Modelling students' academic confidence, personality and academic emotions

Paul Sander[1] · Jesús de la Fuente[2]

Abstract

The research presented here is founded on the Big Five trait approach to personality which has been shown to be related to academic success, students' academic confidence or self-efficacy and the emotions related to academic achievement.To explore whether Personality characteristics would be differentially associated with Academic Confidence and both would jointly predict Academic Emotions.A bespoke online platform was used to survey undergraduate students in two Spanish universities. The data was used to assess bivariate correlation and to build Structural Equation Models.A total of 1398 undergraduate students studying Psychology, Primary Education, or Educational Psychology degree programmes completed the validated Spanish version of the Academic Behavioural Confidence scale. Of those, 636 also completed a validated Spanish language scale to assess Personality along the Big Five dimensions and 551 of the 1398 students complete a validated Spanish language scale to assess Academic Emotions. A total of 527 students completed all three scales.The correlations showed that the student Personality traits of Openness, Conscientiousness, Extraversion and Agreeableness were significantly and positively related to their Academic Confidence whilst Neuroticism was negatively correlated with the degree of Academic Confidence. Similarly student Academic Confidence correlated positively with positive Academic Emotions and negatively with negative Academic Emotions. Structural Equation Modelling resulted in a model of excellent fit that linked the personality traits of Conscientiousness and Neuroticism with overall Academic Confidence and Academic Emotion scores. The methodological issues around the findings along with the implications for undergraduate learning and teaching are discussed.

Keywords Academic confidence · Personality · Academic emotion · University · Students

Introduction

Searching for and understanding effective student learning processes is not just an academic issue in its own right, the comprehension of the interplay of various motivational, emotional and cognitive variables along with behavioural strategies and dispositions but an important educational pursuit to create optimal learning environments for students. The research necessary to understand and build optimal learning, environments is not just part of the domain of educational researchers interested in those engaged in compulsory education but beyond and including the educational dynamic of university undergraduates. The dynamic that exists in all levels of education from primary to university is that pupils' and students' learning is a product of neither just the teaching that is given nor the learning that is done, but is the result of the interplay between a variety of cognitive, affective and motivational variables held by students and their teachers. In this complex social interplay, it is not feasible to investigate the impact of all possible variables in one study. Here, the relationship between Academic Confidence, Personality and Academic Emotions are explored whilst acknowledging that these will unfold and affect learning related activities, thoughts and feelings with the social complexity of the learning situations that the university students find themselves in.

Academic Confidence

A key construct is the self-efficacy construct of Academic Behavioural Confidence (Sander and Sanders 2009; Sander et al. 2011; Sander et al. 2013) with four sub scales Grades, Verbalising,Studying and Attendance although Putwain et al.

✉ Paul Sander
P.Sander@tees.ac.uk

[1] Department of Psychology, Teesside University, Middlesbrough , TS1 3BX Tees Valley, UK

[2] University of Navarra, Pamplona, Spain

(2013) omitted the Attendance scale from their analyses and generally found only adequate Cronbach's Alpha values for the remaining sub scales: Grades = .79, Verbalising = .74 and Studying = .70.

Research has shown Academic Behavioural Confidence (ABC) to be statistically significantly linked to the students' deep or surface approach to learning, and their academic performance (Sander 2009; Nicholson et al. 2013; de la Fuente et al. 2013; Putwain et al. 2013). These findings are consistent with findings from other constructs of competence beliefs, such as academic self-efficacy that also show a positive relationship with academic performance (Richardson et al. 2012; Robbins et al. 2004). Research has also shown that the ABC scale meaningfully discriminates between students on different courses. Students on courses with higher entry requirements such as Medicine, Speech and Language Therapy and Nutrition have higher confidence in one or more of the Grades, Studying and Attendance sub-scales (Sander and Sanders 2009).

Sander (2009) summarises findings that show that dyslexic students in UK higher education have lower academic confidence on the Grades, Verbalising and Studying sub-scales but not on the Attendance sub-scale. Finally, UK data shows that ABC scores drop during a course of study (Sander 2009), again in line with other research findings (Beyer 1998/1999; Papinczak et al. 2008; Zusho et al. 2003).

Personality

Research has shown that the Big Five personality factors Openness, Conscientiousness, Extraversion and Agreeableness positively correlate with university academic performance and Neuroticism negatively or poorly (Richardson et al. 2012; Chen and Schmidt 2015; Köseoglu 2016). Conscientiousness is the strongest predictor albeit it one moderated by the subject of study (Vedel 2014). De Feyter et al. (2012) showed the complexity of the relationship between personality and university academic performance through the mediation of self-efficacy and academic motivation. How Conscientiousness links to academic performance is unclear. Additionally, the means by which personality is measured is critical in the size of the relationships obtained, with self-rating of personality producing smaller effects than other-rated measures of personality (Vedel and Poropat 2017).

Taken together one would expect that self-reported personality measures would correlate with self-reported academic confidence as both have been shown to be linked either directly or indirectly to academic outcomes and academic study related behaviour.

In addition to academic confidence and personality, academic emotions have been extensively researched and shown to be critical in understanding the student learning process in Higher Education.

Academic Emotions

The learning environment helps to construct appropriate emotional and motivational characteristics in the learner which, in turn, promote appropriate learning strategies and behaviours (Muis et al. 2018) as academic emotions are associated with specific emotions and motivations in the learner (Linnenbrink-Garcia et al. 2016).

Academic emotions can be positive or negative and related to different aspects of the learning process (Pekrun 1992). The research question is to consider the extent of the impact of such emotions and their relation to other variables in the learning process (Niculescu et al. 2015). The extensive work on consistency between the attitudinal components of behaviour, cognitions and emotions would predict that the emotions that students have in relation to their studies would agree with their cognitions and their behaviour, the later being measured in this study through the academic confidence scale (Haddock and Maio 2004).

