Motivational and Emotional Profiles in University Undergraduates: a Self-Determination Theory Perspective

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Previous research has focused on specific forms of self-determined motivation or discrete class-related emotions, but few studies have simultaneously examined both constructs. The aim of this study on 472 undergraduates was twofold: to perform cluster analysis to identify homogeneous groups of motivation in the sample; and to determine the profile of each cluster for emotions and academic achievement. Cluster analysis configured four groups in terms of motivation: controlled, autonomous, both high, and both low. Each cluster revealed a distinct emotional profile, autonomous motivation being the most adaptable with high scores for academic achievement and pleasant emotions and low values for unpleasant emotions. The results are discussed in the light of their implications for academic adjustment.
Keywords: self-determination theory, academic emotions, achievement, cluster analysis, motivational profile, emotional profile.

Investigaciones previas han analizado distintas formas de motivación autodeterminada y emociones concretas relacionadas con las clases, pero pocas han examinado simultáneamente ambos constructos. El objetivo del presente trabajo, con 472 universitarios, es doble: realizar un análisis de conglomerados para identificar en la muestra grupos homogéneos en su motivación; y determinar el perfil de cada grupo en sus emociones académicas y su rendimiento. El análisis cluster configuró cuatro grupos según su motivación: controlada, autónoma, ambas altas, y las dos bajas. Cada cluster mostró un perfil emocional diferenciado, siendo el de motivación autónoma el más adaptativo, con valores elevados en rendimiento académico y emociones agradables y bajos en las desagradables. Se discuten los resultados y sus implicaciones para el ajuste académico.
Palabras clave: autodeterminación, emociones académicas, rendimiento, análisis cluster, perfil motivacional; perfil emocional.

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The analysis of motivation has been a central issue in educational psychology. Following several decades of research in this field the consensus is that motivation is a significant factor that explains and predicts academic achievement. Of the array of models concerning academic motivation, one of the most relevant is self-determination theory (SDT) (Deci & Ryan, 2000, 2008). In the last decade, besides motivation, much research has focused on academic emotions particularly since they play a key role in optimizing academic achievement (Pekrun, 2006, 2009). Nevertheless, few studies have jointly assessed both variables i.e., self-determination and specific emotions in educational contexts. Thus, the primary aim of this study was to jointly examine both constructs from a person-centred approach.

The authors of *self-determination theory* distinguish various types of motivation according to the degree of self-determination that ranges from amotivation to intrinsic motivation (Deci & Ryan, 2000, 2008; Ryan & Deci, 2002, 2009; Vallerand, Pelletier, & Koestner, 2008). Amotivated students lack the drive to act thus their behaviour is not-self-determined. Extrinsic motivation is defined as behaviour driven by motives external to the individual and various types have been described: external regulation is defined as motivation driven by the need to achieve an external goal such as to obtain a reward, evade punishment or to fulfil the expectations of others; introjected regulation refers to actions that are undertaken to avoid feelings of guilt or anxiety without internalising the motives; identified regulation occurs when one acknowledges and accepts the implicit value of an act and performs it though it may be unpleasant or distasteful; and integrated regulation involves an individual identifying and assimilating certain goals and values as their own. In contrast, intrinsic motivation refers to the personal desire to do things that one feels are interesting and because they satisfy personal needs of autonomy and competence. In the context of this continuum of various types of motivation in self-determination theory, several authors have contrasted autonomous motivation, which includes intrinsic motivation and identified regulation, to controlled motivation that entails external and introjected regulation (Ratelle, Guay, Vallerand, Larose, & Senécal. 2007; Reeve, 2012; Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009). The analysis of motivation may be approached in several levels (Vallerand, 1997); this work focuses on the analysis of self-determination and emotions in a university academic context.

With reference to *academic emotions*, Pekrun and colleagues (Pekrun, 2006, 2009; Pekrun, Frenzel, Goetz, & Perry, 2007) have linked these to achievement emotions, which are conceived of as entailing complex psychological processes with affective, cognitive, motivational and expressive components, and are directly associated to activities or achievement outcomes that can be evaluated using quality control criteria. These emotions rely primarily on how teachers and students perceive the dynamics of a particular academic context such as the classroom (Meyer & Turner, 2007). Academic emotions have been classified according to several parameters such as positive or negative valence and activation e.g., enjoyment, hope, and pride are positive (pleasant) behavioural activating emotions whereas anxiety and shame are negative (unpleasant) activators, and boredom and hopelessness are negative deactivating emotions (Pekrun, 2006, 2009; Pekrun et al., 2007). Though emotions exert an influence on the student`s academic achievement (Daniels et al., 2008, 2009; Pekrun, 2006, 2009; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Zeidner, 2007), the precise relationship with achievement is complex and is yet to be ascertained. Pleasant emotions are positively associated to academic results; unpleasant deactivating ones, such as hopelessness or boredom, have been consistently negatively correlated to learning outcomes. As for unpleasant activators such as anxiety, the nexus remains unclear i.e., most authors have found a moderately negative correlation (see Zeidner, 2007 for a review) whereas others (Pekrun et al., 2007) argue that the effects may be positive if for example anxiety over an exam serves to drive students to maximize their study potential to meet the challenge.

