*Article*

# The Spanish Adaptation of the Sport Motivation Scale-II in Adolescent Athletes

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## Abstract

The aim of this study was to adapt and validate the Spanish version of the Sport Motivation Scale-II (S-SMS-II) in adolescent athletes. The sample included 766 Spanish adolescents (263 females and 503 males; average age = 13.71 ± 1.30 years old). The methodological steps established by the International Test Commission were followed. Four measurement models were compared employing the maximum likelihood estimation (with six, five, three, and two factors). Then, factorial invariance analyses were conducted and the effect sizes were calculated. Finally, the reliability was calculated using Cronbach's alpha, omega, and average variance extracted coefficients. The five-factor S-SMS-II showed the best indices of fit (Cronbach's alpha .64 to .74; goodness of fit index .971, root mean square error of approximation .044, comparative fit index .966). Factorial invariance was also verified across gender and between sport-federated athletes and non-federated athletes. The proposed S-SMS-II is discussed according to previous validated versions (English, Portuguese, and Chinese).

## Keywords

Motivation, translated questionnaires, tests/questionnaires, factor analysis, validity of assessment

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Literature regarding sport motivation is ample and has been crucial in order to understand all the processes that affect the individuals in their engagement in sport participation (Balaguer, Castillo, Duda, Quested, & Morales, 2011; Perlman, 2012). The enormous benefits that sport practice provides to participants in all domains (e.g., behavioral, Jaakkola, Yli-Piipari, Huotari, Watt, & Liukkonen, 2015; psychological, Jaakkola, Ntoumanis, & Liukkonen, 2015; and social, Viciana, Mayorga-Vega, & Blanco, 2013) justify the interest of researchers for understanding why some athletes are engaged in their sport practice and why others decline in their interest to continue practicing.

The well-known self-determination theory of Deci and Ryan (1985) is the most stable and complete framework that has supported the collected evidence regarding motivation in different sport contexts (Mayorga-Vega & Viciana, 2014; Mesquita, Farias, & Hastie, 2012; Navas, Soriano, & Holgado, 2012). It explains that motivation is a construct that can be ordered on a continuum: from amotivation (non-motivation or not intentional) to extrinsic motivation (controlled) and to intrinsic motivation (self-determined) (Deci & Ryan, 2000). It attempts to explain how the level of autonomous forms of motivation (self-determined) influence several other variables such as physical (Mayorga-Vega & Viciana, 2014) and sport activities (Almagro, Sáenz-López, Moreno-Murcia, & Spray, 2015). Self-determined motivation is associated to positive outcomes such as task involvement or well-being (Papaioannou, Theodosiou, Pashali, & Digelidis, 2012). On the other side, controlled motivation directs behavior of individuals as a form of external regulation through rewards, punishments, attempts to feel worthy, and avoiding guilt and shame (Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013).

Despite the criticism around the continuum mentioned above, which treat the motivation as a unidimensional construct (Chemolli & Gagné, 2014), the reality is that motivational regulation of a person regarding a particular behavior is still considered crucial by researchers, and it is important to have validated instruments that allow them to study this complex multidimensional construct. Nevertheless, a new model has emerged in literature as an alternative against the continuum structure of motivation derived from the self-determination theory, which is originally from Chemolli and Gagné (2014), and is supported by evidence for a second-order factor structure (Gagné et al., 2013), by the significance of comparing the autonomous and controlled motivation instead of the intrinsic and extrinsic motivation (Deci & Ryan, 2008). It is composed of two main dimensions: (a) autonomous motivation (integrating intrinsic, integrated, and identified motivation); and (b) controlled motivation (integrating external and introjected regulation), to which could be added the amotivation dimension.

Regarding the measurement instruments of sport motivation, two decades have passed from the original version of the Sport Motivation Scale (SMS) (Pelletier, Fortier, Vallerand, Tuson, & Blais, 1995) (and the concurrent version

in French from Brière, Vallerand, Blais, & Pelletier, 1995). The SMS had 28 items organized in seven factors (three types of intrinsic motivation: to know, to experience stimulation, and to accomplish; three types of extrinsic regulation: external, introjected, and identified; and amotivation), and it was applied to several contexts and types of samples (e.g., in team or individual sports, Pelletier, Vallerand, & Sarrazin, 2007; in children or adults, Zahariadis, Tsorbatzoudis, & Grouis, 2005; Manouchehri, Tojari, & Soltanabadi, 2015). Afterwards, Li and Harmer (1996) integrated the three dimensions of intrinsic motivation in one unique dimension and verified the structure of the SMS with adequate fit indices (comparative fit index (CFI) = .98; Tucker–Lewis index (TLI) = .94; root mean square error of approximation (RMSEA) = .08).

However, in relatively recent years, a new dimension of motivation has been included in the SMS, coming from Deci and Ryan's theory (1985, 2000), which is the integrated regulation dimension. It is considered as the most autonomous kind of extrinsic motivation, and situated between the intrinsic motivation and the identified regulation. Although this integrated regulation of motivation was not considered at the beginning because it was not differentiated from the identified regulation dimension in educational contexts (Brière et al., 1995), it has been recognized as an important part of the motivation that has improved the understanding of researchers around how motivation influence on individuals' behavior, and therefore, it has been suggested to be included in the SMS structure (Mallett, Kawabata, Newcombe, Otero-Forero, & Jackson, 2007).

