Predicting examination performance using an expanded integrated hierarchical model of test emotions and achievement goals

Dave Putwain & Carolyn Deveney

Abstract
The aim of this study was to examine an expanded integrative hierarchical model of test emotions and achievement goal orientations in predicting the examination performance of undergraduate students. Achievement goals were theorised as mediating the relationship between test emotions and performance. 120 undergraduate students completed self-report measures of test emotions and achievement goals and performance data was collected from a research methods and analysis examination. A series of hierarchical regression analyses provided partial support for the expanded hierarchical model. A mastery goal mediated the pride – examination performance relationship, a performance-avoidance goal partially mediated the shame – examination performance relationship, and a performance-avoidance goal mediated the hopelessness – examination performance relationship. These findings have contributed to the understanding of the relationship between test emotions, motivation and achievement in a higher education context by showing how challenge and threat affect differ in their relations with approach and avoidance motivation in predicting achievement.
Keywords: Test emotions, test anxiety, achievement goals, motivation, examination performance.

ACADEMIC and assessment-related emotions have not been studied extensively in a higher education context (Beard, Clegg & Smith, 2007). A rationale for the study of emotions related to learning and assessment can be developed for three reasons. First, these emotions represent an important topic in their own right to further understanding of the higher education student subjectivity and experience. Second, these emotions are one of a number of factors which predict student achievement in higher education, an understanding of which is critical in informing teaching, learning and assessment strategies in higher education. Third, these emotions interact reciprocally with a range of other student-centred variables, including perceived ability, self-efficacy, identity, self-concept and so forth. This study focuses, specifically, on the emotions experienced by students in relation to their assessments and how the rela-tionship between assessment-related emotions and another student-centred variable of current interest, achievement goals, predicts examination performance.

Test anxiety and test emotions
The test anxiety construct refers to a form of social-evaluation anxiety that is experienced in a range of assessment contexts, such as examinations. It has been described as a fear-of-failure (Hong, 1999; Meijer, 2001) and highly test anxious students will appraise assessment and evaluation situations as threatening (Spielberger & Vagg, 1995). Lowe et al.'s (2008) biopsychosocial model suggests there are three components of test anxiety; cognitive, physiological-affective and behavioural. The cognitive component refers to negative and worrisome self-state-ments such as 'I will probably fail this exam' which may be distracting or interfere with performance if experienced during an

examination. The physiological-affective component refers to the student's perception of their autonomic feelings of arousal and may include feelings of tension, trembling and headaches. The behavioural component refers to behaviours associated with assessments including effort, procrastination and study-skills.

In this model, the degree of anxiety experienced in a given assessment context is determined by the interaction between within-student factors including ability, study skills and academic self-efficacy; and the immediate pressures of a particular test situation including the importance of the test, esteem threats and the fear of negative evaluation from others. Appraisal of performance feeds back to influence the degree of immediate anxiety experienced and student's perception of their academic self-efficacy. Meta-analyses have indicated an inverse relationship between test anxiety and achievement of $r=-.21$ (Seipp, 1991); Fisher's $z=-.23$ (Hembree, 1988), which although small, may still influence a sizable proportion of students' passing or failing a course (McDonald, 2001). Rival models to explain the debilitating effect of test anxiety include the interfering effects on working memory capacity (Eysenck et al., 2007) and various types of skills deficits models (e.g. Covington & Omelich, 1988). Although there is evidence for each position, it is of course possible that different types of test anxious students may exist, characterised by either skills deficits or cognitive interference (Tobias, 1992; Zeidner, 1998).

Pekrun et al.'s (2002) test emotions approach grew out of two limitations of the test anxiety literature. The first was based on evidence from a series of qualitative case studies that anxiety was only one of several emotions, both pleasant and unpleasant, described by both school and university students. Thus, in isolation, test anxiety may provide an incomplete and theoretically sparse account of academic learning and achievement, upon which important consequences for students may depend, including their future educational and occupational trajectories, and the allocation of resources. The second, concerns the profound role of emotions in self-regulated learning by directing attention and motivation, and ultimately achievement. In particular the distinction between activating and deactivating emotions in determining motivational states has the potential to provide a much more comprehensive account of performance than test anxiety in isolation. Indeed the authors speculate on whether the small associations between test anxiety and achievement reported in the literature are a feature of not considering its motivational properties. Pekrun et al. (2002) theorise test anxiety as a unpleasant activating emotion which may reduce intrinsic motivation but also increase extrinsic motivation.