Based on the theory of self-determination, several studies focusing on educational contexts have found that the most self-determined forms of academic motivation were positively correlated to academic satisfaction (Miquelon, Vallerand, Grouzet, & Cardinal, 2005; Ratelle et al., 2007; Vallerand et al., 1993), intrinsic interest (Vallerand et al., 1993), and enjoyment (Álvarez, Balaguer, Castillo, & Duda, 2009; Black & Deci, 2000; Gutiérrez, Ruiz, & López, 2010; Liu, Wang, Tan, Koh, & Ee, 2009; Moreno, Hernández, & González-Cutre, 2009; Ntoumanis, 2002); and negatively correlated to negative affect (Walls & Little, 2005), anxiety in class or during exams (Ratelle et al., 2007; Vansteenkiste et al., 2009), boredom (Álvarez et al., 2009; Ntoumanis, 2002), and academic hopelessness (Ratelle, Vallerand, Senécal, & Provencher, 2005). In contrast, less self-determined types of motivation were positively correlated to negative emotions (Matsumoto & Sanders, 1988) and anxiety (Ratelle et al., 2007; Vansteenkiste et al., 2009), and negatively to academic wellbeing (Walls & Little, 2005). In addition, amotivation was positively correlated to anxiety (Ratelle et al., 2007), and negatively to satisfaction (Ratelle et al., 2007; Vallerand et al., 1993), positive emotions (Assor, Kaplan, Kanat, & Roth, 2005), interest (Vallerand et al., 1993), and enjoyment (Liu et al., 2009; Ntoumanis, 2002). Academic achievement was positively associated to autonomous motivation and negatively to controlled motivation and amotivation (Boiché, Sarrazin, Grouzet, Pelletier, & Chanal, 2008; Ratelle et al., 2007; Vansteenkiste et al., 2009).

Several authors claim that academic achievement is best explained by a combination of different motives (Daniels et al., 2008; Ratelle et al., 2007; Vallerand, 1997; Vansteenkiste et al., 2009). Rather than attesting to the

importance of a particular motivational construct to explain academic achievement, these authors have recommended the application of person-centred or person-oriented analyses to determine how the different types of motivation combine to produce distinct profiles, homogeneous groups of people who share similar motivational characteristics in contrast to other groups. Adopting this analytical perspective offers several advantages: different groups of individuals can be identified according to their profile on each variable; the number and proportion of students characterized by a more or less appropriate profile can be estimated which aids diagnosis and intervention; it provides further evidence of the internal validity of the SDT that claims the qualitative difference between autonomous and controlled motivation is of critical importance for describing students' motivation; and the comparison of the scores obtained by students in each cluster on relevant academic variables serves to highlight the external validity of the postulates of SDT. This approach has been used in educational research to study motivational constructs as achievement goals (Daniels et al., 2008; Levy, Kaplan, & Assor, 2007) and self-determination in adolescents and youngsters in different settings, such as physical activity (Guillet, Vallerand, & Rosnet, 2009), physical education (Boiché et al., 2008; Ntoumanis, 2002) or several academic subjects and activities (Hayenga & Henderlong, 2010; Liu et al., 2009; Ratelle et al., 2007; Vansteenkiste et al., 2009).

As for the number and types of clusters that have been described with the SDT framework, most studies have identified a predominant cluster of autonomous motivation and another of high controlled motivation values (Boiché et al., 2008; Guillet et al., 2009; Hayenga & Henderlong, 2010; Liu et al., 2009; Ntoumanis, 2002; Ratelle et al., 2007; Vansteenkiste et al., 2009). Moreover, these authors have found further combinations of these two motivational types i.e., both high, low or intermediate, and have observed that the clusters of autonomous motivation obtained higher levels of enjoyment (Liu et al., 2009; Ntoumanis, 2002) and achievement (Ratelle et al., 2007, st.3; Vansteenkiste et al., 2009), and lower levels of boredom (Ntoumanis, 2002) and test anxiety (Vansteenkiste et al., 2009, st. 1 and 2). Conversely, the tendency for the clusters with low autonomous motivation was high scores for test anxiety (Vansteenkiste et al., 2009, st.1 and 2), school anxiety (Ratelle et al., 2007, st. 1), and boredom (Ntoumanis, 2002), and low scores for enjoyment (Liu et al., 2009; Ntoumanis, 2002) and academic achievement (Ratelle et al., 2007, st. 3; Vansteenkiste et al., 2009).

Several studies have associated specific academic emotions (i.e., hope, enjoyment, anxiety, and boredom) with various motivational constructs such as perceived control, self-concept, self-efficacy, competence expectancy, perceived competence, expectancy beliefs, and task-value. Other studies have related self-determination to generic emotional concepts such academic satisfaction or positive-negative affect. In spite of the relevance of self-determination and emotional variables, to our knowledge, no study has simultaneously assessed the different types of motivation proposed by the SDT and specific class-related emotions.

Universities have specific characteristics: in most cases class attendance is not compulsory; students are free to choose certain academic subjects; they may opt for a degree of their choice in accordance with their desired career options. For this reason, this study aims to determine the combinations of motives for attending university, and identify the class-related emotions and academic achievement that characterizes each combination. Thus, the primary aim of this study was to describe the motivational profile of undergraduates from a SDT theoretical perspective using a person-oriented approach. Bearing in mind the data from previous studies mostly on secondary students (Boiché et al., 2008; Daniels et al., 2008; Guillet et al., 2009; Levy et al., 2007; Liu et al., 2009; Ntoumanis, 2002; Ratelle et al., 2007; Vansteenkiste et al., 2009), it was predicted that the results would converge towards the following profiles: an autonomous profile, characterized by high scores in intrinsic motivation and identified regulation and low external and introjected regulation values; and a controlled profile with high external and introjected regulation levels and low identified regulation and intrinsic motivation. Combined profiles with high, intermediate or low levels of either type of motivation were also expected, particularly since there is no unanimity regarding the results reported on this aspect in the literature. A further objective was to determine if the students in each cluster exhibited a differentiated profile in academic emotions and achievement. Taking into account the findings of previous research, profiles with greater autonomous motivation were expected to have high achievement and positive emotion scores and low negative emotion values. The opposite tendency was predicted for the low autonomous motivation profile: low achievement and positive emotion values, and high negative emotion values.