The Study

Research has revealed some of the characteristics of the successful learner as well as acknowledging that the efficacy of the students' learning linked to the teachers' teaching strategies (de la Fuente and Sander 2012; de la Fuente et al. 2013; de la Fuente 2015; de la Fuente et al. 2017). This has led to the accumulation of a large amount of data which can be aggregated to explore the relationships between the variables of academic confidence, personality and academic emotions. The research to date on academic confidence has provided a valid instrument. However, the relationship of academic confidence has so far not been tested against personality and academic emotions. This article is motivated by the desire to understand how and to what extent personality influences academic confidence and academic emotions.

Objectives

The objectives are to explore both the relationships between Academic Confidence, Personality and Academic emotions and following that to explore structural models of those relationships.

Hypotheses

- Neuroticism will negatively correlate with academic confidence while Openness, Conscientiousness, Extraversion and Agreeableness will positively correlate.
- Academic confidence will positively correlate with positive academic emotions and a negatively correlate with the negative academic emotions.

- The personality characteristics of the students will be predictive of academic emotions
- Personality and academic confidence will jointly be predictive of academic emotions.

Method

Participants

The sample comprised undergraduate students enrolled in Psychology, Primary Education, or Educational Psychology degree programmes from two universities in Spain. The majority of students were female with ages ranging from 19 to 25 and a mean age of 21.33 (SD = 6.9) years. The proportion of female to male and the age profile of the participants matches the profile of student cohorts on the degrees onto which they were enrolled and is therefore representative of students on such programmes. As the data set was an aggregate from different data collecting moments in which students completed scales measuring academic confidence, personality and academic emotions the exact numbers that appear in the statistical analyses will be reported there but as an indication, the maximum number of students who responded to the Academic Behavioural Confidence scale was 1398, the Big Five scale, 636 and 551 completed the measurement of academic emotions.

Instruments

Academic Confidence was measured by the *Academic Behavioural Confidence* Scale (Sander and Sanders 2009) in a Spanish validated version (Sander et al. 2011). The ABC scale is a psychometric means of assessing the confidence of undergraduate students in their anticipated study related behaviours on a largely of lecture-based course.

The scale requires students to respond to a question stem ('How confident are you that you will be able to...') on a five-point scale (1 = 'not at all confident', 5 = 'very confident') for items such as '...manage your workload to meet coursework deadlines' and '...write in an appropriate academic style'. A higher score therefore indicates greater confidence in self-efficacious study skills or behaviours. Previous work has shown a four-factor model (confidence in attaining grades, studying, attending classes and discussing course material) has shown adequate reliability and validity (Nicholson et al. 2013; Sander and Sanders 2009; Sander et al. 2011).

The internal reliability measures for the sub scales Grades and Verbalising are good (Cronbach's Alphas of .815 and .827 respectively) and that for Studying is acceptable (.703). The alpha value of .625 for a reduced Attendance scale seems poor but as Field (2018) points out, the size of alpha is

dependent also on the number of items in the scale. The more items there are, the higher alpha is likely to be so with just two items one could expect a low alpha value. The absolute correlation between items 6 and 18, the two items used in the Attendance sub-scale, is .458.

Confirmatory factor analysis of the four sub-scale structure of the Academic Behavioural Confidence scale has been supportive of the four sub scale structure: Chi-Squared = 759.414, DF = 98, RMSEA = 0.061, CFI = 0.935, TLI = 0.921.

Big Five Scale (BFQ, Carrasco et al. 2005) was used to measure personality and was based on a version by Barbaranelli et al. (2003) which was adapted and revalidated for young university students (de la Fuente 2014). Students respond to stems such as "I look forward to seeing other people", "I share my things with others" and "I get nervous easily" on a 5 point scale where 1 signifies Rarely. 2, Not very often. 3, Sometimes. 4, Very often and 5, Almost Always.

The Confirmatory Analysis (CFA) has reproduced a structure of five scales corresponding to Big Five model. The results have shown adequate psychometric properties and acceptable adjustment rates. The confirmatory model second order showed a good fit [Chi-square = 38.273; Degrees of freedom (20–15) = 5; $p < 0.001$; Normed Fit Index, NFI = 0.939; Relative Fix Index, RFI = 0.917; Incremental Fix Index, IFI = 0.947; Tucker-Lewis Index TLI = 0.937, Comparative Fit Index, CFI = 0.946; Root Mean Square Error of Approximation, RMSEA = 0.065; HOELTER index = 2453 ($p < 0.05$) and, 617 ($p < 0.01$)]. The internal consistency of the total Scale is good (Alpha = 0.956; Part 1 = 0.932, Part 2 = 0.832; Spearman-Brown = 0.962; Guttman = 0.932).

Academic emotions (AEQ, Pekrun et al. 2002) were measured using scales in Spanish for nine different emotions (enjoyment, hope, pride, relief, anger, anxiety, hopelessness, shame, and boredom). The psychometric properties of the original scale are discussed by Pekrun et al. (2011). The factor structure of the Spanish version is discussed in detailed by de la Fuente et al. (2019) where it was shown to be satisfactory in Spanish university students enrolled on Psychology, Primary Education, and Educational Psychology degree programmes.

Students were invited to read each item carefully and respond using the five point scale provided, where 1- represented Strongly Disagree through to 5 which represented Strongly Agree. Specimen items for illustration are: "Being confident that I will understand the material motivates me"; "Because I'm so nervous I would rather skip the class"; "I worry whether I have studied enough".

The scales measured anticipated study related emotions (hope, anxiety and hopelessness), emotions related to ongoing activities (enjoyment boredom and anger) and emotions for study progress (pride, relief and shame). As such, the scale measures both positive and negative emotions and emotions that facilitate and impede academic studying. The scales used

allowed academic emotions to be self-reported for classroom situations, whilst studying and in test situations. For the purposes of this research, the resultant data was collapsed into positive and negative emotions regardless of time orientation or situation.

