

Academic motivation scale revised. Inclusion of integrated regulation to measure motivation in initial teacher education

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Título: Revisión de la escala de motivación educativa. Inclusión de la regulación integrada para medir la motivación en la formación inicial del profesorado

Resumen: El objetivo de este estudio fue incorporar la medida de la regulación integrada en la *Échelle de Motivation en Éducation* en el contexto español de la formación inicial del profesorado. Participaron 496 profesores en formación inicial (233 hombres and 263 mujeres; $M_{edad} = 25.70$, $DT = 4.23$) del master en formación del profesorado en educación secundaria y bachillerato, formación profesional y enseñanza de idiomas. El análisis factorial confirmatorio mostró aceptables índices de ajuste para la estructura de 8 factores, la cual permaneció invariante respecto al género. La consistencia interna y la estabilidad temporal fueron satisfactorias para cada uno de los 8 factores. El análisis de regresión lineal indicó que la regulación integrada fue el mayor predictor sobre la intención de convertirse en docente. El nuevo instrumento puede contribuir a una comprensión más profunda de los procesos motivacionales involucrados en la formación inicial del profesorado.

Palabras clave: motivación; propiedades psicométricas; teoría de la auto-determinación; profesorado en formación inicial.

Abstract: The objective of this study was to incorporate the integrated regulation assessment into the Academic Motivation Scale within the Spanish initial teacher education context. There were 496 student participants (233 men and 263 women; $M_{age} = 25.70$, $SD = 4.23$) from the Masters in Teaching for Compulsory Secondary Education, Upper Secondary School Education and Professional Education, and Language Teaching. The confirmatory factor analysis showed acceptable fit-indexes for the eight-factor correlated structure and an invariant factor structure across genders. Internal consistency and temporal stability were satisfactory for each of the eight factors. The linear regression analysis indicated that integrated regulation was the strongest predictor of intention to become a teacher. This new instrument may contribute to a deeper understanding of the motivational processes involved in the initial teacher education context.

Key words: motivation; psychometric properties; self-determination theory; initial teacher education.

Introduction

Motivation has been considered as one of the factors that best explains human behaviour in different life contexts (Vallerand, 2000), including education (Pintrich, 2003). To investigate this phenomenon, authors such as Eccles and Wigfield (2002) or Bandura (1989) have conceptualized motivation as a unitary construct, suggesting that a high level of motivation would be enough to determine the adoption of a desirable behaviour. Instead, Self-Determination Theory (SDT; Deci & Ryan, 1985, 2000) proposes a multidimensional perspective for motivation, conferring special relevance to the qualitative dimension of this construct. Thus, counting on a high level of motivation might not guarantee the development of adaptive behaviours whether the motivation involved were of low quality (Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009).

SDT recognises that a person can be motivated in three distinct ways when adopting a behaviour (amotivated, extrinsically motivated or intrinsically motivated). These three forms of motivation are located on an established *continuum* according to the level of self-determination implicit in each of them, reflecting to what extent the behaviour is voluntarily adopted and in accordance with the person's own interests. Representing the highest level of self-determination, intrinsic motivation would express that the activity is conducted for satisfaction and inherent pleasure in itself. Authors such as Vallerand (2000) have conceptualized intrinsic moti-

vation as a global psychological construct that would include the intrinsic motivation to experience stimulation (the behaviour is adopted based on the stimuli generated during the activity), intrinsic motivation to accomplish (the behaviour is adopted based on the pleasure experienced on achieving a new level) and the intrinsic motivation to know (the behaviour is adopted based on the pleasure experienced during the learning process). Situated at the other extreme of this *continuum*, amotivation would reflect the absence of volition and intention in adopting the behaviour. In the central part of the *continuum*, it would be found extrinsic motivation, which contemplates four forms of regulation that would be ordered according to the level achieved in the internalization process; that is to say, the degree to which the person incorporates the social value attributed to a specific activity into their own identity (Deci & Ryan, 2000). From a lesser to a greater degree of internalization, external regulation (the behaviour is adopted to achieve rewards or avoid punishments, for which there is no internalization process), introjected regulation (the behaviour is conducted to avoid the sensation of guilt which would be produced by not carrying out it), identified regulation (the behaviour is conducted because the behaviour's social value is appreciated) and integrated regulation (the behaviour is coherently incorporated into the person's own identity and their personal values system) would appear.

The literature has positively related the most self-determined forms of motivation (i.e., integrated and identified regulations and intrinsic motivation) to diverse desirable behaviours within the educational setting such as persistence (Black & Deci, 2000), student's academic performance (Boiché, Sarrazin, Grouzet, Pelletier, & Chanal, 2008), cooperation and respect towards peers (Sánchez-Oliva, Viladrich,

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Amado, González-Ponce, & García-Calvo, 2014), or the teachers' performance (Aelterman, Vansteenkiste, Soenens, & Haerens, 2016). Instead, the least self-determined forms of motivation (i.e., introjected regulation, external regulation and amotivation) have been positively related to undesirable behavioural outcomes; for example, school dropouts (Vallerand & Blasonnette, 1992), lack of attention in class (Stephens & Pantoja, 2016) or resentment towards equals and towards the teaching staff (Aelterman et al., 2016). In the initial teacher education context, Kim and Cho (2014) observed that while pre-service teachers' intrinsic motivation positively predicted teacher's sense of efficacy during teaching practice, introjected regulation predicted their expectation of reality shock.