Pekrun et al. (2004) describe the development and validation of a measure of test emotions based on the frequency of the four most commonly described pleasant and unpleasant emotions (pleasant: enjoyment, hope, pride and relief; unpleasant: anger, anxiety, shame and hopelessness). Enjoyment, hope and pride (pleasant activating emotions) were associated with increased motivation and achievement, but relationships with relief (a pleasant deactivating emotion) were equivocal and did not always reach significance. All four unpleasant emotions tended to be inversely related to achievement but the unpleasant deactivating emotion, hopelessness, showed a more clear inverse association with intrinsic motivation than the unpleasant activating emotions of anger, anxiety and shame which tended to show smaller effects which were not always significant. The test emotions approach and the associated cognitive-motivational model of performance developed by Pekrun and his associates should be considered instrumental in broadening the aims and scope of test anxiety research and the inclusion of pleasant test emotions especially important given the literature now starting to highlight the benefits of such states in contributing to personal reliance and outlasting the states that con-

tribute to their development (Fredrickson, 2001; 2004; Sammons et al., 2007).

Motivation and achievement goals

The achievement goals construct is one of a number of contemporary approaches to competence motivation (others include expectancy value theory, self-determination theory, self-efficacy, attributional theory and intrinsic/extrinsic motivation theory, for a review see Urdan & Turner, 2005). Achievement goals, sometimes referred to as orientations, have been described as a student's reason or purpose for engaging in academic related behaviours (Dweck & Leggett, 1988) and consist of the patterns of beliefs and feelings about academic work: success, effort, ability, errors, feedback and evaluation (Ames & Archer, 1987, 1988). An important distinction in this framework is made between qualitatively different types of goals: performance and mastery (Ames, 1992). Mastery goals represent the motivation to develop and improve learning and to achieve a sense of competency based on self-referenced standards. In contrast, performance goals represent a concern with self-worth and demonstrating ability judged on norm-referenced standards; appearing able in contrast to other students and the demonstration of learning and/or competence. These goals have also been termed as learning and performance goals, task and performance goals, task-involved and ego-involved in different permutations of achievement goals theory (see Pintrich, 2003). We have chosen to refer to mastery and performance goals, consistent with Ames (1992) interpretation which are becoming the standardised terms in this field of research (see Elliot, 2005).

A further distinction was made in performance goals between approach and avoidance orientations (Elliot, 1997; Elliot & Church, 1997). A performance-approach goal is a focus on normative competence, a striving to demonstrate high ability and/or learning, whereas a performance-avoidance goal represents a focus on normative incom-

petence, or the fear-of-failure. Evidence has indicated that mastery goals are associated with a variety of positive outcomes including choosing challenging over easy tasks, persisting in the face of challenge or difficulty rather than giving up, using deep learning strategies and attributing success to effort rather than ability (Ames & Archer, 1988; Elliot & Dweck, 1988; Schunk, 1996; Anderman & Young, 1994; Wolters, Yu & Pintrich, 1996). Performance goals are associated with mixed outcomes. Whereas performance-approach goals are associated with increased effort and persistence, higher intrinsic motivation, aspiration and academic performance, performance-avoidance goals are associated with increased distraction, a lack of self-regulation, shallow processing of information, a reduced willingness to ask for help, reduced self-efficacy, increased test anxiety and poorer performance (Elliot, 1997, 1999, 2005; Elliot & Harackiewicz, 1996; Middleton & Midgley, 1997).

