	.24	.17
Introjected regulation	-.16	<u>-.07</u>	<u>-.07</u>	.43	.38	.38
Identified regulation	.21	.11*	.15	-.11*	<u>-.03</u>	-.05
Integrated regulation	.36	—	.25	-.23	—	-.10*
IM-General	.36	—	.31	-.50	—	-.28
IM-Accomplish	.37	.32	—	-.32	-.24	—
IM-Knowledge	.28	.28	—	-.29	-.26	—
IM-Stimulation	.37	.31	—	-.37	-.31	—
Mean (<i>SD</i>)		3.63 (.38)			4.13 (.52)	

Note. Underlined correlations were not statistically significant. *Correlation was significant at $p < .05$ (one-tailed). All other correlations were significant at $p < 0.01$ level (one-tailed). Flow and burnout scores measured on 5-point scales.

Discussion

The BRSQ and both versions of the SMS produced scores that appeared internally consistent and fit the hypothesized models well. However, the very high correlation between the identified and integrated regulation factors scores in the SMS-6 cast doubt on the discriminant validity of those scores. More minor, but still noteworthy problems were found concerning the external and introjected factors in the original SMS and the SMS-6 models and in relation to the identified and integrated factors in the BRSQ models.

Interfactor correlations and correlations with burnout and flow scores were ordered in a manner that provided support for a continuum of self-determination underlying the BRSQ scores. However, it was not clear how many distinct levels of self-determination were represented. Some of the interfactor correlations indicated four levels, with only two distinct levels of self-determination associated with the EM scores (i.e., controlled EM and autonomous EM). Examination of other interfactor correlations, as well as the correlations with burnout and flow scores provided evidence that the four EM subscale scores could be ordered at four different levels on the continuum. Further research should be conducted to clarify this issue, but the current results provided general support for the ordering of BRSQ scores.

Hypotheses regarding the ordering of SMS and SMS-6 scores received mixed support in the current study. The most striking problems were observed in relation to the scores intended to represent external and introjected regulation. According to our SDT-based hypotheses, correlations were expected to show that, when compared with external regulation, introjected regulations scores represented more self-determined and more adaptive behavioral regulation. Results did not support these predictions and in some analyses external regulation scores appeared to represent the more self-determined and adaptive form of motivation. These findings call into question the validity of the scores derived from the SMS and SMS-6's external regulation and introjected items.

In summary, the evidence in this study indicated that internal consistency and factorial validity of the BRSQ scores were equal or superior to the SMS and SMS-6 scores. Nomological validity evidence associated with BRSQ scores was superior to that relating to SMS and SMS-6. Clearly, further research is needed before firm conclusions can be reached, but based on the results of this study we judged the psychometric properties of the BRSQ to be superior to those of the SMS or the SMS-6.

Study 4

We conducted a final study to evaluate the test–retest reliability of the BRSQ subscales scores in a sample of adult, competitive athletes. Participants ($N = 34$, mean age = 22.36 years) were male rugby players from three teams competing in a New Zealand amateur club competition (midseason). Players completed the BRSQ before training sessions 7 days apart. A one-week period was appropriate to examine test–retest reliability because true changes in behavioral regulations were likely to be small (or nil) over this period. Therefore, substantial changes in BRSQ scores would have demonstrated a lack of test reliability and not a true change in

motivation. Other researchers have employed a 1-week interval when evaluating the test–retest reliability of scores derived from measures of other relatively stable, motivation-related constructs such as goal orientations (Lane, Nevill, Bowes, & Fox, 2005).

Intraclass coefficients for all subscale scores were acceptable (amotivation = .83, external regulation = .79, introjected regulation = .87, identified regulation = .88, integrated regulation = .90, IM-General = .73, IM-Accomplishment = .86, IM-Knowledge = .80, IM-Stimulation = .90). These results supported the test reliability of the BRSQ subscale scores across a 1-week period.