In order to measure motivation in the academic context from the SDT perspective, one of the most-used instruments until this moment has been the *Échelle de Motivation en Éducation* (EME; Vallerand, Blais, Brière, & Pelletier, 1989), also known as Academic Motivation Scale. This scale consists of 28 items that, distributed into four items for each of its seven factors, measure the 3 sub-types of intrinsic motivation (i.e., to experience stimulation, to accomplish and to know), the 3 types of extrinsic motivation (i.e., identified, introjected and external regulation) and amotivation. This instrument has shown adequate psychometric properties in different contexts (Alivernini & Lucidi, 2008; Barkoukis, Tsorbatzoudis, Grouios & Sideridis, 2008; Caleon et al., 2015; Can, 2015; Cokley, Bernard, Cunningham & Motoike, 2001; Davoglio, dos Santos & da Conceição, 2016; Núñez, Martín-Albo & Navarro, 2005; Núñez, Martín-Albo, Navarro & Grijalvo, 2006; Núñez, Martín-Albo, Navarro & Suárez, 2010; Stover, de la Iglesia, Boubeta & Fernández-Liporace, 2012; Vallerand et al., 1992; Zhang, Li, Li, Li & Zhang, 2016). In this regard, the 7-factor correlated structure has been defended instead of diverse alternative models (Caleon et al., 2015; Cokley, 2015; Núñez et al., 2010; Stover et al., 2012). In addition, the EME factorial structure has been invariant across gender (Grouzet, Otis, & Pelletier, 2006; Ratelle, Guay, Vallerand, Larose, & Sénécal, 2007); although this aspect was not tested by the work which originally adapted the instrument to the Spanish context (Núñez et al., 2005, 2010).

Despite the EME has shown its reliability and validity measuring academic motivation, this instrument does not contemplate the integrated regulation measurement; that is to say, the most self-determined form of extrinsic motivation proposed by SDT. This limitation acquires special significance when considering the evidence that suggests that integrated regulation could contribute to the persistence of the behaviour even in situations characterized by the presence of a growing level of difficulty (Green-Demeirs, Pelletier, & Ménard, 1997). In this way, the study of integrated regulation could be of interest in the initial teacher education context, in which pre-service teachers frequently consider the possibility of leaving the formative process that leads to them becoming teachers (Mattos, Prados, & Padua, 2013). Indeed, it

is possible that, throughout their initial education period, pre-service teachers might retain their intention to become a teacher more for having integrated the meaning of its educational process into their identity and value system, as certain authors have proposed, than because they enjoy the experience in and of itself (Uyulgan & Akkuzu, 2014). Therefore, to have an instrument that might collect the totality of the motivational *continuum* proposed by SDT in this context, would allow one to study the differentiated influence of the distinct forms of motivational regulation on the acquisition and maintenance of pre-service teachers' behaviour.

In recent years, integrated regulation has been incorporated into instruments that measure motivation from the SDT perspective in contexts such as work (Hsu, 2013), exercise (Wilson, Rodgers, Loitz, & Scime, 2006), sports (Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013) and physical education (Ferriz, González-Cutre, & Sicilia, 2015). These instruments have allowed to observe the predictive capacity of integrated regulation with respect to diverse adaptive behaviours, amongst which the practice of physical activity (Ferriz et al., 2015), the adoption of healthy eating habits (Ng et al., 2012), or the intention to commit to post-doctoral research (Litalien, Guay, & Morin, 2015). However, the measurement of integrated regulation has still not been incorporated into the instruments that measure motivation in the educational setting from the SDT perspective and, more specifically, in the initial teacher education context.

Taking into account the consideration undertaken, the objective of this study was to adapt and incorporate the items proposed by Ferriz et al. (2015) for the measurement of integrated regulation to the Spanish version (Núñez et al., 2005, 2010) of the EME (Vallerand et al., 1989). In response to the proposed objective, the instrument's psychometric properties were examined in a sample of pre-service teachers. In accordance with the results of previous research (Barkoukis et al., 2008; Guay, Morin, Litalien, Valois, & Vallerand, 2015; Núñez et al., 2010; Stover et al., 2012), the confirmatory factorial analysis, conducted to provide evidence of validity based on internal structure, considered the factor correlated model originally proposed by Vallerand et al. (1989), as well as, different alternative models that could be supported by the SDT postulates. Furthermore, the instrument's invariance across gender, its internal consistency and temporal stability were analysed. Finally, evidence of validity based on test content was obtained, as well as, on its relations to other variables (AERA, APA, NCME, & JCSEPR, 2014).