Accordingly there has been some debate in the literature over what the most adaptive goal orientation profile might be. Elliot (2005) notes that while mastery goals are associated with positive processes these do not always translate into achievement, as measured though grades, and a performance-approach goal may provide better facilitation of performance attainment in situations where the assessment depends upon externally imposed criteria. In a variation on this theme, Butler (2007) suggests that whether a mastery or performance-approach goal is more adaptive for performance depends on the type of task. As mastery goals promote learning they will display a greater association with performance on tasks requiring problem solving or divergent thinking. Performance-approach goals encourage students to rely on familiar knowledge and/or strategies and will show a superior performance on tasks requiring rote learning or the application of familiar skills. In an advancement of achievement goals theory Elliot and McGregor (2001) have developed a 2x2 approach incorporat-

ing both performance and mastery goals along approach and avoidance dimensions. As Lau and Lee (2008) note however, questions remain over the validity of the mastery avoidance goal and much contemporary research continues to use the earlier trichotomous version (e.g. Femollar, Román & Cuestas, 2007; Chouinard, Karsenti & Roy, 2007). Accordingly, the trichotomous framework of achievement goals was adopted in this study. When viewed along an approach-avoidance dimension the mastery goals specified in the earlier trichotomous framework would correspond to a mastery-approach goal (Elliot, 2005).

Integrating test anxiety and achievement goals

Test anxiety positively correlates with performance goals, more strongly with the performance-avoidance goal than with the performance-approach goal, and is unrelated to mastery goals (Middleton & Midgley, 1997). As the trichotomous version of the achievement goals framework was used in this study, perhaps this interpretation should more accurately read that test anxiety is unrelated to mastery goals conceptualised along an approach dimension. Indeed, as demonstrated by Hagtvet and Benson (1997) the test anxiety and fear-of-failure constructs, the latter analogous to a performance-avoidance goal, may be highly related. One interpretation of this finding might be that fear-of-failure can be represented along cognitive and motivational dimensions by the test anxiety and performance-avoidance goals constructs respectively. It is not clear how mastery and performance-approach goals would fit into this framework, but this issue was partially addressed in a study by Elliot and McGregor (1999) who proposed a hierarchical integrative model in which test anxiety was positively related to both performance-approach and performance-avoidance goals, but lowered examination performance was only found in highly test anxious students who adopted performance-avoidance goals. A positive association

was reported for highly test anxious students with performance-approach goals. This analysis offers a similar explanation to that of Pekrun et al. (2002), outlined above, in accounting for why only small-moderate associations between test anxiety and assessment performance are reported in the literature. In this case, it may be possible to differentiate between test anxious students depending on their achievement goals.

This line of theorising advanced by Elliot and McGregor (1999) is consistent with Pekrun et al.'s (2002) cognitive-motivational model of performance, that motivational factors are mediating the effect of emotion on learning and performance, although over time these will inevitably interact in a reciprocal fashion. Pekrun et al.'s (2002) theory of activating and deactivating positive and negative test emotions generates clear predictions, but in terms of contemporary motivation theory is limited in that it primarily conceptualises motivation in quantitative terms (i.e. motivation is either reduced or enhanced) rather than the qualitative distinctions between different types of motivations (i.e. mastery, performance-approach and avoidance goals).

Furthermore Elliot and McGregor's (1999) integrative hierarchical model did not include mastery goals, which are unrelated to test anxiety, perhaps because it does not consider a broader range of test-related emotions. In short, an integration of the test emotions approach with achievement goals into an expanded hierarchical model could be of considerable benefit to theory attempting to account for learning and achievement in cognitive-motivational terms.

Aims of the present study

The present study aimed to establish the relationships between test emotions, achievement goals and examination performance in a sample of higher education students. Predictions are presented in three clusters: achievement goals and performance, test emotions and achievement goals and the mediating role of achievement goals in test

emotions and performance. First, the relationships between achievement goals and performance: in addressing the point raised by Butler (2007) that associations between achievement goals and assessment performance may depend on the type of task, the examination in question for this study was for a course in undergraduate research methods and analysis containing largely problem-based questions. It would therefore be predicted that examination performance would be positively related to a mastery rather than performance-approach goal and negatively related to performance-avoidance. Second, the relationships between test emotions and achievement goals were based on theorising that each type of achievement goal is related to distinct emotions depending on whether the student experiences a challenge or threat affect (Elliot & Pekrun, 2007). Table 1, based on the work of McGregor and Elliot (2002) predicts relationships between achievement goals and particular test emotions (the signs in parenthesis indicate the direction of relationship). Predictions for relief have not been included in this table as it is likely to result in disengagement from immediate performance goals (previous work suggests an equivocal relationship with motivation, see Pekrun et al., 2004). Furthermore, Elliot and Pekrun (2007) suggest that performance-approach goals could, in principle, also be related to threat affect but there is no empirical evidence for this

relationship at present.

