anales de psicología, 2014, vol. 30, nº 1 (enero), 267-277
http://dx.doi.org/10.6018/analesps.30.1.135031

ISSN edición impresa: 0212-9728. ISSN edición web (http://revistas.um.es/analesps): 1695-2294

The issue of interactional hypothesis in self-determination theory: A proposal of a new motivation quality index

José Martín-Albo[1]*, David González-Cutre[2] y Juan L. Núñez[3]

1 Universidad de Zaragoza. Zaragoza (Spain)
2 Universidad Miguel Hernández de Elche. Alicante (Spain)
3 Universidad de Las Palmas de Gran Canaria. Las Palmas de Gran Canaria (Spain)

Título: El problema de la hipótesis de interacción en la teoría de la autodeterminación: Una propuesta de un nuevo índice de calidad de la motivación

Resumen: Para comprobar los postulados de la teoría de la autodeterminación se ha usado frecuentemente una medida de la calidad de la motivación denominada índice de autodeterminación (IAD). Este índice se basa en la hipótesis de interacción, según la cual la motivación intrínseca y extrínseca no son constructos independientes, sino que cuando aumenta uno disminuye el otro. Sin embargo, la literatura ha revelado que estos constructos son ortogonales y por tanto el IAD presenta problemas de medida. Atendiendo a estas limitaciones, el objetivo de esta investigación fue proponer y comprobar la efectividad de una nueva forma de calcular un índice de calidad de la motivación (IMP: índice de motivación positiva), utilizando dos muestras de deportistas. Los resultados de los dos estudios llevados a cabo revelaron que el IMP se ajustaba mejor a las hipótesis derivadas de la teoría de la autodeterminación que el IAD, encontrándose correlaciones positivas entre la satisfacción de las necesidades psicológicas básicas y el IMP, y entre éste y las emociones positivas. Los resultados obtenidos dan apoyo preliminar a la utilización, en la investigación sobre la teoría de la autodeterminación, del nuevo índice de calidad de la motivación propuesto.

Palabras clave: Teoría de la autodeterminación; deporte; perfiles motivacionales; emociones positivas.

Abstract: The postulates of self-determination theory have been frequently gauged by a measure of motivation quality called self-determination index (SDI). This index relies on an interactional hypothesis. According to this hypothesis, intrinsic motivation and extrinsic motivation are not independent constructs; on the contrary, when one increases the other decreases. However, the literature on the subject has revealed that these constructs are orthogonal and thus SDI presents measurement problems. Considering these limitations, the objective of this research was to propose and test the effectiveness of a new way to calculate a motivation quality index (PMI: positive motivation index). Two athletes' samples were used. Results of the two studies carried out showed that PMI fit better the self-determination theory postulates than SDI did. Positive correlations were found between the satisfaction of basic psychological needs and PMI, and between PMI and positive emotions. Finally, results provided preliminary support for the use of the new motivation quality index proposed from the framework of self-determination theory.

Key words: Self-determination theory; sport; motivational profiles; positive emotions.

Introduction

Self-determination-theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2007) is a theory of human motivation the postulates of which have been tested and applied successfully in many settings, such as education, work, psychopathology, and physical activity, so it is currently one of the most important motivational theories. Different studies have shown the benefits of this theory and its convenience when explaining behavioral mechanisms that make people engage in certain behaviors and experience positive cognitive and affective consequences in different domains of life (Deci & Ryan, 2008). However, research has also identified some theoretical and methodological aspects that can be improved in the study of SDT. One of them is related to the use of self-determination index (SDI) in research with complex methodological designs in order to measure the quality of motivation (i.e., the degree to which the motivation is more self-determined) and its relationship with other dependent and independent variables. The main criticism of this index is that it ignores which types of motivation are optimal depending on the context (Vallerand, Pelletier, & Koestner, 2008). SDI assumes that the higher the self-determined motivation and the lower the non-self-determined motivation, the higher will be the quality of motivation. However, some studies show that, sometimes, the less self-determined forms of motivation (except amotivation) can contribute to generate positive consequences (see Vallerand et al., 2008). Therefore, they must be taken into account as an indicator of the quality of motivation. The objective of this study is to test the usefulness of a new motivation quality index, congruent with the postulates of SDT, but which attends to the peculiarities of context. We decided to conduct the study in a sport context, considering that it is a particular context in which external reinforcements on performance can improve intrinsic motivation (Ryan & Deci, 2000). The following sections explain the theoretical postulates of SDT, the measurement problems found in SDI, and the theoretical and methodological approach in order to use the new index of positive motivation.

*** Dirección para correspondencia [Correspondence address]:**
José Martín-Albo Lucas. Departamento de Psicología y Sociología. Facultad de Ciencias Sociales y Humanas. Universidad de Zaragoza. Campus Universitario de Teruel. C/ Atarazana, s/n. 44003 Teruel (Spain). E-mail: jmartina@unizar.es

Self-determination theory

SDT establishes that there are three universal basic psychological needs, whose satisfaction is associated with more positive forms of motivation and personal well-being: autonomy, competence and relatedness. These can be described as the human need to experience success in different domains (competence), to be free to choose between different options and make decisions (autonomy), and to feel connected to the people around us by maintaining good social relationships (relatedness). Furthermore, SDT establishes different types of motivation that are distributed along a self-determination continuum according to whether they are

more internal or external to the individual. Along this continuum we can find, from lower to higher to level of self-determination: amotivation, extrinsic motivation, and intrinsic motivation. Amotivation represents the absence of motivation and a lack of any intention to carry out a behavior. Extrinsic motivation, in turn, presents various types of regulation with differing degrees of internalization: external regulation, introjected regulation, identified regulation, and integrated regulation. External regulation is the least self-determined type of extrinsic motivation and reflects an action carried out to obtain an external incentive (reward) or to avoid a punishment. Introjected regulation refers to the behavior performed to avoid guilty feelings and to achieve self-approval. Identified regulation occurs when an activity is carried out taking into account the benefits it can provide. Integrated regulation represents the performance of a certain behavior that, although not intrinsically attractive, matches the individual's values, thoughts, and personality. Lastly, intrinsic motivation occurs when the activity is carried out for the pleasure it provides. Pelletier et al. (1995) identify three types of intrinsic motivation: to know, to accomplish, and to experience stimulation.

According to SDT, the satisfaction of basic psychological needs leads people to experience forms of more self-determined motivation (i.e., intrinsic motivation, integrated and identified regulation), which, in turn, are associated with more positive consequences. In order to satisfy basic psychological needs, it is important that people perceive that they operate in a context of autonomy support promoted by different social factors (Deci & Ryan, 2000). For example, if a coach makes an athlete feel effective during training sessions and competitions, makes him or her participate in the decision making process, and generates a good group climate, the athlete is likely to continue the practice of sport because he or she enjoys doing it, and regards it as very important and integrated into his or her lifestyle. This self-determined motivation could help to develop positive emotions and to increase performance, including adaptive consequences. This motivational sequence (autonomy support → basic psychological needs → self-determined motivation → positive consequences) has been tested in a large number of studies (for a review of physical activity and sport, see Ntoumanis, 2012; Standage & Ryan, 2012; Vallerand, 2007).

