ORIGINAL

ACADEMIC MOTIVATION IN THE INITIAL TRAINING OF PHYSICAL EDUCATION TEACHERS

MOTIVACIÓN EDUCATIVA EN LA FORMACIÓN INICIAL DEL PROFESORADO DE EDUCACIÓN FÍSICA

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ABSTRACT

Integrated regulation has been showed as the motivational regulation with the highest predictive power on adaptive behaviors in different life domains; however, it has not been examined in the educational context yet. The purpose of this study was to incorporate the assessment of integrated regulation to the Academic Motivation Scale in the initial training of Physical Education teachers in Brazil and examine the psychometric properties of this instrument. There were 333 undergraduate participants from the bachelor degree of Physical Education, Federal University of Espirito Santo/ Brazil. Confirmatory factor analysis showed acceptable fit indices for the eight-factor correlated structure. The results of the regression analysis showed that the variable integrated

regulation was the strongest predictor of the intention to become a teacher. This new instrument may contribute to a deeper understanding of the motivational processes involved in the initial training of physical education teacher.

KEYWORDS: motivation, psychometric properties, self-determination theory, pre-service Physical Education teacher.

RESUMEN

La regulación integrada se ha mostrado como la regulación motivacional con mayor poder predictivo sobre las conductas adaptativas en diferentes ámbitos de la vida, sin embargo, aún no ha sido estudiada en el contexto educativo. El objetivo de este estudio fue incorporar la medida de la regulación integrada a la Escala de Motivación Educativa y observar las propiedades psicométricas de este instrumento. Participaron en el estudio 333 universitarios del área de Educación Física de la Universidad Federal do Espirito Santo/ Brasil. El análisis factorial confirmatorio mostró índices de ajuste aceptables para el modelo de ocho factores correlacionados. Los resultados del análisis de regresión mostraron que la regulación integrada fue la variable que mejor predijo la intención de ser profesor. Este instrumento podría contribuir a una mayor comprensión de los procesos motivacionales involucrados en el ámbito de la formación inicial en Educación Física en Brasil.

PALABRAS CLAVES: motivación, propiedades psicométricas, teoría de la autodeterminación, formación inicial en Educación Física

INTRODUCTION

Motivation is a key construct in educational psychology when it comes to explain the commitment of the student in the teaching-learning process (Reeve, 2012). Traditionally, motivation has been operationalized as a quantitative construct, which means that a high level of motivation would be more than necessary in order to get appropriate behavior (Bandura, 1989; Eccles & Wigfield, 2002). However, Self-Determination Theory (SDT; Deci & Ryan, 1985, 2000) conceptualizes motivation as a multidimensional construct and it highlights its qualitative side. From this theoretical perspective a high level of motivation would not guarantee the student's commitment with his/her learning if the quality of this motivation was low (Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009).

SDT postulates that a person could commit to a behavior in an amotivated way, in an extrinsically motivated way, and in an intrinsically motivated way (Deci & Ryan, 2000). These three forms of motivation are situated along the full continuum depending on the level of self-determination attributed to each regulation, showing the degree in which the behavior is performed with the highest level of reflexivity and volition (Deci & Ryan, 2000). Amotivation is situated in an end of the continuum, and it is defined as the lack of voluntariness and intentionality in order to perform a behavior. In the other end

of the continuum intrinsic motivation is located, understood as the performance of a behavior for pleasure and the enjoyment intrinsic to it. Particularly, authors like Vallerand (2000) have conceptualized intrinsic motivation as a global psychological construct formed by the motivation intrinsic to stimulating experiences (the behavior is performed by the stimuli created through the development of the behavior), the motivation intrinsic to achievement (the behavior is performed according to the pleasure achieved when a new level is performed), and the motivation intrinsic to knowledge (the behavior is performed according to the pleasure experiences during the learning process). In the middle of the *continuum* is where extrinsic motivation takes place. It is conceptualized as a general psychological construct integrated by four regulations depending on the internalization process, in other words, the extent which a person assumes in his/her identity system the social value attributed to a specific behavior (Deci & Ryan, 2000). According to this internalization process, from the lowest to the highest level of internalization, we would find the external regulation (i.e., the behavior is performed under external pressure or control), the introjected regulation (i.e., the behavior is performed under the person's internal pressure or control), the identified regulation (i.e., the behavior is performed due to the importance it is attributed) and the integrated regulation (i.e., the behavior is performed because it has been harmoniously incorporated within the identity system and the person's values).

