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Validation of the revised sport motivation scale (SMS-II)

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ABSTRACT

Objectives: Although the Sport Motivation Scale (SMS), published in 1995, has demonstrated validity and reliability in multiple studies, the scale has received some criticisms leading to revisions herein described. The objective of the present studies was to examine the construct validity and reliability of a revised scale sport motivation scale (SMS-II).
Design: Two studies were conducted using distinct samples of athletes. Study 1 examined adult athletes participating in a variety of sports and Study 2 examined youth basketball players and swimmers.
Method: In Study 1 the SMS-II was introduced and featured various item content changes, a reduced number of items per subscale, the addition of an integrated regulation subscale, and the introduction of a single intrinsic motivation subscale to replace the three intrinsic motivation subscales in the SMS. Relations of SMS-II subscales with each other and with expected outcomes supported the new scale's validity. In Study 2, the structure of the SMS-II and its relations with outcomes were further examined.
Results: Results of factor analyses, tests for internal consistency, and correlations among the different subscales and between the subscales and several outcomes of interest, supported the validity of the SMS-II.
Conclusions: Discussion focuses on the need for measurement improvement, and potential future directions for SMS-II research.

Regular play and practice of sport activities is associated with a number of positive outcomes, including increased fitness, increased vitality, increased self-esteem, and reduced serious illness (Bouchard, Blair, & Haskell, 2007; Pelletier, Vallerand, & Sarrazin, 2007). Although most people are aware, to some extent, of the positive outcomes associated with sport activity, many people discontinue their sport participation every year (Sarrazin, Boiché, & Pelletier, 2007). Accordingly, a significant amount of research has been conducted on motivation in sport for the purpose of understanding why some athletes show an enduring desire to pursue their sport, whereas others quit or lose interest.

In the view of *Self-Determination Theory* (SDT), motivation for sport is a complex phenomenon, with most athletes having multiple motives for engagement. Athletes can be motivated by external factors such as rewards, evaluations, pressure from parents or coaches, or by opinions they believe others may have of them (Ryan & Deci, 2007). They can also be moved by interest, curiosity, and a desire for mastery and improvement. SDT provides a comprehensive framework for understanding both the extrinsic and intrinsic motivations that can maintain sport participation, and how various motives are differently associated with sport engagement and the benefits derived from it (Hagger & Chatzisarantis, 2007; Standage & Ryan, 2012; Vallerand, 2007). Intrinsic motivation refers to doing something because it is inherently interesting or enjoyable, and extrinsic motivation refers to doing something as a mean to an end because it leads to a separable outcome (Deci & Ryan, 2000).

Self-determination theory

SDT is a theory of motivation that is built on the organismic assumption that humans have innate tendencies to move in directions of greater self-regulation, competence, and integration in action. These actualizing and integrative processes are dependent on the support and fulfilment of three basic psychological needs: competence, relatedness, and autonomy (Deci & Ryan,

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1985a). The need for *competence* is supported when individuals have the opportunity to seek challenges, express their capacities, and develop their confidence. *Relatedness* is seen as a sense of belonging with others and the community as a whole. It is achieved through interpersonal connections and reciprocal care with others. Finally, *autonomy* is seen when an individual can act in ways that are congruent with his or her own interests and values. When autonomous, the person's behaviour is an authentic expression of the self, and is experienced as volitional (Deci & Ryan, 2002; Ryan & Deci, 2007).

SDT proposes that when the three basic needs are met, individuals will naturally internalize and integrate ongoing behavioural regulations (Ryan, 1995). That is, to the degree that individuals experience support and satisfaction for autonomy, competence, and relatedness within a given domain or activity, the more likely they are to internalize and take responsibility and ownership for actions. Within SDT, internalization is viewed in terms of a continuum of relative autonomy, and the degree to which behaviours are internalized is represented by increasing levels of autonomy and self-determination of an individual's motivation (Ryan & Connell, 1989; Vallerand, 1997).

At one end of this continuum the least self-determined type of motivation is *amotivation*, which consists of non-regulation and a lack of intention to act (Deci & Ryan, 2002). Deci and Ryan describe varied types of extrinsic motivation (1985b, 2000). From the least self-determined to the most self-determined these are: external, introjected, identified, and integrated regulations. *External regulation* refers to instances where externally controlled rewards or punishments direct behaviour. *Introjected regulation* marks actions driven by an attempt to feel worthy and/or by guilt and shame avoidance. Although internally driven, introjection is still characterized by a controlled form of motivation and thus a low sense of self-determination. In *identified regulation* one's behaviour is experienced as personally important and worthwhile. This type of regulation is thus accompanied by high levels of perceived autonomy, and a sense of personal commitment and engagement. The final regulation type of extrinsic motivation is *integrated regulation*. It is the most autonomous form and occurs when the behaviour is not only seen as valued, but also as congruent with the individual's other life goals, objectives, and needs. Finally, there is *intrinsic motivation*, which is also very highly self-determined, where the motivation for acting derives from satisfactions found in the behaviour itself (Deci & Ryan, 2002).

The more autonomous types of motivation (i.e., identified, integrated and intrinsic) have been associated with a number of positive outcomes. Individuals who are autonomously regulating their behaviour are more likely to experience task involvement over ego involvement (Ryan & Deci, 2000), intrinsic goals and objectives (Sheldon, Ryan, Deci, & Kasser, 2004), approach instead of avoidance orientations (Nien & Duda, 2009), and more frequent instances of well-being (Deci & Ryan, 2008).

Self-determination theory and sport motivation

A large number of studies incorporating the SDT framework in the sport domain have confirmed that SDT is appropriate for understanding and promoting optimal motivation in sport (Vallerand, 2007). More specifically, research has demonstrated that autonomous motivation predicts long-time commitment (e.g., Pelletier, Fortier, Vallerand, & Brière, 2001) and greater interest (Brière, Vallerand, Blais, & Pelletier, 1995). The fulfilment of the three basic needs in sport has also been examined and results have shown that need satisfaction is associated with increased subjective vitality, sport satisfaction, and an absence of aversive physical symptoms in both young adults (Reinboth, Duda, & Ntoumanis, 2004) and adults (Adie, Duda, & Ntoumanis, 2008; Brière et al., 1995; Pelletier et al., 2001). In contrast, thwarting of basic needs leads to less self-determined motivation and more negative outcomes (Bartholomew, Ntoumanis, Ryan, Bosch, & Thogersen-Ntoumani, 2011). In sum, these findings support that fulfilment of the basic psychological needs leads to an increase in the more autonomous forms of motivation, and a substantial amount of research using SDT framework in the sport domain has confirmed that greater relative autonomy yields better sport and personal outcomes.

The sport motivation scale: measuring sport motivation using SDT

Early sport motivation measurement tools did not adequately measure all of the types of motivation as explained by SDT and/or presented weak factor structures (e.g. McAuley, Duncan, & Tammen, 1989; Weiss, Brademeier, & Shewchuck, 1985). In light of the increasing interest in conducting studies on sport-related motivation, a valid multi-dimensional measurement tool, using a sound theoretical base, was needed. Ryan and Connell (1989) proposed that the inter-correlations between the motivation regulatory styles along the SDT continuum formed a quasi-simplex pattern, where adjacent subscales along the continuum had higher positive correlations than subscales further apart. This discovery provided the necessary framework to develop a variety of scales to measure motivation in various life domains such as motivation in romantic relationships (*The Couple Motivation Questionnaire,* Blais, Sabourin, Boucher, & Vallerand, 1990) or academics (*The Academic Motivation Scale,* Vallerand et al., 1993). Using this framework, a measure was developed to assess sport motivation, called the Sport Motivation Scale (SMS).