Measurement of self-determination

Researchers have adopted three kinds of strategies to analyze the relations of motivation with its determinants and consequences. Firstly, they chose to study the relation of each type of motivation with its determinants and consequences independently. This strategy is limited because various motivations function at the same time in real life contexts (Pintrich, 2003).

Secondly, for a more parsimonious measure of self-determination (Ullrich-French & Cox, 2009), an index has frequently been used that includes the different types of motivation in a single score of the individual's level self determination. This index has been called the relative autonomy index (RAI) or the self-determination index (SDI) and it is calculated by assigning a specific weight (according to its position along the self-determination continuum) to the score of each type of motivation, and adding them to obtain a single score. This index has been primarily used in structural equation modeling in order to reduce the degrees of freedom of the model and to obtain satisfactory fit indices with not very large sample sizes. Although its use may ignore the information about the role played by each type of motivation, the fact is that sometimes it can be useful, as it simplifies the human behavior modeling and provides relevant information.

This index is calculated by assigning to intrinsic motivation, integrated regulation, and identified regulation a weight +3, +2, and +1, respectively, whereas introjected regulation, external regulation, and amotivation are assigned a weight of -1, -2, and -3, respectively (as they are conceptualized as being less self-determined types of motivation). All three types of intrinsic motivation are assigned the same weight (+3) and then the total score for intrinsic motivation is divided by 3 to equate it to the rest of the subscales. When integrated regulation is not measured, intrinsic motivation and identified regulation are assigned a weight of +2 and + 1, respectively, and amotivation is assigned a weight of -2. Introjected and external regulation are added, divided by 2, and assigned a weight of -1 (Vallerand & Rousseau, 2001). Although some authors (e.g. Goudas, Biddle, & Fox, 1994) do not consider amotivation when estimating SDI, from our point of view it is appropriate to include it. SDT posits that different forms of motivation are distributed along a self-determination continuum from intrinsic motivation to amotivation, so it is natural to look at all types of motivation to calculate SDI (Vallerand, 2001). Thus, SDI provides information on the quality of motivation, considering that more self-determined forms of motivation lead more strongly to achieving positive outcomes.This strategy underlies the interactional hypothesis (Vallerand & Fortier, 1998) according to which intrinsic and extrinsic motivation are not independent constructs, and it supports a simplex model of the continuum of self-determination. According to this hypothesis, increased self-determined motivation leads to a reduction in non-self-determined motivation, and vice versa. However, research has shown that intrinsic and extrinsic motivation are not mutually exclusive, but rather they represent orthogonal constructs that are more or less independent (Covington & Müeller, 2001).

In fact, the problems encountered when measuring the relations of motivation with its determinants and consequences with these two strategies has led researchers to adopt a third strategy, which consists of using cluster analysis techniques to identify the way the different types of motivation emerge simultaneously, leading to different motivational profiles (e.g., Gillet, Vallerand, & Rosnet, 2009; McNeill & Wang, 2005; Moreno, Cervelló, & González-

Cutre, 2007; Vlachopoulos, Karageorghis, & Terry, 2000). These studies with athletes support the orthogonality of intrinsic and extrinsic motivation, with different profiles emerging depending on the sample used (e.g., a profile with a high score in self-determined and non-self-determined motivation, a self-determined profile, a non-self-determined profile, a moderate profile, a profile with low scores in both types of motivation). In addition, research has shown that the profile with high scores in self-determined and non-self-determined motivation may lead to more positive, or at least equivalent, consequences than the profile with only a high score in self-determined motivation (Gillet et al., 2009). In this sense, SDI presents measurement problems taking into account two issues. On the one hand, the cluster studies demonstrate that the interactional hypothesis is inadequate. SDI is based on this hypothesis since it assigns positive weights to the self-determined types of motivation (higher as self-determination increases) and negative weights to the non-self-determined types of motivation (lower as self-determination decreases). On the other hand, non-self-determined types of motivation can contribute positively to the quality of motivation (when associated with self-determined types of motivation), causing positive consequences. SDI does not take this aspect into account.

The measurement problems of SDI were revealed in a recent study of motivational profiles carried out in physical education classes (Ullrich-French & Cox, 2009). This study, which did not include amotivation in its analysis, found five motivational profiles: self-determined, motivated (with high scores in all of types of motivation), average, low motivation (low scores in all types of motivation), and external (low scores in all types of motivation except for external regulation). No significant SDI differences were found between the motivated profile and the low motivation profile, but differences were found both in the antecedents and the consequences, with the motivated profile being much more adaptive. Likewise, these authors showed that, despite SDI differences in favor of the self-determined profile compared to the motivated profile, the positive experiences were the same in both cases. The same thing occurred between the average profile and the low motivation profile, as the experiences were similar but SDI was higher in the low motivation profile. This study suggests that SDI is not a good indicator of motivational quality because the SDI showed by the more adaptive motivational profiles was not higher than other motivational profiles which had more negative consequences.

Research has revealed situations where forms of motivation which are less self-determined may contribute to positive outcomes (e.g., commitment). In this sense, when the activity is not interesting, the variables that best predict positive consequences could be integrated and identified regulation, and not intrinsic motivation (Koestner, Losier, Vallerand, & Carducci, 1996). This is the case, for example, when a person votes in political elections or when he or she runs in the rain (a priori unpleasant situations and therefore situations which are not intrinsically motivated). Furthermore, the different types of regulation may not have a linear effect on commitment to the activity but instead they may interact with extrinsic factors such as rewards (Pelletier & Sarrazin, 2007). In this sense, Amabile (1996) suggests that the interpretation and subsequent value granted to such rewards may affect behavior in a synergic model, instead of there being a standard linear effect.

In conclusion, SDI reflects the theoretical proposition of SDT but, when determining what type of motivation is optimal, it does not take into account either deviation from the theoretical model, the inherent role of the context, or the activity (Vallerand et al., 2008).

Present study: Towards a new motivation quality index

The review of the literature reveals the problem with the measure of SDI as well as the need to provide a useful solution to this problem from a methodological and theoretical perspective (Vallerand et al., 2008). The purpose of this research is to propose a new motivation quality index called positive motivation index (PMI) and to compare its measurement with that of SDI.

The self-determination continuum can be considered an operation of vectors in which each one of the dimensions situated along the continuum is referred to as a scalar that varies as a function of the context, as cluster studies have shown. In this sense, we propose a PMI that incorporates the standardized regression weights of a confirmatory factor analysis (*CFA*) in which the latent variable is made up of the scores of each subscale of the self-determination continuum (e.g., Bollen, 1989). Thus, the PMI vector would have as many scalars as there are subscales being assessed and it would respect the self-determination profiles of the sample under study. This strategy does not require taking the fit indices of the *CFA* into account, because it is not intended to test the fit of any model, but simply to know the weight of each type of motivation in the study sample. It is necessary to note that this strategy is used since PMI is treated as a latent variable inferred from their scalar indicators. Accordingly, in order to calculate PMI, it is necessary to multiply the score for each of the types of motivation for its standardized regression weight in *CFA*, and add up all the products. Thus, arbitrary weights are not assigned based on the interactional hypothesis, as it is done for calculating SDI (+3, +2, +1, -1, -2,-3), but the specific weight of each of the types of motivation in context is taken into account. Thus, PMI includes (besides what SDI includes) situations in which non-self-determined forms of motivation positively contribute to self-determined forms of motivation, being therefore also the non-self-determined forms of motivation a source of quality of motivation. PMI would be as convenient as SDI, as it is proposed for use in complex research designs where it is necessary to group the different types of motivation in a unique motivation quality index. PMI would more accurately

check which variables predict quality of motivation and how it is associated with different consequences.