Method

Participants

The sample consisted of 472 students (61.4 % women and the remainder men; age range 17 to 38 years; mean age 20.95 years; SD = 2.79) attending to the Faculty of Educational Sciences of Vigo University, a state institution located in the northwest of Spain with approximately 20.000 undergraduates.

Measures

Self-determination. The evaluation was undertaken using the Spanish version (Núñez, Martín-Albo, & Navarro, 2005) of the *Échelle de Motivation en Éducation (EME)* designed

by Vallerand, Blais, Brière, and Pelletier (1989). In line with the procedures of Vallerand et al. (1989), students received in Spanish the following written instruction: "Why do you go to university? Using the scale below, indicate to what extent each of the following items presently corresponds to one of the reasons why you go to university." A total of 20 statements were used, four for each type of motivation: *amotivation* (α = .78) (e.g. "I once had good reasons for going to university; however, now I wonder whether I should continue"); *external regulation* (α = .86) (e.g. "In order to obtain a more prestigious job later on"); *introjected regulation* (α = .88) (e.g. "To prove to myself that I am capable of completing my college degree"); *identified regulation* (α = .80) (e.g. "Because I believe that a few additional years of education will improve my competence as a worker"); and *intrinsic motivation* toward knowledge (α = .90) (e.g. "For the pleasure that I experience in broadening my knowledge about subjects which appeal to me"). For each item, students were required to choose a value between 1 (*doesn`t correspond at all*) and 7 (*corresponds totally*).

The Spanish version of the scale, designed by Núñez et al. (2005) using a sample of Spanish undergraduates, provides adequate psychometric properties, χ^2/df = 2.76; GFI = .91; NFI = .90; IFI = .93; CFI = .93; RMSEA = .05.

Academic emotions. Academic emotions were assessed using the *Class-Related Emotion Scales* taken from the *Achievement Emotions Questionnaire* (Pekrun, Goetz, & Perry, 2005). The Spanish version of the scale was administered to assess six emotions: *enjoyment* (10 items; α = .85) (e.g. "It's so exciting that I could sit in class for hours listening to the professor" or "I am glad that it paid off to go to class"); *hope* (8 items; α = .84) (e.g. "My hopes that I will be successful motivate me to invest a lot of effort" or "I am optimistic that I will be able to keep up with the material"); *pride* (9 items; α = .80) (e.g. "I am proud of the contributions I have made in class" or "Because I take pride in my accomplishments in this course, I am motivated to continue") ; *anxiety* (12 items; α = .88) (e.g. "I worry whether the demands might be too great" or "I get scared that I might say something wrong, so I'd rather not say anything"); *boredom* (11 items; α = .90) (e.g. "Because I get bored my mind begins to wander" or "I think about what else I might be doing rather than sitting in this boring class"); and *hopelessness* (10 items; α = .85) (e.g. "I feel hopeless continuing in this program of studies" or "Because I don't understand the material I look disconnected and resigned"). In accordance with Pekrun et al. (2005), the students received the following written instructions in Spanish: "Attending classes at university can induce different feelings. Please indicate how you feel, typically, before you go to class, during class or after class." Students were asked to score their emotions experiences on the scale by selecting one of five options: 1 (*totally disagree*) and 5 (*totally agree*).

The Spanish version of the scale was designed by employing cross-cultural scale translation. The process involves three stages: a) the original scale was translated from English to Spanish in accordance with the parallel back-translation procedure (Brislin, 1986); b) a team of two translators and two expert lecturers on self-determination theory selected the items that matched the initial meaning as well as writing the instructions and setting the format of the scale, which was identical to the English version; c) finally, the Spanish version of the scale was applied to 15 undergraduates in order to evaluate the clarity and adequacy of each item.

Academic achievement. The mean of the official grades awarded for the academic subjects taken in the first semester was used as an objective indicator of the student´s academic achievement. The scoring ranged from 1 to 10.

Procedure

The questionnaire was administered by lecturers during the first semester, and students completed their questionnaires in their classrooms during class time; no student refused to complete the questionnaire or to comply with instructions. Prior to completing the questionnaire, all students were informed of the research objectives, the significance of replying sincerely, as well as being assured that their questionnaires would remain anonymous and confidential. Having completed the semester, each student voluntarily handed in a copy of their official faculty grade book with the grades for each academic subject, and each document was assigned a personal student code.

Data analysis

The descriptive statistics and the correlations between variables were calculated using the SPSS.15.0 software programme.

Then, cluster analysis was performed to determine motivational profile. Initially, a hierarchical cluster and a two-step cluster were performed to determine the number of groups prior to carrying out a k-means cluster. Moreover, in accordance with the recommendations of Breckenridge (2000) and the work of Cano and Berbén (2009) and Vansteenkiste et al. (2009), a double-split cross-validation procedure was used to evaluate the stability or replicability of the cluster solutions, i.e., the validity of the model to predicting new observations. The full sample of undergraduates was randomly split into two halves (subsamples A and B). The full two-step clustering procedure (hierarchical with Ward's method, followed by k-means) was then applied to each half, and the two solutions were compared for agreement as follows. The participants of each half of the sample were assigned to new clusters on the basis of their Euclidean distances to the cluster centres of the other half of the sample (SPSS, Analyze, Classify, K-means cluster, and Read initial). These

new clusters were ten compared for agreement with the original cluster by means of Cohen's kappa (κ). The two resulting kappas were averaged. As in other applications of Cohen's kappa (κ), an agreement of at least .60 is considered acceptable.