The original version of the SMS was created in both French and English concurrently and were called the "*Echelle de Motivation dans les Sports*" (Brière et al., 1995) and *the* "*Sport Motivation Scale*" (Pelletier et al., 1995). Both versions went through an extensive validation process where the French version of the scale was administered to a group of over 500 university athletes, representing a variety of sports (Brière et al., 1995). The English version of the scale was validated through two studies using over 600 English-speaking athletes (Pelletier et al.., 1995). Exploratory factor analyses performed on both scales revealed a seven-factor solution, where each factor had four items, for a total of 28 items. The 7-factor structure was supported through confirmatory factor analysis, the reliability of the subscales was above the accepted limit, and the subscales correlated with various sport outcomes as expected according to SDT. The seven factors measured three types of intrinsic motivation (IM to know, IM to experience stimulation, IM to accomplish), three of the four types of extrinsic regulation (external regulation, introjected regulation, and identified regulation), and amotivation. Like many of the scales developed at this time, the French and English versions of the SMS did not include a measure of integrated regulation.

Validation and application of the sport motivation scale

The utility of the SMS was further confirmed through a number of follow-up studies. Li and Harmer (1996) conducted a formal test of the SMS simplex pattern through structural equation modelling, where the simplex structure was tested against the self-determination continuum and the data matrix. The results confirmed the presence of simplex ordering between the SMS subscales. In addition, follow-up studies were conducted using different English and French-speaking athlete populations and the overall results provided support for the construct reliability and

validity of the scale (e.g., Jackson, Ford, Kimiecik, & Marsh, 1998). The scale was also translated and validated in multiple languages (e.g., *Bulgarian*, Chantal, Guay, & Dobreva Martinova, 1996; *Spanish*, Nuñez, Albo, Navarro, & Gonzalèz, 2006). The scale was also tested with different populations to confirm that the SMS was an appropriate measure for male and female participants (Li & Harmer, 1996), participants of different sexual orientations (Zamboni, Crawford, & Carrico, 2008), participants who practice team or individual sports (Pelletier et al., 2007), and, on an adapted version of the scale, for children (Zahariadis, Tsorbatzoudis, & Grouis, 2005). Results consistently supported that the scale maintained its internal consistency, construct validity, and simplex-like pattern across multiple samples (Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003). Finally, a meta-analysis comparing the SMS subscale correlation coefficients, from 21 studies, provided support for the construct reliability and validity of the scale (e.g., Jackson et al., 1998).

Researchers have investigated many antecedents and outcomes of sport motivation using the SMS. Results have shown that the SMS can predict persistence in sport training (Pelletier et al., 2001), practice frequency (Alexandris, Tsorbatzoudis, & Grouios, 2002), and the likelihood of participating in physical activity (Standage, Duda, & Ntoumanis, 2003). The more autonomous forms of motivation have been found to predict positive outcomes like self-esteem (Zamboni et al., 2008), positive emotions (Pelletier et al., 1995), vitality and well-being (Gagné, Ryan, & Bargmann, 2003), coping strategies (Amiot, Gaudreau, & Blanchard, 2004), sportsmanship (Ntoumanis & Standage, 2009; Vallerand & Losier, 1994), and task versus ego orientations in achievement goals (Brunel, 1999). The non-autonomous subscales have also been used to predict burnout (Cresswell & Eklund, 2005), exercise dependence (Hamer, Karageorgis, & Vlachopoulus, 2002), and fear of failing (Conroy, 2004), as well as to explain the motivational determinants of dropout in competitive athletes (Pelletier et al., 2001). In a study using cluster analysis, the SMS was used to describe the situational motivation profiles of athletes (Gillet, Berjot, & Paty, 2009; Gillet, Vallerand, & Rosnet, 2009).

The SMS has thus been widely used and it has had a significant impact on the measurement, prediction, and understanding of sport motivation. SMS-related studies have supported the utility of SDT's multi-dimension approach to sport motivation (Deci & Ryan, 2002; Ryan & Deci, 2007), they have addressed important questions pertaining to sport participation and the consequences of athletic engagement, and they have provided evidence that more autonomous forms of motivation has important implications for athletes' health and well-being.

Criticisms of the SMS

In recent years, a number of researchers have questioned the psychometric properties of the SMS. Mallett, Kawabata, Newcombe, Otero-Forero, and Jackson (2007) suggested that the scale be revisited to include a measure of integrated regulation, as without this measure, the scale did not represent all the constructs in the SDT framework. In addition, with support from a study where the confirmatory factor analysis yielded lower fit indices for the SMS subscales (Martens & Webber, 2002), Mallet et al. argued that certain items should be removed from the scale and that the intrinsic subscales should be combined into one measure. As part of their criticism, they proposed a revised version of the scaled entitled the SMS-6 (Mallet et al., 2007).

Pelletier et al. (2007) confirmed that the literature supports the fundamental structure of the scale across the majority of samples, but acknowledged variable results in some specific studies. They concluded that the variability was the result of sample differences and the psychometric properties of some of the items. Yet they also suggested that the proposed replacement items suggested by Mallet et al. (2007) in the SMS-6 might have problems of their own. Mainly, insufficient information was reported about the new items, and there were questions of external validity. Also, some of the items added as part of the proposed integrated subscale were taken from other SDT-based motivation scales (e.g., *Motivation Towards the Environment Scale*; Pelletier, Tuson, & Green-Demers, 1998) and simply modified to be applicable to sport. These proposed items did fit reasonably well; however, some overlapped with the items measuring identified and intrinsic regulation.

Lonsdale, Hodge, and Rose (2008) developed the Behavioural Regulation in Sport Questionnaire (BRSQ) as an alternative measure of sport motivation as conceptualized by SDT. In contrast to Mallett et al. (2007), these authors used a complete new set of items. The authors proposed two versions of the BRSQ; the BRSQ-8 assesses integrated, identified, introjected, and external regulation; amotivation; and the three forms of intrinsic motivation (knowledge, experience stimulation, and accomplishment as proposed initially by Pelletier et al., 1995); and the BRSQ-6 that contains the same items but assesses general intrinsic motivation rather than all three types of intrinsic motivation. Overall, the results of four studies showed that their scale had good factorial validity, good 1 week test–retest reliability, and their subscales had all good internal consistency. However the construct validity, that was assessed by testing for a simplex pattern of correlations among the six subscales and by assessing the relationships between the BRSQ-6 and indexes of burnout and flow showed some inconsistencies. Overall, although results showed support for the distinctions between the self-determined subscales (intrinsic motivation and identified and integrated regulation) and the non-self-determined subscales (external and introjected regulation), the finer discrimination within each type of category appears to be lacking. More specifically, while some relationships were in line with the simplex pattern, there was a lack of discrimination between external and introjected regulation scores in terms of their relationships with amotivation; identified and integrated regulation subscales both had similar high correlations with intrinsic motivation; and there was a lack of discrimination between the self-determined subscales (intrinsic motivation and identified and integrated regulation) and the concepts of flow and burnout. In sum, although the BRSQ appears to assess the SDT constructs, it does not appear to discriminate among the subscales assessing the self-determined forms of motivation and among the subscales assessing the non self-determined forms of motivation.