To determine whether the proposed PMI improves the measurement of the SDI, two studies were carried out with two independent samples. The research was conducted in a sport context because previous studies have shown that it is a context that can be moved away from the interactional hypothesis, because self-determined motivation positively correlates with non-self-determined motivation (Gillet, Berjot, Vallerand, Amoura, & Rosnet, 2012; Gillet et al., 2009; McNeill & Wang, 2005). So it is possible to test whether PMI operates better than SDI in particular contexts in which the interactional hypothesis is not satisfied, since in those cases where this hypothesis is satisfied, PMI does not differ much from SDI.

The first study was exploratory, taking into account some of the variables which were conceptualized as determinants and consequences of motivation in the framework of SDT. A cluster analysis was performed and, subsequently, a correlation analysis was carried out on each of the profiles obtained among the satisfaction of basic psychological needs, SDI and PMI, and positive emotions. Based on the tenets of SDT, for the profiles with higher scores on self-determined motivation, a higher correlation of motivation quality index with basic psychological needs and positive emotions was expected. This hypothesis will allow us to clarify which motivation quality index (SDI or PMI) operates better. In the second study, we replicated the first one, identifying the motivational profiles and testing in each one, via a structural equation model (*SEM*), the complete sequence proposed by SDT: autonomy support → basic psychological needs → SDI and PMI → positive emotions. After comparing the performance of SDI and PMI in the different clusters, we compared their performance by using the full sample of the second study. The finding that one of the motivation quality indexes operates better than the other taking into account the general characteristics of the sample (full sample), would recommend its use in the analysis of structural equation models.

Study 1

Method

Participants

In the study, 681 Spanish athletes were participants (484 men, 195 women, and 2 participants who did not indicate their gender), aged between 14 and 40 years (M = 20.22, SD = 5.32), who practiced one of the following sports: soccer, basketball, handball, and volleyball. All the athletes competed at the provincial or national level and had an average of 10.85 years of experience in the sport they practiced (SD = 5.33).

Instruments

Basic psychological needs. We used the Spanish version (Sánchez & Núñez, 2007) of the Basic Psychological Needs in Exercise Scale (BPNES, Vlachopoulos & Michailidou, 2006). This instrument, using the heading of "In my sport…", measures satisfaction of the needs of autonomy (e.g., "the sport I practice is closely related to what I like"), competence (e.g., "I think I am capable of meeting the demands of the sport I practice"), and relatedness (e.g., "I feel very comfortable with my teammates") with 12 items (four for each factor). Responses are rated on a Likert-type scale, ranging from 1 (*strongly disagree*) to 5 *(strongly agree*). In this study, we obtained Cronbach's alpha coefficients of .76 for autonomy, .71 for competence, and .84 for relatedness, and the following fit indexes in the *CFA*: χ^2 (50, N = 681) = 226.58, p = .01, χ^2/df = 4.53, the comparative fit index (*CFI* = .93), the incremental fit index (*IFI* = .93), the root mean square error of approximation (*RMSEA* = .05) (Confidence interval, *CI* 90% = .06-.08), and the standardized root mean square residual (*SRMR* = .05).

Sport motivation. To measure the diverse types of motivation established by SDT, we used the Spanish version (Núñez, Martín-Albo, Navarro, & González, 2006) of the Sport Motivation Scale (SMS, Pelletier et al., 1995). The scale is made up of 28 items distributed in seven 4-item subscales that assess the three types of intrinsic motivation (IM): IM to know (e.g., "for the pleasure it gives me to know more about the sport that I practice"), IM to accomplish (e.g., "because I feel a lot of personal satisfaction while mastering certain difficult training techniques"), and IM to experience stimulation (e.g., "for the pleasure I feel in living exciting experiences"), the three types of extrinsic motivation: external regulation (e.g., "because it allows me to be well regarded by people that I know"), introjected regulation (e.g., "because it is absolutely necessary to do sports if one wants to be in shape"), and identified regulation (e.g., "because, in my opinion, it is of the best ways to meet people"), and amotivation (e.g., "I used to have good reasons for doing sports, but now I am asking myself if I should continue doing it"). Each item was a response to the question "Why do you practice your sport?" and was scored on a Likert-type scale ranging from 1 (*doesn't correspond at all*) to 7 (*corresponds exactly*). In this study, we obtained alpha values of .81 for IM to know, .86 for IM to accomplish, .78 for IM to experience stimulation, .72 for identified regulation, .81 for introjected regulation, .78 for external regulation, and .78 for amotivation, and the following fit indexes in the *CFA*: χ^2 (325, N = 681) = 1194.63, p = .01, χ^2/df = 3.67, *CFI* = .91, *IFI* = .91, *RMSEA* = .05 (*CI* 90% = .06-.07), *SRMR* = .05.

Positive emotions. We used the subscale of positive emotions from an adapted version of the Perceived Autonomy Scale in the Life Domains (Blais & Vallerand, 1991). The subscale is made up of four items (e.g., "I'm happy"), headed by the sentence "While I practice sport", which were answered using a Likert-type scale ranging from 1 (*strongly disa-*

gree) to 7 (*strongly agree*). Cronbach's alpha was .87 and the following fit indexes were obtained in the *CFA*: χ^2 (2, N = 681) = 3.99, p = .14, χ^2/df = 1.99, *CFI* = .99, *IFI* = .99, *RMSEA* = .03 (*CI* 90% = .01-.09), *SRMR* = .01.

Procedure

Various directors and coaches of several sports teams were contacted to inform them about the purpose of this research and to ask for their collaboration. All the instruments were administered before a training session in a single 15-minute session. A trained interviewer explained how to complete the instruments, placing emphasis on the anonymity of the responses, and clearing up any doubts that arose. Before beginning the study, we obtained all the necessary institutional permissions, including paternal consent in the case of minor participants.

Data analysis

Firstly, the two motivation indexes were calculated, one by applying the classic formula (SDI), and the other with our new proposal (PMI). To identify the motivational profiles of the sample under study, we carried out a hierarchical cluster analysis. Subsequently, to determine which motivation index fit SDT hypotheses better, we performed a Pearson correlation analysis between the basic psychological needs, SDI and PMI, and the positive emotions in each profile. All the analyses were performed with the SPSS 15.0 and AMOS 7.0 statistical packages.