Method

Participants

In the present study two distinct samples were employed. The main sample comprised 496 students (233 men and 263 women) of between 21 and 49 years old ($M_{age} = 25.70$, $SD = 4.23$) enrolled on the Masters in Teacher Education in Com-

pulsory Secondary, Upper Secondary School Education, Professional Education and Language Teaching at the University of Granada. The independent sample employed to analyse the scale's temporal stability was composed by 82 students (57 men and 25 women) who enrolled on the Diploma in Primary Education at the University of Almeria, aged between 20 and 37 years ($M_{age} = 22.29$; $SD = 2.71$). The people who formed this independent sample answered the questionnaire twice, with a 2-week interval between the first and second data collection.

Instruments

Academic Motivation Scale-Revised (EME-R)

Four items to measure integrated regulation, according to wording of Ferriz et al. (2015), were included in the Spanish version of the EME (Núñez et al., 2005). The final instrument was composed of 32 items grouped into 8 factors of 4 items each (i.e., amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, intrinsic motivation to know, intrinsic motivation to accomplish and intrinsic motivation to experience stimulation). The sentence preceding the instrument was "I am carrying out this Masters/Degree..." For the answer a 7-point Likert scale was used, ranging from 1 (does not correspond at all) to 7 (corresponds exactly).

Intention to Become a Teacher Scale

It was created for the present study, following the guidelines established by Ajzen and Fishbein (1980). This instrument assesses the student's future intention to dedicate to teaching. It is comprised of 3 items: "I intend to work as a teacher in the next 3 years", "I will try to work as a teacher in the next 3 years" and "I am determined to work as a teacher in the next 3 years". For the answer, a 7-point Likert scale was used, ranging from 1 (totally improbable) to 7 (extremely probable). The scale showed a Cronbach alpha value of .91.

Procedure

The items of the Perceived Locus of Causality Scale in Physical Education (Ferriz et al., 2015) measuring the integrated regulation were adapted; to the initial teacher education context, substituting the words "physical education" for "to study to become a teacher". In the same vein, the words "University" and "Vocational Education/ Upper Secondary School Education" in the Núñez et al. (2005) version were substituted with the words "Masters" and "Degree". Then a group of experts in SDT and teacher education analysed the items obtained to make sure that they represented the construct for which they were designed.

Subsequently, a pilot-study was carried out to check the correct understanding of the items, applying the instrument

to a reduced group of students ($N = 11$) who were enrolled on the Primary Education Degree. The totality of the students who participate in the study indicated that they understood the wording of the proposed items.

As a prior step to administrate the questionnaire, we contacted both the coordinator and the teaching staff of the University Masters course on which the participants were studying. Once access to the classroom was obtained, one of the work's authors informed the potential participants who were present ($N = 516$, out of a total of 656 enrolled students) about the voluntary and anonymous character of participation in this study. Twenty students (3.88%) expressed that they did not wish to participate in the study, giving rise to the main sample previously described ($N = 496$). The same researcher, who had previously informed the participants about the study characteristics, made themselves available to resolve any doubts that might have arisen during the administration of the questionnaire. The average time employed to fill in the questionnaire was 15 minutes.

Statistical and Psychometric Analysis

First, the descriptive statistics and the correlations between the EME-R factors were calculated. Second, validity evidences based on internal structure were obtained. In this sense, given that it corresponds to the adaptation of a scale (Lloret-Segura, Ferreres-Traver, Hernández-Baeza, & Tomás-Marco, 2014), whose factors have been precisely delimited to the theoretical level (Deci & Ryan, 2000), we chose to confirm the structure through a confirmatory factorial analysis, following the same procedure as previous works which incorporated the integrated regulation measurement to the scales evaluating motivation from the SDT perspective (Ferriz et al., 2015; González-Cutre, Sicilia, & Fernández, 2010). In concordance with the lack of multivariate normality (Mardia's coefficient = 197.44; $p < .01$), the confirmatory factor analyses were carried out using the maximum likelihood method along with the bootstrapping procedure (Byrne, 2010). To evaluate the model fit, different indexes were used: χ^2/df , CFI (Comparative Fit Index), IFI (Incremental Fit Index), SRMR (Standardized Root Mean Square Residual) and RMSEA (Root Mean Square Error of Approximation) with its 90% confidence interval (CI). Given that the χ^2 statistic is very sensitive to the sample size (Jöreskog & Sörbom, 1993), the χ^2/df index was used, which is acceptable with values below 5 (Bentler, 1989). CFI and IFI values above .90 (Schumacker & Lomax, 2010) and RMSEA and SRMR values below .06 and .08, respectively, (Hu & Bentler, 1999), were considered indicative of adequate model fit to the data. Values equal to or above .50 in the standardised regression weights were considered adequate (Hair, Black, Babin, Anderson, & Tatham, 2006). Third, a multi-group analysis across gender, following the methodological proposed by Milfont and Fisher (2010), was conducted to determine whether the instrument's factor structure was invariant according to this variable. It was considered

that the null hypothesis of invariance should not be rejected where there are increases in the CFI and RMSEA value less than .010 and .015, respectively, in the successive restricted models (Cheung & Rensvold, 2002).