Procedure

Participants voluntarily completed the scales using an online platform (de la Fuente et al. 2015) [http://www.estres. investigacion-psicopedagogica.com/english/seccion.php? idseccion=1]. All students gave their informed consent through an online signature that is required when creating an account on the platform, before any questionnaires are completed. A range of specific teaching-learning processes were evaluated, covering different university subjects over a two-year period and these included the scales in question here. To avoid fatigue, students were invited to complete only one questionnaire at two different times of each week, during a semester. For their participation they were provided with a Certificate of Participation in Research as an incentive to maintain motivation and recognise the effort. In the Spanish speaking world, such certificates can be very beneficial to students alongside their CV.

The presage variables of personality and academic confidence were evaluated in September and October of the years 2017 and of 2018, the process variable, academic emotions in February and March of 2017 and of 20,178. Further data not reported here was collected in May- and June of 2017 and of 2018. The procedure was approved by the respective Ethics Committees (ref. 2018.170), in the context of a R & D Project (2018–2020).

Data Analysis

Correlation Analysis To test the hypotheses relating the variables academic confidence, personality and academic emotions, Pearson Correlation Bivariate analysis was used in SPSS (v.25)..

Structural Equation Modelling Confirmatory factor analysis was conducted as evidence of factorial validity and to validate the previous structural models of the psychometric scales used. Model fit was initially assessed in AMOS version 25, but then developed and explored using Onyx (von Oertzen et al. 2015) by first examining the chi-square to degrees of freedom ratio as well as the Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI) which, for a good model fit, should be greater than .90 and the RMSEA statistic with a value less than .06 (Schumaker and Lomax 2010; Hoyle 2011). Competing models were compared using the AIC index. Scale reliability was assessed using Cronbach's Alpha in SPSS (v.25).

Results

Linear Models

Correlation: ABC and Personality

The correlations presented in Table 1 show the relationship between academic confidence and Personality. Neuroticism has a weak but statistically significant negative relationship with academic confidence, both at the level of the total scale score and with the individual sub scales used whilst the traits: Openness, Extraversion and Agreeableness show a weak but statistically significant positive relationship at the sub scale and total scale levels. The remaining Big Five personality trait, Conscientiousness correlates significantly but more strongly with academic confidence at sub scale and scale total levels. The extent of the correlation between Conscientiousness and the academic confidence sub scales of Grades and Verbalising are noteworthy for their magnitude (see row two in Table 1).

As will be evidenced later, Verbalising and Grades are the only two academic confidence sub scales that are strongly supported in this data set. The substantial correlation between Conscientiousness and the total ABC score (final column of Table 1) provides a marker for using total ABC scores in analyses. Overall, these results support the first hypothesis.

Correlation: Academic Confidence and Academic Emotions

The correlations presented in Table 2 show the extent of the relationship between ABC and academic emotions (Studies). This finding is mirrored for academic emotions related to the Classroom (Table 3) and those relating to Testing (Table 4). Overall, the data shows very strong support for the hypothesis that academic confidence is related to the academic emotions across all sections or sub scales of the measures and in a predictable way, namely that academic confidence correlates positively with the positive emotions and negatively with the negative emotions. Given the relatively large numbers of students completing the scales (for each correlation coefficient reported in the tables, the associated number of pairs of scale scores is shown below the coefficient), statistically significances are to be expected with relatively low correlation coefficients. For the category Class, the ABC total score correlates substantially and positively with the overall academic emotion Positive emotions score (r = .597) and also substantially and negatively (r = −.434) with the Negative academic emotions score. In the final category of the AE, Test, the total ABC score correlates appreciably with the Positive AE emotion score (r = .480).

The relationship between the academic emotions and Personality was similarly explored through correlations (Table 5) and again the relationship is as predicted: significant positive relationships were found between the personality traits

Table 1 Correlations (number of participants) between ABC sub scales and Personality measures

Personality	Academic Behavioural Confidence				
	Grades	Verbalising	Studying	Attendance	ABC Total
Extraversion	.181**	.205**	.340**	.231**	.307**
	(618)	(620)	(629)	(631)	(633)
Conscientiousness	.514**	.614**	.228**	.379**	.571**
	(613)	(619)	(628)	(628)	(633)
Neuroticism	−.200**	−.180**	−.181**	−.201**	−.239**
	(618)	(619)	(632)	(632)	(636)
Agreeableness	.271**	.311**	.182**	.250**	.324**
	(612)	(614)	(622)	(623)	(627)
Openness	.312**	.306**	.370**	.298**	.391**
	(607)	(607)	(616)	(616)	(621)

**Correlation is significant at the 0.01 level (1-tailed)

of Extraversion, Conscientiousness, Agreeableness and Openness and the positive academic emotions and a negative relationship with the negative academic emotions. The converse is found with Neuroticism. Looking at the overall academic emotion scores for the Positive and the Negative emotions, the stronger correlations are found with Conscientiousness again and Openness as well with the Positive academic emotions whilst Neuroticism correlates with the Negative academic emotions.

These results offer support for hypotheses two and three. They also suggest that it would be acceptable to work with the AE's at the level of aggregate Positive and appreciate Negative AE scores.

To explore the fourth hypothesis, that personally and academic confidence will jointly be predictive of students' academic emotions, a structural equation had to be built and tested against the data and against alternative models.

The first stage in the model building process was to look at the correlations between Personality, academic confidence and academic emotions as shown in Table 5 to ask whether the academic emotion measures, Studies, Class and Test could be combined for each of the positive and the negative emotions to create two academic emotion variables, one for the positive emotions (AE + ve) and the other for the negative emotions (AE-ve). Cronbach's Alpha for AE + ve was .881

and for AE-ve, .818 which coupled with the fact that Confirmatory Factor Analysis of the academic emotions scale was very poor (Table 6) drove the use of this two measure conception of academic emotion with overall scores for each of positive and negative emotions from the three sub-categories Class, Studies and Test with concomitant benefits to the model building process (Hoyle 2011).