Recently, the SMS-II instrument (Pelletier et al., 2013) surfaced as a revised version of the original SMS (Pelletier et al., 1995), considering several modifications: (a) a reduction of the number of dimensions (the intrinsic motivation was included as a unique dimension, integrating the three original types of intrinsic motivation); (b) a reduction of the number of items (18 instead of 28), resulting in a version with three items per factor; (c) the inclusion of the integrated regulation construct, which is a different concept than intrinsic motivation and identified regulation constructs; and (d) in general, some items were removed from the original version and some others were included as more adequate, conceptually speaking. The SMS-II was composed of six factors: intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external motivation, and amotivation. SMS-II had a good factor structure (RMSEA = .05; CFI = .93; TLI = .91), according to the confirmatory factor analysis conducted in the study 2 reported by Pelletier et al. (2013); and good Cronbach's alpha coefficients (from .70 to .88), reported in the study 1. In sum, SMS-II has turned out as a more complete and valid instrument that enables the furtherance of sport motivation research.

In the Spanish context, Núñez, Martín-Albo, Navarro, and González (2006) analyzed the original SMS adapted to the Spanish language in 275 sport athletes, obtaining a seven-factor structure, and showing good reliability for the seven factors (alphas between .70 and .80). Balaguer, Castillo, and Duda (2007) also

compared the structure of three-, five-, and seven-factor models applied to a sample of 301 Spanish athletes, being the seven-factor structure the best fitted version (RMSEA = .05; CFI = .91). Then, a Spanish version of the original SMS was also validated by Núñez, Martín-Albo, and Navarro (2007), showing good levels of fit indices (reliability, Cronbach's alpha between .73 and .79; and validity, IFI = .91; RMSEA = .06; CFI = .90). Finally, Granero-Gallegos, Baena-Extremera, Gómez-López, Sánchez-Fuentes, and Abraldes (2014) analyzed the SMS in a Spanish sample of 758 high school students of Physical Education, comparing three structural models and concluding the seven-factor model as the best fitted one applied to the Physical Education setting (reliability, Cronbach's alpha between .72 and .84; and validity, goodness of fit index (GFI) = .98; RMSEA = .04; CFI = .98).

Unfortunately to our knowledge, there is no Spanish version of the SMS-II (S-SMS-II) that can be applied to Spanish language speaking samples. The S-SMS-II could help researchers to study the phenomenon of sport motivation without the language barriers; in a complete form, including the integrated regulation; and applying a shorter version than the original SMS previously used in Spanish athletes samples. Consequently, the aim of this study was to adapt and validate the S-SMS-II. Specifically, the aims were to: (a) adapt/translate the SMS-II original by Pelletier et al. (2013) according to Muñiz, Elosua, and Hambleton's (2013) recommendations; (b) test several factor structures of the resulting S-SMS-II; and (c) verify the adapted version's factorial invariance for sport-federated athletes versus non-federated athletes.

## Method

### *Participants*

The sample was composed of 766 participants belonging to Secondary educational level, 263 females and 503 males (total sample average age = 13.71 ± 1.30 years old; female's average age = 13.66 ± 1.34 years old; male's average age = 13.73 ± 1.29 years old), recruited from six different high school centers (two from each of the following Spanish Communities: Andalusia, Granada; Valencia, Valencia; and Castilla la Mancha, Ciudad Real; which represent 37.21%, 13.97%, and 48.82% of the sample, respectively). Some self-reported data were collected in order to know their participation in sports (e.g., football, basketball, swimming, athletics, tennis, judo, or volleyball; 343 practiced individual sports, 313 practiced team sports, and 110 practiced both individual and teams sports), the number of training per week (3.61; SD = 1.31), and the duration of training sessions (96.89 minutes; SD = 37.40). Questions like "Which modality of sport do you practice? How many days a week? How long do the training session last? Are you registered at any sport federation?" were introduced to the participants at the beginning of the questionnaire in order to collect

this self-reported information. Belonging to a sport federation implies that athletes are training regularly along the week with the supervision of a capable professional, and are competing regularly in matches (formal competition in minor regional leagues). In order to conduct the analyses for the factor invariance, besides according to gender, the sample was divided into two sub-samples: (a) athletes belonging to a sport federation ($n = 476$); and (b) practitioners who were involved in sport activities habitually, but without regular competitions ($n = 290$).

## *Adaptation of the instrument*

The original SMS-II developed by Pelletier et al. (2013) is composed of 18 items belonging to six dimensions (three items per dimension): amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation, that assess individuals' level of motivation toward sport, using the self-determination theory as the background framework. The questionnaire uses an introductory sentence "Why do you practice your sport?" and a 7-point Likert scale ranging from "1 = does not correspond at all" to "7 = correspond completely."

In order to translate and adapt the questionnaire, the norms of the International Test Commission guidelines, in Muñiz et al.'s (2013) work (six categories of guidelines), have been followed.