Results

Motivation quality index

The motivation quality index was calculated considering two alternatives. Taking into account that the classic alternative (SDI) assigns a specific weight to each type of motivation according to its position on the self-determination continuum, in this study, the following formula was applied: 2 × (IM to know + IM to accomplish + IM to experience stimulation) / 3 + Identified regulation – (Introjected regulation + External regulation) / 2 – 2 × Amotivation (Vallerand & Rousseau, 2001). Applying this formula, SDI ranged between -10.71 and 14.88 (M = 4.16, SD = 4.16).

Our new alternative considers that the weight used should vary according to how the sample under study displays the self-determination continuum. To calculate this new index, the concrete scaled values were substituted by the values of the standardized regression weights in a *CFA*. We used a latent variable called positive motivation index and seven observable variables that corresponded to the mean scores obtained in each of the SMS subscales. Thus, the resulting formula was: .85 × IM to know + .88 × IM to accomplish + .90 × IM to experience stimulation + .71 × Identified regulation + .53 × Introjected regulation + .50 × External regulation – .08 × Amotivation. With this new alternative, PMI ranged between 7.73 and 30.51 (M = 21.43, SD = 4.50).

Cluster analysis and correlations

Firstly, we performed a hierarchical cluster analysis using the Ward method with a measurement of the squared Euclidean distance and entering the diverse forms of motivation in the analysis. This method was selected because it minimizes the differences within the clusters and avoids the linkage problems found with other methods (Hair, Anderson, Tatham, & Black, 1998). As cluster analysis is sensitive to outliers, we performed a preliminary analysis that revealed that in no case was the distance to the mean three times higher than the standard deviation. The dendogram suggested the presence of two clusters for this sample of athletes. Table 1 shows the means and standard deviations in the types of motivation for each cluster. Figure 1 shows the motivational profiles for the two-cluster solution. The first profile, called "profile with high score in self-determined and non-self-determined motivation," was made up of 481 athletes (70.6%) and displayed high scores in all three types of intrinsic motivation, in identified and introjected regulation; moderate scores in external regulation, and low scores in amotivation. The second profile (n = 200; 29.4%), called "moderate profile," displayed moderate scores in intrinsic motivation, identified and introjected regulation, and low scores in external regulation and amotivation.

Table 1. Descriptive Statistics for Total N and Clusters in Study 1.

Variables	Total Sample (N = 681)		Cluster 1 (n = 481)		Cluster 2 (n = 200)	
	M	*SD*	*M*	*SD*	*M*	*SD*
IM to Accomplish	5.16	1.33	5.67	.97	3.94	1.28
IM to Know	4.92	1.35	5.43	1.04	3.70	1.23
IM to Experience	5.51	1.09	5.85	.88	4.71	1.12
Identified R.	4.56	1.29	5.04	1.08	3.38	.98
Introjected R.	5.33	1.36	5.82	.95	4.16	1.48
External R.	3.75	1.55	4.33	1.36	2.35	.96
Amotivation	2.33	1.42	2.49	1.49	1.92	1.15

Secondly, we carried out a correlation analysis in each cluster to test which motivation index (SDI or PMI) better fit the hypotheses proposed by SDT. Specifically, as Cluster 1 presented a more self-determined profile, we expected high and positive correlations between the basic psychological needs and motivation index. Likewise, we expected that the relation between motivation index and positive emotions would be high and positive. However, as Cluster 2 presented a less self-determined profile, we hypothesized that the correlations between the basic psychological needs and motivation index, and between motivation index and positive emotions, would be lower than in Cluster 1.

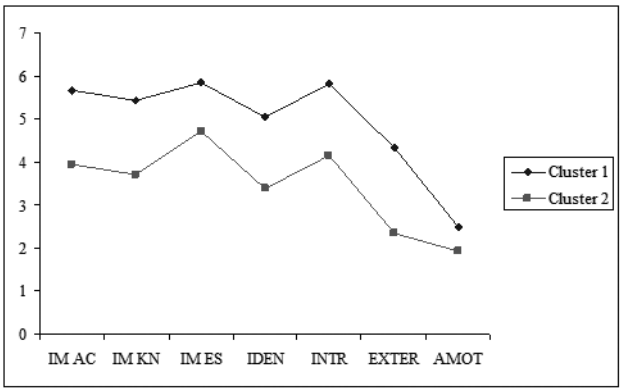

Figure 1. Motivational profiles in Study 1. IM AC = Intrinsic motivation to accomplish; IM KN = Intrinsic motivation to know; IM ES: Intrinsic motivation to experience stimulation; IDEN = Identified regulation; INTR = Introjected regulation; EXTER = External regulation; AMOT = Amotivation.

As can be observed in Table 2, considering SDI, the results showed that, in general, the correlations between basic psychological needs and SDI and between SDI and positive emotions were higher in Cluster 2. With regard to PMI, the correlations between basic psychological needs and PMI were higher in Cluster 1. However, the correlation between PMI and positive emotions was slightly higher in Cluster 2 than in Cluster 1. When comparing the correlations between the two types of motivation index, the results showed that PMI obtained higher correlations than SDI in the more self-determined profile, and lower correlations in the less self-determined profile.

Table 2. Correlations Between Variables.

	1	2	3	4	5	6
Cluster 1						
1. Autonomy		.55**	.40**	.35**	.42**	.39**
2. Competence			.37**	.29**	.42**	.35**
3. Relatedness				.13**	.18**	.34**
4. SDI					.60**	.29**
5. PMI						.31**
6. Positive emotions						
Cluster 2						
1. Autonomy		.54**	.33**	.38**	.23**	.34**
2. Competence			.29**	.27**	.10	.32**
3. Relatedness				.18*	.14*	.35**
4. SDI					.73**	.40**
5. PMI						.37**
6. Positive emotions						

*$p < .05$; **$p < .01$

Discussion

The goal of this first study was to test which motivation index fits SDT postulates better, taking into account the different motivational profiles found in a sample of athletes. Cluster analysis revealed the presence of two profiles: a profile with a high score in self-determined and non-self-determined motivation and a moderate profile. Previous studies found similar profiles in other samples of athletes (e.g., Gillet et al., 2009; Vlachopoulos et al., 2000). The results indicate that PMI assesses the quality of motivation better than SDI. Firstly, the different regression weights used to calculate it respect the self-determination values of the sample under study, in contrast to SDI, in which certain weights, previously derived from the position that the dimensions occupy on the continuum, are assigned. As can be seen, the regression weights of the *CFA* support the existence of a self-determined continuum, as proposed by SDT, but without having to subtract the forms of non-self-determined motivation. In fact, except for amotivation, all the weights are positive, with their value decreasing from intrinsic motivation to external regulation. Secondly, the correlational analysis also showed that PMI better supports SDT by obtaining higher and positive correlations with the basic psychological needs in the more self-determined profile, and lower ones in the less self-determined profile. However, in SDI, the relations were the opposite. The only theoretical anomaly found was the correlation between PMI and positive emotions, in which the less self-determined profile obtained the highest score. Nevertheless, this result could be explained because this profile (despite being less self-determined) presents moderate scores in the diverse types of motivation. Moreover, using SDI, the correlation between SDI and positive emotions was even higher, and the difference in the value of this correlation between both motivational profiles was higher.

