International Journal Educational Psychology
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Date of publication: June 24th, 2022
Edition period: June 2022 - October 2022

To cite this article: Fierro-Suero, S.; Almagro, B.J.; Becker, E.S. & Sáenz-López, P. (2022). Basic Psychological Needs, Class-related Emotions and Satisfaction with Life in Spanish Teachers. *International Journal of Educational Psychology, 11* (2), 153-181.
doi: http://doi.org/10.17583/ijep.9106

To link this article: http://dx.doi.org/10.17583/ijep.9106

IJEP – International Journal of Educational Psychology Vol. 11 No.2 June 2022 pp. 153-181

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Abstract

The objective of this study was to examine possible antecedents and consequences of teachers' emotions in the classroom. Based on a cognitive-social perspective and self-determination theory, we examined the relationship between basic psychological needs (BPNs), teachers' class-related emotions and teachers' life satisfaction. A sample of 595 teachers from Andalusia (Spain) participated in an online survey. A structural equation model was tested, in which BPNs predicted teachers' emotions ($\beta = .69$; $p < .001$ positive emotions and $\beta = -.42$; $p < .001$ negative emotions). In addition, BPNs ($\beta = .36$; $p < .001$) and positive emotions ($\beta = .23$; $p < .001$) predicted satisfaction with life. The results show that the fulfilment of work-related BPNs is important to generate positive emotions and well-being in teachers. In addition, the study is the first to provide extensive details on the psychometric properties for assessing teacher emotions with the Achievement Emotions Questionnaire - Teachers (AEQ-T) in a Spanish sample.

Keywords: self-determination theory; achievement emotions; control-value theory; psychometric properties.

ISSN: 2014-3591
DOI: 10.17583/ijep.9106

IJEP – International Journal of Educational Psychology Vol. 11 No.2 June 2022 pp. 153-181

Necesidades Psicológicas Básicas, Emociones en las Clases y Satisfacción con la Vida en Profesores Españoles

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Resumen

El objetivo del estudio fue examinar los posibles antecedentes y consecuencias de las emociones de los profesores en el aula. Basados en una perspectiva cognitivo social y la teoría de la Autodeterminación, se examina la relación entre las necesidades psicológicas básicas (BPNs), las emociones de los profesores relacionadas con la clase y la satisfacción con la vida de los docentes. Una muestra de 595 profesores de Andalucía (España) participó en una encuesta online. Se probó un modelo de ecuación estructural, en el que las BPNs predijeron las emociones de los profesores (β = .69; p <.001 emociones positivas y β = -.42; p <.001 emociones negativas). Además, las BPNs (β = .36; p <.001) y las emociones positivas (β = .23; p <.001) predijeron la satisfacción con la vida. Los resultados muestran la importancia de satisfacer las BPNs relacionadas con el trabajo para generar emociones positivas y bienestar en los docentes. Además, el estudio es el primero en aportar amplios detalles sobre las propiedades psicométricas para evaluar las emociones de los profesores con el Cuestionario de Emociones de Logro (AEQ-T) en una muestra española.

Palabras clave: teoría de la autodeterminación; emociones de logro, teoría del valor-control, propiedades psicométricas.

ISSN: 2014-3591
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The importance of emotions in education is widely acknowledged and a recurring study topic as emotions have been, amongst others, shown to be relevant for learning processes and achievement (Destacamento, 2018; Frenzel et al., 2016; Luo et al., 2019; Pekrun, 2006). For a long time, the research in this field has mainly focused on showing the antecedents and effects of students' emotions, especially test anxiety (Lichtenfeld et al., 2012; Pekrun et al., 2017; Pekrun, 2006). However, research from the past years has additionally demonstrated the relevance of teachers' emotions in respect to their own well-being and health (Chang, 2009; Keller et al., 2014) as well as the quality of their teaching (Becker et al., 2014; Chen, 2019). Hence, teacher emotions have an impact on student outcomes such as their learning and motivation (Arens & Morin, 2016; Frenzel et al., 2021). Despite this empirical progress, there are still a limited number of studies on discrete emotions in education professionals (Frenzel et al., 2016; Luo et al., 2020) that help to fully understand, theoretically and methodologically, the role of emotions and their interaction with other variables (Uitto et al., 2015). Reasons that there are still many open questions regarding teacher emotions lie in the complexity and dynamics of emotional constructs: In educational settings, emotions are omnipresent and can be elicited by various factors that lie within a teacher (e.g., teachers' goals, standards and beliefs influence their emotions, see Schutz, 2014) or are rather external (e.g., students' behaviour, such as their motivation or misbehaviour, see e.g., de Ruiter et al., 2020). Therefore, depending on the dynamics of the class and the interaction with the students as well as a teacher's personal dispositions (Frenzel et al., 2016; Klassen et al., 2012; Schutz et al., 2006), teachers may experience a wide range of emotions such as enjoyment, pride, anger, frustration and anxiety (Chang, 2013; Darby, 2008; Frenzel et al., 2009, 2016; Luo et al., 2020). Contemporary component process models of emotions (Scherer, 2009) define emotions as interrelated psychological processes that comprise cognitive, expressive, physiological and motivational components. Therefore, teachers' emotions are not only inner feelings, but also outwardly expressed and perceivable by their interaction partners. Thus, research has shown that teacher emotions are perceived by their students and can lead to emotional contagion, that is students' emotions are directly impacted by teachers' emotions (Becker et al., 2014; Frenzel et al., 2009; Frenzel, 2014; Sutton &