Finally, to explore the external validity of the retained cluster solution, another MANOVA was performed to establish the profile for the emotions and achievement.

Results

Preliminary analysis

The AMOS 7.0 programme (Arbuckle, 2006) was used for the confirmatory factorial analysis (CFA) of both scales. The skewness and kurtosis values were below |1.96| for all items, with the exception of the amotivation subscale. Mardia's coefficient of multivariate kurtosis, however, surpassed the critical ratio (c.r.) for both scales, with values of 169.3 (c.r. = 61.9) for the Échelle de Motivation en Éducation; and 105.2 (c.r. = 47.6) for positive emotions and 48.5 (c.r. = 26.7) for negative emotions of the Class-Related Emotion Scales. Thus, to test whether non-normality influenced the estimators, two types of analysis were performed (Arbuckle, 2006; Byrne, 2001): one for the original sample using the maximum likelihood method; the other, for the 500 bootstrap samples obtained in the original sample, using the maximum likelihood method. A 90% confidence interval was set to evaluate bias i.e., the difference between the bootstrap mean estimate and the original estimate. The comparison of the results obtained by both methods revealed that the only differences were at the third decimal place; as for the confidence intervals of the standardised factor loadings, these were observed not to include zero; hence, we concluded that the bootstrap parameter estimates were highly similar to those of the original model and that non-normality did not significantly affect the accuracy of the factor loadings (Byrne, 2001). We now proceed to review the results of the analysis performed on the original samples of the motivation and emotions questionnaires.

In accordance with the proposal of Vallerand et al. (1989), in the Échelle de Motivation en Éducation five factors were identified: amotivation, external regulation, introjected regulation, identified regulation, and intrinsic motivation; the four items for each factor were used as indicators. The analysis revealed an acceptable fit of the data to the structure of the five factors proposed by SDT, $\chi^2(df = 160, n = 472) = 418.7, p < .001; \chi^2/df = 2.62$; GFI = .92; NFI = .92; IFI = .95; CFI = .95; RMSEA = .06; SRMR = .05. All of the standardised factor loadings were significant ($p < .001$).

CFA was performed for the scores of the Class-Related Emotion Scales (Pekrun et al., 2005), consisting of 60 indicators grouped in 6 factors: enjoyment (10 items), hope (8), pride (9), anxiety (12), boredom (11), and hopelessness (10). For CFA, Byrne (2001, p.71) recommends the inclusion of no more than 24 observed variables, whereas Bentler and Chou (1987, p. 97) reduce the number to a maximum of 20 indicators. Thus two factorial analyses were performed; one for positive emotions and the other for negative ones. As the total number of indicators for each CFA was greater than 20-24, the items for each emotion were grouped in parcels, in compliance with criteria of Marsh, Hau, Balla, and Grayson (1998) who established the number of optimum indicators for each variable should be within the range of 4-6. Among the array of techniques available for the parcelling of items (Little, Cunningham, Shahar, & Widaman, 2002), the criteria applied by Daniels et al. (2009) were selected for the parcelling of the items on the scales i.e., summing together items that were similarly worded and correlated. Finally, the scales were configured as follows: 13 parcels for pleasant emotions, enjoyment (5), hope (4), and pride (4); and a total of 16 parcels for unpleasant emotions, anxiety (6), boredom (5), and hopelessness (5). The analysis revealed that three factor structure proposed by the authors of the scale had a good fit with the data for both positive emotions, $\chi^2(df = 56, n = 472) = 231.4, p < .001; \chi^2/df = 4.13$; GFI = .93; NFI = .91; IFI = .93; CFI = .93; RMSEA = .08; SRMR = .05; and negative emotions, $\chi^2(df = 97, n = 472) = 373.7, p < .001; \chi^2/df = 3.85$; GFI = .91; NFI = .92; IFI = .94; CFI = .94; RMSEA = .08; SRMR = .07. All of the standardised factor loadings were significant ($p < .001$).

Table 1 shows the descriptive statistics for each of the variables and the correlations between them. In relation to the mean score, the more self-determined types of motivation (identified regulation and intrinsic motivation) obtained notably high values; likewise, positive emotions were greater than negative ones. In terms of gender, the comparison of the mean scores for each variable using t-test revealed no significant differences.

The correlation analysis shows that each type of motivation was positively and more intensely correlated to its most proximal type of motivation in the SDT model; conversely, correlation intensity was lower or even negative between the most distant types of motivation in the model. Thus, pleasant emotions positively correlated between each other as did the unpleasant ones and, on the whole, correlations between pleasant and unpleasant emotions were negative.

As for the nexus between motivation and emotions, the most notable results were as follows: the observed tendency was pleasant emotions were positively correlated to more self-determined types of motivation (intrinsic and identified), negatively correlated to less self-determined types of motivation (amotivation), and poorly or mainly negatively correlated to the other two types of motivation (external

Table 1
Descriptive statistics and correlations between measured variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Amotivation	—											
2. External R.	.18	—										
3. Introjected R.	.09	.43	—									
4. Identified R.	−.20	.24	.30	—								
5. Intrinsic M.	−.17	.05	.22	.53	—							
6. Enjoyment	−.24	−.20	−.09	.19	.42	—						
7. Hope	−.22	−.15	−.12	.18	.29	.64	—					
8. Pride	−.24	−.05	.07	.23	.30	.53	.61	—				
9. Anxiety	.10	.20	.18	.04	−.07	−.04	−.17	.04	—			
10. Boredom	.24	.17	.03	−.08	−.26	−.46	−.24	−.23	.33	—		
11. Hopelessness	.21	.16	.13	−.06	−.16	−.12	−.19	−.07	.73	.49	—	
12. Achievement	−.17	−.03	.13	.43	.41	.21	.22	.22	−.06	−.18	−.19	—
Mean	*1.39*	*3.96*	*2.97*	*5.15*	*5.08*	*3.02*	*3.31*	*3.27*	*2.29*	*2.61*	*1.92*	*6.84*
SD	*.72*	*1.65*	*1.68*	*1.30*	*1.44*	*.67*	*.70*	*.64*	*.71*	*.82*	*.60*	*.87*

Sample size: $n = 472$. $|r| \geq .10$: $p < .05$; $|r| \geq .12$: $p < .01$.

and introjected regulation). As for unpleasant emotions, these tended to be positively correlated to less self-determined types of motivation (amotivation, external and introjected regulation), with poor uniformity in the nexus with more self-determined types of motivation.