*Precondition guidelines.* The adapted instrument maintained the six dimensions and the same number of items that composed the English version of the SMS-II. These are cross-cultural dimensions, considering that motivation in individuals is influenced by the same factors in any culture, and consequently the original version (SMS, Pelletier et al., 1995) has been previously used in several contexts (e.g., Spain (Granero-Gallegos et al., 2014; Núñez et al., 2007) or Bulgaria (Chantal, Guay, & Dobreva-Martinova, & Vallerand, 1996)). The present test adaptation study focused sampling on Spanish adolescents, due to this educational stage of secondary school being crucial in the burnout or the continuity of sport practice (Cocca, Liukkonen, Mayorga-Vega, & Viciana, 2014).

*Development guidelines: Item translation and pilot study.* Two experienced researchers translated the items from the original SMS-II into Spanish independently. According to the original English version, the tense of verbs, complexity and abstraction level, and format of the items, as well as scoring of the scale were considered in the Spanish adapted instrument.

Afterwards, a professional translator and native English speaker carried out a back-translation. The process obtained the following results: (a) 7 of the 18 items turned out equal to the originals; (b) eight items were modified in several

fine aspects in order to obtain a better adaptation into the Spanish language. For instance: (b.1.) *expressions* like "because it gives me pleasure..." was translated into Spanish as "porque me gusta...," because a literal translation like "porque me da placer..." would be incorrect or at least it could cause other possible interpretations of the item. The expression "to take the time to do something" is commonly used in English; however a better adaptation into Spanish than a literal translation would be "dedicarle tiempo a algo," which also caused a little modification of the back-translation regarding the original expression. The expression "...I am not capable of having success..." appeared in the original item as "...I am not capable of succeeding...," which has the same meaning; (b.2.) *simple forms of infinitive verbs* like "learning" or "discovering" of the back-translation appeared as "to learn" or "to discover" in the original items; (b.3.) *nuances* like eliminating the word "deepest" in the expression "deepest principles" because the word "principios" for any individual in Spanish entails to be deep, for instance, also caused little changes in the back-translation results; or (b.4.) *synonyms* like "form/forms" or "recompense" in the back-translation were "way/ways" or "reward" in the original items, respectively; and (c) three items were modified in order to obtain a better adaptation into the Spanish language (e.g., "because I find it enjoyable..." in the original version was back-translated "because I enjoy..." because the first translation into Spanish was "porque disfruto...," which is a correct expression, while "porque lo encuentro disfrutable..." would not be correct).

Nevertheless, according to Brislin (1986), it is important to denote that a literal translation is not the best way to adapt some sentences from one language to another, and does not guarantee the complete equivalency between items of two different languages.

*Confirmation guidelines.* The International Test Commission makes reference to the equivalency of a new version scale adapted from de original in terms of psychometric properties, data collection, reliability, and validation. In the present study, the "Results" section reports all those parameters, which have been analyzed together with the factor invariance.

*Administration guidelines.* After consulting the principals of the school centers and obtaining their permission, all questionnaires were administered by the same experienced researcher and with the same protocol during one previously agreed upon physical education class. Participants were encouraged to fill out the questionnaire voluntarily, and were informed that their responses and results would be anonymous. The whole process lasted approximately 30 minutes, from the initial explanations to the end of the S-SMS-II fulfillment. An informed consent from the Ethical Committee of the University of Granada has been obtained for this research. Data collection was carried out during the months of March–June of the 2016, the first center surveyed serving

as a pilot study (n = 75). However, no questions regarding the understanding of the items or any other aspect of the scale were reported by the participants and, therefore, no modifications were applied to the S-SMS-II for the following school centers.

*Scoring and interpretation guidelines.* The factorial invariance (see Results section) compared mean factor scores in two sub-samples regarding two criteria (gender, male/female participants; and being or not registered in a sport federation, federated/non-federated participants). Results showed that females had lower levels of extrinsic motivation than the male athletes, and sport-federated practitioners scored higher than non-federated practitioners on three of the factors of the S-SMS-II (see Results section), providing logical consistency to the questionnaire, given the sub-samples' conditions.

*Documentation guidelines.* As described below, guidelines suggested by Prieto and Muñiz (2000) were followed in order to interpret the scores of the S-SMS-II in future research. The Development guidelines section described the adaptation and translation process of the items of the S-SMS-II, and the Result section will expose the structural differences regarding the original version of Pelletier et al. (2013), justifying the changes for statistical reasons. Afterwards, all those changes have been discussed (see Discussion section).

## *Data analyses*

In order to eliminate the items that resulted with an extreme kurtosis, skewness, or a discriminant index under .30, the first step consisted of calculating the means, standard deviations, kurtosis, skewness, and discriminant indices of each item of the S-SMS-II. Additionally, multivariate normality was calculated using the Mardia's multivariate coefficient. Afterwards, four measurement models were compared: S-SMS-II-6, with six factors according to the factor structure of the original SMS-II; S-SMS-II-5, which had five factors, eliminating the introjected regulation factor due its insufficient discriminant validity; and finally, S-SMS-II-3 with three factors (autonomous motivation, controlled motivation, and amotivation) and S-SMS-II-2 with two factors (autonomous motivation and controlled motivation) were also tested using the theoretical variation model proposed by Chemoli and Gagné (2014), as an alternative of the continuum structure. When conducting confirmatory factor analysis, following the Thompson's (2004) recommendation is suggested, consisting of not only corroborating the theoretical model's goodness of fit but also that of various alternative models, employing the maximum likelihood estimation and computing goodness of fit indices for those models in order to select the best one. The maximum likelihood estimation method with the application of re-sampling *bootstrap* procedures is very robust for non-normality cases, especially if the

sample is wide enough and the values of asymmetry and kurtosis are not extreme, as they were in the present study (Byrne, 2013; Kline, 2011).