Wheatley, 2003). Taken together, for studying teacher emotions, researchers need to be aware of this complexity, formulate a clear theoretical and methodological focus and use valid instruments to assess emotions. The present study tries to identify possible antecedents and effects of teacher emotions based on consolidated theories and validates an instrument for assessing teacher emotions´ in Spanish, that is so far only available in English, German, Japanese and Korean language.

Control-Value Theory of Achievement Emotions

Control-Value Theory of Achievement Emotions (CVTAE; Pekrun & Stephens, 2010) focuses on emotions that are directly related to achievement activities (e.g., teaching) and defines antecedents and outcomes based on a cognitive-social perspective. CVTAE was originally developed as a framework for students' emotions but has been adapted by Frenzel and colleagues for teacher emotions (Frenzel et al., 2009). In CVTAE an appraisal-perspective is employed with cognitive appraisals (especially appraisals related to control and value) mediating the relation between factors from the learning environment on students' or teachers' emotions respectively. Emotions are organised in three dimensions: valence (positive or negative), level of activity (activation or deactivation) and focus of the objective (activity or outcome) (Pekrun, 2006). With these dimensions, various discrete emotions can be distinguished that are relevant in an achievement context: For example, pride is an activating positive emotion focused on achievement (Pekrun, 2006). This emotion is experienced when teachers assess student learning and performance to be the result of their own effort (Trigwell, 2012). Enjoyment, like pride, is a positive and activating emotion, but focuses rather on the activity itself and not the outcome. Enjoyment occurs when class activities are in line with the objectives that the teachers has set for themselves (Frenzel et al., 2009; Sutton & Wheatley, 2003). Anger, on the other hand, is an activating negative emotion focused on the activity that teachers feel when they blame others for undesirable outcomes (Hong et al., 2016). It is distinguishable from frustration, as frustration arises when the circumstances are blamed for an undesired result and not the interaction partners themselves (see also Roseman, 2013). Anxiety is an activating negative emotion focused on achievement that occurs

when teachers feel they are unable to meet class goals or to control challenging situations (Darby, 2008).

To measure these discrete emotions, the Achievement Emotions Questionnaire (AEQ) was created (Pekrun et al., 2005) that focuses on various discrete emotions as multidimensional constructs and allows the assessment of general emotions (trait perspective, e.g., enjoyment in mathematic lessons) and in-situ emotions (state perspective, e.g., enjoyment while test-taking). Hence, it provides researchers with various possibilities to measure emotions in academic settings. The AEQ has been used successfully in various studies to measure emotions in students (e.g., Fierro-Suero et al., 2020; Peixoto et al., 2015). In 2010, Frenzel and colleagues developed the AEQ for Teachers (AEQ-T) to measure teachers' enjoyment, anger and anxiety (in newer publications they use the term *Teacher Emotion Scales*, see Frenzel et al. 2016), which has advanced research on teacher emotions in various settings and cultures (e.g., Becker et al., 2015; Burić et al., 2018; Hong et al., 2016; Klassen et al., 2012; Lee & van Vlack, 2018). Over the years, the AEQ-T has been extended to measure other discrete emotions, namely pride and frustration (Hong et al., 2016), and also other instruments have been developed that measure teacher emotions in respect to broader settings (e.g. Chen, 2016). However, the AEQ-T (or the Teacher Emotion Scales, respectively) is the only instrument that measures discrete emotions that teachers' specifically experience during their teaching, based on a consolidated theory. Therefore, the present study aims to validate the AEQ-T also in a Spanish-speaking country.

Emotions and Well-being

Teaching is an emotional endeavour (Hargreaves, 2000) and emotions are not only a positive resource for teachers but also 'work' (Schutz, 2014) that can deplete resources: Research has shown that feeling negative emotions for a long time during classes while using dysfunctional emotion management strategies (such as surface acting, that is e.g. suppressing emotions) can ultimately lead to teacher *burnout* (Atmaca et al., 2020; Chan, 2011; Chang, 2013; Keller et al., 2014) and lowered job satisfaction (Keller et al., 2014; Lee et al., 2019). In addition, by occupying a significant part of their daily time, emotions related to teaching can affect teachers' overall satisfaction with their

lives (Braun et al., 2020; Chan, 2011; Ignat & Clipa, 2012). Satisfaction with life reflects the cognitive assessment that people make of their lives (Erdogan et al., 2012), and it is a holistic indicator of people's overall well-being (Diener & Biswas-Diener, 2008; Erdogan et al., 2012). As emotions are elicited by situational facets of the learning environment and personal prerequisites (such as overall well-being) through cognitive appraisals, this can lead to a dangerous spiral with exhausted, unsatisfied teachers who experience even more negative emotions in class (Goetz et al., 2015). On the other side, teachers who manage their emotions effectively and report to have a balanced life, have students who experience greater social and emotional well-being (Braun et al., 2020), higher academic performance and creativity (Trigueros et al., 2020), among other benefits. Hence, it is important to explore the relations and interplay between teacher emotions and overall well-being in more depth and to also identify sources of teachers' well-being regarding work-related characteristics.