Previous research has evidenced that the most self-determined regulations (i.e., intrinsic motivation and identifies regulation) are associated with more adaptive behaviors, both in the educational context and in the teachers' initial training, such as the academic achievement, the learning process, the development of skills, or the teaching self-efficacy (Kim & Cho, 2014; Reeve, 2012), while less self-determined regulations (i.e., introjected regulation, external regulation and amotivation) have been related to more maladaptive behaviors like school dropout, academic frustration, or the reality clash in teaching (Atalay, Can, Erdem, & Müderrisoglu, 2016; Kim & Cho, 2014; Vallerand et al., 1992).

In order to measure the educational motivation from SDT perspective, one of the most internationally widespread instruments is the Academic Motivation Scale (AMS; Vallerand, Blais, Brière, & Pelletier, 1989). This measure consists of 28 items (4 per factor), which are more likely to measure the three subtypes of intrinsic motivation, the three types of extrinsic motivation (i.e. identified, introjected and external regulation) and amotivation. The seven-factor correlated of this instrument has presented appropriate psychometric properties in different countries and cultures (Alivernini & Lucidi, 2008; Barkoukis, Tsorbatzoudis, Grouios, & Sideridis, 2008; Can, 2015; Cokley, 2015; Núñez, Martín-Albo, & Navarro, 2005; Núñez, Martín-Albo, Navarro, & Grijalvo, 2006; Núñez, Martín-Albo, Navarro, & Suárez, 2010; Sobral, 2003; Stover, de la Iglesia, Boubeta, & Fernández-Liporace, 2012; Vallerand et al., 1992; Zhang, Li, Li, Li, & Zhang, 2016). In addition, this factor structure has been psychometrically supported against a series of alternative factor models of one, two, three and five factors identified by previous research (Caleon et al., 2015; Cokley, 2015; Núñez et al., 2010; Stover et al., 2012). Moreover, literature has showed evidences that support the factor invariance according to the genre of the instrument (Grouzet, Otis, & Pelletier, 2006).

Although AMS has been presented as a psychometrically appropriate instrument for the assessment of motivation in education, this instrument does not consider one of SDT regulations: integrated regulation. One of the reasons why AMS has not included integrated regulation is the fact that it is unknown the precise moment in life when a behavior is harmoniously included in the person's identity (Pelletier & Sarrazin, 2007). However, integrated regulation means that the behavior is aligned with the person's values and interests, so to measure it might help to explain the persistence of a behavior even in moments when the activity is characterized for the existence of a growing level of complexity (Green-Demeirs, Pelletier, & Ménard, 1997). In fact, as Koludrovic and Ercegovac (2015) suggest, in initial teacher training seems more likely for the person to keep his/her intention to work as a teacher because he/she has harmoniously incorporated in his/her identity the social value attributed to teaching rather than for the simple pleasure and enjoyment of the academic activity.

Given the importance that integrated regulation seems to have, the measure of this type of motivation has been recently incorporated in SDT in contexts such as work (Hsu, 2013), exercise (Wilson, Rodgers, Loitz, & Scime, 2006), or sport (Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013). This has made possible the analysis of the predictive power of integrated regulation against the rest of motivational regulations on a series of adaptive behaviors such as participation in charity events (Ferguson, Gutberg, Schattke, Paulin, & Jost, 2015), the intention to continue with post-doctoral research (Litalien, Guay, & Morin, 2015) or physical activity (Ferriz et al., 2015). However, so far there is no evidence of the fact that integrated regulation had been incorporated within the instruments that measure motivation in the educational context, especially in initial teacher training.

In the Brazilian educational context the most used instrument in order to measure the different types of motivation from the tenets proposed by SDT has been the adaptation that Sobral (2003) made of AMS (Vallerand et al., 1989). In general, the Brazilian version of Sobral's AMS (2003) has showed good reliability, except of intrinsic motivation to stimulating experiences, and an appropriate discrimination among motivational regulations. Nevertheless, so far factorial and predictive validities of the instrument were not tested. On the other hand, as previously said, AMS does not include the measure of integrated regulation, so this limitation was carried in the instrument's adaptation made by Sobral for the Brazilian context.

Therefore, the main objective of this study was to adapt to Portuguese the items elaborated by Ferriz et al. (2015) for the assessment of integrated regulation in physical education in order to include them in the Portuguese version of AMS (Vallerand et al., 1989) developed by Sobral (2003). In addition, this study analyses the psychometric properties of the instrument resulted within Physical Education Brazilian teachers in initial training. To do so, it was tested the sustainability of a 8-factor correlated model compared to alternative models of one, two, three and six factors identified in the literature (Barkoukis et al., 2008; Stover et al., 2012), which may have theoretical support as far as SDT is

concerned. Moreover, factor invariance across gender and reliability were assessed at the same time evidences of this instrument's predictive validity were presented.