General Discussion

The studies outlined in this article provided initial evidence regarding the reliability and validity of the BRSQ scores in elite and nonelite athlete populations. The internal consistency of the BRSQ scores received strong support throughout our investigations and an initial study indicated that the test–retest reliability of the scores was acceptable. The factorial validity of the BRSQ scores was also generally supported. The majority of the evidence also supported the nomological validity of the scores. For example, hypotheses concerning the presence of an underlying self-determination continuum were supported as correlations between factors hypothesized to be closer together on the continuum were generally stronger than those further apart. Results of analyses involving measures of hypothesized motivational consequences (flow and burnout; Study 3) also supported the hypotheses as they showed a pattern of correlations that indicated scores intended to represent more self-determined motivation were more adaptive than scores intended to represent less self-determined motivation.

However, further research is needed to clarify whether the BRSQ scores represent four or six levels of self-determined motivation. Most of the evidence indicated that the EM scores were best represented by four separate factors, but there was conflicting evidence regarding the levels of self-determination associated with these factors. For example, some of the nomological validity evidence from Study 3 indicated that, as expected, introjection was more self-determined and adaptive than external regulation. Other analysis indicated that these factors had similar levels of self-determination. Research examining different aspects of introjected regulation could prove particularly interesting. In line with other SDT-based physical activity motivation measures (e.g., Mullan et al., 1997), the items in the BRSQ introjected regulation subscale largely reflected motivation to avoid feelings of guilt and shame. The current subscale contains one approach-motivation item and one item intended to tap motivation to protect one's sense of self-worth. However, future research, employing more approach-oriented items, could be conducted to specifically investigate the extent to which approach-oriented and ego-involving motivation may be more or less self-determined and/or adaptive than the avoidance and guilt-related aspects of introjected regulation.

Further research might also investigate the utility of maintaining separate identified and integrated regulation subscales. With respect to the BRSQ data, these factors did not separate cleanly in Study 3 and had similar relationships with other subscale scores in both Study 2 and 3. These problems were even more serious

with respect to the SMS-6 identified and integrated subscales (Study 3). Although contrary to theoretical predictions, these results were in line with previous research that has included items to measure integrated regulation related to exercise (Li, 1999) and environmental behaviors (Pelletier, Tuson, Green-Demers, Noels, & Beaton, 1998). Items from these nonsport questionnaires and the BRSQ all appear to reflect the key concepts of integrated regulation, including alignment with core values and integration into the individual's sense of self. Thus, the problem may not lie within the items themselves. Instead, some participants in our sample (and in investigations of other life contexts) may not have spent a great deal of time reflecting on their sense of self and core values. If this were the case, it might have been difficult for these individuals to express their views on integrated regulation using a questionnaire format. Perhaps an interactive approach (e.g., an interview) involving clarifying explanations and probing questions could provide more informative data regarding integrated regulations. Research in which BRSQ and interview data are collected from the same sample could provide further insight into the validity of the BRSQ integrated regulation scores. For the time being, we suggest that researchers who deem it important to assess the integrated regulation construct may wish to employ the BRSQ subscale, but should interpret these scores with a degree of caution.

Overall, the results of the four studies outlined in this article are promising and we believe the BRSQ should allow further research to be conducted in areas in which previous SDT-based studies have produced conflicting results. For example, in research utilizing the SMS, athlete burnout and EM have not been consistently related (see Eklund & Cresswell, 2007, for a review), with nonsignificant or modest negative relationships across the autonomous and controlled EM subscales. Results in Study 3 indicated that BRSQ EM scores showed relationships with burnout scores that were in line with hypotheses. However, further research is needed to more fully examine the utility of SDT as theoretical framework for understanding the antecedents of athlete burnout.

Cross-sectional studies are an important step in testing the relationships posited by SDT, but more longitudinal research is needed to more rigorously test the application of the theory to sport (e.g., Pelletier et al., 2001). Longitudinal studies are obviously more time consuming, and therefore costly, but an understanding of changes in the social environment, psychological processes, and consequences is needed if we are to develop the sport motivation knowledge base.