Emotions and Self-Determination Theory

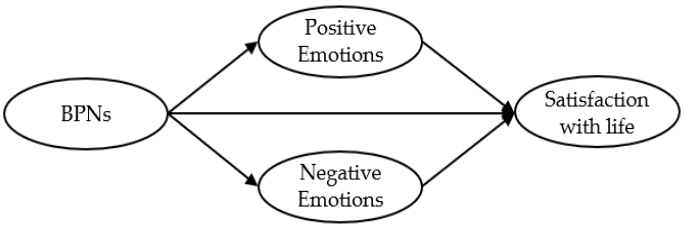
Self-Determination Theory (SDT) (Deci & Ryan, 1985; Ryan & Deci, 2017) postulates that people's well-being and motivation is conditioned by the satisfaction of basic psychological needs (BPNs) that are innate and universal in all people. These needs are autonomy (the feeling of being the originator of one's own actions), competence (the feeling of efficacy in the actions carried out) and relationship (the feeling of having a meaningful connection with others) (Deci & Ryan, 1985). Therefore, social environments, in this case the work environment of teachers, can be assessed to the extent that it supports or controls BPNs. When coordinators increase their workers' autonomy, they experience greater job satisfaction, greater commitment and less absenteeism (Baard et al., 2004). At an emotional level, support for autonomy has been associated with higher levels of positive emotions and lower levels of negative emotions for workers in various occupations (e.g. Baard et al., 2004; Klassen et al., 2012). In education, various studies have shown that BPN satisfaction acts as a predictor of positive emotions in students (e.g. Fierro-Suero et al., 2020; Flunger et al., 2013; Ryan & Deci, 2001). However, the relationships between these variables in teachers has been rarely investigated. An exception is the study by Klassen and colleagues (Klassen et al., 2012), which found that

the satisfaction of BPNs influenced the commitment and emotions experienced by teachers at various educational stages. Along these lines, the second objective of this study was to analyse the predictive power of the satisfaction of BPN on teacher emotions and satisfaction with life (as an indicator of teacher well-being).

The Present Study

Based on the theoretical framework developed above, this work intended to focus on teacher emotions in relation to other variables to provide a better understanding of the surrounding educational process. This study analyses teachers' satisfaction with BPNs as a precursor of emotions and teachers' satisfaction with life as an important outcome (that may influence teachers' experiences and actions while teaching). Based on previous findings and on SDT, it is hypothesised that the satisfaction of the BPNs will predict satisfaction with life, both directly and mediated through the emotions experienced during teaching (Figure 1). Although Spanish is one of the most spoken languages in the world, there are no instruments to measure teachers' emotions. For that reason, it is necessary to validate a Spanish version of the AEQ-T. It is hypothesised that the adaptation to Spanish of the AEQ-T will demonstrate suitable psychometric properties. With this instrument it is possible to identify discrete achievement emotions that Spanish-speaking teachers experience during their classes and provide additional empirical data on the prevalence of teacher emotions in a new cultural setting. As quantitative data on teacher emotions are still scarce, this will be an important step in studying teacher emotions in greater detail, also expanding the range of emotions studied.

Figure 1
Hypothesised model of the relationship between basic psychological needs, emotions, and satisfaction with life.



Method

Sample

The sample consisted of 595 teachers from Andalusia, Spain (199 men 33.4%, 389 women 65.4% and 7 preferring not to say, 1.2%) with an average age of 45.5 years (SD = 9.53). The youngest participant was 23 years old and the oldest was 70 years old. The average experience as teachers was 17.43 years (SD = 10.88). Of the participating teachers, 93.1% (N = 443) were working in public centres and 6.9% (N = 41) in private or state subsidised centres. Approximately every fifth teacher (20.3%, N = 121) was teaching primary students, 53.9% (N = 321) were teaching secondary students, 14.8% (N = 88) worked in vocational training and 10.9% (N = 65) were teaching in several stages.

Procedure

This study has the approval of the Comité de Investigación Biomédica de Andalucía (Andalusian Biomedical Research Committee) (TD-OCME-2018) and has been carried out following the ethical principles established by the American Psychological Association (2010). The selection of the sample was non-probabilistic. For recruiting our participants, we contacted all the primary and secondary teaching and vocational training centres in Andalusia vie email and provided them with a brief overview of the aims of the study. Those

centres that wanted to share the information with their teachers, gave the information and a study link directly to the teachers. After a sufficient sample size (i.e., a minimum of 500 teachers) was obtained, data assessment was stopped. The online questionnaire consisted of the three scales (AEQ-T, BPN, teacher satisfaction with life) and some socio-demographic questions and was completed electronically and anonymously. It took participants around 10-15 min to complete the questionnaire and they received no compensation for their participation.