To provide validity evidence based on testing content, the correlations between the latent factors and their respective 95% CI were obtained. We considered that there is an absence of discrimination whether this included absolute values above the unit (Anderson & Gerbing, 1988). Then, the internal consistency of the factors was determined using Cronbach's alpha (α), which is acceptable with values above .70 (Nunnally & Bernstein, 1994). Furthermore, the corrected item-total correlation coefficient (ITCC-c) was calculated, which is adequate with values above .30 (Nunnally & Bernstein, 1994). Subsequently, the scale's temporal stability was evaluated through a test-retest analysis using intra-class correlation coefficient (ICC) and its 95% CI, which is suitable with values equal to or above .70 (Fleiss, 2011).

Finally, to provide validity evidence based on relations to other variables, a linear analysis in two steps was conducted, where the different motivational regulations were considered as independent variables and the intention to become a teacher as a dependent variable. To determine the incremental predictive capacity of integrated regulation, this variable was introduced in the second step. The analyses were carried out using the SPSS 21.0 and AMOS 19.0 statistical programmes.

Results

Descriptive Statistics and Correlation Analysis

Table 1 shows that, generally, the highest scores obtained by the participants corresponded with the items that measured identified regulation, while the lowest corresponded to items that measured introjected regulation.

Table 1. Descriptive Statistics, variance and internal consistency of the respective factor whether the item is eliminated of the Academic Motivation Scale – revised.

Items por factor	<i>M</i>	<i>SD</i>	<i>G</i> ₁	<i>G</i> ₂	σ^2	α no-ítem	ITCC-c
Intrinsic Motivation to Experience Stimulation							
8. Por los intensos momentos que vivo cuando comunico mis propias ideas a los demás	3.97	1.68	-0.08	-0.81	2.82	.82	.53
16. Por el placer de leer temas interesantes	3.48	1.67	0.11	-0.77	2.80	.77	.66
24. Por el placer que experimento al sentirme completamente absorbido por tratar ciertos temas	3.21	1.66	0.31	-0.76	2.75	.76	.67
32. Porque me gusta "meterme de lleno" cuando leo diferentes temas interesantes	3.38	1.67	0.33	-0.85	2.80	.74	.71
Intrinsic Motivation to Accomplish							
7. Por la satisfacción que siento cuando me supero en mis estudios	4.24	1.74	-0.21	-0.83	3.03	.81	.70
15. Por la satisfacción que siento al superar cada uno de mis objetivos personales	4.11	1.75	-0.24	-0.84	3.05	.80	.73
23. Por la satisfacción que siento cuando logro realizar actividades académicas difíciles	3.10	1.69	0.45	-0.65	2.84	.80	.72
31. Porque la Universidad me permite sentir la satisfacción personal en la búsqueda de la perfección dentro de mis estudios	3.08	1.68	0.37	-0.84	2.81	.84	.63
Intrinsic Motivation to Know							
6. Porque para mí es un placer y una satisfacción aprender cosas nuevas	5.02	1.52	-0.57	-0.23	2.31	.81	.63
14. Por el placer de descubrir cosas nuevas desconocidas para mí	3.93	1.67	-0.07	-0.81	2.80	.79	.68
22. Por el placer de saber más sobre las cuestiones que me atraen	4.01	1.66	-0.15	-0.76	2.77	.76	.75
30. Porque este Máster me permite continuar aprendiendo un montón de cosas que me interesan	3.71	1.69	0.03	-0.82	2.84	.81	.63
Integrated Regulation							
5. Porque está de acuerdo con mi forma de vida	5.03	1.56	-0.64	-0.27	2.42	.83	.52
13. Porque considero que forma parte de mí	3.86	1.79	-0.04	-0.98	3.20	.76	.70
21. Porque lo veo como una parte fundamental de lo que soy	3.66	1.78	0.05	-0.95	3.18	.73	.75
29. Porque considero está de acuerdo con mis valores	4.19	1.70	-0.25	-0.81	2.89	.78	.64
Identified Regulation							
4. Porque pienso que este Máster me ayudará a preparar mejor lo que quiero ser	4.16	1.84	-0.21	-0.99	3.37	.64	.44
12. Porque posiblemente me permitirá entrar en el mercado laboral dentro del campo que a mí me guste	5.37	1.57	-0.98	0.32	2.47	.70	.37
20. Porque me ayudará a elegir mejor mi orientación profesional.	4.56	1.71	-0.51	-0.58	2.93	.60	.51
28. Porque creo que unos pocos años más de estudios van a mejorar mi competencia como profesional	4.44	1.88	-0.40	-0.93	3.55	.61	.52
Introjected Regulation							
3. Para demostrarme que soy capaz de terminar un Máster	1.94	1.48	1.73	2.30	2.18	.82	.59
11. Porque aprobar en la Universidad me hace sentirme importante	2.32	1.55	1.17	0.67	2.39	.79	.76
19. Para demostrarme a mí mismo que soy una persona inteligente	2.53	1.66	0.96	0.03	2.75	.76	.72
27. Porque quiero demostrarme que soy capaz de tener éxito en mis estudios	3.03	1.77	0.54	-0.74	3.15	.78	.70