The next stage in building a model of Personality, academic confidence and academic emotions was to consider the level at which to use the scores from the Academic Behavioural Confidence scale. Originally it was conceptualised as a scale with four factor, Grades, Studying, Verbalising and Attendance (Sander and Sanders 2009) but Putwain et al. (2013) had to remove the Attendance sub scale due to poor model fit. Therefore it was deemed wise to consider the four factor model and alternatives which could be used in modelling the data here. The results are presented in Table 7 to which it is worth adding that the Cronbach's Alpha values for the four factors in the original (2009) model were low (Grades, .822; Verbalising, .838; Studying, .699; Attendance, .581).

The three factor model following Putwain et al. 2013) was no better so alpha values were not computed. Whilst the two factor solution fitted the data very well, it had no theoretical

Table 2 Correlations (number of participants) between ABC sub scales and AE (Studies)

Academic Emotions (Studies)	Academic Behavioural Confidence				
	Grades	Verbalising	Studying	Attendance	ABC Total
Studies: Positive (+)	.440**	.470**	.266**	.354**	.474**
	479	485	488	490	494
Studies: Negative (−)	−.376**	−.312**	−.284**	−.260**	−.389**
	490	493	496	496	501

**Correlation is significant at the 0.01 level (1-tailed)

Table 3 Correlations (number of participants) between ABC sub scale and AE (Class)

Academic Emotions (Class)	Academic Behavioural Confidence				
	Grades	Verbalising	Studying	Attendance	ABC Total
Class: Positive (+)	.460**	.514**	.464**	.515**	.597**
	539	539	547	547	551
Class Negative (−)	−.328**	−.325**	−.429**	−.371**	−.434**
	505	509	524	514	518

*Correlation is significant at the 0.05 level (1-tailed)

**Correlation is significant at the 0.01 level (1-tailed)

basis and is mentioned here as a possibility for future research. It comprised a factor Grades constructed from items 1, 2, 6, 15, 16, 20, 22 & 23 from the original scale and a factor Verbalising which remained unchanged (items: 3, 5, 8 & 10).

When first published (Sander and Sanders 2006) the ABC scale was presented as unidimensional and has worked adequately at that level. From the data in this study (items 1, 2, 3, 4, 5, 6, 7, 8, 10 15, 16, 18, 20, 21, 22, 23) when considered together unidimensionally has a respectable alpha value of .851 leading to the decision to use a single Academic confidence score calculated from the scale items identified.

Confirmatory factor analysis of the Five Factor personality measures was sound (TLI = .906, CFI = .953, RMSEA = .038). Inspection of the correlations between the individual Big Five traits and Academic confidence (Table 1) and academic emotions (Table 5) shows that the traits Conscientiousness and Neuroticism would seem to be more closely related to Academic confidence and to academic emotions than Openness or Extraversion. Although Openness presents a case for consideration, the two strongest relating traits are Conscientiousness and Neuroticism. From considering these correlations, three models were tested each with a uni-dimensional ABC score, aggregate positive academic emotions, aggregate negative academic emotions with the full five factor personality measure (model 1) or with personality represented as just a Conscientiousness and Neuroticism score (model 2) or by Conscientiousness, Neuroticism and Openness (model 3). The model fit statistics are shown in Table 8 and show a very poor fit

for the full 5 factor personality model (model 1) with academic confidence and academic emotion but reducing the personality contribution to just Conscientiousness, Openness and Neuroticism, produced two very acceptable models with Model 3 showing a slightly better fit but less parsimony in comparison to model 2. Model 2 with an AIC statistic of 4711 presents a better case than model 3 with a greater AIC of 5218, although in neither case does the AIC statistic approach zero. In Model 2 (Fig. 1), all paths are significant at $p < .01$ (Table 9) and the signs of the estimates are as one would predict. The regressions from Neuroticism are negative, the regression to AE-ve is negative and the covariances from ABC and AE + ve to AE-ve and that between Conscientiousness and Neuroticism are negative. These are shown in red in Table 9. The regression from Neuroticism to ABC whilst having a small load is necessary to the fit of the model. Removing it from the Model 2 yields: TLI = .942, CFI = .988, RMSEA = .084 and AIC = 4716.

In conclusion, Model 2 is accepted as the preferred model to explain the interactions between personality, academic confidence and academic emotions and in that hypothesis 4 is addressed. Descriptive statistics for the variables in Model 2 are shown in Table 10.

Discussion and Conclusions

This research was motivated by the desire to understand how and to what extent personality influenced academic confidence and

Table 4 Correlations (number of participants) between ABC sub scale and ARE (Test)

Academic Emotions (Test)	Academic Behavioural Confidence				
	Grades	Verbalising	Studying	Attendance	ABC Total
Test: Positive (+)	.430**	.442**	.316**	.336**	.480**
	516	525	526	527	532
Test: Negative (−)	−.313**	−.262**	−.341**	−.297**	−.362**
	481	488	493	493	497

*Correlation is significant at the 0.05 level (1-tailed)

**Correlation is significant at the 0.01 level (1-tailed)

Table 5 Correlations between personality measures and academic emotions

Personality	Academic Emotions					
	Class +ve	Class -ve	Studying +ve	Studying -ve	Test +ve	Test -ve
Extraversion	.390**	−.287**	.324**	−.219**	.352**	−.129**
Conscientiousness	**.586****	−.362**	**.577****	−.341**	**.534****	−.295**
Neuroticism	−.143**	.378**	−.161**	.466**	−.176**	.487**
Agreeableness	.325**	−.228**	.352**	−0.195	.245**	−.179**
Openness	**.523****	−.383**	.478**	−.354**	.480**	−.319**

*Correlation is significant at the 0.05 level (1-tailed)

**Correlation is significant at the 0.01 level (1-tailed)

academic emotions and to that end the analyses started by considering possible relationships between those variables. It was predicted that academic confidence would positively correlate with the traits Openness, Conscientiousness, Extraversion and Agreeableness, and negatively with Neuroticism. Likewise, it was predicted that academic confidence would positively correlate with positive academic emotions and negatively with the negative academic emotions. Finally, it was predicted that Personality would predictably influence academic emotions.