Measures

Achievement Emotions Questionnaire Teacher (AEQ-T). The AEQ was selected as it is based on a consolidated theory such as the CVTAE (Pekrun, 2006) and has had successful results previously in students (e.g. Fierro-Suero et al., 2020; Peixoto et al., 2015) and in teachers (Frenzel et al., 2010; Hong et al., 2016). Based on the extension and adaption of the AEQ-T from Hong and colleagues (2016), items on teachers' enjoyment, anger, anxiety, pride and frustration were translated into Spanish by two translators. Later two other translators did the reverse translation. Finally, this last version was compared with the original to verify that both were the same. The instrument (Appendix A) is made up of a total of 20 items, four for each of the five emotions measured: Pride (e.g. 'I feel proud of the way I prepare for my teaching'), enjoyment (e.g. 'I often have reasons to be happy while I teach'), anger (e.g. 'I often have reason to be angry while I teach'), anxiety (e.g. 'I feel uneasy when I think about teaching') and frustration (e.g. 'Generally, teaching frustrates me'). The responses are rated on a Likert-type scale that ranges from 1 (Totally disagree) to 4 (Totally agree).

Basic Psychological Needs at Work Scale. To assess BPNs at work we used the Spanish adaptation by Abós et al. (2018) of the original scale of Brien et al. (2012). The instrument is preceded by the sentence 'At work in the school…', and consists of a total of 12 items, 4 for each BPN: Autonomy (e.g., 'My job allows me to make decisions'), competence (e.g., 'I feel competent at work') and relationship (e.g., 'When I am with the people from my work environment, I feel understood). The responses are rated on a Likert-type scale that ranges from 1 (Totally disagree) to 6 (Totally agree).

Satisfaction with Life scale. We used the Spanish version by Atienza et al. (2000) of the original scale of Diener et al. (1985) to assess teachers' satisfaction with life (SWL). This scale consists of 5 items (e.g., 'The conditions of my life are excellent'). The responses are rated on a Likert-type scale that ranges from 1 (Totally disagree) to 5 (Totally agree).

Data Analysis

For the validation of the AEQ-T (Spanish version), a confirmatory factor analysis (CFA) was carried out using the maximum likelihood estimation method given the normality results obtained (Satorra & Bentler, 1994). To evaluate the model, the currently most recommended fit indices were used; i.e., $\chi 2/gl$, the comparative fit index (CFI), the Tucker–Lewis index (TLI), the goodness of fit index (GFI), the incremental fit index (IFI), the root-mean-square error of approximation (RMSEA) and standardised root-mean-square residual (SRMR). Values equal to or greater than .90 for the CFI, TLI, GFI and IFI; less than or equal to 5 for $\chi 2/gl$ and .08 for RMSEA and SRMR are considered good fit indices (Hu & Bentler, 1999; Schermelleh-Engel et al., 2003). The invariance of the model was evaluated by means of a multigroup analysis, taking into account gender first and the educational stage of the teaching second (primary, secondary or vocational training). For each of the proposals, various invariance models were tested: no restrictions, invariant measurement weights, invariant structural covariances and invariant measurement residuals. A comparison was also performed to show there were no differences between the unrestricted model and that of invariant measurement weights (Marsh, 1993), minor changes of .01 in CFI and .015 in RMSEA as indicative of measurement invariance (Chen, 2007). In addition, internal consistency was studied using Cronbach's Alpha and McDonald Omega. Finally, the bivariate correlations were calculated between different dimensions of the scale.

To explore the second research question, namely the effect of BPNs and emotions on satisfaction with life in teachers, the model proposed in Figure 1 was evaluated through a structural equation analysis. Previously, the multivariate normality and a measurement model had been tested with the variables used, by means of a CFA. The models were evaluated following the adjustment indices mentioned above. SPSS 23.0 and AMOS 23.0 (IBM, Armonk, NY, USA) packages were used for the analyses.