Items por factor	<i>M</i>	<i>SD</i>	<i>G</i> ₁	<i>G</i> ₂	σ^2	α no-ítem	ITCC-c
External Regulation							
2. Porque sólo con el Grado no podría encontrar un empleo bien pagado	3.51	2.03	0.26	-1.22	4.13	.85	.44
10. Para conseguir en el futuro un trabajo de más prestigio y mejor pagado	4.29	1.85	-0.23	-0.95	3.43	.71	.72
18. Porque en el futuro quiero tener una buena vida	4.88	1.66	-0.69	-0.14	2.75	.77	.61
26. Para tener en el futuro un mejor sueldo	4.33	1.91	-0.31	-1.00	3.63	.69	.78
Amotivation							
1. Sinceramente no lo sé; verdaderamente, tengo la impresión de perder el tiempo en el Máster	3.41	1.93	0.37	-1.03	3.72	.77	.58
9. En su momento, he tenido buenas razones para matricularme pero ahora me pregunto si debería continuar en él	3.04	1.97	0.64	-0.84	3.87	.79	.55
17. No sé por qué me he matriculado en este Máster, me trae sin cuidado	1.95	1.50	1.74	2.34	2.25	.75	.63
25. No lo sé, no consigo comprender qué hago matriculado en este Máster	2.22	1.69	1.34	0.86	2.84	.70	.74

Note: *G*₁ = Skewness; *G*₂ = Kurtosis; σ^2 = Variance; ITCC-c = Corrected Item-Total Correlation Coefficient.

Table 2 shows the existence of moderately high positive correlations between the three sub-types of intrinsic motivation ($r = .73$ to $.78$, $p < .01$). In general, correlations existing between adjacent factors were of greater magnitude to those existing between these factors and those further away on the *continuum*. However, two cases that did not follow this tendency were observed. First, introjected regulation correlated to a higher extent with factors further away on the *continuum* such as intrinsic motivation to accomplish ($r = .66$, $p < .01$)

and intrinsic motivation to experience stimulation ($r = .47$, $p < .01$) than with contiguous factors such as identified regulation ($r = .39$, $p < .01$) and external regulation ($r = .42$, $p < .01$). Second, even though the three sub-types of intrinsic motivation correlated negatively with amotivation, these values were weak and of lesser magnitude compared to those existing between amotivation and a closer theoretical factor on the self-determination *continuum*, such as integrated regulation ($r = -.32$, $p < .01$).

Table 2. Descriptive Statistics, Internal Consistency, Correlations of all Factors and Temporal Stability of the Academic Motivation Scale-Revised.

	N = 496													N = 82
	<i>M</i>	<i>SD</i>	<i>G</i> ₁	<i>G</i> ₂	α	1	2	3	4	5	6	7	8	ICC (95%CI)
1. IM to experience stimulation	3.51	1.35	0.14	-0.53	.82	.77**	.78**	.54**	.39**	.47**	-.12**	-.01	.75 (.61 - .83)	
2. IM to accomplish	3.63	1.43	0.05	-0.67	.86		.73**	.51**	.47**	.66**	-.20**	-.01	.81 (.71 - .88)	
3. IM to know	4.17	1.34	-0.14	-0.50	.84			.61**	.52**	.35**	-.01	-.15**	.78 (.66 - .86)	
4. Integrated regulation	4.19	1.38	-0.13	-0.58	.83				.60**	.30**	.04*	-.32**	.78 (.66 - .86)	
5. Identified regulation	4.63	1.25	-0.36	-0.24	.70					.39**	.31**	.31**	.73 (.58 - .83)	
6. Introjected regulation	2.45	1.32	0.94	0.35	.83						.42**	.19**	.88 (.82 - .92)	
7. External regulation	4.24	1.49	-0.25	-0.73	.83							.22**	.89 (.82 - .93)	
8. Amotivation	2.66	1.41	0.94	0.34	.81								.75 (.62 - .84)	

Note: IM = Intrinsic Motivation; *G*₁ = Skewness; *G*₂ = Kurtosis; α = Cronbach alpha; ICC = Intra-Class Correlation Coefficient; CI = Confidence Interval. ** $p < .01$, * $p < .05$

Confirmatory Factor Analysis

A first confirmatory factor analysis showed unsatisfactory fit-indexes: χ^2 (436; $N = 497$) 1663.32, $p < .001$; $\chi^2/df = 3.82$; CFI = .87; IFI = .87; SRMR = .066; RMSEA = .072 (.072 - .079). Analysis of the modification indexes suggested the need to correlate four pairs of errors (items 6-7, 14-15, 23-24 and 31-32), all of them corresponding to the sub-types of intrinsic motivation. The fit-indexes of the re-specified model markedly improved: χ^2 (432; $N = 497$) 1342.76, $p < .001$; $\chi^2/df = 3.11$; CFI = .90; IFI = .91; SRMR = .065; RMSEA = .060 (.057 - .065); The standardized re-

gression weights of the items ranged between .55 and .92, and were statistically significant ($p < .001$). The error variance ranged from .29 to .85, while the correlations between the eight latent factors oscillated between -.41 and .93. The 95% CI for the correlation of higher magnitude to those observed between the distinct factors (i.e., intrinsic motivation to know and intrinsic motivation to experience stimulation) not included an absolute value above the unit (.88 to .96), therefore suggesting the instrument's discriminating validity. In turn, and as shown in Table 3, the fit-indexes for each of the tested alternative models did not improve on those obtained by the 8-factor correlated model.