METHOD

PARTICIPANTS

There were 333 students who participated (193 men and 140 women) from the Bachelor's Degree on Physical Education at the Universidad Federal do Espirito Santo, who were between 17 and 44 years old ($M_{age} = 21.96$; $SD_{age} = 4.29$).

MEASUREMENTS

Revised Academic Motivation Scale. It was used the Portuguese version adapted to the Brazilian context (Sobral, 2003) of the AMS (Vallerand et al., 1989), by adding four new items proposed by Ferriz et al. (2015) to measure integrated regulation. The new scale consists of 32 items grouped by eight subscales (i.e. motivation intrinsic to stimulating experiences, motivation intrinsic to achievement, motivation intrinsic to knowledge, integrated regulation, identified regulation, introjected regulation, external regulation and amotivation). This measurement started with the sentence: "Eu estou realizando o Curso de Licenciatura/Bacharelado em Educação Física ...". The answer used the 7-point Likert-type scale, from 1 (*totally agree*) to 7 (*totally disagree*).

Future Intention to Become a Physical Education Teacher Scale. Following the guidelines established by Ajzen and Fishbein (1980) there were three items produced: "Tenho a intenção de trabalhar como professor nos próximos 5 anos"; "Tentarei trabalhar como professor nos próximos 5 anos"; "Estou determinado em trabalhar como professor nos próximos 5 anos". Each item was measured by 7-point Likert-type scale, from 1 (*totally agree*) to 7 (*totally disagree*). For that study the fit índices were the following: χ^2 (0, $N = 333$) = 0.00, $\chi^2/df = 0.00$; CFI = 1.00; IFI = 1.00; SMSR = 0.000; RMSEA = 0.972 (0.920 – 1.024). As it is showed in Table 1, internal consistency was appropriate.

PROCEDURE

First of all, items that measure integrated regulation from Perceived Locus of Causality Scale for Physical Education (Ferriz et al., 2015) were adapted to the specific Brazilian context for the initial Physical Education teachers training, using the strategy of reverse translation (Muñiz, Elosua, & Hambleton, 2013). Similarly, Sobral's version (2003) of AMS was adapted to the specific context for initial teachers training. Secondly, a group of experts in SDT and Physical Education teachers' training assessed the content of each item guaranteeing that each one measures the construct for which it was developed. Thirdly, a pilot study was conducted with university students to ensure the correct understanding of the instrument. Fourthly, the questionnaire was administered in the presence of the authors of the present study, who reported

anonymity and voluntariness in participating in the study, and who were available to the respondents to solve any doubt that could arise during the data collection process. The time required to complete the measurement was approximately 15 minutes. This project has been approved by the Ethics Committee of the Universidade Federal do Espirito Santo.

ANALYSIS OF DATA

Descriptive statistics and Pearson's correlations were calculated for each subscale. Several confirmatory factor analyses (CFA) were performed using the maximum likelihood method with the bootstrapping procedure, given the absence of multivariate normality (Mardia Coefficient = 118.54, p <0.01). This procedure consisted of establishing 5,000 random samples estimating the typical error of each parameter. In order to judge the goodness of the factor model, a combination of fit indices was used: χ^2/df, CFI (Comparative Fit Index), IFI (Incremental Fit Index), RMSEA (Root Mean Square Error of Approximation) along with its confidence interval at 90% (90%CI), SRMS (Standardized Root Mean Square Residual) and AIC (Akaike Information Criterion). Since χ^2 is very sensitive to the sample size (Jöreskog & Sörbom, 1993), χ^2/df was used and it was acceptable with values below 5 (Hu & Bentler, 1999). CFI and IFI are acceptable with values equal to or greater than 0.90 (Lomax & Schumacker, 2012) and RMSEA and SMSR with values lower than 0.08 (Byrne, 2010). AIC is a relative measure of the goodness of the fit, thus, the lowest its absolute value is, the best goodness is expressed (Byrne, 2010). Standardized regression weights are adequate with values equal to or greater than 0.40 (Byrne, 2010). For the discriminant validity the sustainability of different alternative models was tested. A multigroup analysis was performed across gender to verify if the factor structure was invariant for men and women, assuming factor invariance when there were no statistically significant differences (p <0.05) in the statistic χ^2 between the unconstrained model (Model 1) and the invariant model in measurement's weights (Model 2) (Byrne, 2010). Reliability was analyzed using Cronbach's alpha, Raykov's composed consistency coefficient, both acceptable with values greater than 0.70 (Dunn, Baguley, & Brunsden, 2014; Raykov, 2004), and Average Variance Extracted (AVE), which is adequate with values greater than 0.50 (Hair, Black, Babin, & Anderson, 2010). Finally, to provide evidence of predictive validity, a linear regression analysis in two steps was performed to analyze the predictive power of the different forms of motivation on the future intention to become a teacher. In the first step, the seven forms of motivation measured by Sobral (2003) were introduced, while the second step incorporated the measure of integrated regulation to analyze the predictive power of this form of regulation beyond the effects of the rest of regulations. Statistical analyzes were performed using SPSS 21.0 and AMOS 21.0.