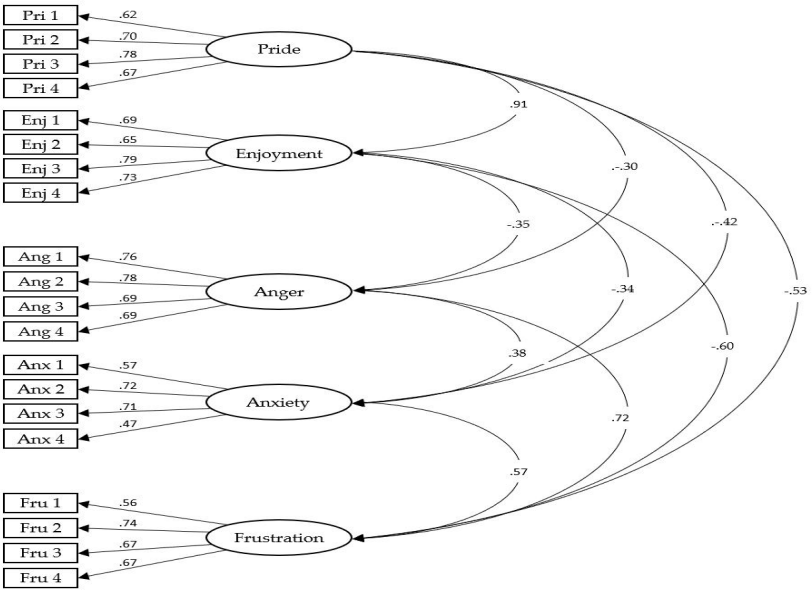
Results

Confirmatory Factor Analysis of the AEQ-T

To examine the 5-factor structure of the model, a confirmatory factor analysis was used, using the maximum likelihood estimation method since Mardia coefficient was 27.34 (Satorra & Bentler, 1994). The results of the analysis showed a good fit to the five-factor model: χ^2 (160) = 539.49, p <.001, χ^2/gl = 3.37, CFI = .92, TLI = .90, IFI = .92, GFI =. 91, RMSEA = .06, SRMR = .05. The standardised factor loadings were statistically significant (p <.001) and ranged from .47 to .79 (Figure 2).

Figure 2

Confirmatory factor analysis of the Achievement Emotions Questionnaire for Teacher (AEQ-T) in Spanish. The rectangles represent the items, and the ellipses represent the factors.



Analysis of the Invariance of AEQ-T

To verify that the factorial structure of the AEQ-T in Spanish was invariant, a multigroup analysis was used by gender (Table 1) and by the educational stage of the teaching (Table 2). Both proposals were examined by testing four increasingly restrictive models as specified above. For the invariance as a function of gender, there are no statistically significant differences between Model 1 (without restrictions) and Model 2 (invariant measurement weights) unlike the rest of the models. Equality between Model 1 and 2 is a minimum criterion to accept factor invariance by gender. Furthermore, the small variations in the CFI and RMSEA also suggest the invariance of the factorial model. The summary model fit statistics are given in Table 1.

Table 1

Invariance as a function of gender

	$\chi 2$	Gl	x^2/gl	Δgl	$\Delta \chi 2$	CFI	IFI	TLI	RMSEA	SRMR
Model 1	707.96	320	2.21			.91	.91	.90	.045	.067
Model 2	726.50	335	2.17	15	18.54	.91	.91	.90	.045	.068
Model 3	763.78	350	2.18	30	55.82*	.91	.91	.90	.045	.081
Model 4	791.07	370	2.14	50	83.11*	.91	.91	.90	.044	.081

Notes: Model 1 = no restrictions; Model 2 = invariant measurement weights; Model 3 = invariant structural covariances; Model 4 = invariant measurement residuals. *$p < .05$

For the invariance as a function of the educational stage in which the teachers work (Table 2), it is shown that there are no statistically significant differences between any of the four models and the differences between the CFI and RMSEA are very small, demonstrating the invariance of the factorial model as a function of the educational stage in which the classes are given. The summary model fit statistics are given in Table 2.

Table 2

Invariance as a function of the educational stage of the teaching

	χ^2	*Gl*	χ^2/gl	*Δgl*	*Δ* χ^2	*CFI*	*IFI*	*TLI*	*RMSEA*	*SRMR*
Model 1	937.93	530	1.77			.90	.90	.90	.038	.060
Model 2	951.00	545	1.75	15	13.08	.90	.90	.90	.038	.060
Model 3	959.53	560	1.71	30	21.61	.90	.90	.90	.037	.061
Model 4	376.88	580	1.68	50	38.96	.90	.90	.90	.036	.061

Notes: Model 1 = no restrictions; Model 2 = invariant measurement weights; Model 3 = invariant structural covariances; Model 4 = invariant measurement residuals. *$p < .05$

Descriptive Statistics, Internal Consistency, and Bivariate Correlations

In a first step, to evaluate the prevalence of Spanish teachers' discrete emotions, descriptive analyses were performed (Table 3). Results show higher reports of positive emotions (pride and enjoyment) than negative emotions (anger, anxiety and frustration). The results obtained from Cronbach's alpha and McDonald omega show adequate internal consistency in all dimensions of the AEQ-T. Finally, all emotions were significantly correlated amongst themselves (Table 4), with a positive relationship between emotions with the same valence (positive-positive or negative-negative) and a negative one between emotions with a different valence (positive-negative).