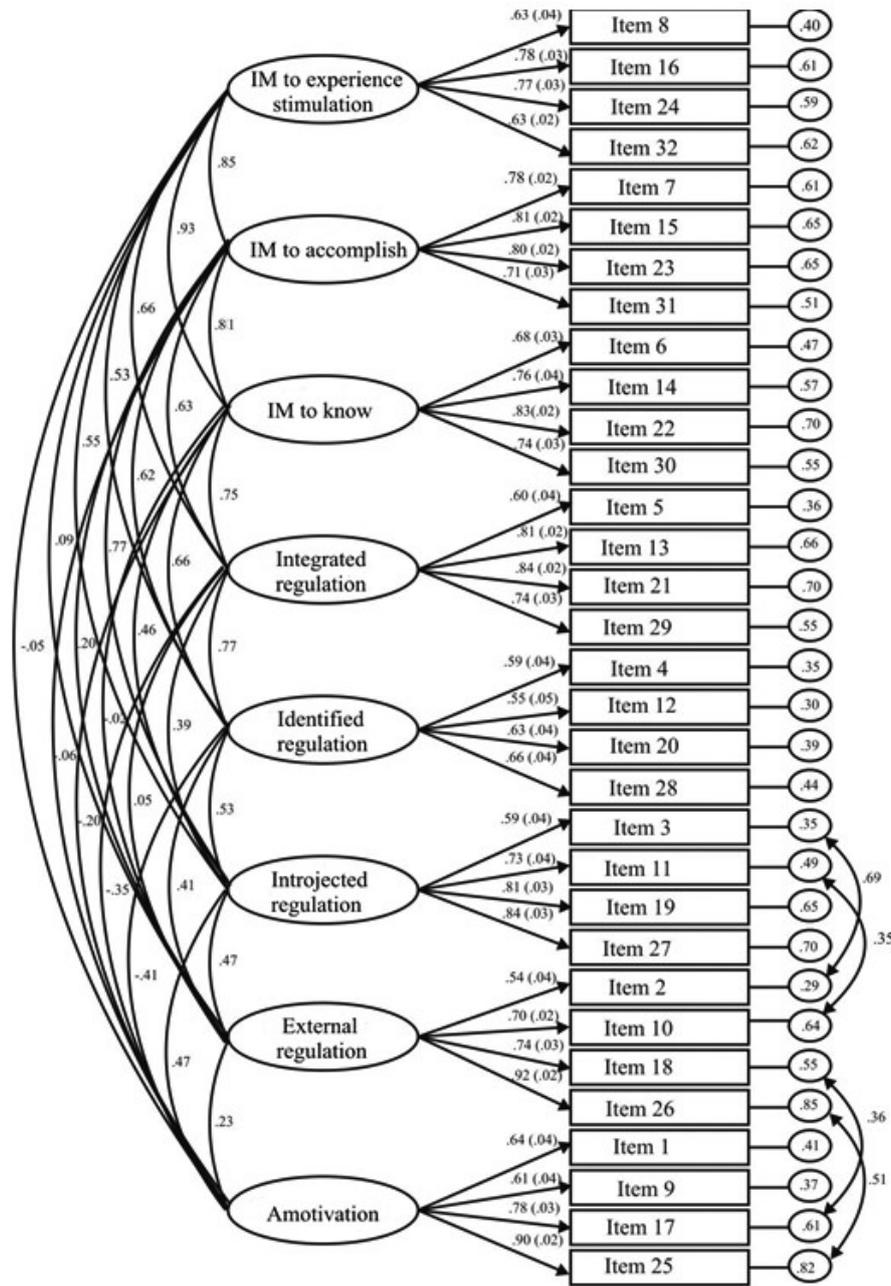


Figure 1. Confirmatory Factor Analysis for the *Academic Motivation Scale-revised*. The ellipses represent the factors and the rectangles represent the diverse items. The values in parenthesis represent the standard error of the bootstrapping. The residual variances are in the small circles. The double-arrow to right represent the correlations between pairs of residual errors.

Table 3. Fit-Indexes for the Tested Alternative Models.