In relation to the first hypothesis, each of the academic confidence sub scales and the total academic confidence score correlated positively with Extraversion, Conscientiousness, Agreeableness and Openness and negatively with Neuroticism. Inspection of Table 1 and in accordance with previous research (Richardson et al. 2012; Chen and Schmidt 2015; Köseoglu 2016; Vedel 2014) suggested that Conscientiousness was the trait most predictive of academic confidence. As predicted Neuroticism shows up as the trait associated with lower academic confidence and negative academic emotions and thus could be linked to less optimal educational outcomes (Reese et al. 2017). Complementarily, each of the academic confidence factors and the total academic confidence score correlates positively with the positive academic emotions for Studies, Class and Test, and negatively with the negative academic emotions providing support for the second hypothesis. The correlations in Table 5 show that Personality and academic emotions too are linked in the predicted way.

Table 6 Confirmatory factory analysis of the academic emotion model

	Model Fit Statistics		
	TLI	CLI	RMSEA
AE Studies	0.867	0.872	0.175
AE Class	0.825	0.831	0.197
AE Test	0.861	0.866	0.165

These correlational analyses suggest that the confidence that students have in their academic abilities and behaviour is related to their personality and relates to their study related emotions but it says nothing about any possible causal relationships. That the distinct constructs of personality, academic confidence and academic emotions are statistically connected suggests that there is a possibility that they interact (De Feyter et al. 2012).

Three SEM models were considered and Model 2 (Fig. 1) accepted as the model best fitting the data as it establishes a consistent and significant relationship between academic confidence and Personality, with Conscientiousness and Neuroticism being the two traits that connect strongest with academic confidence and academic emotions. Openness was included in Model 3 but that model was disregarded for being less parsimonious. That model 2 was left as the working model should not be interpreted as saying that the remaining Big Five traits have no role in academic confidence or academic emotions but rather their connection is somewhat less or less direct.

In relation to the fourth hypothesis, model 2 suggests a double emotional route with Conscientiousness appearing as a predictor of academic confidence and positive academic emotions, while neuroticism with a lack of confidence and negative academic emotions. This result is consistent with previous evidence, which has repeatedly revealed the relationship between neuroticism and negative emotionality. In this case, the contribution of this piece of research is to introduce academic confidence as a mediating factor between personality characteristics and emotions.

This resulting model (model 2) shows that academic confidence, as an attitudinal construct (de la Fuente 2015) is significantly associated with personality variables and together they predict academic emotions; thus, greater academic confidence is related to positive academic emotions, while the lack thereof predicts negative academic emotions. The model is consistent with the extensive evidence that shows Neuroticism as a limiting factor in learning and achievement (Deason et al. 2019; Nikose, Chari, & Gupta,2018).

Table 7 Confirmatory factory analysis of the academic confidence scale

Model	Fit Statistics		
	TLI	CLI	RMSEA
Original 4 factor model (Sander and Sanders 2009)	0.854	0.865	0.08
3 Factor model Putwain et al. (2013)	0.864	0.865	0.09
2 Factor model from exploratory factor analysis	0.955	0.956	0.06

Limitations and Future Research

Pervin (1994) drew renewed attention to Mischel's .30 barrier in research in trait personality theory and from Tables 1 to 5 it can be seen that many if not most of the correlation coefficients presented whilst being statistically significant are low, around .3 or lower. Low but significant correlation coefficients are neither convincing nor conducive to good model building. In working with an overall academic confidence score and in constructing aggregate achievement emotion scores the degree of unexplained variance in the data has been lessened. Drawing both on previous research (Richardson et al. 2012; Chen and Schmidt 2015; Köseoglu 2016; Vedel 2014) and from examining carefully the data collected, the incorporation of just the traits Conscientiousness and Neuroticism into the model helped understand the inter-relationships between the constructs Personality, Academic Confidence and Academic Emotions. The selectivity was key in deriving a workable model. What remains lacking is the incorporation of mediating factors between Personality and academic performance (De Feyter et al. 2012) and academic performance itself as essentially that is the crucial factor.

The inclusion of other-report measures in addition to self-report measures of variables such as personality and academic confidence (Vedel 2014) should also be considered. That all of these are absent in the research considered here is a drawback to this research. Finally, it would also be wise to follow Weisberg et al. (2011) and measure the Big Five traits at the aspect level in order to follow more carefully the gender differences in personality characteristics that may be lost at the macro level of five traits.

Another essential limitation of this work, a limitation that future research should resolve, is the relationship between the lack of academic confidence and the experience of academic stress. Also, to be considered is the extent to which the teaching context, in interaction with the personal characteristics of the students, contributes to academic confidence and emotions (Deason et al. 2019; Nikose et al. 2018). The history of psychological research repeatedly illustrates the importance of the environment, here an environment created by the teacher, in determining behaviour, here the learning of the student.

Methodologically, this research has served as a reminder against assuming the stability over time of scale properties. The Academic Behaviour Confidence scale had shown over repeated measures, a four sub scale structure in both UK and Spanish student samples yet this was not supported here. The data was showing an unaltered Verbalising scale, no Attendance scale as found by Putwain et al. (2013), very little support for a Study scale but an expanded Grades scale. Further research could usefully explore the factor structure of this scale and that of the academic emotions scale. One might expect the factorial structure of such scales to change as the demographics of the student population change and as teaching and learning methods change not least in respect to the availability and use of online resources requiring different skills in our students and stressing them in different ways.