RESULTS

DESCRIPTIVE STATISTICS, RELIABILITY AND CORRELATION ANALYSIS

The internal consistency analysis revealed adequate values for Cronbach's alpha (α between 0.80 and 0.93), Raykov's composed consistency coefficient

(rho between 0.82 and 0.93) and average variance extracted (between 0.53 and 0.78). The correlation analysis showed that, in general, the correlations obtained between the underlying subscales were positive and of greater intensity than those obtained between the subscales located at the ends of *self-determination continuum*.

Table 1. Descriptive statistics, Reliability and Correlation Analysis for the Revised Academic Motivation Scale

	M	DT	γ_1	γ_2	α	rho	AVE	1	2	3	4	5	6	7	8	9
1. MI to stimulating exp.	4,89	1,61	1,49	15,58	0,87	0,87	0,63	-	0,61"	0,58"	0,51"	0,46"	0,38"	0,20"	-0,28"	0,37"
2. MI to achievement	5,39	1,59	2,58	31,24	0,89	0,89	0,76		-	0,60"	0,52"	0,46"	0,37"	0,23"	-0,19"	0,38"
3. MI to knowledge	5,66	1,54	0,23	6,37	0,93	0,93	0,67			-	0,57"	0,49"	0,24"	0,17"	-0,38"	0,41"
4. Integrated Regulation	5,29	1,72	2,12	25,77	0,89	0,89	0,78				-	0,57"	0,29"	0,21"	-0,37"	0,42"
5. Identified Regulation	5,34	1,42	-0,50	1,46	0,83	0,83	0,55					-	0,41"	0,41"	-0,29"	0,35"
6. Introjected Regulation	3,90	1,58	0,46	1,41	0,81	0,82	0,53						-	0,56"	0,15"	0,07
7. External Regulation	4,10	1,50	-0,13	-0,58	0,80	0,82	0,54							-	0,09	0,06
8. Amotivation	2,04	1,25	1,42	1,51	0,86	0,88	0,66								-	-0,29"
9. Intention to be PH teach	5,18	1,84	-0,76	-0,55	0,94	-	-									-

Note. MI = Motivation Intrinsic to; exp. = experiences; PH = Physical Education; Teach. = Teacher; γ_1= asymmetry; γ_2 = Kurtosis; α= Cronbach's alpha; rho = Raykov's composed consistency coefficient; AVE = Average Variance Extracted; ***$p < 0.001$.

CONFIRMATORY FACTOR ANALYSIS

A first confirmatory factor analysis was performed for the 8-factor correlated structure, which obtained unacceptable fit indices: χ^2 (436; $N = 333$) = 1,313.50, $p < 0.001$; $\chi^2/df = 3.01$; CFI = 0.89; IFI = 0.89; SMSR = 0.085; RMSEA = 0.078 (0.073 – 0.083). An analysis of modification indices suggested the need to correlate two pairs of errors (items 6 and 7, items 14 and 15) belonging to the subtypes of intrinsic motivation. Fit indices of the new specified model were appropriate: χ^2 (436; $N = 333$) = 1,213.30, $p < 0.001$; $\chi^2/df = 2.80$; CFI = 0.90; IFI = 0.91; SMSR = 0.080; RMSEA = 0.074 (0.069 – 0.078). Standardized regression weights for each item ranged from 0.49 to 0.97, which were statistically significant ($p < 0.001$). Correlations between the 8 subscales ranged from -0.44 to 0.98.