Future directions of the SMS

Although it was decided not to implement any of the specific item changes recommended by Mallet et al. in the SMS-6 (2007) and by Lonsdale et al. in the BRSQ (2008), it was recognized that some of their concerns were legitimate and should be addressed. In 2008 and 2009, several exchanges between Pelletier, Ryan, and Vallerand led to an initial review of the SMS. Overall, these researchers came to the conclusion that many of the items were potentially wrongly classified, some conflated goal contents and goal regulations (Sheldon et al., 2004), and some were not clear enough. In 2010, fifteen years after the SMS's original publication, a panel of SDT and sport motivation experts (Deci, Pelletier, Vallerand, & Ryan) reviewed the structure of the scale and the face validity of all the items. It was agreed that some items did not fit the theoretical constructs as defined by SDT as adequately as they could. These items were identified for removal and a series of replacement items were created. Since the time of the initial scale publications, research in SDT has evolved substantially and it was agreed that an integration subscale should be included in the

revised version, as it has been done for the Client Motivation for Therapy Scale (Pelletier, Tuson, & Haddad, 1997) and the Global Motivation Scale (Pelletier & Dion, 2007). Next, although no problems have been reported with the 3 types of intrinsic motivation, the panel of experts concluded that the 12 items measuring the different types of intrinsic motivation made the scale less practical to administer and that not all researchers may have an interest for the 3 types of intrinsic motivation. Thus, the panel reviewed the intrinsic motivation subscales and suggested that one measure of intrinsic motivation might be appropriate but that the 12 items measuring the 3 types of intrinsic motivation of the original SMS could be retained and then used by the researchers interested by the role that different forms of intrinsic motivation could play in the regulation of sport behaviour. As a result, several items measuring general intrinsic motivation were created. Overall, the panel of experts concluded that even though years of research has shown that the original version of the scale has made significant contributions, it would be useful to increase the scale's performance by improving its structure and modifying some items.

Present studies

The objective of the present studies is to create and validate a revised version of the SMS. In Study 1, we focus on the formulation of the revised scale (SMS-II), including the justification of adding the integrated subscale and the creation of one measure of intrinsic motivation. In addition, we seek to reduce the number of items per subscale to three with the objective of reducing the overall length of the scale and facilitating its future administration. Finally, we examine the structure of the SMS-II, as well as examine the relations of its subscales with expected outcomes as explained by SDT. In Study 2, we confirm the validity of the structure of the SMS-II and its relation with outcomes with a separate, distinct sample of athletes.

Regarding support for the simplex pattern, the construct validity, the concurrent and, nomological validity, the reliability, and the correlations with different outcomes examined in Study 1, it is anticipated that the SMS-II will demonstrate strong construct validity, validity to discriminate, and reliability, as well as better support for the relative autonomy continuum. It is also expected that the integrated subscale of the SMS-II will represent a distinct construct from identified regulation and intrinsic motivation and that it will be associated with higher positive outcomes as suggested by SDT.

Study 1

Participants

A sample of 412 Canadian adult athletes (218 female; 104 males; 90 athletes did not indicate their gender) with a mean age of 40.44 (SD = 13.66), representing a variety of sports (e.g., basketball, figure skating, hockey, soccer, running, swimming, etc.), participated in the present study. Participants were actively training for their sport and were recruited through word of mouth, advertisements within sporting communities, and postings on web forums. Their sport experience ranged from 3 to 55 years ($M = 12.45$) and the majority ($n = 365$) trained a minimum of 5 times per week. Participants' competed at the local ($n = 218$), provincial ($n = 53$), national ($n = 64$), and international ($n = 77$) levels.

Procedure

Participants completed an on-line questionnaire entitled "*Sport Motivation*". The study was advertised as an anonymous questionnaire about goals, motivation sources, and energy levels for adult athletes. The questionnaire assessed participants' sport motivation (i.e., the original SMS and several new items), as well as global motivation, task and ego orientation towards sport, general sport information, satisfaction with life, well-being, and demographical information. Before beginning the questionnaire, participants read the consent form where they were informed of their ethical rights, reminded they were not obliged to respond to any of the questions if they did not feel comfortable, and told they could terminate their participation in the study at any point.

Measures

The following instruments were used. The majority of participants ($n = 326$) completed a full version of the questionnaire, while the remaining participants completed a modified version (sport assessment and sport motivation scale only).

Sport assessment

These questions were developed for the purposes of this study to gauge participants' involvement in their sport. Participants were required to respond to questions regarding the length of time they have been practicing their sport, their training frequency, their level of involvement, and the financial implications of their sport, among other sport demographic-type questions.

Sport motivation scale (SMS; Pelletier et al., 1995)

The scale was designed to assess individuals' level of motivation towards sport, using the self-determination theory framework. Participants reported the extent to which the listed reasons for practicing their sport corresponded with their own personal reasons. Participants' motivation was assessed using a 7-point Likert scale ranging from 1 (*Does not correspond at all*) to 7 (*Corresponds completely*). The scale consisted of the 28 items measuring seven factors (three types of intrinsic motivation, four types of extrinsic motivation, and amotivation). For the purpose of the present study, the scale that was presented to participants also included 25 new items that were formulated by experts to replace the items identified as problematic in the original version of the SMS, and to assess integrated regulation with a new subscale (the original SMS items and the new items appear in Appendix 1).

Global motivation scale (GMS; Pelletier & Dion, 2007)

The scale is designed to assess individuals' enduring differences in global regulatory orientations under the self-determination theory framework. Participants are asked to indicate the reasons why they generally do different things. The responses range from 1 (*Not at all agree*) to 7 (*Completely agree*). There are three items per subscale and participants' scores are calculated by computing a mean score for each subscale. Participants' GMS scores have been used to predict a number of outcomes including emotion control, exercise behaviours, and eating behaviours (Pelletier & Dion, 2007; Pelletier, Dion, & Séguin-Lévesque, 2004; Pelletier, Dion, Slovinec-D'Angelo, & Reid 2004; Slovinec D'Angelo, Reid, & Pelletier, 2007). Original validation studies reported that the scale had satisfactory internal consistency ($\alpha > 0.73$).

Task and ego orientation in sport questionnaire (TEOSQ; Chi & Duda, 1995; Duda, 1989)

The TEOSQ is a 13-item questionnaire designed to measure task and ego orientation towards sport. Participants are asked to indicate, using a 7-point Likert scale, the extent to which they agree with statements about their success in sport. Participants' scores are calculated for each orientation and they receive a score between 1 (*Low*) and 7 (*High*) for task and ego orientation.

Satisfaction with life scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985)

This instrument was designed to measure life satisfaction, a construct of subjective well-being. The questionnaire consists of five items that assess how individuals see their lives currently. The scale was modified slightly for this study as participants responded using a 7-point Likert scale, instead of a 5-point one, and response options ranged from 1 (*Not at all agree*) to 7 (*Completely agree*).

Subjective vitality scale (SV; Ryan & Frederick, 1997)

This instrument was designed to assess feelings of aliveness, alertness, and energy available to the self. Participants rated their agreement with the 9 items on a 7-point Likert scale ranging from 1 (*Not at all true*) to 7 (*Very true*). Participants' scores are obtained by reversing the negatively phrased items and computing the average of all scores.

Statistical analyses

The sample of participants was split into two groups using a random number generator. *Group 1* ($n = 206$) was used to determine the structure of the revised scale (SMS-II) through exploratory factor analysis and *Group 2* ($n = 206$) was used to examine the structure of the SMS-II through confirmatory factor analyses. In a first step, the exploratory and confirmatory factor analyses were performed only to examine the structural validity of the SMS-II because several studies have already establish the factorial validity of the different subscales of the original SMS. However, because we propose that several items may not represent adequately the different subscales as suggested by SDT, in a second step, we examine construct validity and the reliability of both the SMS and the SMS-II. Both *Group 1* and *Group 2* were combined to perform multigroup analysis for gender and age, and all participants were used to compare the SMS-II and SMS for their subscale reliability, simplex pattern, and correlations with expected outcomes as explained by SDT.