Table 8 Confirmatory factory analysis of combined personality, academic confidence and academic emotion models

Model	Chi-Squared (DF)	Fit Statistics			
		TLI	CLI	RMSEA	AIC
Model 1 Big Five	1221.785 (28)	0.792	0.874	0.13	6635
Model 2 Conscientiousness & Neuroticism	638.924 (10)	0.983	0.998	0.045	4711
Model 3 Conscientiousness, Openness & Neuroticism	848.725 (15)	0.996	1.0	0.028	5218

Fig. 1 Personality (Conscientiousness and Neuroticism) and Academic Confidence (ABC) combine to affect student Academic Emotions (AE + ve and AE-ve). All paths are statistically significant. Standardised estimates are shown parenthetically
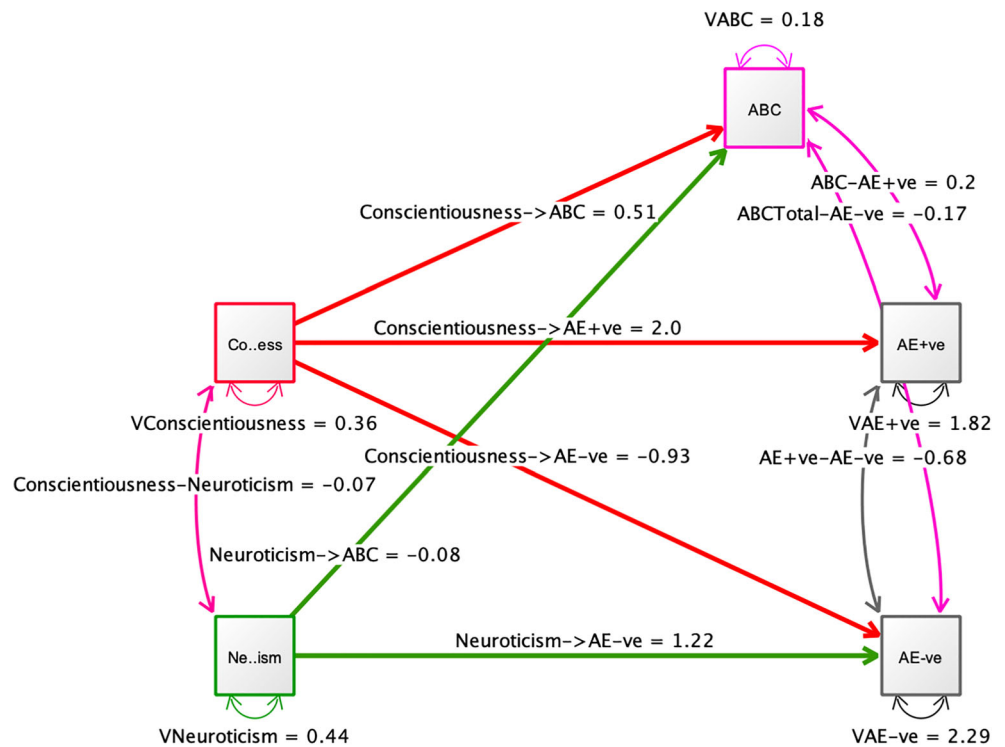
Methodologically, a lot of data was lost due to students not completing all the scales. The data that went into the fourth phase of the results, model consideration, was just a small subset of the data that was collected. Whilst convenient, online completion of scales and other activities generates this significant drawback.

Implications for Practice in Higher Education

The variables of personality and academic confidence are clearly connected with Personality influencing Academic Confidence more than the reverse given the extent of the heritability of the Big Five traits. Thus, students with high Conscientiousness scores will have higher academic confidence and vice versa and students with higher scores for neuroticism are more likely to have more negative emotions (Linnenbrink-Garcia et al. 2016). Therefore knowing the personal characteristics of the students could facilitate preventative measures. Students with high scores in neuroticism and lower academic confidence should be subject to intervention to help them manage the worst emotions and confidence during learning (Deason et al. 2019).

The variables measured here are merely hypothetical constructs that can not be considered to be truly causal per se in

Table 9 Model 2 path statistics: the paths that one would expect to be negatively loading and indeed are negatively loading are shown in red nothing is showing in red - if that is not possible please delete all but "Model 2 path statistics" In the table below the 7th row Neuroticism<-> Neuroticism needs to be deleted. Apologies

Path	Estimate	Standard Error	Z	Standardised Estimate
ABC < -> ABC	0.18	0.01	16.02	0.65
AE + ve < -> AE + ve	1.82	0.14	13.07	0.56
AE-ve < -> AE-ve	2.29	0.19	11.84	0.67
Conscientiousness < − > Conscientiousness	0.36	0.02	15.89	1.0
Conscientiousness -- > ABC	0.51	0.03	15.75	0.57
Conscientiousness —— > AE + ve	2.00	0.12	16.75	0.66
Neuroticism -- > AE-ve	1.22	0.14	8.98	0.44
Conscientiousness -- > AE-ve	−0.93	0.16	−5.92	−0.3
AE-ve < −> ABC	−0.17	0.04	−4.21	−0.17
AE + ve < −> ABC	0.20	0.03	6.20	0.21
Neuroticism -- > ABC	−0.08	0.03	−2.71	−0.09
Neuroticism < −> Conscientiousness	−0.07	0.02	−4.03	−0.18
AE-ve < −> AE + ve	−0.68	0.13	−5.25	−0.2

Table 10 Model 2 variable descriptive statistics. The model data came from 527 students

Variable	Descriptives		
	Mean	Standard Deviation	Scale Maximum
Conscientiousness	3.69	0.060	5
Neuroticism	2.59	0.67	5
ABC	3.78	0.53	5
AE + ve	10.34	1.82	15
AE-ve	6.34	1.85	15

determining the successful study behaviour of students and reflected in their academic emotions. These constructs are more likely to be proxies for something situational that created the behavioural characteristics of the personality traits, any genetic contribution to personality aside. One possible candidate is parental involvement in children's education which Gorard et al. (2012) found from an extensive review to be the strongest of a wide range of measures that predicted academic school performance. The extent to which parental involvement is remains a prime influencer of academic attainment at university is an avenue for future research but to speculate one can see how the appropriate support and encouragement of children by their parents during their school years could lay the foundations and pave the way for a commitment to education that could be encapsulated in the hypothetical constructs of Conscientiousness and Academic Confidence. In short, the focus needs to be on the social environments constructed for boys and girls as they grow up with particular attention paid to culture and social stereotypes (Jäncke 2018).