Figure 1. Results of Confirmatory Factor Analysis of the Revised Academic Motivation Scale
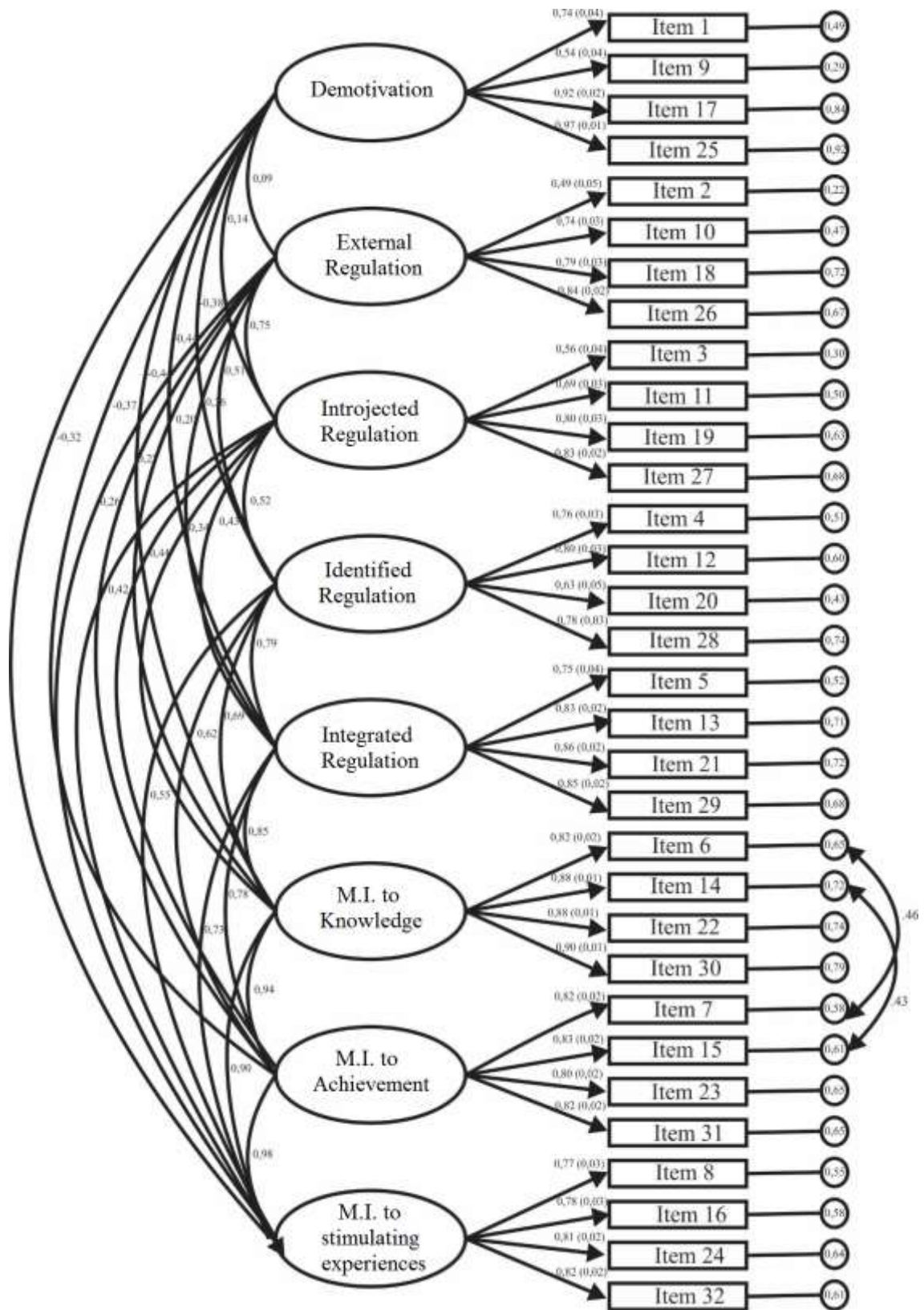
Note: Ellipses represent latent constructs. Rectangles represent the different items. Small circles represent multiple squared correlations. The numbers in parentheses represent the standard error of the standardized regression weight.