Study 2

Method

Participants

The participants of this study were a total of 517 Spanish athletes (395 men and 122 women) who practiced diverse sports (soccer, handball, basketball, and volleyball). All the athletes competed at the provincial or national level and had an average of 9.83 years of experience in the sport they practiced (SD = 5.32). Age ranged between 14 and 39 years, mean age 20.37 years (SD = 5.16).

Instruments

Autonomy support. We used an adaptation to sports of the Spanish version (Moreno, Parra, & González-Cutre, 2008) of the Perceived Autonomy Support Scale for Exercise Settings (PASSES, Hagger et al., 2007). This scale has 12 items that assess a single dimension (e.g., "my coach supports me in this sport"). The scale was rated on Likert-type format, ranging from 1(*strongly disagree*) to 7 (*strongly agree*). In this study, we obtained a Cronbach's alpha coefficient of .93 and the following fit indexes in the *CFA*: χ^2 (51, N = 517) = 253.42, p = .01, χ^2/df = 4.68, *CFI* = .95, *IFI* = .95, *RMSEA* = .08 (*CI* 90% = .07-.09), *SRMR* = .03.

Basic psychological needs. We used the Spanish version (Sánchez & Núñez, 2007) of the BPNES (Vlachopoulos & Michailidou, 2006). In this study, we obtained Cronbach's alpha coefficients of .77 for autonomy, .80 for competence, and .85 for relatedness, and the following fit indexes in the *CFA*: χ^2 (50, N = 517) = 189.54, p = .01, χ^2/df = 3.79, *CFI* = .94, *IFI* = .94, *RMSEA* = .07 (*CI* 90% = .06-.08), *SRMR* = .05.

Sport motivation. We used the Spanish version (Núñez et al., 2006) of the SMS (Pelletier et al., 1995). In this study, we obtained alpha values of .82 for IM to know, .87 for IM to accomplish, .82 for IM to experience stimulation, .75 for identified regulation, .82 for introjected regulation, .79 for external regulation, and .81 for amotivation, and the following fit indexes in the *CFA*: χ^2 (325, N = 517) = 996.34, p = .01, χ^2/df = 3.09, *CFI* = .91, *IFI* = .91, *RMSEA* = .05 (*CI* 90% = .06-.07), *SRMR* = .05.

Positive emotions. We used the subscale of positive emotions from an adapted version of the Perceived Autonomy Scale in the Life Domains (Blais & Vallerand, 1991). Cronbach's alpha was .90 and the following fit indexes were obtained in the *CFA*: χ^2 (2, N = 517) = 1.43, p = .48, χ^2/df = .07, *CFI* = .99, *IFI* = .99, *RMSEA* = .01 (*CI* 90% = .01-.07), *SRMR* = .01.

Data analysis

As in the first study, at first we calculated both motivation indexes. Next, we identified the motivational profiles of this new sample by means of a k-means confirmatory cluster analysis. Lastly, we tested a two-step structural model (Anderson & Gerbing, 1988), using the variables autonomy support, autonomy, competence, relatedness, SDI and PMI, and positive emotions in each profile and in the total sample. The purpose was to determine whether when using PMI, the relations found would coincide with the theoretical postulates proposed by SDT. We used the SPSS 15.0 and the AMOS 7.0 for the analyses.

Results

Motivation quality index

As in the previous study, we calculated two motivation indexes (SDI and PMI). Applying the classic formula, SDI ranged between -10.71 and 14.88 *(M* = 5.62, *SD* = 4.43). Using the new proposed alternative, the formula applied to this sample of athletes was: .85 × IM to know + .88 × IM to accomplish + .90 × IM to experience stimulation + .72 × Identified regulation + .58 × Introjected regulation + .52 × External regulation – .11 × Amotivation, with PMI ranging between 6.18 and 30.34 (*M* = 21.18, *SD* = 4.82).

Confirmatory cluster analysis and structural equation models

A k-mean cluster analysis was performed on the result obtained in the hierarchical cluster analysis of Study 1. This kind of cluster analysis is called confirmatory because one must previously determine the clusters one expects to find. In this case, as the sample under study had very similar characteristics to that of Study 1, two clusters were specified in the analysis. Table 3 shows the means and standard deviations in the types of motivation for each cluster.

Table 3. Descriptive Statistics for Total N and Clusters in Study 2.

Variables	Total sample (N = 517)		Cluster 1 (n = 299)		Cluster 2 (n = 218)	
	M	*SD*	*M*	*SD*	*M*	*SD*
IM to Accomplish	5.18	1.42	6.04	.78	4.00	1.25
IM to Know	4.88	1.44	5.70	.98	3.75	1.18
IM to Experience	5.53	1.18	6.14	.71	4.69	1.17
Identified R.	4.53	1.38	5.31	1.00	3.46	1.08
Introjected R.	5.31	1.42	6.04	.90	4.31	1.39
External R.	3.79	1.56	4.56	1.37	2.74	1.14
Amotivation	2.38	1.49	2.39	1.56	2.36	1.41

As can be observed in Figure 2, the motivational profiles obtained were very similar to those found in Study 1 and, therefore, they had the same names. The first cluster ("profile with high score in self-determined and non-self-determined motivation") included 299 athletes (57.8%) and it displayed high scores in all three types of intrinsic motivation, identified and introjected regulation, moderate scores in external regulation, and low scores in amotivation. Cluster 2 or "moderate profile" (n = 218; 42.2%) showed moderate scores in intrinsic motivation, identified and introjected regulation, and low scores in external regulation and amotivation.

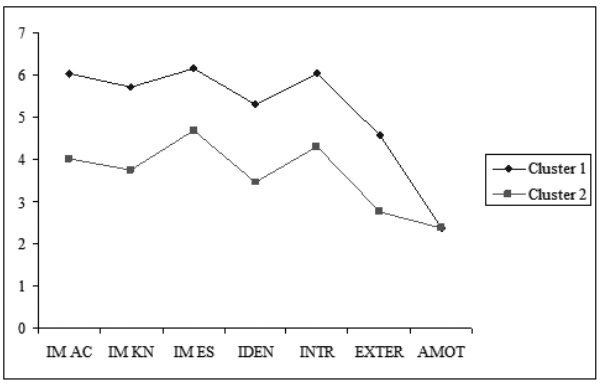

Figure 2. Motivational profiles in Study 2. IM AC = Intrinsic motivation to accomplish; IM KN = Intrinsic motivation to know; IM ES: Intrinsic motivation to experience stimulation; IDEN = Identified regulation; INTR = Introjected regulation; EXTER = External regulation; AMOT = Amotivation.