Using the BRSQ

We must emphasize that we designed the BRSQ specifically for use with competitive sport participants. As a result, we do not advocate its use in other physical activity contexts, such as physical education or exercise. We suggest researchers employ questionnaires designed or adapted specifically for those contexts (e.g., Goudas, Biddle, & Fox, 1994; Markland & Tobin, 2004).

We also recommend that researchers should carefully consider which BRSQ IM subscale(s) they include in their studies. Our goal was to develop a measure, not to advocate one theoretical position over another. As such, we decided to create items that reflected both the multidimensional (Vallerand, 1997) and unitary (Deci & Ryan, 1985) conceptualizations of IM. Evidence supported the internal consistency

and factorial validity of the scores derived from the subscales intended to represent the multidimensional conceptualization of IM. Correlations with other BRSQ subscale scores as well as with scores from measures of hypothesized consequences indicated that all three subscales produced scores that represented autonomous regulation. However, when compared with IM-General scores (BRSQ-6), tripartite IM scores were not as strongly related to the motivational consequences scores. We suggest that most researchers will likely only employ the IM-General subscale in their studies, but our inclusion of items that also measure the tripartite IM constructs will allow researchers to choose which conceptualization they believe is most appropriate to their research question or to make direct comparisons between unitary and multifaceted conceptualizations of IM.

Finally, the evidence presented here supports the reliability and validity of the BRSQ scores and we hope that others will employ this new measure as they seek to advance the sport motivation knowledge base. However, scale development is an ongoing process and, therefore, we urge researchers to continue the process of psychometric evaluation of the BRSQ scores and suggest revisions as necessary.

Notes

1. We included 13 original or slightly modified SMS items in our initial pool of 80 items. We eliminated 6 of these 13 items because the expert reviewers judged them to be conceptually ambiguous or not clearly worded. We removed four more items owing to low or cross-loading identified during the CFAs in Study 1 or 2. The final BRSQ-8 contained three SMS items; the BRSQ-6 had one SMS item.
2. We also tested second-order CFA models in which a higher order controlled motivation factor predicted external and introjected regulation factors and a higher-order autonomous motivation factor predicted IM and the self-determined EM factors. The fit of these models was acceptable ($RMSEA < .08$, CFI and TLI $> .95$) and there were small–moderate negative correlations between the two higher-order factors. Results were similar in the elite (Study 2) and nonelite samples (Study 3) for the BRSQ-6 and BRSQ-8 models. These results indicated that there was a basic distinction between autonomous and controlled motivation scores and provided further support for the factorial validity of the BRSQ scores. Contact the first author for details.
3. We also tested the gender invariance of the BRSQ-6 and BRSQ-8 factorial models. We collapsed the data collected in Study 2 (elite athletes) and Study 3 (nonelite athletes). The models fit the data adequately in the male ($n = 301$) and female ($n = 356$) samples. We then tested the fit of a multigroup baseline CFA model in which no constraints were place on the parameter estimates followed by progressively more constrained models (loadings, variances, covariances, error terms, and intercepts). BRSQ models were invariant across genders as we found no substantial decrease in fit (maximum $\Delta CFI = .006$). Contact the first author for details.