Models	χ^2	df	χ^2/df	CFI	IFI	SRMR	RMSEA (IC90%)
UNI	4815.52***	464	10.38	.52	.53	.139	.138 (.134 - .141)
SM/NSM	3147.08***	445	7.07	.70	.71	.148	.111 (.107 - .114)
AMO/EM/IM	3694.91***	461	8.02	.65	.65	.122	.119 (.115 - .123)
AMO/4F/IM	1949.95***	449	4.34	.84	.84	.076	.082 (.078 - .086)

Note: UNI = 1-factor structure; SM/NSM = 2-factor structure (self-determined motivation and not self-determined motivation); AMO/EM/IM = 3-factor structure (amotivation, extrinsic motivation and intrinsic motivation); AMO/4F/IM = 6-factor structure (amotivation, four types of extrinsic motivation and intrinsic motivation)

*** $p < .001$

Invariance Analysis, Internal Consistency and Temporal Stability

Table 4 shows the absence of increments of CFI value higher than .010, as well as increments higher than .015 for RMSEA in the successive restrictive models. Therefore, the null hypothesis of invariance could not be rejected. On the other hand, Table 2 shows that the internal consistency val-

ues (α) of the different factors oscillated between .70 (identified regulation) and .86 (intrinsic motivation to accomplish), while those for temporal stability (CCI) ranged between .73 (identified regulation) and .89 (external regulation). Consequently, and in accordance with the established criteria, it was estimated that the instrument had adequate levels of internal consistency and temporal stability.

Table 4. Invariance Analysis across Gender

	χ^2	df	χ^2/df	CFI	IFI	SRMR	RMSEA (IC90%)	CM	$\Delta\chi^2$	Δdf	ΔCFI	$\Delta RMSEA$
1. Model 1	1896.34	864	2.20	.888	.889	.072	.049 (.046 - .052)	-	-	-	-	-
2. Model 2	1917.63	888	2.16	.888	.889	.071	.048 (.045 - .051)	2 vs. 1	21.30	24	.000	-.001
3. Model 3	1994.71	920	2.17	.883	.884	.072	.049 (.046 - .051)	3 vs. 2	77.07***	32	-.005	.001
4. Model 4	2032.82	952	2.14	.882	.882	.071	.048 (.045 - .051)	4 vs. 3	38.11	32	-.001	.001

Note: Model 1 = Unconstrained; Model 2 = Invariant Measurement Weights; Model 3 = Invariant Intercepts; Model 4 = Invariant Error Variances.

Linear Regression Analysis

Table 5 shows that the model not including integrated regulation (Step 1) explained 14% of the variance in intention to become a teacher. In this model, only identified regulation ($\beta = .26, p < .001$) and motivation ($\beta = -.24, p < .001$) predicted the intention to become a teacher in a statistically-

significant way. The inclusion of integrated regulation into the model (Step 2) made it possible to explain 19% of the variance of intention to become a teacher. In turn, in this model, integrated regulation was shown as the form of motivation with the highest predictive effects on intention to become a teacher ($\beta = .24, p < .001$).

Table 5. Linear Regression Analysis that Predict Intention to Become a Teacher from Motivational Regulations.

	B	B SE	β	t	Tolerance	VIF	R ² adj.
Step 1	5.30	.33		15.85			.14**
IM to experience stimulation	-0.06	.09	-.05	-0.73	.29	3.46	
IM to accomplish	0.07	.08	.06	0.80	.27	3.77	
IM to know	0.17	.09	.15	1.94	.28	3.56	
Identified regulation	0.31	.07	.26***	4.56	.51	1.95	
Introjected regulation	-0.01	.07	-.01	-0.15	.47	2.13	
External regulation	0.09	.05	.09	1.90	.69	1.45	
Amotivation	-0.26	.05	-.24***	-5.16	.73	1.37	
Step 2	4.97	.33		14.68			.19***
IM to experience stimulation	-0.12	.09	-.11	-1.44	.28	3.57	
IM to accomplish	0.06	.08	.06	0.79	.27	3.77	
IM to know	0.23	.09	.20**	2.61	.27	3.66	
Integrated regulation	0.27	.06	.24***	4.18	.47	2.12	
Identified regulation	0.21	.07	.17**	2.86	.45	2.23	
Introjected regulation	-0.02	.07	-.02	-0.30	.47	2.13	
External regulation	0.11	.05	.11*	2.32	.68	1.46	
Amotivation	-0.22	.05	-.20***	-4.32	.70	1.42	

Note: IM = Intrinsic Motivation; SE = Standard Error; VIF = Variance Inflation Factor.

*** $p < .001$, ** $p < .01$, * $p < .05$

Discussion and Conclusions

The objective of the present work was to incorporate integrated regulation into the EME of Vallerand et al. (1989), with the intention of obtaining an instrument that would allow to measure the totality of the motivational regulations proposed by SDT in the Spanish educational context. Thus, the items proposed by Ferriz et al. (2015) for the physical education setting were adapted to the initial teacher education context and included into the Spanish version of the EME (Núñez et al., 2005). The results of the different anal-

yses provided evidences that suggest that, generally, the new instrument possesses adequate psychometric properties.