In relation to academic achievement, correlations were positive or moderate ($r = .40$ approx) for identified regulation and intrinsic motivation and to a lesser degree ($r = .20$ approx) with pleasant emotions; and the correlations with amotivation, boredom and hopelessness were low or negative.

Furthermore, a Kruskal Wallis Test of independence was performed between the different groups-class for each of the variables under analysis. The indexes ranged from a value of $\chi^2(df = 15, n = 472) = 18.66$, $p > .22$ for identified regulation, and $\chi^2(df = 15, n = 472) = 5.39$, $p > .98$ for amotivation. These results reveal no significant differences between the groups in any of the variables under study.

Cluster analysis

The next stage involved cluster analysis that was performed in accordance with other studies on achievement goals (Daniels et al., 2008; Levy et al., 2007) and self-determination (Boiché et al., 2008; Guillet et al., 2009; Liu et al., 2009; Ntoumanis, 2002; Ratelle et al., 2007; Vansteenkiste et al., 2009). Initially, a hierarchical cluster analysis was performed on the scores of the five types of motivation using Ward's cluster method and the squared Euclidean distance; the resulting dendrogram and the agglomeration schedule indicate that the four cluster solution was the most appropriate. This finding was also confirmed

by the two-step cluster analysis using the Bayesian Information Criterion (BIC).

Thereafter, a k-means cluster analysis was undertaken to draw the four groups. In order to facilitate the interpretation of the results and the comparison between groups, the scale was standardized (z scores). Table 2 shows the mean values for each cluster and the post hoc comparisons between them using the test of Scheffé. Likewise, Figure 1 shows the standard score for each of the four clusters.

The clusters were labelled according to the score of each cluster in comparison to the others. In line with Levy et al. (2007), the values of the standard scores below -1.00 were considered very low; from -1.00 to -.50, low; and from -.49 to .00, moderately low. Analogously, standard scores greater than 1.00 were considered very high; from 1 to .50, high; and from .49 to .00, moderately high.

The first cluster was defined by moderately high amotivation scores, and low or very low in the other types of motivation; thus, it was labelled as low autonomous and controlled motivation (Low AU-C). The second cluster was characterized by high values in external regulation and moderately high in introjected regulation (as well as amotivation), and low or moderately low in identified regulation and intrinsic motivation, and was labelled Controlled motivation. The third cluster was characterized by high or very high scores in external regulation, introjected regulation, identified regulation, and intrinsic motivation, and moderately high in amotivation, and was labelled high autonomous and controlled motivation (High AU-C). Finally, the fourth cluster was characterized by low or moderately low scores in amotivation, external and introjected regulation, and high or moderately high values in identified regulation and intrinsic motivation, and was labelled Autonomous motivation.

Table 2
Cluster centres, in direct and standard scores, for the types of motivation

Types of motivation	1. Low AU-C	2. Controlled	3. High AU-C	4. Autonomous	$F(3, 467)$	η^2
	Mean (*SD*) z	Mean (*SD*) z	Mean (*SD*) z	Mean (*SD*) z		
Amotivation	1.46 (.67) .11 [b]	1.68 (.99) .40 [b]	1.43 (.79) .05 [a]	1.17 (.39) −.30 [a]	10.7	.07
External R.	2.55 (1.1) −.85 [a]	5.40 (.88) .87 [b]	4.97 (1.3) .61 [b]	2.97 (1.2) −.61 [a]	153.9	.50
Introjected R.	1.56 (.70) −.84 [a]	3.07 (1.3) .06 [b]	4.85 (1.1) 1.12 [c]	1.92 (.92) −.62 [a]	268.1	.63
Identified R.	3.38 (1.1) −1.4 [a]	4.57 (1.1) −.45 [b]	5.97 (.89) .62 [d]	5.55 (.90) .31 [c]	142.7	.48
Intrinsic M.	3.52 (1.1) −1.1 [a]	3.65 (1.1) −.99 [a]	5.89 (.85) .56 [b]	5.83 (.85) .52 [b]	200.9	.56
N (%)	*74 (16%)*	*88 (19%)*	*143 (30%)*	*167 (35%)*		

Note: Cluster means are significantly different if they have different subscripts, when tested with Scheffé procedure.

The stability or replicability of this four-cluster solution was examined by means of the double-split cross-validation procedure described earlier. The average Cohen's kappa value across the two subsamples ($\kappa = .83$) provided substantial evidence for the stability of this four-cluster solution.

Having established the four groups, a multivariate analysis of variance (MANOVA) was carried out with the types of motivation as dependent variables and cluster type as independent variable. The results, with Wilk's $\lambda = .082$, $F(15, 1278) = 125.8$, $p < .001$, $\eta^2 = .57$, indicate the clusters differed significantly between them in terms of motivation and corroborate the motivational profiles found. The variable gender as a co-variable in the analysis revealed no significant differences.