To conclude, this research was motivated by the desire to understand how and to what extent personality characteristics were linked to academic confidence and academic emotions in undergraduate students. The results showed that Conscientiousness was the trait most predictive of high academic confidence and positive academic emotions whilst Neuroticism was associated with lower academic confidence and negative academic emotions Academic confidence correlated positively with the positive academic emotions and negatively with the negative academic emotions suggesting that the confidence that students have in their academic attitudes, abilities and behaviour is related to their personality and to their academic emotions. The relationships between personality, academic confidence and academic emotions was captured in a structural equation model of very good fit.

Compliance with Ethical Standards

References

Barbaranelli, C., Vittorio, G., Rabasca, C. A., & Pastorelli, C. (2003). A questionnaire for measuring the Big Five in late childhood. *Personality and Individual Differences, 34*(4), 645–664.

Beyer, S. (1998/1999). Gender differences in causal attributions by college students of performance on course examinations. *Current Psychology, 17*, 346–358. https://doi.org/10.1007/s12144-998-1016-5

Carrasco, M. A., Holgado, F. P., & Del Barrio, M. V. (2005). Dimensionalidad del cuestionario de los cinco grandes (BFQ-N) en población infantil Española. *Psicothema, 17*, 275–280.

Chen, X. & Schmidt, L.A., (2015). Temperament and Personality (chapter 5), *Handbook of Child Psychology and Developmental Science, volume 3. Socioemotional Processes*. https://doi.org/10.1002/9781118963418.childpsy305

De Feyter, T., Caers, R., Vigna, C., & Berings, D. (2012). Unraveling the impact of the Big Five personality traits on academic performance: The moderating and mediating effects of self-efficacy and academic motivation. *Learning and Individual Differences, 22*(4), 439–448.

de la Fuente, J. (2014). Five Scale, BFQ-U. *Adaptation for Young University Students.* Almería: University of Almería. Manuscript pending publication.

de la Fuente, J. (2015). *Competency for studying, learning and performing under stress: Self-help guide for university students, graduates and professional examination candidates*. Almería: Education & Psychology I+D+I: e-publishing R&D&I Series.

de la Fuente, J. & Sander, P. (2012). Effects of Academic Confidence and Gender on the Perception of the Teaching-Learning Process at University in Edwards, M & Adams, S. O. (Eds), *Learning Strategies, Expectations and Challenges* (pp. 93–108). Nova Science Publishers.

de la Fuente, J., Sander, P., & Putwain, D. (2013). Relationship between undergraduate student confidence, approach to learning and academic performance: The role of gender. *Revista de Psicodidáctica, 18*(2), 373–391.

de la Fuente, L, Zapata, S, & Fadda, S. (2015). Improving Mental Health Through an Online Assessment and Self-help e-Utility in University Students. In Roberta *V. nata*, *Progress in Education* (Chapter 6; Volume 33). New York: NOVA Publisher.

de la Fuente, J., Sander, P., Martínez-Vicente, J. M., Vera, M. M., Garzon, A., & Fadda, S. (2017). Combined Effect of Levels in Personal Self-Regulation and Regulatory Teaching on Meta-cognitive, on Meta-motivational and on Academic Achievement Variables in Undergraduate Students. *Frontiers in Psychology, 8*, 232. https://doi.org/10.3389/fpsyg.2017.00232.

de la Fuente, J., Martínez-Vicente, J. M., Peralta-Sánchez, F. J., Garzón-Umerenkova, A., Vera, M. M., & Paoloni, P. (2019). Applying the SRL vs. ERL Theory to the Knowledge of Achievement Emotions in Undergraduate University Students. *Frontiers in Psychology, 10*, 2070. https://doi.org/10.3389/fpsyg.2019.02070.

Deason, D. L., Dahlen, E. R., Madson, M. B., & Bullock-Yowell, E. (2019). Five-Factor Model of Personality, Social Anxiety, and Relational Aggression in College Students. *Journal of College Student Development, 60*(1), 110–114. Project MUSE. https://doi.org/10.1353/csd.2019.0007.

Field, A. (2018). *Discovering statistics using IBM SPSS statistics*, 5th edition. London: SAGE Publications.

Gorard, S., See, B., & Davies, P. (2012). The impact of attitudes and aspirations on educational attainment and participation. Joseph Rowntree Foundation. https://www.jrf.org.uk/sites/default/files/jrf/migrated/files/education-young-people-parents-full.pdf .

Haddock, G., & Maio, G. R. (2004). *Contemporary perspectives on the psychology of attitudes*. Hove: Psychology Press Ltd.

Hoyle, R.H., (2011). *Structural Equation Modeling for Social and Personality. Psychology*. Sage.

Jäncke L. (2018). Sex/gender differences in cognition, neurophysiology, and neuroanatomy. *F1000Research*, 7, F1000 Faculty Rev-805. https://doi.org/10.12688/f1000research.13917.1

Köseoglu, Y. (2016). To What Extent Can the Big Five and Learning Styles Predict Academic Achievement. *Journal of Education and Practice, 7*(30), 43–51.