Results

Preliminary analyses

Before conducting the hypothesis testing, the data was cleaned and screened for missing data, out-of-range values, outliers, and sample distribution normality. A missing values analysis was conducted on the predictor data, Sport Motivation Scale (SMS) scores, for the data set. The value for Little's MCAR test was significant (chi-square = 3993.84, df = 3657, $p < 0.001$) which means the data cannot be assumed to be missing completely at random (MCAR). The missing values pattern was analyzed and separate variance *t*-tests were conducted to confirm whether any correlations existed among the row and column variables and to compare the means of each group. The results of the separate variance *t*-tests were examined for their significance and, given that the significant *t*-tests represented less than 1% of all tests, the data imputation was conducted using expectation maximization. All values for SMS scores were within their expected theoretical ranges and were screened for univariate outliers. The scores were standardized and data with *Z*-scores below −3.29 and above 3.29 were considered to be outliers. Outlier scores were recoded to the most extreme, but within normal range, value for the identified items (Tabachnick & Fidell, 2013).

SMS variables were examined for normality and variables were considered to be non-normal if their skewness and kurtosis values were greater than the acceptable limit of ±2.00 (Tabachnick & Fidell, 2013). The results indicated that the variables were normally distributed with the exception of the items measuring amotivation. These results were expected given past research has found similar results with the amotivation subscale (Pelletier et al., 1995).

Exploratory factor analysis

The new proposed items and the items from the original scale, with the exception of the items that were identified as problematic and the intrinsic regulation items, were included in the exploratory factor analysis. Through careful examination of the theory, critical evaluation of the item content, elimination of similar items, and analysis of the initial factor loading, the number of items was reduced to 18. The results from *Group 1* supported the use of factor analysis (KMO = 0.828, Bartlett's test of sphericity $p < 0.001$) and revealed six factors with Eigenvalues above the recommended cutoff (Cattell, 1966; Kaiser, 1960) which explained 71.75% of the total variance. The rotated component matrix, using varimax rotation to optimize the differences between factors, was observed to inspect the item loadings. As shown in Table 1, the items loaded

Table 1
Study 1 and 2: factor loadings for exploratory factor analysis with varimax rotation after item reduction and the confirmatory factor analysis (SMS-II).

Scale	EFA	CFA	
	Study 1	Study 1	Study 2
Intrinsic			
Because it gives me pleasure to learn more about my sport.	0.89	0.80	0.85
Because I find it enjoyable to discover new performance strategies.	0.79	0.86	0.85
Because it is very interesting to learn how I can improve.	0.68	0.86	0.77
Integrated			
Because practicing sports reflects the essence of whom I am.	0.75	0.78	0.68
Because participating in sport is an integral part of my life.	0.78	0.73	0.77
Because through sport, I am living in line with my deepest principles.	0.81	0.75	0.79
Identified			
Because I have chosen this sport as a way to develop myself.	0.86	0.78	0.90
Because I found it is a good way to develop aspects of myself that I value.	0.71	0.70	0.75
Because it is one of the best ways I have chosen to develop other aspects of myself.	0.66	0.91	0.63
Introjected			
Because I would feel bad about myself if I did not take the time to do it.	0.84	0.59	0.71
Because I feel better about myself when I do.	0.72	0.62	0.67
Because I would not feel worthwhile if I did not.	0.64	0.68	0.47
External			
Because people I care about would be upset with me if I didn't.	0.73	0.94	0.59
Because I think others would disapprove of me if I did not.	0.83	0.79	0.76
Because people around me reward me when I do.	0.66	0.57	0.74
Amotivated			
I used to have good reasons for doing sports, but now I am asking myself if I should continue.	0.83	0.74	0.95
So that others will praise me for what I do.	0.85	0.76	0.77
It is not clear to me anymore; I don't really think my place is in sport.	0.82	0.74	0.77

cleanly onto the appropriate factors representing intrinsic regulation, integrated regulation, identified regulation, introjected regulation, external regulation, and amotivation, and revealed the structure of an 18-item, 6-factor SMS-II. None of the retained items had a cross loading above 0.30 onto another factor.

Confirmatory factor analysis

Next, the structure of the SMS-II was examined through a confirmatory factor analysis performed in SPSS AMOS 20 (Arbuckle, 2011), using *Group 2* ($n = 206$). The model parameters were estimated using the maximum likelihood function. The factor loadings are summarized in Table 1. The resultant six factor CFA model was significant ($\chi^2(120, N = 206) = 231.88$, $p < 0.001$). The other indices suggested that the fit of the six-factor model to the data was satisfactory to very good: RMSEA = 0.06; RMSEA 90% CI = 0.04–0.06; CFI = 0.94; NFI = 0.90; TLI = 0.92. Item-factor loadings ranged from 0.57 to 0.94. Overall, the analyses support the addition of the integrated regulation subscale and the modifications to the other subscales.

Following the CFA with the second groups we used the full sample ($N = 316$) to examine the fit of a multigroup baseline CFA model for gender (women $N = 212$; men $N = 104$) in which no constraints were placed on the parameters estimates to test the configural invariance. The results indicated that the factor structure of that SMS-II was the same for men as it was for women ($\chi^2(240, N = 316) = 450.25$, $p < 0.001$; RMSEA = 0.05; CFI = 0.92; NFI = 0.84; TLI = 0.90) which suggest that the two groups are equivalent with regards to factor structure. Next, we tested a constrained model to determine the metric invariance of the scale by constraining the loadings for men and women. The results indicated that the change in chi-square between the constrained model and the unconstrained model was not significant ($\chi^2(258, N = 322) = 461.75$, $p < 0.001$; RMSEA = 0.05; CFI = 0.92; NFI = 0.84; TLI = 0.90; $\Delta\chi^2(18) = 11.50$, $p > 0.05$) which means that men and women are invariant with regards to SMS-II factor structure and that we could safely create the composite variables from each factor scores for these two groups.

Finally we used the full sample again to examine the fit of a multigroup baseline CFA model for age by dividing the athletes ($N = 327$; 55 athletes did not provide their age and 30 were exactly 40) in two groups those above 40 ($N = 161$; means = 26.8) and those below 40 ($N = 166$; means = 50.8). No constraints were placed on the parameters estimates to test the configural invariance. The results indicated that the factor structure of that SMS-II was the same for both age groups ($\chi^2(240, N = 327) = 419.27$, $p < 0.001$; RMSEA = 0.05; CFI = 0.93; NFI = 0.86; TLI = 0.91) which suggest that the two groups are equivalent with regards to factor structure. Next, we tested a more constrained model to determine the metric invariance of the scale by constraining the loadings for both groups. The results indicated that the change in chi-square between the constrained model and the unconstrained model was barely significant ($\chi^2(258, N = 327) = 440.82$, $p < 0.001$; RMSEA = 0.05; CFI = 0.93; NFI = 0.85; TLI = 0.91; $\Delta\chi^2(18) = 21.55$, $p = 0.04$). However none of the relative fit indices differed by more than 0.05 across groups, indicating that the difference in fit across groups is negligible (Little, 1997). Thus, although we could safely create the composite variables from each factor scores for these two age groups, we conclude that the model is an equally acceptable, but not identical, fit for both age groups.

Reliability analysis

For the reliability analyses for each subscale, *Group 1* and *2* were combined and the reliability of each subscale was calculated using Cronbach's alpha. The results are summarized in Table 2. The SMS-II yielded good reliability values for all subscales where Cronbach's α greater or equal to 0.70. The reliability for all the new introjected regulation items was analyzed with the objective of confirming whether a different combination of items would yield higher reliability or a specific item was compromising the reliability of the subscale. The reliability for the six proposed introjection items did yield a higher reliability ($\alpha = 0.75$), which is not surprising given the influence of the number of items on alpha levels. The individual items were then analyzed to examine whether a specific item may have been lowering the reliability of the three-item scale, and it was determined that none was detrimental, so the increased reliability from 0.70 to 0.75 was a result of the increased number of items and not the improvement of the eliminated items. As such, the three items initially selected for the introjected subscale of the SMS-II were retained.