Table 3

Descriptive statistics and internal consistency

Variables	Range	*M*	*SD*	*α*	*ω*	*Skewness*	*Kurtosis*
1. Pride	1-4	3.20	.48	.80	.79	-.64	1.65
2. Enjoyment	1-4	3.39	.48	.81	.81	-.90	2.48
3. Anger	1-4	1.99	.64	.82	.82	.38	-.38
4. Anxiety	1-4	2.03	.58	.70	.71	.34	-.16
5. Frustration	1-4	1.77	.56	.75	.75	.44	-.46
6. Autonomy	1-6	5.03	.80	.87	.87	-1.51	4.01
7. Competence	1-6	5.19	.67	.89	.89	-1.84	7.47
8. Relationship	1-6	4.74	.88	.89	.89	-1.14	2.45
9. Satisfaction with life	1-5	4.20	.73	.87	.87	-1.35	2.42

Notes: *M* = mean; *SD* = standard deviation; *α* = Cronbach's Alpha, *ω* = McDonald omega

Likewise, the rest of the study variables show adequate values for internal consistency (Table 3). Bivariate correlations (Table 4) have shown a positive and statistically significant relationship between BPNs, satisfaction with life, and emotions with a positive valence. The relationship between these variables and emotions with negative valence was negative and statistically significant, except for relationship facet of BPNs and teachers' anger, which did not show a significant correlation.

Table 4

Bivariate correlations

Variables	1	2	3	4	5	6	7	8	9
1. Pride	-	.70**	-.23**	-.31**	-.39**	.39**	.58**	.28**	.34**
2. Enjoyment		-	-.30**	-.23**	-.45**	.40**	.52**	.23**	.42**
3. Anger			-	.30**	.57**	-.14**	-.16**	-.00	-.16**
4. Anxiety				-	.42**	-.14**	-.27**	-.09*	-.22**
5. Frustration					-	-.32**	-.34**	-.12**	-.26**
6. Autonomy						-	.72**	.60**	.39**
7. Competence							-	.53**	.43**
8. Relationship								-	.32**
9. Satisfaction with life									-

Notes: * = $p < .05$; ** = $p < .001$.

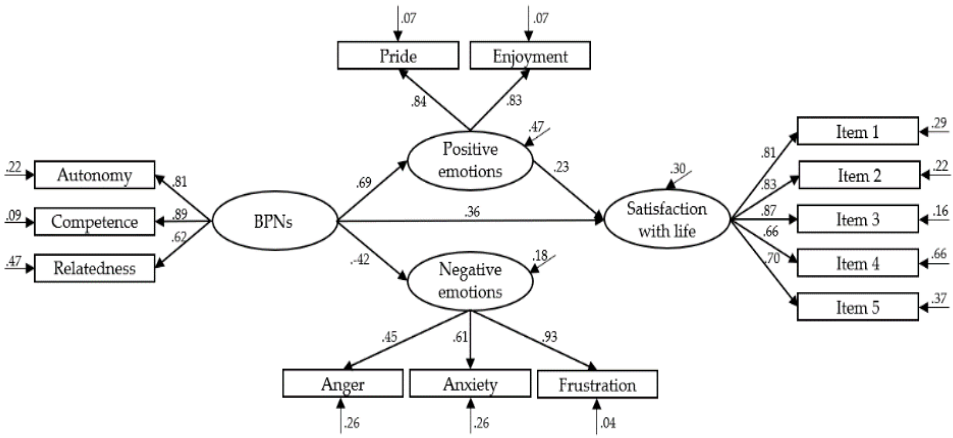
Structural Equation Analysis

Based on the result obtained in descriptive and correlational statistics, emotions with same valence were merged to simplify the structural equation model (SEM). To test the hypothesised SEM, the Mardia´s coefficient was calculated (45.31) and indicated multivariate non-normality in the data (Satorra & Bentler, 1994). Based on this result, the maximum likelihood estimation method was used to develop the analysis. Likewise, the corresponding measurement model was performed beforehand with CFA on

the four latent constructs. The measurement analysis showed the following fit indices: χ^2 (59) = 207.34, p <.001, χ2/d.f. = 3.51, IFI = .96, TLI = .95 CFI = .96, SRMR = .05, RMSEA = .06. Once the adequacy of the fit indices was verified, the initially hypothesised structural equation model was tested (Figure 1). This model, despite showing correct fit indices, suggested the elimination of the direct relationship between negative emotions and satisfaction with life, as it was not statistically significant. The final structural equation model (Figure 3) gave the following fit indices: (χ^2 (61) = 296.41; χ2/gl = 4.42; p < .001; CFI = .94; TLI = .93; IFI = .94; RMSEA = .08; SRMR = .07). The proposed structural equation model explained 30% of the variance in satisfaction with live. In addition, the satisfaction of BPNs explained 47% and 18% of the variances of positive emotions and negative emotions, respectively. The structural equation model shows how the satisfaction of BPNs negatively predicted negative emotions (β = -.42; p < .001) and positively predicted positive emotions (β = .69; p < .001). In turn, the latter predicted the teachers' satisfaction with life (β = .23; p < .001). Furthermore, BPNs directly predicted satisfaction with life (β = .36; p < .001).

Figure 3

Final structural equation model.