Linnenbrink-Garcia, L., Patall, E. A., & Pekrun, R. (2016). Adaptive Motivation and Emotion in Education: Research and Principles for Instructional Design. *Policy Insights From the Behavioral and Brain Sciences, 3*(2), 228–236.

Muis, K. R., Chevrier, M., & Singh, C. A. (2018). The Role of Epistemic Emotions in Personal Epistemology and Self-Regulated Learning. *Educational Psychologist, 53*(3), 165–184. https://doi.org/10.1080/00461520.2017.1421465.

Nicholson, L. J., Putwain, D. W., Connors, L., & Hornby-Atkinson, P. (2013). The key to successful achievement as an undergraduate student: Confidence and realistic expectations? *Studies in Higher Education, 38*(5), 272–284. https://doi.org/10.1080/03075079.2011.585710.

Niculescu, A., Tempelaar, D., Dailey-Hebert, A., Segers, M., & Gijselaers, W. (2015). Exploring the antecedents of learning-related emotions and their relations with achievement outcomes. *Frontline Learning Research, 3*(1), 1–17. https://doi.org/10.14786/flr.v%25vi%25i.136.

Nikose D, Chari S, & Gupta M. (2018). Study of the Relationship between Personality Traits and Academic Performance of Health Science Students. International Archives of Biomedical and Clinical Research, *4*(1), 178–181.

Papinczak, T., Young, L., Groves, M., & Haynes, M. (2008). Effects of a metacognitive intervention on students' approaches to learning and self-efficacy in a first year medical course. *Advances in Health Sciences Education, 13*(2), 213–232. https://doi.org/10.1007/s10459-006-9036-0.

Pekrun, R. (1992). The Impact of Emotions on Learning and Achievement: Towards a Theory of Cognitive/Motivational Mediators. *Applied Psychology, 41*, 359–376. https://doi.org/10.1111/j.1464-0597.1992.tb00712.x.

Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic Emotions in Students' Self-Regulated Learning and Achievement: A Program of Qualitative and Quantitative Research. *Educational Psychologist, 37*(2), 91–105. https://doi.org/10.1207/S15326985EP3702_4.

Pekrun, R., Goetz, T., Frenzel, A. C., Barchfeld, P., & Perry, R. P. (2011). Measuring emotions in students' learning and performance: The Achievement Emotions Questionnaire (AEQ). *Contemporary Educational Psychology, 36*(1), 36–48. https://doi.org/10.1016/j.cedpsych.2010.10.002.

Pervin, L. A. (1994). A Critical Analysis of Current Trait Theory. *Psychological Inquiry, 5*(2), 103–113.

Putwain, D., Sander, P., & Larkin, D. (2013). Academic self-efficacy in study-related skills and behaviours: relations with learning-related emotions and academic success. *British Journal of Educational Psychology, 83*(4), 633–650. https://doi.org/10.1111/j2044-8279.2012.02084.x.

Reese, E., Myftari, E., McAnally, H. M., Chen, Y., Neha, T., Wang, Q., Jack, F., & Robertson, S. (2017). Telling the Tale and Living Well: Adolescent Narrative Identity, Personality Traits, and Well-Being Across Cultures. *Child Development, 88*, 612–628. https://doi.org/10.1111/cdev.12618.

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin, 138*(2), 353–387.

Robbins, S. B., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin, 130*(2), 261–288.

Sander, P. (2009). Current developments in measuring academic behavioural confidence. *Psychology Teaching Review, 15*(1), 32–44.

Sander, P., & Sanders, L. (2006). Understanding Academic Confidence. *Psychology Teaching Review, 12*(*1*), 29–39.

Sander, P., & Sanders, L. (2009). Measuring Academic Behavioural Confidence: The ABC Scale Revisited. *Studies in Higher Education, 34*(1), 19–35.

Sander, P., de la Fuente, J., Stevenson, K., & Jones, T. (2011). The Validation of the Academic Behavioural Confidence Scale with Spanish Psychology Student. *Psychology Learning and Teaching, 10*(1), 11–24.

Sander, P., Putwain, D., & de la Fuente, J. (2013), Using Structural Equation Modelling to Understand Predictors of Undergraduate Students' Academic Performance. In Jeroen Huisman, Malcolm Tight (ed.), *Theory and Method in Higher Education Research* (International Perspectives on Higher Education Research, Volume 9), Emerald Group Publishing Limited, pp.219–241. https://doi.org/10.1108/S1479-3628(2013)0000009015

Schumaker, R. E., & Lomax, R. G. (2010). *A Beginner's Guide to Structural Equation Modeling* (3rd ed.). New York: Routledge.

Vedel, A. (2014). The Big Five and tertiary academic performance: A systematic review and meta-analysis. *Personality and Individual Differences, 71*, 66–76. https://doi.org/10.1016/j.paid.2014.07.011.

Vedel, A., & Poropat, A. E. (2017). Personality and academic performance. In V. Zeigler-Hill, & T. K. Shackelford (Eds.), *Encyclopedia of personality and individual differences* (pp. 1–9). Springer. https://doi.org/10.1007/978-3-319-28099-8_989-1

von Oertzen, T., Brandmaier, A. M., & Tsang, S. (2015). Structural Equation Modeling with Ωnyx. *Structural Equation Modeling: A Multidisciplinary Journal, 22*(1), 148–161. https://doi.org/10.1080/10705511.2014.935842.

Weisberg, Y. J., Deyoung, C. G., & Hirsh, J. B. (2011). Gender Differences in Personality across the Ten Aspects of the Big Five. *Frontiers in Psychology, 2*, 178. https://doi.org/10.3389/fpsyg.2011.00178.

Zusho, A., Pintrich, P. R., & Coppola, B. (2003). Skill and will: The role of motivation and cognition in the learning of college chemistry. *International Journal of Science Education, 25*(9), 1081–1094. https://doi.org/10.1080/0950069032000052207