Table 2. Fit Indices of Tested Alternative Models

Model	χ^2	gl	χ^2/gl	CFI	IFI	SRMR	RMSEA (IC90%)	AIC
1F	3796.22***	464	8.18	0.60	0.60	0.145	0.147 (0.143 - 0.151)	3924.22
2F: MNA/MA	3160.22***	463	6.83	0.68	0.68	0.188	0.132 (0.128 - 0.137)	3290.22
3F: AM/ ME/MI	2478.12***	461	5.38	0.76	0.76	0.122	0.115 (0.110 - 0.119)	2612.12
6F: AM /RE/ RIntr/RId/RInte /MI	1469.31***	449	3.27	0.88	0.88	0.086	0.083 (0.078 - 0.087)	1627.31
8F: AM /RE/ RIntr/RId/RInte/MIC/MIL/MIE	1313.50***	436	3.01	0.89	0.89	0.085	0.078 (0.073 - 0.083)	1497.50
8F: Two pairs of correlated errors	1213.30***	434	2.80	0.91	0.91	0.080	0.074 (0.069 - 0.078)	1401.30

Note: 1F = one factor; 2F = two factors; 3F = three factors; 6F = six factors; 8F = eight factors; MNA = non self-determined motivation; MA = self-determined motivation; AM = amotivation; RE = external regulation; RIntr = introjected regulation; RId = identified regulation; RInte = integrated regulation; MI = intrinsic motivation; MIC = motivation intrinsic to knowledge; MIL = motivation intrinsic to achievement; MIE = motivation intrinsic to stimulating experiences. *** p <0.001

ANALYSIS OF FACTORIAL INVARIANCE ACROSS GENDER

Table 3 presents the results of the multigroup analysis. Only statistically significant difference (p <0.05) was found in the χ^2 test between the unconstrained model (model 1) and the invariant model in measurement residuals (model 4). Consequently, the absence of statistically significant difference (p> 0.05) in the χ^2 statistic between model 1 and model 2 has supported factor invariance across gender, since the null hypothesis of invariance cannot be rejected.

Table 3. Analysis of invariance across gender

Model	χ^2	gl	χ^2/gl	$\Delta \chi^2$	Δgl	CFI	ΔCFI	IFI	SRMR	RMSEA (IC90%)
Model 1	1718.35	868	1.98	-	-	0.90	-	0.90	0.084	0.054 (0.051 - 0.058)
Model 2	1744.80	892	1.96	26.46	24	0.90	0.00	0.90	0.085	0.054 (0.050 - 0.057)
Model 3	1791.47	928	1.93	73.13	60	0.90	0.00	0.90	0.088	0.053 (0.049 - 0.057)
Model 4	1861.42	962	1.94	143.07***	94	0.89	0.01	0.89	0.088	0.053 (0.050 - 0.057)

Note: Model 1 = unconstrained; Model 2 = invariant in measurement weights; Model 3 = invariant in structural covariances; Model 4 = invariant in measurement residuals; ***p <0.001

LINEAR REGRESSION ANALYSIS

Table 4 reflects the predictive results of the forms of motivation on the future intention to become a teacher. If we observe step one, identified regulation (β = 0.18, p <0.001), intrinsic motivation to knowledge (β = 0.14, p <0.05) and intrinsic motivation to achievement (β = 0, 17, p <0.05) were the forms of motivation that significantly predicted the future intention to become a teacher, explaining the 23% of variance. The incorporation in the integrated regulation

model (step two) increased the explained variance of the future intention to become a teacher by 2%. In fact, considering in the model all the forms of motivation contemplated in the *continuum* established in SDT, it can be observed that integrated regulation was showed as the greatest predictor of the future intention to become a teacher ($\beta = 0.18$, *p*< 0.01).

Table 4. Linear Regression Analysis that predicts the Future Intention to Become a Teacher from the Forms of Motivation

	B	ET B	β	t	Tol	VIF	R²adj
Step one	2.18	0.52	-	4.20	-	-	0.23***
M.I. to stimulating exp.	0.14	0,08	0,12	1.77	0.51	1,96	
M.I. to achievement	0.20	0,08	0,17*	2.51	0.51	1,97	
M.I. to knowledge	0.17	0.08	0.14*	2.11	0.50	1,99	
Identified regulation	0.24	0.08	0.18***	2.85	0.57	1,76	
Introjected regulation	-0.13	0.08	-0,11	-1.75	0.54	1,83	
External regulation	-0.04	0.07	-0,03	-0.50	0.63	1,58	
A motivation	-0.14	0.08	-0,09	-1.66	0.72	1,39	
Step two	2.00	0.52	-	3.86	-	-	0.25***
M.I. to stimulating exp.	0.12	0.08	0.10	1,53	0.51	1,94	
M.I. to achievement	0.17	0.08	0.14*	2,11	0.51	1.98	
M.I. to knowledge	0.13	0.08	0.11	1,53	0.49	2.02	
Integrated regulation	0.19	0,07	0.18**	2..3	0.51	1.95	
Identified regulation	0,17	0.09	0,13*	2.01	0.52	1,92	
Introjected regulation	-0,15	0.08	-0,13	-1,96	0.54	1.84	
External regulation	-0,03	0.07	-0,03	-0.43	0,63	1.58	
A motivation	-0.10	0.08	-0.07	-1.16	0.70	1.44	