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Appendix

Sport Motivation Scale	Behavioral Regulation in Sport Questionnaire
Stem: I practice my sport . . . Anchors: 1 = <i>does not correspond at all</i>, 4 = <i>corresponds moderately</i>, 7 = <i>corresponds exactly</i>	Stem: I participate in my sport . . . Anchors: 1 = <i>Not at all true</i>, 4 = <i>Somewhat true</i>, 7 = <i>Very True</i>
IM-General (SMS-6 and BRSQ only)	
Because I feel a lot of personal satisfaction while mastering certain difficult training techniques (from SMS Intrinsic Motivation to Accomplish Subscale).	because I enjoy it.
For the excitement I feel when I am really involved in the activity (from SMS Intrinsic Motivation to Experience Stimulation).	because I like it.
For the satisfaction I experience while I am perfecting my abilities (from SMS Intrinsic Motivation to Accomplish Subscale).	because it's fun.
For the pleasure of discovering new performance strategies (from SMS Intrinsic Motivation to Know subscale).	because I find it pleasurable.
Intrinsic Motivation to Know	
For the pleasure it gives me to know more about the sport I practice.	for the pleasure it gives me to know more about my sport.
For the pleasure of discovering new training techniques.	because I like learning how to apply new techniques.
For the pleasure I feel while learning training techniques I have never tried before.	because I enjoy learning new techniques.
For the pleasure of discovering new performance strategies.	I enjoy learning something new about my sport.
Intrinsic Motivation to Experience Stimulation	
For the pleasure I feel in living exciting experiences.	because I love the extreme highs that I feel during sport.
For the excitement I feel when I am really involved in the activity.	because of the excitement I feel when I am really involved in the activity.
For the intense emotions I feel while I am doing a sport that I like.	because of the pleasure I experience when I feel completely absorbed in my sport.
Because I like the feeling of being totally immersed in the activity.	because of the positive feelings that I experience while playing my sport.

(continued)

Appendix continued

Sport Motivation Scale	Behavioral Regulation in Sport Questionnaire
Intrinsic Motivation to Accomplish Because I feel a lot of personal satisfaction while mastering certain difficult training techniques. For the pleasure I feel while improving some of my weak points. For the satisfaction I experiences while perfecting my athletic abilities. For the pleasure I feel while executing certain difficult movements.	 because I enjoy the feeling of achievement when trying to reach long-term goals. because I enjoy the feeling of success when I am working toward something important. because I enjoy doing something to the best of my ability. because I get a sense of accomplishment when I strive to achieve my goals.
Integrated Regulation (SMS-6 and BRSQ only)	
Because it is an extension of me. Because participation in my sport is consistent with my deepest principles. Because participation in my sport is an integral part of my life. Because it is part of the way in which I've chosen to live my life.	because it's a part of who I am. because its an opportunity to just be who I am. because what I do in sport is an expression of who I am. because it allows me to live in a way that is true to my values.
Identified Regulation	
Because, in my opinion, it is one of the best ways to meet people. (SMS only) Because training hard will improve my performance. (SMS-6 only) Because it is one of the best ways I have chosen to develop other aspects of myself. Because it is a good way to learn lots of things which could be useful to me in other areas of my life. Because it is one of the best ways to maintain good relationships with my friends.	because the benefits of sport are important to me. because it teaches me self-discipline because I value the benefits of my sport. because it is a good way to learn things which could be useful to me in my life.

Introjected Regulation

Because it is absolutely necessary to do sports if one wants to be in shape.	because I would feel ashamed if I quit.
Because I must do sports to feel good about myself.	because I would feel like a failure if I quit.
Because I would feel bad if I was not taking time to do it.	because I feel obligated to continue.
Because I must do sports regularly.	because I would feel guilty if I quit.

External Regulation

Because it allows me to be well regarded by people I know.	because if I don't other people will not be pleased with me.
For the socio-economic benefits of being an athlete. (SMS-6 only)	because I feel pressure from other people to play.
For the prestige of being an athlete.	because people push me to play.
Because people around me think it is important to be in shape. (SMS only)	to satisfy people who want me to play.
To show others how good I am at my sport.	

Amotivation

I used to have good reasons for doing sports, but now I am asking myself if I should continue doing it. (SMS only)	but I wonder what's the point.
I often ask myself; I can't seem to achieve the goals I set for myself. (SMS only)	but I question why I continue.
I don't seem to be enjoying my sport as much as I previously did. (SMS-6 only)	but the reasons why are not clear to me anymore.
I don't know if I want to continue to invest my time and effort as much in my sport anymore. (SMS-6 only)	but I question why I am putting myself through this.
I don't know anymore; I have the impression that I am incapable of succeeding at this sport.	
It is not clear to me anymore; I don't really think my place is in sport.	

Note. Please contact the first author to obtain complete instructions for the BRSQ.