A further multivariate analysis of variance (MANOVA) was performed to determine the differences between the clusters in each emotion and in achievement. Academic emotions and achievement were the dependent variables and cluster type the independent variable. The values obtained, with Wilk's $\lambda = .550$, $F(21, 1327) = 14.64$, $p < .001$, $\eta^2 = .181$, indicate significant differences between the clusters in academic emotions and achievement. Table 3 exhibits these profiles in direct and standard scores, and the post hoc contrasts using the Scheffé test. The standard scores for each emotion, achievement, and cluster are shown in Figure 2.

Significant differences in emotions were found between clusters, the most notable being positive emotions. As for emotional profiles, the Low C-AU cluster obtained low scores for positive emotions and above the mean in negative ones. The Controlled group exhibited a similar profile to the Low C-AU cluster. The values for emotions in the High C-AU cluster were close to the mean, higher for pride, anxiety and hopelessness but lower for the remainder. The Autonomous group obtained high values for positive emotions and low values for negative ones.
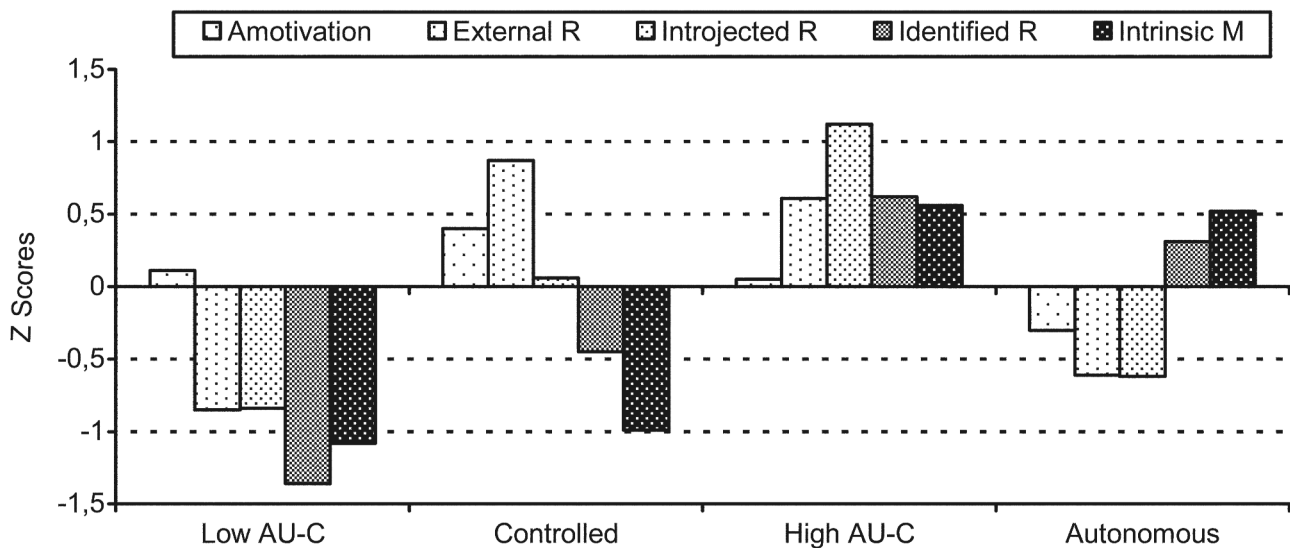

Figure 1. Academic motivational profiles.

Table 3

Comparison of profile groups based on emotions and achievement

Types of motivation	1. Low AU-C	2. Controlled	3. High AU-C	4. Autonomous	$F(3, 467)$	η^2
	Mean (SD) z	Mean (SD) z	Mean (SD) z	Mean (SD) z		
Enjoyment	2.80 (.66) −.32 $_{a\,b}$	2.68 (.67) −.49 $_a$	3.00 (.61) −.03 $_b$	3.30 (.62) .42 $_c$	22.4*	.13
Hope	3.00 (.69) −.43 $_a$	3.11 (.56) −.29 $_a$	3.19 (.63) −.17 $_a$	3.65 (.70) .48 $_b$	24.9*	.14
Pride	2.97 (.63) −.46 $_a$	3.04 (.61) −.35 $_a$	3.34 (.60) .12 $_b$	3.45 (.63) .28 $_b$	15.0*	.09
Anxiety	2.33 (.73) .06 $_{ab}$	2.37 (.67) .12 $_b$	2.47 (.74) .25 $_b$	2.06(.66) −.31 $_a$	9.5*	.06
Boredom	2.72 (.87) .13 $_{ab}$	2.95 (.79) .41 $_b$	2.53 (.75) −.10 $_a$	2.46(.82) −.19 $_a$	8.1*	.05
Hopelessness	2.10 (.65) .31 $_b$	2.03 (.61) .19 $_b$	1.97 (.61) .09 $_b$	1.73 (.52) −.31 $_a$	9.8*	.06
Achievement	5.95 (.62) −1.01 $_a$	6.44 (.68) −.45 $_b$	7.03 (.79) .22 $_c$	7.27 (.76) .50 $_c$	67.4*	.30