Discussion

Emotional experiences are ever-present in education, playing a fundamental role in the learning process, since they affect the motivation and performance of students (Destacamento, 2018; Pekrun, 2006). Therefore, its study in recent years has expanded, trying to cover, in addition to the emotions experienced by students (Lichtenfeld et al., 2012; Pekrun, 2006; Pekrun et al., 2017), the emotions experienced by teachers (Becker et al., 2014; Chen, 2019; Keller et al., 2014; Frenzel et al., 2021). It is essential to have instruments that measure the discrete emotions experienced by teachers while they are teaching (Chang, 2013). This approach to teachers' emotions has traditionally been carried out from a qualitative perspective (diaries, interviews, etc., see e.g., Atmaca et al., 2020). For this reason, it was necessary to validate the AEQ-T (Hong et al., 2016) for Spanish language. This instrument is based on CVTAE that outlines a cognitive-social perspective on emotions and emotion development (Pekrun, 2006). It has been previously used to measure emotions in students (e.g. Fierro-Suero et al., 2020; Peixoto et al., 2015) and in teachers. Originally, the instrument for teachers was developed in German and it had been used in Germany (Frenzel et al., 2010) and Switzerland (Keller & Becker, 2020) among others. Additionally, this instrument has been adapted to English (TES, Frenzel et al., 2016) and Asian context (Hong et al., 2016) being used in Canada (Klassen et al., 2012), United States (Hong et al., 2020), Korea and Japan (Hong et al., 2016) among others. Therefore, its translation and adaptation into Spanish is of interest. To provide evidence of the validity of the instrument, a CFA was performed that showed adequate adjustment indices. Subsequently, the invariance of the factorial model was studied as a function of gender and the educational stage of the teaching (primary, secondary or vocational training). In both cases, the factorial model turned out to be invariant, showing that the AEQ-T in Spanish is valid for measuring emotions, regardless of the gender of the teachers or the educational level of the teaching. The five dimensions of the instrument (one for each emotion evaluated) showed adequate internal consistency. Thus, the evidence of the emotions included in previous versions of the AEQ-T for teachers (e.g. Becker et al., 2015; Frenzel et al., 2010; Hong et al., 2016) has been confirmed. Our study supports findings by Hong et al. (2016), that a differentiation of anger and frustration can be meaningful (in some previous studies, the overlap was

quite big making a distinction almost impossible, e.g., Sutton, 2007). Therefore, this result may encourage other language versions of the AEQ-T to include the emotion of frustration. One of the objectives in teacher emotion research should be to broaden the emotional range of discrete emotions to better understand teachers' emotional lives in all its complexity. Teacher frustration can be distinguished from anger theoretically (blaming the adverse situation on the circumstances rather than on people), hence an empirical differentiation is also needed (Roseman, 2013).

At a descriptive level, teachers reported to experience positive emotions (enjoyment and pride) to a greater extent than negative emotions (anxiety, anger and frustration), which is in line with research from other countries (Frenzel et al., 2016; Keller et al., 2014; Luo et al., 2020). However, social desirability needs to be taken into account and could differ between countries as research also has shown that there are certain emotions that are deemed as not appropriate for teachers' professional image, for instance teachers rather report frustration instead of anger (Liljestrom et al., 2007; Sutton, 2007). Future cross-cultural studies could employ in-situ assessments of teachers' emotions that are supposedly less prone to influences from social desirability (e.g. Goetz et al., 2015).

Besides studying the prevalence of different discrete teachers' emotions in different cultural settings, research also focuses on antecedents and effects of emotions. Thereby, it has been shown that teacher emotions' are related to emotional exhaustion (Chang, 2013; Keller et al., 2014) and low job satisfaction (Keller et al., 2014; Lee et al., 2019), showing that teaching places high emotional demand on teachers. Work takes up an important fraction of teachers' vital time, and, therefore, suffering from work-related burnout has been associated with low personal life satisfaction (Chan, 2011). To avoid emotional exhaustion and low life satisfaction (Ruiz et al., 2015; Van den Berghe et al., 2014), SDT offers a theoretical framework that focuses on work-related conditions that may fulfil BPNs and foster teacher motivation (Janke et al., 2015; Ruiz et al., 2015) or teacher emotions, as these two constructs are linked with each other (Sutton & Wheatley, 2003). Our results have shown statistically significant correlations between the BPNs and the discrete emotions that were investigated and corroborates previous findings in this field that were found with samples of teachers (Klassen et al., 2012) and students (Fierro-Suero et al., 2020). The only non-significant correlation was

found between anger and BPN regarding the relationship dimension. This finding may be explained by the scale we employed for measuring BPN which focuses on general working conditions and hence the relationship with the rest of the teachers and not with the students while teaching. If you blame your working conditions for undesired outcomes this actually leads to frustration (which was significantly related to all dimensions of BPN) while anger arises, if you blame your direct interaction partners, which would be the students while teaching.

Besides the effects of BPN on teacher emotions, we also investigated effects on teachers' satisfaction with life and if this relation is mediated through experienced emotions using structural equation modelling. To reduce complexity two latent factors (positive/negative emotions) were used. The results of the structural equation model showed, firstly, that the BPNs predicted teachers' positive and negative emotion reports. Secondly, it showed that both BPNs and positive emotions predicted teacher satisfaction with life, confirming the study hypothesis. These results highlight the importance of satisfying the BPNs and generating positive emotions in the teaching staff. Both constructs have been shown to be predictors of teachers' satisfaction with life, which extends findings on the relationship of BPN with job satisfaction (Atmaca et al., 2020) to an even broader, overarching construct, indicating that teaching is more than 'just a job'.