Correlational analysis

Composite scores were calculated for each of the subscales and the between-subscale correlations were calculated for both the SMS and the SMS-II to inspect the fit of the simplex pattern. The correlation matrices can be viewed in Table 2. The correlations suggest evidence of a simplex-like pattern that is more consistent for the SMS-II when compared with the SMS as the effect sizes are,

Table 2
Study 1: correlations, means, standard deviations, and reliability scores.

Measure	1	2	3	4	5	6	7	*M*	SD
Original sport motivation scale (SMS)									
1. IM to know	(0.87)	0.79**	0.69**	0.57**	0.24**	0.29**	−0.02	4.52	1.49
2. IM to acc.		(0.83)	0.71**	0.55**	0.24**	0.31**	0.01	5.12	1.30
3. IM exper			(0.81)	0.62**	0.30**	0.32**	−0.06	5.33	1.28
4. Identified				(0.78)	0.32**	0.48**	0.07	4.03	1.40
5. Introjected					(0.73)	0.43**	0.12	4.18	1.39
6. External						(0.81)	0.33**	2.80	1.36
7. Amotivated							(0.86)	1.48	0.77
Revised sport motivation scale (SMS-II)									
1. Intrinsic	(0.88)	0.63**	0.56**	0.26**	0.16**	−0.08		4.72	1.51
2. Integrated		(0.80)	0.59**	0.42**	0.19**	−0.04		4.85	1.49
3. Identified			(0.82)	0.46**	0.24**	−0.03		5.07	1.40
4. Introjected				(0.70)	0.36**	0.16**		4.15	1.33
5. External					(0.74)	0.38**		1.60	0.81
6. Amotivated						(0.81)		1.41	0.76

Note. $n = 412$. $^{**}p < 0.01$ (2-tailed). $^{*}p < 0.05$ (2-tailed). Standardized Cronbach's alpha is between parentheses.

for the most part, stronger between subscales situated closer along the SDT continuum and weaker for the subscales falling further away on the SMS-II relative to the SMS. The new integrated regulation subscale fits cleanly into the simplex pattern as expected.

Outcome comparisons

Next, using the full sample, participants' subscale scores were calculated for the GMS, TEOSQ, SWLS, and Vitality Scale using the score calculation methods outlined by the developers of each scale. The matrix outlining the correlations between the SMS-II subscales and the outcomes is presented in Table 3. It was anticipated that the GMS subscales would yield the strongest correlations with the equivalent subscales on the SMS-II. According to SDT, vitality, satisfaction with life, and task orientations should be highly associated with autonomous forms of motivation. As such, it was expected that those outcomes would have stronger correlations with the autonomous subscales of the SMS-II, and the opposite was expected for ego orientation. The correlations between the SMS-II and the GMS are strong and support a cross-scale simplex pattern. The results show stronger correlations and effect sizes for the situated closely along the scale and lower correlations as we move along the continuum. As expected, ego orientation was more strongly associated with the non self-determined forms of motivation while task orientation was more strongly associated with the self-determined forms of motivation.

When observing the measure of vitality, the SMS-II subscales yielded similar results to those of the SMS and demonstrated a clear change in effect size while moving along the continuum. The correlation coefficient changes direction when we move from amotivated regulation to extrinsic regulation. In the measure of task orientation, the SMS-II and the SMS demonstrated similar results where the autonomous forms of motivation were associated with high effect sizes for task orientation and the non-autonomous forms of motivation were associated with weak to moderate effect sizes for task orientation. Similar results, although with weaker effect sizes, were found for the satisfaction with life scale results.

Discussion

The original Sport Motivation Scale had demonstrated reliability and validity across many studies; however certain elements of the scale could be improved. Mainly, the scale has been criticized for its lack of integrated regulation subscale, for its three measures of intrinsic motivation, and for a few problematic items. The objective of *Study 1* was to formulate a revised scale (the SMS-II) that eliminated problematic items from the original SMS, contained an integrated regulation subscale, combined subscales measuring intrinsic motivation, and was more efficient (i.e., contained fewer items per subscale). The model fit, reliability, simplex pattern, and outcome comparisons of the SMS-II were examined to confirm that the scale performed equally, if not better, than the original SMS.

Scale validation

The exploratory factor analyses results revealed that the pool of items from the original scale and the newly proposed ones could be reduced to 18 items that clearly load onto six distinct factors, as expected given the structure of the scale and as suggested by SDT. The model of this new scale structure provided ample support for the SMS-II, as all of the cut-off requirements for a good model fit were met on all of the fit indices observed. The good fit of the SMS-II may be attributable to the reduction of the three intrinsic regulation subscales into one measure of intrinsic regulation. If those three dimensions were essentially measuring the same underlying factor, then the original scale solution would be influenced by the presence of a dominating factor comprised of 12 items that was responsible for more than half of the variance explained by all 7 factors. In the SMS-II, the items measuring intrinsic motivation have been reduced to one subscale that is responsible for less than 30% of the total variance explained by the entire model. For the integrated regulation construct, the results of the exploratory factor analysis demonstrate that the integrated regulation subscale is measuring a distinct concept that is different from the intrinsic motivation and identified regulation constructs, which provides support for the addition of this new subscale. In sum, the results suggest that the SMS-II has a very good factor structure.

When observing the Cronbach's alpha coefficients for each of the subscales, the SMS-II generates very good coefficients with the exception of the introjected subscale, which is slightly lower, but still at an acceptable level. Even though the number of items per subscale was reduced to three, the reliability did not decrease substantially. It is believed that the increased or maintained reliability, despite having fewer items per subscale, is attributable to the removal of problematic items, as determined by the panel of SDT experts. Importantly, the introjected items include a mix of approach and avoidance measures of introjected regulation within the factor, as these each can play an important motivational role in introjection (Roth, Assor, Kanat-Maymon, & Kaplan, 2007).

Table 3
Study 1: correlations between SMS and SMS-II with outcome measures.

Measure	GMS intrinsic	GMS integrated	GMS identified	GMS Introjected	GMS external	GMS Amotivation	SWLS	Vitality	Ego	Task
Original sport motivation scale (SMS)										
IM to know	0.44**	0.36**	0.40**	0.10	0.20**	0.06	0.17*	0.34**	0.18**	0.64**
IM to accom	0.40**	0.35**	0.43**	0.14*	0.211**	0.09	0.19**	0.26**	0.22**	0.65**
IM exp	0.45**	0.39**	0.41**	0.14*	0.23**	0.09	0.19**	0.34**	0.27**	0.57**
Identified	0.31**	0.41**	0.45**	0.20**	0.35**	0.16**	0.09	0.31**	0.23**	0.42**
Introjected	0.18**	0.33**	0.36*	0.52**	0.33**	0.14*	0.02	0.14*	0.18**	0.18**
External	0.04	0.13*	0.23**	0.43**	0.74**	0.26**	−0.01	0.04	0.55**	0.15**
Amotivated	−0.06	−0.06	0.06	0.35**	0.35*	0.26**	−0.18**	−0.25**	0.21**	−0.06
Revised sport motivation scale (SMS-II)										
Intrinsic	0.40**	0.35**	0.42**	0.11	0.22**	0.09	0.12	0.36**	0.16**	0.61**
Integrated	0.33**	0.64**	0.47**	0.26**	0.24**	0.10	0.25**	0.37**	0.16**	0.43**
Identified	0.38**	0.45**	0.50**	0.18**	0.28**	0.09	0.14*	0.33**	0.15**	0.47**
Introjected	0.14*	0.29*	0.33**	0.52**	0.43**	0.19**	−0.07	0.02	0.27**	0.22**
External	0.01	0.12*	0.15**	0.42**	0.54**	0.24**	0.05	0.04	0.39**	0.09
Amotivated	−0.07	−0.06	0.04	0.31**	0.33**	0.35**	−0.11	−0.21**	0.22**	−0.07

Note. $n = 326$. $^{**}p < 0.01$ (2-tailed). $^{*}p < 0.05$ (2-tailed).