The correlational analysis showed that the different forms of motivation did not follow the simplex pattern structure proposed by Ryan and Connell (1989). Thus, in line with previous studies (Barkoukis et al., 2008; Núñez et al., 2005, 2010), the correlation between intrinsic motivation to accomplish and introjected regulation was of a higher magnitude to that existing between the latter and its adjacent theoretical factors (i.e. identified and external regulation). Despite it has been argued that the three intrinsic motivation sub-

types present in the instrument could not have the necessary level of sensitivity and discrimination (Núñez et al., 2010), in the present study only intrinsic motivation to know positively and statistically-significant predicted intention to become a teacher. These results support the idea expounded by certain authors, according to whom the different motivational regulations ought to be considered more in terms of their singular characteristics than attending to their strict position on the *continuum* (Chemolli & Gagné, 2014).

The confirmatory factor analysis revealed acceptable fit-indexes for the 8-factor correlated model, verifying the results of previous studies that considered this type of structure (Barkoukis et al., 2008; Caleon et al., 2015; Can, 2015; Cokley, 2015; Núñez et al., 2010; Stover et al., 2012). The fit-indexes for the model that grouped the three sub-types of intrinsic motivation were not satisfactory in this study, in contrast to previous studies that have suggested this possibility (Alivernini & Lucidi, 2008; Koludrovic & Ercegovac, 2015). Furthermore, the fit-indexes observed in the present work were similar to those previously obtained in the Spanish context (Núñez et al., 2005, 2010), although those works did not consider the measurement of integrated regulation. In spite of this, it is worth noting that to obtain an acceptable fit, it was necessary to correlate four pairs of residual errors. However, this number was less than the 6 in the original validation study (Vallerand et al., 1989), to the 26 in the English version (Vallerand et al., 1992) or to the 10 previously required in the Spanish context (Núñez et al., 2010). The need to correlate these error pairs suggests that future studies ought to improve the wording of some of the instrument's items.

For the first time in the Spanish context, this study provides evidence that suggest the scale's factorial structure remains invariant across gender. This evidence allows to recommend the use of EME-R to study more deeply the differences in the levels of the distinct forms of motivation in men and women previously identified by the research (Grouzet et al., 2006; Ratelle et al., 2007). In turn, the analysis of internal consistency revealed acceptable values for each factor that comprised the instrument, not observing the problems of internal consistency ($\alpha < .70$) previously shown for identified regulation (Núñez et al., 2005, 2010; Stover et al., 2012; Vallerand et al., 1992, 1989). These results suggest that including integrated regulation in the EME might have contributed to greater differentiation and comprehension of the items that measure identified regulation, therefore, improving the internal consistency of this factor. On the other hand, the values obtained by the analysis of temporal stability were suitable and similar to those obtained in previous works in other contexts (Barkoukis et al., 2008; Núñez et al., 2005, 2010, Vallerand et al., 1992, 1989).

The analysis of criterion validity evidence based on relations to other variables showed that integrated regulation

was the form of motivation that best predicted the intention to become a teacher in pre-service teachers. Therefore, one could deduce that beyond the implicit satisfaction in their initial education period (Uyulgan & Akkuzu, 2014), the pre-service teachers express their will to work as teachers from the internalization process by which the value attributed to the behaviour is integrated in the self. These results are in line with those obtained in other contexts, where integrated regulation has been shown as the motivational form with the highest predictive effect on adaptive behaviours, such as in the practice of physical activity (Ferriz et al., 2015) or the intention to devote oneself to research after following a doctoral programme (Litalien et al., 2015).

With respect to the complexity of the human cognitive processes, validation of a psychometric instrument should be understood as a continual process over time. Therefore, future research ought to address the unknowns arising from the limitations present in this work. First, using a sample of convenience makes it impossible to generalize the results. Future research could consider more heterogeneous samples based on their geographical and age characteristics, so that one can determine whether the instrument's factor structure remains invariant for both variables. Second, the study population was confined to the initial teacher education context. According to the relevant role performed by the motivational processes in predicting behaviour, and taking into account all the recent evidence that suggests the differentiated contribution of integrated regulation to these processes (Ferriz et al., 2015; Ng et al., 2012), future studies could consider the validity of the new instrument in educational contexts such as higher education and, compulsory and post-compulsory secondary education. In turn, future research could contribute to the instrument's development showing validity evidence from distinct psychometric perspectives. For example, it would be interesting whether future research studied the psychometric properties of EME-R using Item Response Theory, due to this approach allows to frame psychometric models within general probabilistic models in order to evaluate and measure non-observable variables (Edelen & Reeve, 2007).

The results of the present study indicate that the proposed instrument (EME-R) is both valid and reliable in measuring the motivational spectrum proposed by SDT in the Spanish initial teacher education context. This instrument has allowed us to compile evidence that suggests that the integration of the teaching-learning process within the student's value system and lifestyle could benefit their commitment to the educational process and their intention to persist in the teaching vocation. These results highlight the importance of considering integrated regulation when studying the motivational process that determines the adoption of human behaviour.

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