Note: Cluster means are significantly different if they have different subscripts, when tested with Scheffé procedure.
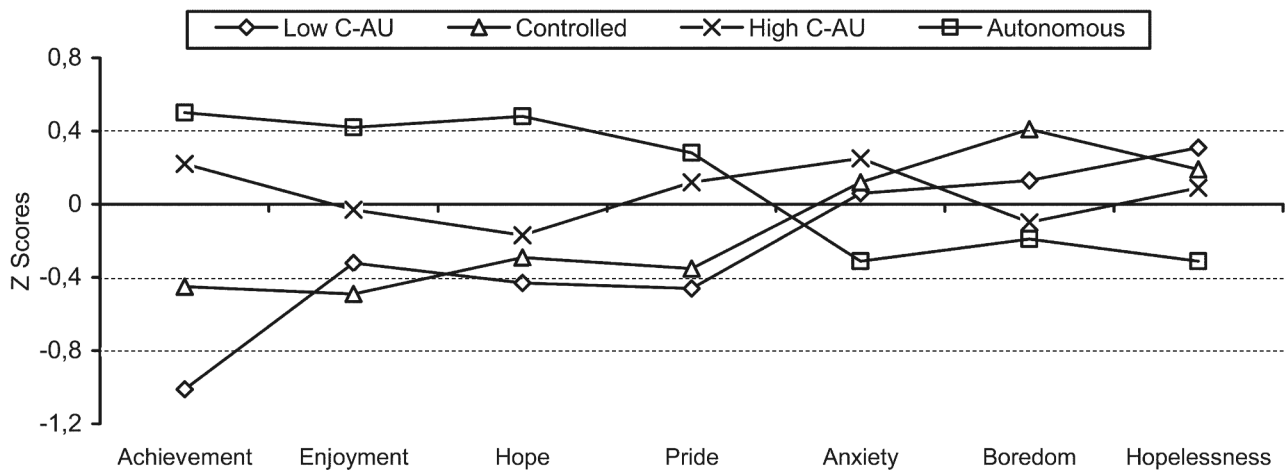* $p < .001$.

Figure 2. Cluster profiles on academic achievement and class-related emotions.

In terms of achievement significant differences were observed in the comparison of the clusters with high autonomous motivation and low autonomous motivation.

Discussion

Based on the theoretical models of SDT (Deci & Ryan, 2000; Ryan & Deci, 2002) and emotions (Pekrun, 2006; Pekrun et al., 2007), the present work assessed simultaneously the different types of motivation on the SDT in a university context with several class-related emotions and mean academic achievement levels using a person-centred approach.

Though most of the correlation scores were not very high, correlation analysis revealed that the more self-determined types of motivation (intrinsic motivation and identified regulation) tended to be positively associated to pleasant emotions and achievement. On the whole, pleasant emotions were negatively associated to less self-determined

types of motivation (external and introjected regulation) that were positively correlated to unpleasant emotions. Amotivation was positively correlated to unpleasant emotions and negatively to pleasant ones. The results obtained for the specific emotions under assay agree with those reported in previous studies (Assor et al., 2005; Black & Deci, 2000; Liu et al., 2009; Matsumoto & Sanders, 1988; Ntoumanis, 2002; Miquelon et al., 2005; Vallerand et al., 1993; Walls & Little, 2005) that focused primarily on general constructs such as satisfaction, well-being, affect, emotion, and interest.

Cluster analysis grouped the undergraduates into four motivational clusters. One cluster clearly tended towards controlled motivation; another exhibited a marked bias towards autonomous motivation; and the remaining two clusters combined both types of motivation, one with low scores in both types of motivation and the other with high scores in both types. The four-cluster solution was found to be highly replicable and internally valid. These motivational profiles are analogous to others observed in

previous studies using similar questionnaires with adolescents and youngsters in educational and sports contexts: Guillet et al. (2009), Liu et al. (2009), and Vansteenkiste et al. (2009) found four clusters almost identical to those in this study, but Boiché et al. (2008), Ntoumanis (2002), and Ratelle et al. (2007) have found only three clusters in their studies. Nevertheless, the groups found in these studies were very similar in profile to those reported in this study. This confirms that, in general academic contexts, students may be simultaneously driven by a host of reasons to study at university, and may combine intrinsic and extrinsic motivation to varying degrees.

The comparison of the clusters revealed that the Low AU-C cluster obtained the worst results, with scores below the mean for positive emotions and higher than the mean for negative emotions. Academic achievement was notably low, and significantly lower than in the other groups.

The main motivational characteristic of students in the Controlled cluster was the presence of external regulation and to a lesser extent introjection. The only significant difference in comparison to the Low AU-C cluster was higher academic achievement. On the whole the results for both clusters concur with the findings of previous studies that report that students with low autonomous motivation obtained lower levels of enjoyment (Liu et al., 2009), school satisfaction (Vansteenkiste et al., 2009), and academic achievement (Boiché et al., 2008; Ratelle et al., 2007; Vansteenkiste et al., 2009).

Furthermore, the students of the High AU-C cluster expressed identified and intrinsic reasons for attending university. The addition of autonomous motivation was associated with significant improvement in academic achievement, enjoyment of classes, pride for one´s achievements, and reducing boredom.

From a complementary perspective, a comparison of the Controlled vs. High AU-C clusters was undertaken in terms of type of motivation and the intensity of emotions for each group. The students of the Controlled cluster, who were mostly studying for externally regulated reasons (e.g., in order to obtain a more prestigious post in later life, or in order to have a better salary later on), experienced more boredom than anxiety. In contrast, anxiety was greater than boredom for students in the High AU-C group, whose primary reasons for studying were introjected (e.g., to show myself that I am an intelligent person or to show myself that I can succeed in my studies); we should bear in mind that Ryan and Deci (2002) define introjected regulation as behaviours performed to avoid guilt or anxiety. Though both groups improved their academic achievement (Controlled vs. Low AU-C; High AU-C vs. Controlled), the experience of unpleasant emotions in both groups can be considered as examples of what Guay, Ratelle, and Chanal (2008) have referred to as the "psychological costs" that are often associated to external and introjected regulations.