Next, a two-step *SEM* was performed on each cluster and on the total sample to determine whether PMI fit the SDT postulates better, as was reflected in Study 1. We included in the model the social factor autonomy support as a determinant, the three basic psychological needs as mediators, SDI and PMI, and positive emotions as a consequence. We analyzed two models, one of them using SDI and the other one using PMI. To measure the latent variable autonomy support, we used three indicators, each one of which

represented the mean score of four items. To measure the latent variables autonomy, competence, relatedness, and positive emotions, we used the items of each scale, respectively, as indicators. To measure the latent variable SDI and PMI, we used four indicators, each one of which was calculated by introducing a single item from each SMS subscale in the formulas of SDI and PMI. This procedure for calculating the indicators of the latent variable motivation index has been used in several studies (e.g., Boiché & Sarrazin, 2007). Since in this case, each of the subscales of the SMS consists of four items, using the score of each of these items separately in the motivational index formula (SDI or PMI) is the most appropriate way to obtain various indicators for the structural equation analysis. We used the covariance matrix with the maximum likelihood estimation method along with the *bootstrapping* procedure, as the data were not normal. This procedure allowed us to verify that the estimators were not affected by the lack of normality and, therefore, they were robust (Byrne, 2001).

To test goodness of fit of the model, we used various indexes: the ratio between χ^2 and the degrees of freedom (χ^2/df), the *CFI*, the *IFI*, the *RMSEA* and its confidence interval (*CI*) of 90%, and the *SRMR* . We used the χ^2/df index because the χ^2 is very sensitive to sample size (Jöreskog & Sörbom, 1993). For this index, values lower than 3 are usually accepted (Schermelleh-Engel, Moosbrugger, & Müller, 2003). According to Hu and Bentler (1999), *CFI* and *IFI* values higher than .95, together with values equal to or lower than .06 for *RMSEA* and .08 for *SRMR* , indicate a good fit of the model. Nevertheless, some expert psychometricians consider that these *CFI* and *IFI* values are too demanding and difficult to achieve with complex models that use real data instead of simulated data (e.g., Marsh, Hau, & Grayson, 2005). Therefore, values higher than .90 are usually considered acceptable. Other authors consider values lower than .10 for *SRMR* to be acceptable for models with a large number of parameters (Kline, 2005).

Before testing the predictive relations of the model in the clusters, following the premises established by Anderson and Gerbing (1988), we first analyzed a measurement model in which all the latent variables correlated freely and which corresponded to a *CFA*. The fit indexes obtained in these analyses were satisfactory, but for reasons of brevity, they are not presented herein, although they are available on request.

In the second step, the structural model showed that autonomy support would positively predict satisfaction of basic psychological needs, and these, in turn, would predict motivation index, and motivation index would positively predict positive emotions. We hypothesized that PMI would fit the SDT postulates better than SDI. Thus, as Cluster 1 presented a more self-determined profile, we expected high and positive standardized regression weights between the basic psychological needs and PMI, and between PMI and positive emotions. For Cluster 2, as it presented a less self-determined profile, we hypothesized that the standardized regression weights between the basic psychological needs and PMI, and between PMI and positive emotions would be lower than in Cluster 1. However, using SDI, we would not obtain these hypothesized relations.

Table 4 and Figure 3 present the fit indexes, standardized regression weights, and explained variances for each cluster and for the full sample. Considering SDI, the results showed that the relations between the basic psychological needs and SDI, and between SDI and positive emotions were higher in Cluster 2. Moreover, the relation between autonomy and SDI was negative in both clusters. With regard to PMI, the relations between the basic psychological needs and PMI were higher in Cluster 1 (except for the relation between the need for relatedness and PMI, which was similar in both clusters). However, the correlation between PMI and positive emotions was higher in Cluster 2 than in Cluster 1. In any case, with PMI, the relations were positive. If we compare the regression weights of the two motivation indexes, we observe that PMI obtained higher values than SDI in the more self-determined profile and lower values in the less self-determined profile. Regarding the explained variances, they were similar although, in the case of Cluster 1, the value of PMI was higher than that of SDI (.28 versus .11, respectively), which was reversed in the case of Cluster 2 (.13 versus .31). Lastly, we attempted to show that PMI was a better measurement than SDI, using the entire sample of athletes of this study. With PMI, the results revealed positive and significant relations between all the variables, whereas with SDI, the relation between autonomy and SDI was negative and nonsignificant.

Table 4. Fit Indexes and Explained Variances.

	Cluster 1		Cluster 2		Total *N*	
	SDI	PMI	SDI	PMI	SDI	PMI
χ^2/df	2.15	1.95	1.73	2.02	2.60	2.71
CFI	.92	.93	.94	.92	.95	.95
IFI	.92	.93	.94	.92	.95	.95
RMSEA (*CI* 90%)	.06 (.05-.07)	.06 (.05-.06)	.06 (.05-.07)	.07 (.06-.08)	.06 (.05-.06)	0.6 (.05-.06)
SRMR	.11	.08	.08	.09	.09	.08
Explained variances (R^2)						
Autonomy	.12	.12	.15	.15	.17	.17
Competence	.24	.23	.21	.20	.28	.27
Relatedness	.20	.20	.14	.14	.20	.20
Motivation	.11	.28	.31	.13	.27	.33
Positive emotions	.03	.08	.30	.17	.21	.19

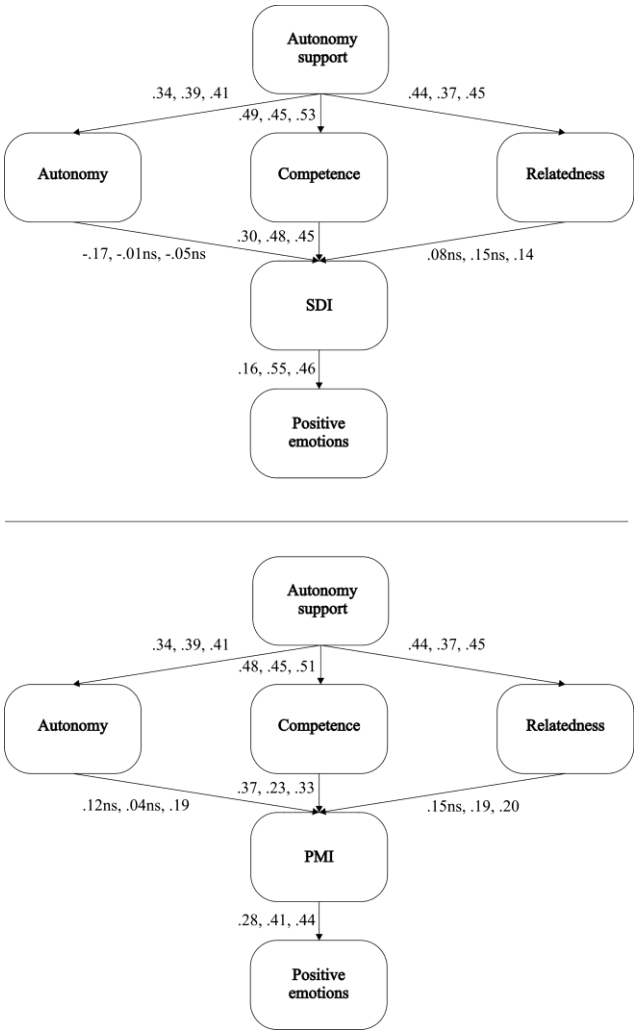

Figure 3. Structural equation model showing the standardized regression weights. From left to right: the values for the first cluster, the second cluster and the total sample. All the parameters are statistically significant at $p < .05$, except those marked with ns (non-significant).