To assess the model's goodness of fit, the chi-squared coefficient, the adjusted GFI, and the RMSEA were calculated as measures of absolute fit. The adjusted goodness-of-fit index (AGFI), the TLI, and the CFI were used as incremental fit indices. Chi-squared divided by degrees of freedom (CMIN/DF) and the Akaike information criterion (AIC) were used as measures of parsimonious fit (Gelabert et al., 2011). The previous literature considers acceptable values for these indices to possess goodness of fit as follows: GFI and CFI should be $\geq .90$; RMSEA should be under .08; and CMIN/DF should be under 5 (Hu & Bentler, 1999).

Subsequently, using the best model obtained in the previous stage, the factorial invariance analysis was conducted according to Abalo, Lévy, Rial, and Varela's (2006) recommendations for sport-federated and non-federated participants, as well as for male and female participants. The Cohen's *d* of effect sizes was calculated (Cohen, 1992). According to Cohen's (1992) benchmarks, the *r* effect sizes were interpreted as trivial ($r = .00$–09), small ($r = .10$–.29), moderate ($r = .30$–.49), and large ($r = .50$–1.00). Finally, the reliability of each obtained factor of the S-SMS-II-6 and S-SMS-II-5 models was calculated using Cronbach's alpha (Nunnally & Bernstein, 1995), omega, and average variance extracted coefficients (Revelle & Zinbarg, 2009). The previous literature considers the following as acceptable values: Cronbach's alpha and Omega coefficients should be $\geq .70$ and average variance extracted coefficient should be $\geq .50$ (Nunnally & Bernstein, 1995; Rial, Varela, Abalo, & Lévy, 2006).

## Results

### *Descriptive analyses and discriminant indices*

Table 1 summarizes the results of descriptive analyses and discriminant indices (corrected item-total correlations) for each of the 18 items of the S-SMS-II in the total sample. All items' responses showed mean scores above 1.50 (responses ranged between 1 and 7). All skewedness and kurtosis values (between $\pm 2.0$ and $\pm 3.0$, respectively) indicated that the distribution was normal (Kline, 2011). Regarding the items' discriminant indices, all of them were satisfactory, above .30 (Brzoska & Razum, 2010). However, Mardia's multivariate coefficient was above 70, so multivariate normality could not be inferred (Rodríguez & Ruiz, 2008).

### *Confirmatory factor analysis for the total sample*

Overall results corresponding to confirmatory factor analysis for the S-SMS-II-6 showed an acceptable measurement model (GFI = .948; RMSEA = .054;

**Table 1.** Descriptive analysis and discriminant indices of all items of S-SMS-II.

| Total sample | | | | | |
|---|---|---|---|---|---|
| Item | *M* | *SD* | Skewness | Kurtosis | $r_{i-total}$ |
| 1 | 3.57 | 2.13 | .18 | −1.36 | .40 |
| 2 | 2.01 | 1.81 | 1.82 | 2.02 | .16 |
| 3 | 5.43 | 1.65 | −.93 | .03 | .48 |
| 4 | 4.75 | 1.92 | −.50 | −.86 | .55 |
| 5 | 2.05 | 1.72 | 1.65 | 1.60 | .27 |
| 6 | 5.40 | 1.62 | −.98 | .31 | .40 |
| 7 | 5.87 | 1.56 | −1.52 | 1.65 | .39 |
| 8 | 2.11 | 1.76 | 1.60 | 1.45 | .31 |
| 9 | 5.27 | 1.79 | −.95 | −.04 | .44 |
| 10 | 2.16 | 1.81 | 1.51 | 1.05 | .10 |
| 11 | 5.52 | 1.72 | −1.05 | .16 | .49 |
| 12 | 5.37 | 1.69 | −.93 | .01 | .52 |
| 13 | 1.84 | 1.65 | 2.00 | 3.0 | .02 |
| 14 | 4.82 | 1.81 | −.52 | −.70 | .53 |
| 15 | 2.77 | 2.14 | .87 | −.72 | .39 |
| 16 | 5.83 | 1.57 | −1.44 | 1.37 | .50 |
| 17 | 5.77 | 1.54 | −1.31 | 1.06 | .52 |
| 18 | 5.60 | 1.52 | −1.14 | .78 | .53 |
| Mardia's multivariate coefficient | | | | 111.33 | |

*Note. M*: mean; *SD*: standard deviation; $r_{i-total}$: corrected item-total correlation.

AGFI = .926; TLI = .910; CFI = .930; CMIN/DF = 3.272; AIC = 494.657) (Table 2).

The S-SMS-II-6 explained 63% of the variance and according to results shown in Table 3, 6 of the 18 items loaded under .60 on their predicted dimensions (items 1, 2, 6, 7, 10, and 15). Introjected regulation showed high intercorrelations with the intrinsic, integrated, and identified regulations factors, as well as the integrated regulation with the identified regulation (i.e., 95% CI exceed the .90), which suppose inadequate discriminant validity.