Note. MI = intrinsic motivation; Exp = experiences; B = non-standardized regression coefficient; ET B = typical error of B; β = standardized regression coefficient; Tol = tolerance; VIF = Variance inflation factor *p <0.05; **p <0.01; ***p <0.001.

DISCUSSION

The objective of the present study was to analyze the psychometric properties of the Academic Motivation Scale (Vallerand et al., 1989), once integrated regulation were incorporated, with the aim of counting on an instrument with sensitivity to measure all motivational regulations established by SDT in the Brazilian context of initial teachers training. The obtained results give evidence to consider the new instrument as a valid and reliable measurement in the evaluation of different motivational regulations in this specific context.

The confirmatory factor analysis of the 8-factor correlated model revealed acceptable fit indices, offering for the first time a confirmation of this factorial structure in the context of initial teacher training in Brazil. Although these results support the eight-factor theoretical model in the revised Academic Motivation Scale (AMS-R), in line with previous work (Barkoukis et al., 2008; Caleon et al., 2015; Núñez et al. 2010; Stover et al., 2012; Vallerand et al., 1992, 1989), it should be noted that in order to get the model to fit adequately to the data, it was necessary to correlate two pairs of residual errors. However, the correlation of pairs of errors in this study was in line with the results of previous studies. Specifically, in the study of Vallerand et al. (1989), with a Canadian sample, a correlation of six pairs of errors was required to achieve an adequate fit to the data. Similarly, the work of Vallerand et al. (1992) with Americans required the correlation of 26 pairs of errors, whereas the validation of the AMS to Spain required the correlation of 10 pairs of errors (Núñez et al., 2005).

The correlation analysis showed that the eight motivational regulations generally supported the simplex structure proposed by Ryan and Connell (1989), where adjacent subscales have stronger and positive correlations, while the opposite subscales on the *continuum* are less intensely correlated and in a negative way. However, this research, given the high correlations obtained between the three subtypes of intrinsic motivation, together with the need to correlate two pairs of errors between these subtypes, suggests a lack of sensitivity of the instrument in the measurement of these three constructs or a lack of conceptual discrimination of the items that represent each subtype of intrinsic motivation (Núñez et al., 2010). Given the high correlations between the three subscales of intrinsic motivation, the eight-factor model was compared with a six-factor model, where the three subtypes of intrinsic motivation were considered as a single latent factor. Confirmatory factor analysis did not provide psychometric support for the six-factor model, contradicting the results of certain studies (Alivernini & Lucidi, 2008; Koludrovic & Ercegovac, 2015). On the other hand, the eight-factor model was also compared to alternative models of one, two and three factors (Table 2), showing no better fit to the data than the eight-factor model. Therefore, the results of the factorial analyzes of the alternative models showed evidence of the discriminant validity of a model of eight correlated factors.

One contribution of this study was to verify the instrument's invariance across gender in the Brazilian context. In line with studies conducted in other countries (Ratelle, Guay, Vallerand, Larose, & Senécal, 2007), the results of the multigroup analysis showed that AMS-R is a valid instrument for comparing different types of motivation among men and women in the context of teachers' initial training in Physical Education. On the other hand, the analysis of internal consistency showed appropriate Cronbach's alpha values for each subscale of the instrument, with no conflicting values ($\alpha < 0.70$), as detected by previous studies in the subscale identified regulation (Núñez et al., 2005, 2010; Stover et al., 2012; Vallerand et al., 1992, 1989), and intrinsic motivation to stimulating experiences (Barkoukis et al., 2008, Sobral, 2003). These findings suggest that the incorporation of integrated regulation in AMS could have contributed to improve discrimination and understanding of the items that represent identified regulation and intrinsic motivation to stimulating experiences and, therefore, to

improve internal consistency measured by Cronbach's alpha. In addition, this study reports for the first time adequate composite internal consistency values measured by Raykov's coefficient (rho> 0.70) for all subscales and appropriate internal consistency values obtained by the average variance extracted (AVE>0.50).