Discussion

The goal of this second study was to verify whether the new proposed PMI fit the SDT postulates better than SDI. The results of the *CFA* with the diverse types of motivation corroborated the existence of a self-determined continuum which ranged from intrinsic motivation to amotivation, but taking into account the particular characteristics of the context. Similarly to Study 1, the results show that the regression weights gradually decrease in parallel to self-determination, but considering the pattern of the sample (not using arbitrary weights of -3 to +3) and not necessarily subtracting all non-self-determined types of motivation. In fact, in this case, only amotivation accounts negatively.

In the *SEM* analysis, we obtained similar results to those of Study 1. Specifically, we obtained higher positive relations between basic psychological needs and PMI in the more self-determined profile than in the less self-determined profile, whereas with SDI, these relations were reversed. Moreover, the relation between perception of autonomy and SDI was negative in both profiles, and it was even significant in the profile with high self-determined and non-self-determined motivation. Regarding the relation with positive emotions, the results showed the same deviation as in Study 1.

To test the usefulness of PMI without performing a prior analysis of motivational profiles, we carried out a *SEM* using the total sample. It must be taken into account that in this research we performed a cluster analysis only for a methodological purpose, to compare the effectiveness of two motivation indexes (SDI and PMI) based on the tenets of SDT. This might suggest that it is necessary to establish the different motivational profiles of the sample and calculate the PMI for each of them. However, the results show that PMI also performs better than SDI when using the full sample, irrespective of whether it is composed of different profiles. Therefore, it seems advisable for future studies to use PMI in structural equation analysis instead of SDI. The results of this study indicate that PMI is more appropriate to the SDT postulates because it respects the self-determination continuum of the sample under study.

General discussion

The purpose of this research was to propose a new criterion to calculate a motivation quality index (positive motivation index: PMI) and to compare its measurement with the classic criterion used until now (SDI). The motivation quality index is mainly used in structural equation analysis. It allows to test which variables predict positive motivation and, in turn, which consequences are predicted by positive motivation. The results of this study suggest that PMI represents more adequately the quality of motivation, considering all the types of motivation that contribute to positive consequences (not necessarily the self-determined motivation only) and the specific weight which each of them contributes.

These results help to solve the theoretical and methodological problem of the use of SDI identified in the literature (Pelletier & Sarrazin, 2007; Vallerand et al., 2008). The new calculation criterion considers that PMI is a vector made up of the scaled values of each one of the subscales measured, so that the theoretical continuum proposed by SDT is respected. From an empirical perspective, previous studies have shown that there are different motivational profiles that deviate from the interactional hypothesis (e.g., Gillet et al., 2009; Ullrich-French & Cox, 2009), depending on the contexts. In this sense, the classic form of calculating SDI does not allow us to match the contextual differences proposed by these studies, because the scores of the different types of motivation are assigned a priori and arbitrarily. The new criterion to calculate the motivation quality index (PMI)

respects the motivational differences derived from the context when defining a posteriori values in each type of motivation using a *CFA* of the data obtained in a sample.

The *CFA*s carried out to calculate PMI have shown that the three forms of intrinsic motivation obtained higher regression weights, followed by identified and introjected regulation, and external regulation. In addition, amotivation was the only negative standardized regression weight. As can be observed, these weights were distributed along a continuum that is coherent with SDT postulates. In the present study, the scores of introjected and external regulation contributed positively to PMI. This can be explained because, in certain contexts, the reinforcers can positively affect the development of intrinsic motivation (Ryan & Deci, 2000). This is the case of intangible or unexpected reinforcers, such as when, in a sport context, the coach verbally reinforces a player for a good performance.

To compare the SDI and PMI measures, we started with the hypotheses proposed by SDT. According to these hypotheses, in a more self-determined profile, basic psychological needs and positive emotions should be more positively and highly related to the quality of motivation than in a less self-determined profile. Furthermore, the relations derived from the motivational sequence proposed by SDT (autonomy support → basic psychological needs → quality of motivation → positive emotions) should be positive and significant.

Regarding the first hypothesis, the results of the two studies have shown that PMI is the only one that complies with it. In fact, using SDI, the results are contrary to this hypothesis, because the relations of SDI with basic psychological needs and positive emotions were higher in the less self-determined profile. This is because in the profile with high scores in self-determined and non-self-determined motivation, the more self-determined motivation is penalized by subtracting the values of introjected and external regulation when, actually, both values are positively related to the quality of motivation. However, with PMI, the values respect the relations found between the diverse types of motivation, so that the value of PMI is not penalized and this allows the relations to be coherent, independently of the profile analyzed.

Nevertheless, in contrast to our expectations, the relation between PMI and positive emotions was higher in the less self-determined profile. As mentioned previously, this could be due to the fact that this profile is not a non-self-determined profile but a moderate profile. Anyhow, using PMI, the value of this relation was considerably lower than when using SDI, which is more coherent with the theory.

Regarding the second hypothesis, the results also supported the use of PMI. This support focuses on two basic aspects derived from SDT: first, the hypothesis is confirmed because positive and significant relations were found between the determinants and PMI, and between PMI and positive emotions; and second, both the measurement model and the structural model obtained good fit indexes. However, with SDI, the relation in the *SEM* between perceived autonomy and quality of motivation was negative, which can hardly be explained from the SDT paradigm.

It is important to note that, when considering the motivational profiles either separately or in the entire sample, PMI was seen to be more coherent with the SDT postulates than SDI. These results indicate that PMI could be used without the need of performing a previous cluster analysis. In addition, PMI would allow the analysis of motivational models in which external and introjected regulation would act in diverse ways (increasing or decreasing self-determination), and scores that were suitable to each context could be established. Although PMI and SDI share the notion of a self-determination continuum, with the former, one can consider external and introjected regulation to exert relevant influence on intrinsic motivation; however, this should always be done using standardized regression weights that are lower than the intrinsic motivation scales. In this sense, when introjected and external regulation do not contribute to intrinsic motivation, both ways of calculating the motivation quality index (SDI and PMI) should coincide in their relations with the antecedents (e.g., basic psychological needs) and their consequences (e.g., positive emotions).

Despite the results obtained, this study is not exempt from limitations. Firstly, we could only compare the two formulations of motivation quality index in two motivational profiles, so the results should be considered preliminary. Secondly, we only used team sports in the sample. Lastly, we did not consider other variables (e.g., gender or the number of years of sport practice) that could affect the results. Regarding future perspectives, more empirical evidence of the functioning of PMI should be provided, relating it to other determinants and consequences and using other samples of sports and other life contexts (e.g., education).

To conclude, the results obtained provide preliminary support to the use of the new motivation quality index we have proposed. PMI improves the measurement of SDI, better fitting the SDT postulates by respecting the self-determination continuum of the sample under study. This new criterion to calculate the quality of motivation implies an advance, both from the theoretical and the methodological viewpoints, in the field of research of SDT.

References

Amabile, T. M. (1996). *Creativity in context*. Boulder, CO: Westview Press.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103,* 411-423.