When evaluating the presence and quality of the simplex-like patterns for the SMS-II, the scale performs consistently. Specifically, the effect sizes of the correlations for the SMS-II are more accurately in line with what would be expected in a simplex-like pattern than is the case for the SMS. In general, the SMS-II has a quite good pattern fit for almost all the relations, with the one exception of the integrated regulation subscale that is slightly more correlated with the introjected regulation than the identified regulation with the introjected regulation subscales. All six subscales in the SMS-II clearly demonstrate stronger correlations with the subscales that are situated closely along the continuum and weaker correlations with the items situated further apart. The modifications of the SMS led to the addition of two new items out of three for the identified regulation subscale and three new items for the external regulation subscale. The results suggest now that the two subscales demonstrate greater change in effect size as we move from one subscale to another, which provides clearer support for the SDT continuum. In sum, these observations are most likely the result of the improvement to the factor structure and reliability in the SMS-II.

When the SMS-II subscales are compared to the outcome measurements, the scale performs as expected when the most and least self-determined ends of the scale are compared. The intrinsic and amotivated regulation measures correlate both in strength and direction with the outcomes as anticipated based on the results of previous research comparing the scales to outcome measurements (Pelletier et al., 1998). In sum, in light of the results of *Study 1*, it is possible to confirm that the SMS-II performs as well, if not better, than the original scale, while both improving the item contents and reducing the number of items per subscale. These results thus support the creation of an 18-item scale, namely the SMS-II.

Study 2

The objective of *Study 2* was to replicate the model, reliability, simplex pattern, and outcome correlations found in *Study 1* with an independent sample.

Participants

Compare to Study 1, a younger sample of 290 (177 female) Canadian youth provincial-level basketball players ($n = 140$) and swimmers ($n = 150$) with a mean age of 17.41 (SD = 1.77), participated in the present study. Participants were actively competing in their sport and had a minimum of 3 years of competitive experience, with the average experience at 7.93 years (SD = 2.5).

Procedure

Participants were recruited through their provincial sporting organization and participated in the study during breaks at their respective provincial championships. The study was advertised as an anonymous questionnaire about goals, motivation sources, and energy levels for athletes. The questionnaire assessed participants' sport motivation, global motivation, goals and objectives, task and ego orientation, satisfaction with life, well-being, and perceptions of interpersonal behaviours. Before beginning the questionnaire, participants read the consent form where they were informed of their ethical rights, reminded they were not obliged to respond to any of the questions if they did not feel comfortable, and told they could terminate their participation in the study at any point.

Measures

Participants in this study were assessed using the instruments from *Study 1*, although, some participants completed a shortened version that did not include the GMS, the SWLS, or the measure of subjective vitality. There were also a few modifications: first, participants completed the 18-item SMS-II that was created in *Study 1*, instead of the version made up of the SMS and the new proposed items; and second, the following instrument was added to the present study for all participants.

Interpersonal behaviour scale

The IBS measures the frequency of interpersonal behaviours that satisfy basic psychological needs of autonomy, competence, and relatedness (IBS: Beaudry & Pelletier, 2008; Otis & Pelletier, 2005). Participants rate their perceptions on twelve items (four items per subscale) using a scale from 1 (*Never*) to 7 (*Always*). Sample items include: "My coach openly acknowledges my thoughts and feelings although they may be different from his or hers" (*autonomy)*, "My coach only tells me about my faults" (*competence*; *reverse-scored*) and "I feel that my coach honestly enjoys spending time with me" (*relatedness*). Scores can be computed for each subscale or combined to form an index of the perception of support for one's psychological needs. The authors report three studies that have been conducted for the purpose of developing and validating this measure of individuals' perception of significant others' interpersonal behaviours in different life domains. In Study 1, results of an exploratory factor analysis with a mixed sample (perceptions of parents', teachers', and coaches' interpersonal behaviours) supported the three-factor structure of the scale. In Study 2, results of three confirmatory factor analyses performed separately on perception of parents', teachers', and coaches' interpersonal behaviours replicated the factorial structure found in Study 1. In Study 2 and Study 3, the construct validity of IBS was supported by a series of correlational analyses between the IBS subscales and different forms of motivation, as well as between the IBS subscales and consequences related to the education domain, sport domain and general well-being.

Statistical analyses

A confirmatory factor analysis was conducted to confirm that the model of the SMS-II could be repeated with a separate sample. The subscale reliability, simplex pattern, and correlations with expected outcomes as explained by SDT were calculated to provide additional support for the validity of the SMS-II.

Results and discussion

Preliminary analyses

Preliminary analyses revealed that five cases (2%) had some data missing on the GMS. They were imputed using expectation maximization in SPSS. There were no other missing observations. Data was screened for outliers and normality using the same procedures outlined in Study 1. The distribution of standardized scores for each variable in the data set was examined for the presence of univariate outliers. Less than 2% of the cases had standardized scores of 3.29 or greater on one or more variables. Outlier scores were recoded to the most extreme, but within normal range, value for the identified items (Tabachnick & Fidell, 2013). SMS variables were examined for normality and variables were considered to be non-normal if their skewness and kurtosis values were greater than the acceptable limit (Tabachnick & Fidell, 2013).

Confirmatory factor analysis

The model of the 18-item, 6-factor SMS-II was tested through a confirmatory factor analysis performed in SPSS AMOS 20

(Arbuckle, 2011). The model parameters were estimated using the maximum likelihood function. The factor loadings were observed and verified for their fit within the model (see Table 1). The resultant 18-item, six factor CFA model was significant ($\chi^2(120, N = 290) = 258.14$, $p < 0.001$). The other indices suggested that the fit of the six-factor model to the data was satisfactory to very good: RMSEA = 0.07; RMSEA 90% CI = 0.05–0.08; CFI = 0.94; NFI = 0.90; TLI = 0.92. Item-factor loadings ranged from 0.47 to 0.95. Overall, the analyses support the addition of the integrated regulation subscale, the modifications to the other subscales, and support the fit of the SMS-II model on an independent sample of participants.

In addition, we further examined the discriminant and the convergent validity using the average variance extracted (AVE), and the squared interconstruct correlation estimates (SIC, see Table 4). The results suggest that all the AVE estimates (with the exception of the introjected subscle) are 0.50 or greater which suggest adequate convergent validity. Also, the AVE estimates are greater than the SIC estimates, which indicates that the measured variables have more in common with the construct they are associated with than they do with the other constructs. Overall, these estimates suggest that measures of constructs that theoretically *should* be related to each other are, in fact, observed to be related to each other, and measures of constructs that theoretically should *not* be related to each other are, in fact, observed to not be related to each other (Hair, Black, Babin, & Anderson, 2010).

Reliability and correlational analysis

The reliability of each subscale was calculated using Cronbach's alpha and the results indicate that they range from 0.73 to 0.86 and they are all above the acceptable cut-off. Next, the individual items were analyzed to examine whether any specific item was influencing the reliability of any of the subscales, and it was determined that none was directly influencing any obtained reliability score.

The composite scores were calculated for each of the subscales and the between-subscale correlations were calculated to confirm the fit of the simplex pattern. The correlation matrix for the between-subscale correlations and the interfactor correlations (Phi values) can be viewed in Table 4. The results demonstrate strong support for the simplex pattern for both the between-subscale correlations and the Phi values with an increase in variability of effect sizes along the continuum compared to the results of *Study 1*, and higher but moderate coefficients for subscales that adjacent on the self-determination continuum.