Overall results of confirmatory factor analysis on the second model tested (S-SMS-II-5), which had a five-factor structure (introjected regulation and item 15 were eliminated, due to they not being explained enough by the factor solution), showed that this model is better than the S-SMS-II-6 and has an optimal goodness of fit (GFI = .971; RMSEA = .044; AGFI = .955; TLI = .954; CFI = .966; CMIN/DF = 2.498; AIC = 244.378) (Table 2). The total set of the five factors explained 66% of variance.

**Table 2.** Absolute, incremental, and parsimonious fit indices for the generated models.

| | Absolute indices | | | Incremental indices | | | Parsimonious indices | |
|---|---|---|---|---|---|---|---|---|
| Model | $\chi^2$ | GFI | RMSEA | AGFI | TLI | CFI | CMIN/DF | AIC |
| S-SMS-II-2 | 697.794* | .884 | .095 | .843 | .781 | .814 | 7.840 | 759.794 |
| S-SMS-II-3 | 647.782* | .853 | .091 | .810 | .732 | .769 | 4.907 | 725.782 |
| S-SMS-II-6 | 392.657* | .948 | .054 | .926 | .910 | .930 | 3.272 | 494.657 |
| S-SMS-II-5 | 167.378* | .971 | .044 | .955 | .954 | .966 | 2.498 | 244.378 |

*Note*. GFI: goodness of fit index; RMSEA: root mean square error of approximation; AGFI: adjusted goodness of fit index; TLI: Tucker–Lewis index; CFI: comparative fit index; CMIN/DF: chi-squared fit index over degrees of freedom; AIC: Akaike information criterion; $\chi^2$: chi squared.
*$p < .05$

According to the results in Table 3, except 2 of the 14 items (items 2 and 10), all of the items had a factor loading above .60 on their predicted dimensions. Moreover, discriminant validity improved regarding the previous model showing low to moderate correlations between the five factors.

Finally, the S-SMS-II-3 and S-SMS-II-2 models, based on the proposal of Chemoli and Gagné (2014), were tested, but their indices of fit were not good enough to consider these models as acceptable (for S-SMS-II-3: CMIN/DF = 4.907; GFI = .853; RMSEA = .091; AGFI = .810; CFI = .769; CMIN/DF = 4.907; AIC = 725.782, and for S-SMS-II-2: CMIN/DF = 7.840; GFI = .884; RMSEA = .095; AGFI = .843; CFI = .814; CMIN/DF = 7.840; AIC = 759.794).

## *Confirmatory factor analyses in male and female participants, and in sport-federated and non-federated participants*

According to the results in Tables 4 and 5, confirmatory factor analyses of the 14 items grouped into five factors both in male participants and female participants were optimal (GFI = .967, RMSEA = .042, AGFI = 948, TLI .959, CFI = .970; and GFI = .933, RMSEA = .064, AGFI = .895, TLI = .908, CFI = .933, respectively), and also in sport-federated participants and non-federated participants (GFI = .960, RMSEA = .052, AGFI = .934; TLI = .929, CFI = .950; and GFI = .966, RMSEA = .025, AGFI = .944, TLI .986, CFI = .990, respectively).

According to the results in both sub-samples (regarding both criteria: federated and non-federated; and gender, male and female participants), appropriate discriminant validity was obtained (data not reported), except for female participants that showed a punctuation of over .90 in the 95% CI intercorrelations between the integrated and identified regulations.

**Table 3.** Standardized confirmatory factor analyses solutions for the S-SMS-II-6 and S-SMS-II-5 models.

Total sample

| | Model SMS-II-6 | | | | | | Model SMS-II-5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Item | F1 | F2 | F3 | F4 | F5 | F6 | F1 | F2 | F3 | F5 | F6 |
| Factor loadings | | | | | | | | | | | |
| 3 | .65 | | | | | | .65 | | | | |
| 9 | .68 | | | | | | .70 | | | | |
| 17 | .77 | | | | | | .75 | | | | |
| 4 | | .68 | | | | | | .69 | | | |
| 11 | | .73 | | | | | | .72 | | | |
| 14 | | .70 | | | | | | .69 | | | |
| 6 | | | .58 | | | | | | .64 | | |
| 12 | | | .70 | | | | | | .75 | | |
| 18 | | | .69 | | | | | | .67 | | |
| 1 | | | | .40 | | | | | | | |
| 7 | | | | .54 | | | | | | | |
| 16 | | | | .67 | | | | | | | |
| 5 | | | | | .65 | | | | | .64 | |
| 8 | | | | | .70 | | | | | .76 | |
| 15 | | | | | .53 | | | | | | |
| 2 | | | | | | .56 | | | | | .57 |
| 10 | | | | | | .59 | | | | | .59 |
| 13 | | | | | | .69 | | | | | .66 |

(continued)