In order to show evidence of the predictive value of the instrument, a linear regression analysis was performed to determine the predictive effects of the different types of motivation on the future intention to become a teacher. The results showed that intrinsic motivation to achievement, integrated regulation and identified regulation had positive predictive effects on the future intention to become a teacher. However, it is noteworthy that integrated regulation provided an explanatory variance on the future intention to become a teacher apart from the prediction power of other forms of regulation. In addition, integrated regulation was showed as the motivational form with greater predictive capacity on the intention to become a teacher. This suggests that, apart from the pleasure and enjoyment that the pre-service teacher can show during his/her studies, he/she will be more inclined to dedicate himself to teaching when he incorporates within his/her identity the attributed value of this activity. The findings of this research are in line with studies that have measured integrated regulation in other contexts, showing that integrated regulation is showed as the form of motivation which has the most predictive force on adaptive behaviors, such as the intention to continue with postdoctoral research (Litalien et al., 2015), to participate in charitable events (Ferguson et al., 2015), or physical activity (Ferriz et al., 2015).

Despite the evidences showed in this paper, some limitations should also be considered. Firstly, the use of a convenience sample has made it impossible to generalize the results to the general population, requiring future work to replicate this factor structure in samples belonging to other educational levels (e.g. secondary education, university). Secondly, the specific characteristics of the sample (i.e., pre-service Physical Education teachers), require that future work expand the exploration of this measure in more heterogeneous samples regarding professional experience and age. Thirdly, the high correlations obtained between the three subtypes of intrinsic motivation, together with the correlation of two pairs of errors between the items belonging to two subtypes of intrinsic motivation, suggest the need to revise the nomological network related to the construct. The validation of an instrument is a continuous process over time and future research should address some of the limitations showed in this study to confirm the utility of AMS-R to measure motivation in the context of Brazil's teachers' initial training.

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APPENDIX

Escala de Motivación Educativa–Revisada
Eu estou realizando o curso de Educação Física...

Desmotivação

1. Sinceramente não sei; verdadeiramente tenho a impressão de perder tempo no curso

9. Já tive boas razões para isso, agora, entretanto, eu me pergunto se devo continuar

17. Não sei porque me matriculei nesse curso, o fiz sem pensar

25. Não sei, não consigo compreender o que faço matriculado nesse curso

Regulacão Externa

2. Porque só com o Ensino Médio eu não poderia encontrar um trabalho com bom salário

10. Para conseguir no futuro um trabalho com mais prestígio e com melhor salário

18. Porque no futuro quero ter uma boa vida

26. Para ter no futuro um salário melhor

Regulação Introjetada

3. Para demonstrar que sou capaz de terminar um curso de graduação

11. Porque aprovar na Universidade me faz me sentir importante

19. Para demonstrar a mim mesmo que sou uma pessoa inteligente

27. Porque quero demonstrar que sou capaz de ter sucesso em meus estudos

Regulação Identificada

4. Porque penso que esse curso me ajudará a me preparar melhor para a carreira que escolhi

12. Porque, possivelmente, me permitirá entrar no mercado de trabalho dentro do campo que eu gosto

20. Porque me ajudará a escolher melhor minha orientação profissional

28. Porque acredito que alguns poucos anos mais de estudos vão melhorar minha competência profissional

Regulação Integrada

5. Porque me formar nesse curso está de acordo com a minha forma de vida

13. Porque considero que faz parte de mim

21. Porque vejo o curso como uma parte fundamental do que eu sou

29. Porque considero que está de acordo com meus valores

Motivação Intrínseca ao Conhecimento

6. Porque para mim é um prazer e uma satisfação aprender coisas novas

14. Pelo prazer de descobrir coisas novas antes desconhecidas por mim

22. Pelo prazer de saber mais sobre as questões que me atraem

30. Porque esse curso me permite continuar aprendendo um monte de coisas que me interessam

Motivação Intrínseca para a realização

7. Pela satisfação que sinto quando me supero nos meus estudos

15. Pela satisfação que sinto ao superar cada um dos meus objetivos pessoais

23. Pela satisfação que sinto quando consigo realizar atividades acadêmicas difíceis

31. Porque a Universidade me permite sentir satisfação pessoal na busca da perfeição dentro dos meus estudos

Motivação Intrínseca para Experiências Estimulantes

8. Pelos intensos momentos que vivo quando comunico minhas próprias ideias aos demais

16. Pelo prazer de ler temas interessantes

24. Pelo prazer que experimento ao me sentir completamente absorvido por tratar certos temas

32. Porque me sinto satisfeito quando leio diferentes temas interessantes