Outcome comparisons

Next, participants' subscale scores were calculated for the IBS, TEOSQ, SWLS, and Vitality Scale using the score calculation methods outlined by the developers of each scale. The matrix outlining the correlations may be viewed in Table 5. It was anticipated that the TEOSQ, SWLS, and Vitality measures would yield similar results to the correlations found in Study 1. It was also anticipated that the Coach Autonomy Support and Coach Care Subscales of the IBS would be positively correlated with the Intrinsic, Integrated, and Identified subscales, while the Coach Incompetence subscale would be positively correlated with the Introjected, the External and the Amotivation subscales. In general, the results supported these hypotheses.

When observing the measure of vitality, the correlations with the SMS-II subscales demonstrate a clear change in effect size while moving along the continuum, that is, the correlation coefficient changes direction when we move from amotivated regulation to extrinsic regulation. Similar results, although with weaker effect sizes, were found for the satisfaction with life scale results. As in Study 1, the correlations with the measure of task orientation demonstrate results in which the autonomous forms of motivation were associated with high effect sizes for task orientation and the non-autonomous forms of motivation were associated with weak to moderate effect sizes. For ego orientation, the highest effect sizes were observed on the external subscale. The SMS-II demonstrated evidence of the simplex pattern where the non-autonomous forms of motivation had higher effect sizes than the autonomous forms. These findings, in combination with observations made earlier, further support the validity SMS-II. When observing the measures of coaches' behaviours, the correlations with the SMS-II subscales were consistent with our hypotheses for the Coach Care and Coach Incompetence subscales but the correlations with Coach Autonomy-Support were not as clear as that subscale correlated more strongly with intrinsic motivation and almost equally with integrated, identified and introjected motivation.

Overall, the results of Study 2 support the factorial structure and the construct validity of the SMS-II. Taken together, the results show a simplex pattern consistent with the hypothesized relationships among the types of motivation proposed by SDT and very good support for the relative-autonomy continuum. In line with SDT, the present correlational analyses also provide support for our hypotheses regarding associations, on one hand, between athletes' levels of types of motivation and coaches interpersonal behaviours, and, on the other hand, between athletes' types of motivation and various sport related outcomes.

General discussion

Since its publication in 1995, the SMS has had a significant impact on the measurement, prediction, and understanding of sport motivation, although in recent years, researchers have questioned some of the item contents and psychometric properties of the scale (Lonsdale et al., 2008; Mallett et al., 2007; Martens & Webber, 2002). More than fifteen years after the SMS's original publication, a panel of experts on SDT (Pelletier, Ryan, Deci, and Vallerand) recognized that some of the concerns raised were legitimate and should be addressed. More specifically, it was agreed that many of the items were wrongly classified, that some items did not fit the theoretical constructs as defined by SDT as well as they could, some items conflated contents and goal regulations, and some were not clear enough. As a result, we reviewed the structure of the scale and the face validity of all the items. Following the

Table 4
Study 2: correlations (above the diagonal), Phi values (below the diagonal), means, standard deviations, and the average variance extracted (diagonal).

Measure	1	2	3	4	5	6	*M*	SD
1. Intrinsic	0.72	0.67**	0.63**	0.34**	−0.01	−0.24**	5.11	1.34
2. Integrated	0.78(0.61)	0.58	0.72**	0.49**	0.06	−0.19**	4.99	1.31
3. Identified	0.68(0.46)	0.70(0.49)	0.67	0.47**	0.14*	−0.14*	5.20	1.26
4. Introjected	0.33(0.11)	0.62(0.38)	0.45(0.20)	0.41	0.38**	−0.09	4.04	1.24
5. External	0.06(0.00)	0.17(0.03)	0.20(0.04)	0.50(0.25)	0.52	0.35**	2.68	1.43
6. Amotivated	−0.14(0.02)	−0.12(0.14)	−0.08(0.01)	0.16(0.03)	0.38(0.14)	0.60	1.91	1.25

Note. $n = 290$. **$p < 0.01$ (2-tailed). *$p < 0.05$ (2-tailed). () = square of the correlation between Phi values. All the Phi values are significant, $p < 0.01$.

Table 5
Study 2: correlations between SMS-II and outcome measures.

Measure	Coach autonomy	Coach incompetence	Coach care	Ego goals	Task goals	Life satisfaction	Vitality
Intrinsic	0.24**	0.06	0.21*	0.06	0.54**	0.12	0.34**
Integrated	0.17*	−0.14	0.18*	0.09	0.45**	0.11	0.29**
Identified	0.21*	−0.06	0.15	0.12	0.42**	0.20*	0.25**
Introjected	0.18*	0.13	0.08	0.09	0.29**	−0.02	0.17**
External	0.13	0.19*	0.11	0.26**	−0.02	−0.12	−0.19*
Amotivated	0.01	0.17*	−0.03	0.13*	−0.20**	−0.30**	−0.33**

Note. $n = 290$ for Coach Autonomy, Coach Incompetence, Coach Care, Ego Goals, and Task Goals. $n = 185$ for Life Satisfaction and Vitality. $^{**}p < 0.01$ (2-tailed). $^{*}p < 0.05$ (2-tailed).

review of the scale, several items were identified for removal and a series of replacement items were created. It was also agreed that an integration subscale should be included in the revised version, and for practical reasons, that the three intrinsic regulation measures included in the original SMS would be combined into one intrinsic motivation subscale. Finally, in the revised measure the number of items per subscale was reduced to three with the objective of reducing the overall length of the scale and facilitating its administration. The aim of the present studies was to examine the reliability and construct validity of the revised scale, the SMS-II.

In Study 1 the newly formulated SMS-II, including the new integrated subscale and the combined intrinsic regulation subscale, was examined. The structure of the SMS-II, including its factor structure, test of invariance for gender and age, and fit with a simplex model, was generally supported. In addition, the relations of the different subscales with expected outcomes also supported the new measure. In Study 2, the validity of the structure of the SMS-II and its relation with outcomes with a separate, distinct sample of athletes was further examined. Results of a factor analysis and tests for internal consistency and correlations among the different types of motivation, as well as correlations with several outcomes of motivation, all supported the validity of the SMS-II and suggested that the SMS-II performs as well as or better than the original scale. Because the newly formulated scale works well and is conceptually cleaner, we therefore recommend it replacing the original SMS.

As suggested earlier in this article, we feel that one single form of intrinsic motivation may be more practical for the researchers that do not have an interest for the 3 types of intrinsic motivation (to know, to accomplish, and to experience sensation) assessed originally in the SMS. However, because no problems have been reported with the 3 types of intrinsic motivation, we suggest that the 12 items measuring the different types of intrinsic motivation be used by the researchers interested by the role that different forms of intrinsic motivation could play in the regulation of sport behaviour instead of the general form of intrinsic motivation.

Nonetheless, it should be noted that a complete assessment of the psychometric properties of the SMS-II, such as a test–retest reliability, will necessitate additional research. One important issue that was not addressed in the present studies that would need to be addressed by future research includes further examining how the different forms of motivation assessed by the scale can reliably predict sport participation, sport retention, and sport performance over time. In particular, despite significant advances in the understanding and conceptualization of integrated regulation, it remains under-investigated compared to the other regulation types (Pelletier & Sarrazin, 2007). With the addition of the integrated regulation subscale to the SMS-II, it will be possible to continue the advancement of research in this area.