**Table 3.** Continued.

| Total sample | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model SMS-II-6 | | | | | | Model SMS-II-5 | | | | |
| Item | F1 | F2 | F3 | F4 | F5 | F6 | F1 | F2 | F3 | F5 | F6 |
| Factor correlations | | | | | | | | | | | |
| F1 | – | | | | | | – | | | | |
| F2 | .74 (.68, .80) | – | | | | | .75 (.69, .81) | – | | | |
| F3 | .75 (.67, .83) | .86 (.80, .92) | – | | | | .67 (.60, .75) | .83 (.77, .88) | – | | |
| F4 | .84 (.76, .93) | .87 (.81, .93) | .87 (.80, .95) | – | | | | | | | |
| F5 | .14 (.04, .24) | .17 (.07, .27) | .18 (.07, .28) | .22 (.12, .32) | – | | .00 – | .00 – | .00 – | – | |
| F6 | −.24 (−.34, .15) | −.22 (−.33, −.13) | −.15 (−.25, −.06) | −.23 (−.37, −.12) | .67 (.56, .76) | – | −.28 (−.37, −.20) | −.22 (−.32, −.15) | −.19 (−.27, −.11) | .65 (.54, .74) | – |

*Note.* F1: intrinsic regulation, F2: integrated regulation, F3: identified regulation, F4: introjected regulation, F5: external regulation, F6: non-regulation.

**Table 4.** Absolute, incremental, and parsimonious indices for the produced models. Confirmatory factor analysis in male and female participants.

| | Absolute indices | | | Incremental indices | | | Parsimonious indices | |
|---|---|---|---|---|---|---|---|---|
| Model | $\chi^2$ | GFI | RMSEA | AGFI | TLI | CFI | CMIN/DF | AIC |
| Factor solutions for male participants | | | | | | | | |
| Independent | 2042.252** | .494 | .207 | .417 | .000 | .000 | 22.442 | 2070.252 |
| Saturated | 0.000 | 1.000 | | | | 1.000 | | 210.000 |
| S-SMS-II-5 | 125.887** | .967 | .042 | .948 | .959 | .970 | 1.879 | 201.887 |
| Factor solutions for female participants | | | | | | | | |
| Independent | 1145.104** | .474 | .210 | .393 | .000 | .000 | 12.584 | 1173.104 |
| Saturated | 0.000 | 1.000 | | | | 1.000 | | |
| S-SMS-II-5 | 138.067** | .933 | .064 | .895 | .908 | .933 | 2.061 | 214.067 |

Goodness of fit indices

| | $\chi^2$ | $\Delta\chi^2$ | df | $\Delta$df | GFI | NFI | CFI | RMSEA | AIC |
|---|---|---|---|---|---|---|---|---|---|
| Unconstrained model | 263.955** | | 134 | | .955 | .917 | .957 | .036 | 415.955 |
| Measurement invariance | 285.091** | 21.136* | 143 | 9 | .951 | .911 | .953 | .036 | 419.091 |
| Strong factorial invariance | 298.439** | 13.348 | 155 | 12 | .950 | .906 | .952 | .035 | 408.439 |

*Note.* AIC: Akaike information criterion; AGFI: adjusted goodness of fit index; CFI: comparative fit index; CMIN/DF: chi-squared fit index divided by degrees of freedom; df: degrees of freedom; $\Delta$df: change in degrees of freedom; $\Delta\chi^2$: change in Chi squared; GFI: goodness of fit index; NFI: normed fit index; RMSEA: root mean square error of approximation; TLI: Tucker–Lewis index; $\chi^2$: Chi squared.
*$p < .05$. **$p < .01$.

**Table 5.** Absolute, incremental, and parsimonious indices for the produced models. Confirmatory factor analysis in sport-federated and non-federated participants.

| | Absolute indices | | | Incremental indices | | | Parsimonious indices | |
|---|---|---|---|---|---|---|---|---|
| Model | $\chi^2$ | GFI | RMSEA | AGFI | TLI | CFI | CMIN/DF | AIC |
| Factor solutions for sport-federated participants | | | | | | | | |
| Independent | 1736.946* | .531 | .195 | .459 | 0.000 | 0.000 | 19.087 | 1764.946 |
| Saturated | 0.000 | 1.000 | | | | 1.000 | | 210.000 |
| S-SMS-II-5 | 146.265* | .960 | .052 | .934 | .929 | .950 | 2.285 | 228.265 |
| Factor solutions for non-federated participants | | | | | | | | |
| Independent | 1263.808* | .474 | .211 | .393 | 0.000 | 0.000 | 13.888 | 1291.808 |
| Saturated | 0.000 | 1.000 | | | | 1.000 | | 210.000 |
| S-SMS-II-5 | 75.412* | .966 | .025 | .944 | .986 | .990 | 1.178 | 157.412 |

Goodness of fit indices

| | $\chi^2$ | $\Delta\chi^2$ | df | $\Delta$df | GFI | NFI | CFI | RMSEA | AIC |
|---|---|---|---|---|---|---|---|---|---|
| Unconstrained model | 221.677* | | 128 | | .962 | .926 | .967 | .031 | 385.677 |
| Measurement invariance | 236.549* | 14.872 | 137 | 9 | .959 | .921 | .965 | .031 | 382.549 |
| Strong factorial invariance | 272.794* | 36.245** | 152 | 15 | .953 | .909 | .957 | .032 | 388.794 |

*Note.* AIC: Akaike information criterion; AGFI: adjusted goodness of fit index; CFI: comparative fit index; CMIN/DF: chi-squared fit index divided by degrees of freedom; df: degrees of freedom; $\Delta$df: change in degrees of freedom; $\Delta\chi^2$: change in Chi squared; GFI: goodness of fit index; NFI: normed fit index; RMSEA: root mean square error of approximation; TLI: Tucker–Lewis index; $\chi^2$: Chi squared.
* $p < .05$. ** $p < .01$.