Blais, M. R., & Vallerand, R. J. (1991). *Échelle de perception d'autodétermination dans les domaines de vie (ÉPADV-16)* [Perceived autonomy scale in the life domains (ÉPADV-16)]. Unpublished manuscript. Universitè du Québec.

Boiché, J. C. S., & Sarrazin, P. G. (2007). Self-determination of contextual motivation, inter-context dynamics and adolescents' patterns of sport participation over time. *Psychology of Sport and Exercise, 8,* 685-703.

Bollen, K. A. (1989). *Structural equations with latent variables*. New York: John Wiley & Sons.

Byrne, B. M. (2001). *Structural equation modeling with Amos: Basic concepts, applications, and programming*. Mahwah, NJ: Erlbaum.

Covington, M. V., & Müeller, K. J. (2001). Intrinsic versus extrinsic motivation: An approach/avoidance reformulation. *Educational Psychology Review, 13,* 157-176.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum Press.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behaviour. *Psychological Inquiry, 11,* 227-268.

Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology, 49,* 14-23.

Gillet, N., Berjot, S., Vallerand, R. J., Amoura, S., & Rosnet, E. (2012). Examining the motivation-performance relationship in competitive sport: A cluster-analytic approach. *International Journal of Sport Psychology, 43,* 79-102.

Gillet, N., Vallerand, R. J., & Rosnet, E. (2009). Motivational clusters and performance in a real-life setting. *Motivation and Emotion, 33,* 49-62.

Goudas, M., Biddle, S. J. H., & Fox, K. (1994). Perceived locus of causality, goal orientations and perceived competence in school physical education classes. *British Journal of Educational Psychology, 64,* 453-463.

Hagger, M. S., Chatzisarantis, N. L. D., Hein, V., Pihu, M., Soos, I., & Karsai, I. (2007). The perceived autonomy support scale for exercise settings (PASSES): Development, validity, and cross-cultural invariance in young people. *Psychology of Sport and Exercise, 8*, 632–53.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis*. Upper Saddle River, NJ: Prentice-Hall.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6,* 1-55.

Jöreskog, K. G., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Chicago: Scientific Software.

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York: Guildford Press.

Koestner, R., Losier, G. F., Vallerand, R. J., & Carducci, D. (1996). Identified and introjected forms of political internalization: Extending self-determination theory. *Journal of Personality and Social Psychology, 70,* 1025-1036.

Marsh, H. W., Hau, K-T., & Grayson, D. (2005). Goodness of fit evaluation in structural equation modeling. In A. Maydeu-Olivares & J. McCardle (Eds.), *Contemporary psychometrics: A Festschrift to Roderick P. McDonald* (pp. 275-340). Mahwah, NJ: Erlbaum.

McNeill, M. C., & Wang, C. K. J. (2005). Psychological profiles of elite school sports players in Singapore. *Psychology of Sport and Exercise, 6,* 117-128.

Moreno, J. A., Cervelló, E., & González-Cutre, D. (2007). Young athletes' motivational profiles. *Journal of Sports Science and Medicine, 6,* 172-179.

Moreno, J. A., Parra, N., & González-Cutre, D. (2008). Influencia del apoyo a la autonomía, las metas sociales y la relación con los demás sobre la desmotivación en educación física [Influence of autonomy support, social goals and relatedness on amotivation in physical education classes]. *Psicothema, 20,* 636-641.

Ntoumanis, N. (2012). A self-determination theory perspective on motivation in sport and physical education: Current trends and possible future research directions. In G. L. Roberts & D. C. Treasure (Eds.), *Advances in motivation in sport and exercise* (3rd ed., pp. 91-128). Champaign, IL: Human Kinetics.

Núñez, J. L., Martín-Albo, J., Navarro, J. G., & González, V. M. (2006). Preliminary validation of a Spanish version of the Sport Motivation Scale. *Perceptual and Motor Skills, 102,* 919-930.

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., Tuson, K. M., Brière, N. M., & Blais, M. R. (1995). Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sports: The Sport Motivation Scale (SMS). *Journal of Sport and Exercise Psychology, 17,* 35-53.

Pelletier, L. G., & Sarrazin, P. (2007). Measurement issues in self-determination theory and sport. In M. S. Hagger & N. L. D. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 143-152). Champaign, IL: Human Kinetics.

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology, 95,* 667-686.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55,* 68-78.

Ryan, R. M., & Deci, E. L. (2007). Active human nature: Self-determination theory and the promotion and maintenance of sport, exercise, and health. In M. S. Hagger & N. L. D. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 1-19). Champaign, IL: Human Kinetics.

Sánchez, J. M., & Núñez, J. L. (2007). Análisis preliminar de las propiedades psicométricas de la versión española de la Escala de Necesidades Psicológicas Básicas en el Ejercicio Físico [Preliminary analysis of the psychometric properties of a Spanish version of the Basic Psychological Needs in Exercise Scale]. *Revista Iberoamericana de Psicología del Ejercicio y el Deporte, 2*(2), 83-92.

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online, 8*(2), 23-74.

Standage, M., & Ryan, R. M. (2012). Self-determination theory and exercise motivation: Facilitating self-regulatory processes to support and maintain health and well-being. In G. L. Roberts & D. C. Treasure (Eds.), *Advances in motivation in sport and exercise* (3rd ed., pp. 233-270). Champaign, IL: Human Kinetics.

Ullrich-French, S., & Cox, A. (2009). Using cluster analysis to examine the combinations of motivation regulations of physical education students. *Journal of Sport and Exercise Psychology, 31,* 358-379.

Vallerand, R. J. (2001). A hierarchical model of intrinsic and extrinsic motivation in sport and exercise. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 263-319). Champaign, IL: Human Kinetics.

Vallerand, R. J. (2007). Intrinsic and extrinsic motivation in sport and physical activity. A review an a look at the future. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of sport psychology* (3rd ed.)(pp. 59-83). New York: John Wiley & Sons.

Vallerand, R. J., & Fortier, M. S. (1998). Measures of intrinsic and extrinsic motivation in sport and physical activity: A review and critique. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 81-101). Morgatown, WV: Fitness Information Technology.

Vallerand, R. J., Pelletier, L. G., & Koestner, R. (2008). Reflections on self-determination theory. *Canadian Psychology, 49,* 257-262.

Vallerand, R. J., & Rousseau, F. L. (2001). Intrinsic and extrinsic motivation in sport and exercise: A review using the hierarchical model of intrinsic and extrinsic motivation. In R. N. Singer, H. A. Hausenblas, & C. M. Janelle (Eds.), *Handbook of sport psychology* (2nd ed.)(pp. 389-416). New York: John Wiley & Sons.

Vlachopoulos, S. P., Karageorghis, C. I., & Terry, P. C. (2000). Motivation profiles in sport: A self-determination theory perspective. *Research Quarterly for Exercise and Sport, 71,* 387-397.

Vlachopoulos, S. P., & Michailidou, S. (2006). Development and initial validation of a measure of autonomy, competence, and relatedness: The Basic Psychological Needs in Exercise Scale. *Measurement in Physical Education and Exercise Science, 10,* 179-201.

(Article received: 07-09-2011; reviewed: 20-01-2013; accepted: 04-09-2013)