In particular, more research is necessary to determine how the concept of integrated regulation in sport could be distinguished from intrinsic motivation and identified regulation, and how integrated regulation could enhance our understanding of optimal functioning in both the sport domain and in the athlete's life more generally. SDT posits that the integrated regulation of behaviours reflects coherence with other aspects of the person's identity, beliefs, values, and emotions (Ryan & Deci, 2011). The SMS-II provides researchers with the opportunity to examine these concepts through comparing participants' integration subscale scores with the outcomes expected to be associated with integration such as lack of conflict, goal strivings in different life domains, task orientation, and vitality. In sum, the inclusion of the integrated subscale provides the opportunity to progress from the mere study of athletes, to that of whole individuals who, in addition to being athletes, also attempt to regulate other activities in their life.

In addition, because the SMS-II has now focused its item contents exclusively on regulatory styles or motives ("why" one is doing something) rather than goal contents (what life goals is the person after) the relations between goal contents and regulatory styles can be further advanced without confounds. In particular looking at how the SMS-II relates to intrinsic and extrinsic goal contents in the domain of sport would be informative, just as it has been in studies of physical exercise (e.g., Sebire, Standage, & Vansteenkiste, 2011).

Insofar as coaches set up the practice and competitive environments, they affect the psychological climate of the sport experience (e.g. Bartholomew et al., 2011; Pelletier et al., 2001). When considering the basic psychological needs, research has already demonstrated that athletic coaches play an important role in ensuring need satisfaction in athletes (Gagné et al., 2003). If the need for autonomy is considered, the literature suggests that coaches can support their athletes' autonomy by presenting challenges, providing choices, allowing athletes to provide feedback, demonstrating empathy, and showing engagement (Mageau & Vallerand, 2003). Unfortunately, coaches can also thwart their athletes' need for autonomy by engaging in controlling behaviours such as emphasizing rewards, enforcing punishments, being intimidating, or using controlling feedback (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009; Bartholomew et al., 2011). Although the benefits of autonomy-support are very well understood, there is a lack of research connecting autonomy-supportive versus controlling coaching behaviours to specific regulatory styles and their outcomes. Research should also focus on identifying the roles of the other basic psychological needs in both coaching behaviours and sporting contexts. Once these concepts are better understood, it will be necessary to further investigate the predictors of the satisfaction of these needs, and how need satisfaction can be enhanced. It would also be interesting to investigate the differences between team and individual sport in terms of both motives and need satisfactions, an area that remains under-investigated.

Upcoming research using the SMS-II should also focus on recruiting diversified participants from multiple countries, sports, and age so that the stability of the structure can be further examined and confirmed. These additional studies would also create opportunities to translate the revised SMS-II into other languages,

as was done for the original SMS, and it would address factors that may affect motivation differently as a function of an athlete's culture. Studies could also further examine the stability of the structure with regards to age. Although, our first study provided support for the configural invariance of the scale with regards to age, the results were not conclusive with regards to the metric invariance of the scale for athletes above and below 40 years of age.

Finally, regarding the SMS-II in relation to the SMS-6 developed by Mallet et al. (2007) and the BRSQ developed by Lonsdale et al. (2008), we think that the SMS-II represents a scale that better addressed the limitations observed with the original SMS and that showed more consistent results with SDT. Future research is necessary to determine whether or not the SMS-II is a more reliable and valid scale than the SMS-6 and the BRSQ in different contexts, in different sports, in different cultures, with athletes of different age groups, and over time.

In conclusion, the SMS-II is presented as a recommended alternative to the SMS, as it is more theoretically aligned in its item content, performs as well or better than the original scale, and (despite adding an integrated subscale) is overall briefer and more efficient to administer. Future research framed with the SMS-II should lead to a more comprehensive understanding of the psychological processes underlying motivational phenomena that occur in sport and it should generate even more research in a domain that plays an important role in many people's lives.

Appendix 1

Scale items

The following items were administered as part of the SMS in the present study. The "SMS" column refers to the 28 items that appeared in the original version of the scale. The "new" column refers to the 30 new items that were proposed as part of Study 1. Lastly, the "SMS-II" column indicates the 18 items that were retained in the revised version of the SMS.

Intrinsic regulation	**SMS**	**New**	**SMS-II**
For the pleasure it gives me to know more about the sport that I practice.	x		
For the pleasure of discovering new training techniques.	x		
For the pleasure I feel while learning training techniques that I have never tried before.	x		
For the pleasure of discovering new performance strategies.	x		
Because I feel a lot of personal satisfaction while mastering certain difficult training techniques.	x		
For the pleasure I feel while improving some of my weak points.	x		
For the satisfaction I experience while I am perfecting my abilities.	x		
For the pleasure that I feel while executing certain difficult movements.	x		
For the pleasure I feel in living exciting experiences.	x		
For the excitement I feel when I am really involved in the activity.	x		
For the intense emotions that I feel while I am doing a sport that I like.	x		
Because I like the feeling of being totally immersed in the activity.	x		
Because it gives me pleasure to learn more about my sport.		x	x
Because it is very interesting to learn how I can improve.		x	x
For the strong enjoyment that I feel while I am doing my sport.		x	
Because it is interesting to execute certain difficult movements.		x	
Because I really enjoy learning new techniques.		x	
Because I find it enjoyable to discover new performance strategies.		x	x
Integrated regulation	**SMS**	**New**	**SMS-II**
Because practicing sports reflects the essence of whom I am.		x	x
Because it fits well with my values and interests.		x	
Because through sport, I am living in line with my deepest principles.		x	x
Because by doing it I am fully expressing my deepest values.		x	
Because participating in sport is an integral part of my life.		x	x
Because it is consistent with my personal values.		x	
Identified regulation	**SMS**	**New**	**SMS-II**
* Because, in my opinion, it is one of the best ways to meet people.	x		
Because it is one of the best ways I have chosen to develop other aspects of myself.	x		x
* Because it is a good way to learn lots of things which could be useful to me in other areas of my life.	x		
* Because it is one of the best ways to maintain good relationships with my friends.	x		
Because I have chosen this sport as a way to develop myself.		x	x
Because it is important to me to get better at my sport.		x	
I choose to do it because my sport is a central part of myself.		x	
Because it is personally important to me to practice.		x	
Because it is valuable to me to practice my sport.		x	
Because I found it is a good way to develop aspects of myself that I value.		x	x
Introjected regulation	**SMS**	**New**	**SMS-II**
* Because it is absolutely necessary to do sports if one wants to be in shape.	x		
Because I must do sports to feel good about myself.	x		
* Because I would feel bad if I was not taking the time to do it.	x		
* Because I must do sports regularly.	x		
Because I would feel bad about myself if I did not take the time to do it.		x	x
Because doing my sport lets me feel like a worthy person.		x	
Because I feel like other people approve of me when I do.		x	
Because I feel better about myself when I do.		x	x
Because I would not feel worthwhile if I did not.		x	x
External regulation	**SMS**	**New**	**SMS-II**
* Because it allows me to be well regarded by people that I know.	x		
* For the prestige of being an athlete.	x		
* Because people around me think it is important to be in shape.	x		

(*continued on next page*)

(*continued*)

* To show others how good I am at my sport.	x		
Because people around me pressure me to do it.		x	
So that others will praise me for what I do.		x	
Because people I care about would be upset with me if I did not.		x	x
Because others will be mad and criticize me if I don't.		x	
Because people around me reward me when I do.		x	x
Because playing my sport gets me some benefits.		x	
Because I think others would disapprove of me if I did not.		x	x
Amotivated regulation	**SMS**	**New**	**SMS-II**
I used to have good reasons for doing sports, but now I am asking myself if I should continue.	x		x
I don't know anymore; I have the impression that I am incapable of succeeding in this sport.	x		x
It is not clear to me anymore; I don't really think my place is in sport.	x		x
I often ask myself; I can't seem to achieve the goals that I set for myself.	x		

*Items identified as problematic by SDT and Sport Motivation Experts.

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