### *Factorial invariance between male and female participants, and between sport-federated and non-federated participants*

The equivalency between the basic measurement models in the two sub-samples is accepted due to the goodness of fit indices obtained (for both male/female, and federated/non-federated participants, Tables 4 and 5, respectively), accepting the factorial invariance compliance (Cheung & Rensvold, 2002). Consequently, factor loadings between male/female participants and between sport-federated/non-federated participants are equivalent. The strong factorial invariance was also analyzed, showing an appropriate fit of the model, independently assessed or regarding its nesting with the measurement invariance model (male/female GFI = .950, RMSEA = .035; federated/non-federated participants GFI = .953, RMSEA = .032; and the difference between both Bentler's CFIs were = .001 for male/female participants, and .008 for federated/non-federated participants).

### *Factor means comparison: male participants versus female participants, and sport-federated participants versus non-federated participants*

Results of means comparisons between male and female participants showed that the average of the external regulation factor was significantly lower in female than in male athletes (−.353, $p < .01$; $d = -.23$). Regarding sport-federated participants and non-federated participants, significantly lower scores were found in non-federated participants in intrinsic, integrated, and identified regulation factors, with moderate-to-high effect size values according to Cohen's (1992) criteria (−.613, $p < .001$, $d = .45$; -.908, $p < .001$, $d = .63$; and -.356, $p < .001$, $d = .31$, respectively).

### *Reliability*

The majority of the factors in the total sample and both sub-samples obtained internal consistency values above .70 (Table 6), indicating an acceptable internal consistency for this type of scale, particularly if the reduced number of items is considered (Nunnally & Bernstein, 1995). Regarding the S-SMS-II-6, Table 6 shows lower values for external and introjected regulations dimensions.

## Discussion

The first aim of this study was to adapt/translate the SMS-II original by Pelletier et al. (2013) into the Spanish language. Although previous research adapted the original version of the SMS into the Spanish language and was used with adolescents (Balaguer et al., 2007; Granero-Gallegos et al., 2014; Núñez et al., 2006, 2007), a new adaptation was required due to the modifications of the structure

**Table 6.** Omega, Alpha, and average variance extracted coefficients for the six- and five-factor models of the Spanish version of the SMS-II.

| | S-SMS-II-6 | | | S-SMS-II-5 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample | | | Total sample | | | Males | | | Females | | | Sport-federated | | | Non-federated | | |
| Factor | Ω | α | AVE | Ω | α | AVE | Ω | α | AVE | Ω | α | AVE | Ω | α | AVE | Ω | α | AVE |
| Intrinsic regulation | .743 | .737 | .492 | .743 | .737 | .492 | .733 | .727 | .480 | .758 | .757 | .511 | .693 | .678 | .432 | .771 | .772 | .530 |
| Integrated regulation | .746 | .744 | .495 | .742 | .744 | .490 | .762 | .762 | .516 | .707 | .703 | .707 | .702 | .703 | .440 | .740 | .739 | .488 |
| Identified regulation | .696 | .686 | .434 | .729 | .700 | .474 | .704 | .666 | .444 | .777 | .723 | .539 | .729 | .700 | .475 | .721 | .652 | .464 |
| Introjected regulation | .662 | .637 | .398 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| External regulation | .552 | .536 | .300 | .659 | .655 | .494 | .661 | .653 | .496 | .648 | .648 | .480 | .647 | .637 | .481 | .703 | .700 | .544 |
| Non-regulation | .645 | .635 | .379 | .637 | .635 | .370 | .659 | .654 | .392 | .601 | .592 | .344 | .656 | .656 | .390 | .606 | .601 | .343 |

*Note*. Ω: Omega; α: Alpha; AVE: Average variance extracted.

and items carried out in the SMS-II (Pelletier et al., 2013). According to the modifications performed and described in the Method section, the adaptation was carried out and its applicability to Spanish adolescents was tested after the data collection.

The second aim of the present study was to test the factor structure of the resulting S-SMS-II. Both, a six-factor structure model and a five-factor structure model, with 18 and 14 items, respectively, were feasible, valid, and with good indices of fit (S-SMS-II-6: GFI = .948; RMSEA = .054; CFI = .930, and S-SMS-II-5: GFI = .971; RMSEA = .044; CFI = .966), according to the results of the analyses conducted. Standardized factor loadings according to the proposed structure for the questionnaire were appropriate (better in the S-SMS-II-5 than in the S-SMS-II-6) and good internal consistencies were observed, if the reduced number of items is considered.