Our findings are of high relevance for educational professionals and policy-makers, as previous research has shown that teachers with adequate levels of well-being are capable of transmitting social and emotional well-being to their students (Becker et al., 2015; Braun et al., 2020; Frenzel et al., 2009), generating productive classroom environments (Becker et al., 2014; Chen, 2019) in which students perform better and have greater motivation and creativity (Arens & Morin, 2016; Løvoll et al., 2017, Trigueros et al., 2020). Thus, teachers who perceive that they can choose and take on responsibilities in the teaching process (autonomy), who perceive that they have sufficient resources to cope with their work demands (competence) and who feel integrated with their peers (relationship) can be key to teachers achieving well-being (Abós et al., 2018). It has also been shown, as suggested by Fierro-Suero et al. (2020), that the strategies to generate positive emotions and avoid negative emotions could be in line with the proposals to satisfy BPNs.

However, there is still very little knowledge about how to help teachers maintain a positive attitude towards their classes and teaching (Frenzel, 2014).

Limitations and Future Directions

This study has a series of limitations but still opens the way to very promising lines of research. Regarding the limitations, it should be noted that the questionnaire was sent to all educational centres in Andalusia (Spain), however, it was not possible to guarantee that all of them shared the information with their teachers. In consequence, it was not possible to calculate response-rates and determine if our sample may be positively biased towards very engaged teachers. Furthermore, the temporal stability (test-re-test) of the instrument has not been considered. Another limitation refers to the correlational and cross-sectional nature of the study, which prohibits interpretations of causality. The investigated relations are based on theoretical considerations but nevertheless it is possible, that life satisfaction influences teachers' perception of BPN and emotions and vice versa.

Future research should employ longitudinal designs to answer questions regarding the antecedents and effects of teacher emotions. This research should also include possible influencing variables, such as the subject taught and the profile and behaviour of students (Frenzel et al., 2015).

Validating the AEQ-T in Spanish is an important step for enabling researchers from other locations to study teachers' emotions (e.g., South America) and with the extensions from Hong et al. (2016) the AEQ-T now includes five distinct emotions. Yet, it would be advisable to continue expanding the emotional range and encompass other dimension of the CVTAE (e.g., boredom: deactivating negative emotion focus on the activity), as in various versions of the AEQ for students (e.g. Fierro-Suero et al., 2020; Peixoto et al., 2015).

Regarding the relationship between BPNs and emotions, future research could focus on BPNs that are more strongly related to teaching activities and interactions with students, as students are an important part of the social relations experienced by teachers (Klassen et al., 2012). Another important field of research regarding teacher emotions pertains to the assumed impact of teacher emotions on their instructional behaviour, classroom climate and academic performance. To date, there are only few empirical studies with large samples, that demonstrate the strength of this assumed relationship.

Conclusion

It was found, through the proposed structural equation model, firstly, that the satisfaction of the BPNs predicts the emotions experienced by teachers. And secondly, that teachers' satisfaction with life is predicted, both by positive emotions and by basic psychological needs. Thus, it has been shown that, generating environments in which the BPNs are satisfied is important for having teachers who experience positive emotions during their classes and are satisfied with their lives. Moreover, this investigation provides various pieces of evidence for the validity and reliability of the AEQ-T in Spanish. This instrument has been shown to measure, with suitable psychometric properties, the main discrete emotions experienced by Spanish teachers while teaching.

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Appendix A. Achievement Emotions Questionnaire Teacher (AEQ-T) Spanish Version

1. La preparación de las clases a menudo me causa preocupación.
2. Me siento orgulloso/a de la manera en que preparo mis clases.
3. A menudo tengo motivos para estar feliz mientras imparto clases.
4. A veces me enfado mucho mientras imparto clases.
5. Generalmente enseñar me frustra.
6. Me siento inquieto/a cuando pienso en enseñar.
7. Mi trabajo me suscita una sensación de orgullo.
8. Generalmente disfruto preparando mis clases.
9. A menudo tengo razones para enfadarme cuando enseño.
10. Conseguir que los estudiantes se involucren con el aprendizaje es frustrante.
11. Generalmente me siento tenso/a y nervioso/a mientras imparto clases.
12. Estoy orgulloso/a del modo en que imparto clases.
13. Generalmente disfruto de la enseñanza.
14. Algunos días, impartir clases me pone furioso/a.
15. Con frecuencia me siento frustrado/a cuando trabajo con estudiantes.
16. A menudo me preocupa no estar impartiendo las clases muy bien.
17. Pensar en mi éxito como docente me hace sentir orgulloso.
18. Generalmente imparto mis clases con entusiasmo.
19. Con frecuencia, siento ira durante las clases.
20. Normalmente pienso que la frustración es parte de la labor docente.