The high autonomous motivation cluster (Autonomous) had the most adaptable profile: students in this cluster experienced the highest levels of positive emotions, the lowest in negative ones, and reached higher levels of academic achievement. The comparison of these scores with those obtained by the students from the two low autonomous motivation clusters (Low AU-C and Controlled) revealed significant differences in all of the variables.

The comparison of the profiles of both clusters with high autonomous motivation (High AU-C vs. Autonomous) shows that the autonomous motivation group enjoyed more their classes, had higher hopes for their academic results, and experienced lower levels of anxiety and hopelessness. These findings corroborate the results of previous studies (Liu et al., 2009; Ntoumanis, 2002; Ratelle et al., 2007) and the claim that the high autonomous motivation profile is the preferred choice when compared the other profiles. Likewise, Vallerand et al. (2008) and Vansteenkiste et al. (2009) recommend the preference for good quality of motivation (autonomous) over high quantity of motivation (autonomous and controlled): the presence of controlled motivation, next to a high amount of autonomous motivation, provides poor benefits to students. Notwithstanding, in this study nonsignificant differences were observed in the Autonomous vs. High AU-C cluster in terms of pride, boredom, and academic achievement, which agrees with the findings of Ratelle et al. (2007, st.3) and with some data from the work of Vansteenkiste et al. (2009). The absence of significant differences in academic achievement may be due to, as Vallerand et al. (2008, p. 239) have suggested, that if the task is less interesting (or even dull), intrinsic motivation becomes less relevant, and the most self-determined types of extrinsic motivation should then be more pertinent and lead to more positive outcomes. Given that mean academic achievement and general class-related emotions have been assessed, it is highly probable that students will find some subjects more boring than others, and that the motives that drive them to classes are introjected. In spite of its psychological costs, this type of motivation was the most intensely correlated to perseverance in not very interesting academic tasks, a decisive factor for improving academic achievement (Guay et al., 2008).

The results of this study and the findings of previous works support the notion proposed by the authors of self-determination theory of a novel dichotomy i.e., autonomous motivation vs. controlled motivation that substitutes the traditional opposition of intrinsic vs. extrinsic motivation (Boiché et al. 2008; Deci & Ryan, 2008; Miquelon et al., 2005; Ratelle et al., 2007; Reeve et al., 2008; Vansteenkiste et al., 2009). This new dichotomy, according to self-determination theory, reflects the continuum between different types of motivation ranging from external regulation to intrinsic motivation i.e., types of motivation are mutually compatible rather than inherently exclusive.

This motivational continuity provides the framework for grounding an array of intervention programmes whereby teachers and parents can foster learner autonomy to encourage learners to progress from controlled motivation towards more autonomous motivation through a process of internalization (Álvarez et al., 2009; Assor, 2012; Deci & Ryan, 2008; Gutiérrez et al., 2010; Jang, Reeve, & Deci, 2010; Mas & Medinas, 2007); Reeve, 2012; Ryan & Deci, 2009). Furthermore, our findings highlight the value of other initiatives such as those proposed by Black and Deci (2000), Meyer and Turner (2007) or Ruthig et al. (2008) aimed at enhancing positive emotions, minimizing the impact of negative ones, and promoting self-regulation of academic emotions. It is worth noting the following: to communicate to students that learning serves to achieve future personal goals; to raise the student's perception of control e.g., by linking failure to controllable causes such as the lack of effort or strategies; given that certain academic activities or tasks are boring but sometimes unavoidable, students should develop coping strategies such as reflecting on the value or utility of boring tasks; provide a variety of activities and tasks graded according to difficulty, bearing in mind that difficult tasks may be just as boring as simple ones; raise and maintain the student's interest during student-teacher interaction. Other initiatives (Koole & Kuhl, 2008) focus on motivational and emotional regulation through volitional strategies that enable students to cope with frustration while trying to achieve their intended objectives particularly under adverse circumstances.

In spite of the significance of these results, we should bear in mind that the conclusions are limited given the correlational nature of this study as is the case of most of the works cited. Further studies would benefit from research into the three components of intrinsic motivation (to know, toward accomplishment, and to experience stimulation) outlined in the model proposed by Deci and Ryan (2000, 2008) and Vallerand (1997). The assessment of other constructs closely related to motivation and emotion such as engagement, effort, persistence, disaffection, dropout, or the use of cognitive and metacognitive strategies would also provide valuable insight (Assor, 2012; Assor et al., 2005; García, Cervelló, Jiménez, Iglesias, & Moreno, 2010; Gil, Bernaras, Elizalde, & Arrieta, 2009; Gutiérrez et al., 2010; Jang et al., 2010; Pekrun & Linnenbrink-García, 2012; Reeve, 2012; Vansteenkiste et al., 2009). The results obtained in this study could be substantiated by longitudinal studies, such as the work of Daniels et al. (2008, 2009), who examine the gradual evolution of the relationship between motivation and emotions spanning periods of an entire academic year or a university degree; this design would enable the detailed analysis of casual relationships between motivation and emotions. A further proposal would be to investigate the relationships between motivation and emotions in situational settings such as specific academic subjects or activity types (Pekrun, 2006; Vallerand, 1997).

Moreover, in line with the suggestions of Pekrun et al. (2007, 2011), one may combine emotions scales with other instruments or with neuropsychological or behavioural assessment. In addition, larger samples and clusters of students from a broader range of professional backgrounds such as from the field of science and technology could be included for study (Gil et al., 2009).

In short, cluster analysis revealed that university undergraduates may subscribe to different types of motivation simultaneously, the most adaptable being those combinations with a greater component of autonomous motivation, in particular when controlled motivation is weak i.e., the undergraduates in this group experienced the highest levels of pleasant class-related emotions and the lowest levels in unpleasant ones as well as achieving high academic performance.

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