According to these previous comments, two main modifications are proposed in the new version of the S-SMS-II: (a) two items belonging to the introjected regulation dimension showed problems of loading in the present study (item 1 loaded under .50, and item 7 loaded under .60), causing their elimination in the best fitted model (S-SMS-II-5); and (b) item 15 belonging to the external regulation dimension was also removed from the S-SMS-II-6 in order to obtain better indices of fit for the S-SMS-II-5. Researchers of the present study consider that a substitution of these three previous items (1, 7, and 15) is needed in order to maintain the six-factor structure of the questionnaire, and consequently maintaining the complete spectrum of the continuum of the Deci and Ryan's (1985) self-determination theory, which is the more complete framework around the sport motivation research, regardless of Chemoli and Gangné's (2014) new model. Although items 1, 7, and 15 could be maintained due to previous literature supporting their factor loadings (Byrne, 2013), some reasons set out below need to be taken into account.

Pelletier et al. (2013) also obtained problematic factor loadings of item 1 (because I would feel bad about myself if I did not take the time to do it), that loaded under .60 in the introjected regulation dimension, and item 7 (because I would not feel worthwhile if I did not), that also loaded under .50 in the introjected regulation dimension, both in their studies 1 (with 412 adult Canadian athletes) and 2 (with 290 youth provincial-level athletes), respectively. Moreover, in the study 1 of Pelletier et al. (2013), the item 15 (because people around me reward me when I do) belonging to the external regulation also loaded under .60, showing similar problems as in the present study (.57 in Pelletier et al.'s study, and .53 in the six-factor model of the present study). Incidentally, the recent Portuguese version of the SMS-II applied to a sample of 364 Brazilian athletes (Nascimento et al., 2014) had problems with: (a) the introjected regulation dimension, mainly caused by the low factor loadings of the items 1 (.47) and 7 (.38); and (b) with item 15 belonging to the external regulation dimension, which showed a factor loading of .52. Nascimento et al. (2014)

commented that the formulation of items 1 and 7 could be one of the reasons for their problems, due to the fact that they are formulated in a negative form in their respective sentences, and this could confuse respondents as commented previously in literature (Roszkowki & Soven, 2010).

Moreover, researchers of the present study also contacted by email the authors of the recent validated Chinese version of the SMS-II, as the factor loadings of the items were not reported in their article (Li, Kawabata, & Zhang, 2016). This Chinese version of the SMS-II had problems with several items: item 2 belonging to non-motivation with a loading of .46 (I used to have good reasons for doing sports, but now I am asking myself if I should continue); item 15 belonging to the external regulation dimension with a factor loading of .55; item 1 belonging to introjected regulation with a factor loading of .54; and item 18 belonging to identified regulation with a factor loading of .58 (because it is one of the best ways I have chosen to develop other aspects of myself). Finally, Stenling, Ivarsson, Johnson, and Lindwall (2015) also applied the English-original version of the SMS-II to a Swedish sample of 364 competitive athletes, obtaining problems with the factor loading of item 7 belonging to entrojected regulation (under .60), and with one item of external motivation (under .50).

As previously commented in the above-mentioned studies, the items 1, 7, and 15 once again had some problems not only in the Spanish version but also in the English and Portuguese versions, and the items 1 and 15 in the Chinese version as well. Thus, it is possible to conclude that a revision of those items is necessary in order to improve the validity of the introjected regulation dimension in the SMS-II, as well as item 15 belonging to the external regulation dimension. Taking advantage of the list of new proposed items by Pelletier et al. (2013) for the SMS-II in their article, researchers of the present study have suggested changing the formulation of items 1, 7, and 15 (see Supplementary material) for future application of the S-SMS-II-6, maintaining the six-factor structure and the 18 items.

Finally, the third aim of this study was to verify the adapted version's factorial invariance across gender, and also for sport-federated athletes versus non-federated athletes. On one hand, the factorial structure of the two models analyzed was verified as equivalent according to the results obtained in both comparisons (male/female and federated–non-federated athletes). A high structural reliability was obtained given the factor coefficients and intercepts. Moreover, on the other hand, the construct validity of the S-SMS-II-5 was also tested. The external regulation factor was significantly lower in female than in male athletes (as previous studies reported, in the Spanish context, Núñez et al., 2006; and in international contexts, Pelletier et al., 1995; Brière et al., 1995), and sport-federated participants showed higher punctuations in all dimensions related to self-determined motivation (intrinsic, integrated, and identified regulation dimensions), which confirmed logical results when compared to

non-federated participants, as demonstrated in previous research with Spanish adolescents (Isorna, Rial, & Vaquero, 2014).

Social desirability bias coming through the used self-report measurement is the main limitation of this study, as well as the self-reported data of the participants' sport practice. Future application of the S-SMS-II should be reported also in relation to different scales in order to reinforce the validity of the adapted questionnaire. Finally, growth and biological maturation were not considered in this study due to the measurements being transversal. Nevertheless, further applications of this questionnaire in longitudinal or intervention studies should consider the mismatch between chronological age and biological age during pubertal years.

After the analyses were conducted and the results were obtained, it was concluded that the S-SMS-II-6 and 18 items (Supplementary material) are valid, reliable, and available to be applied in research in Spanish School aged athletes samples, as in the present study. Nevertheless, as Pelletier et al. (2013) commented in their future prospective when discussing the original SMS-II, it is necessary to continue applying this questionnaire to multiple sample characteristics (e.g., younger and older Spanish athletes, athletes belonging to different sports modalities, and samples from different cultures). This could allow researchers to count on higher robust evidences regarding the factorial structure of this questionnaire.

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