Third, the relationships between test emotions and performance, mediated by achievement goals. As a mastery goal predicts higher exam performance and joy predicts a mastery goal, it is hypothesised that a mastery goal will mediate the relationship between joy and performance. As a performance-avoidance goal predicts lower examination performance, and anxiety, shame and hopelessness and predict a performance-avoidance goal, it is hypothesised that a performance-avoidance goal will mediate the relationships between anxiety, shame and hopelessness with performance. No meditational relationships are hypothesised for a performance-approach goal as, based on the theorising of Butler (2007) above, it is predicted this goal will be unrelated to the problem-based material assessed by the examination for which data were collected in this study.

Method
Participants and Procedure
Self-report questionnaires for academic emotions and achievement goals were completed by 120 students (female=93; male=27) from two successive year cohorts (cohort 1, N=58; cohort 2, N=62) who were following an undergraduate course in research methods and analysis and completed six weeks prior to the end-of-course examination. Questionnaire order was counterbalanced and presented with an instruction/consent

Table 1: Theorised relationships between achievement goals and test emotions.

Achievement Goal	Challenge/Threat Affect	Discrete Emotion
Mastery (approach)	Challenge Affect	Joy (+) Anger (–)
Performance-approach	Challenge Affect	Hope (+) Pride (+)
Performance-avoidance	Threat Affect	Anxiety (+) Hopelessness (+) Shame (+)

sheet requesting permission to use end-of-course examination performance for this project.

Measures

Assessment related emotions were measured using the 24-item Test Emotions Questionnaire (Pekrun et al., 2004). This questionnaire provides a measure of four pleasant assessment related emotions (joy, hope, pride and relief) and four unpleasant assessment related emotions (anger, shame, hopelessness and anxiety). These assessment related emotions are conceptualised as being trait-like, as instructions asked students to respond to items based on they generally feel about examinations, and are not measured in the context of a specific examination. Each academic emotion consists of three items (e.g. 'During exams, I feel very tense') with five response options (1=strongly disagree; 5=strongly agree). The reliability and construct validity of the Test Emotions Questionnaire has been demonstrated by Pekrun et al. (2004).

Achievement goals were measured using 17-items from the Approaches to Learning questionnaire (Greene & Miller, 1996), providing scores for mastery, performance-avoidance and performance-approach goals. Each item has six response options

(1=strongly disagree; 6=strongly agree). Versions of this measure have been used in numerous previous studies (DeBacker & Crowson, 2006; DeBacker & Nelson, 1999, 2000; Greene, DeBacker, Ravindran, & Krows, 1999) all of which support the reliability and validity of the subscales.

Examination performance was taken from the end-of-course examination. The mark was expressed as a percentage.

Results

Descriptive statistics

Descriptive statistics are reported in Table II below. In general, positive emotions were more strongly endorsed than negative emotions ($t_{119}=2.27$; $p=.03$). Differences were reported between pleasant test emotions ($F_{1,119}=10.12$; $p=.002$), where relief was the most strongly endorsed (relief vs. joy, hope and pride all $p<.001$), and unpleasant test emotions ($F_{1,119}=10.73$; $p=.001$) where shame was the most strongly endorsed (shame vs. anger and anxiety $p<.001$ and shame vs. hopelessness $p=.002$). Differences were reported between achievement goals ($F_{1,119}=602.74$; $p<.001$), where students reported holding a mastery goal as the strongest motivational orientation (mastery versus performance-approach and perform-

Table 2: Correlation coefficients, descriptive data and reliability coefficients for test emotions and achievement goals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Test Emotions												
Joy (1)	--	.47**	.31**	-.24*	-.22*	-.38**	-.36**	-.46**	.15	-.10	-29**	.02
Hope (2) [a]		--	.75**	-.24*	-.60**	-.69**	-.71**	-.87**	.15	.28**	-.47**	.10
Pride (3)			--	.30**	-.29**	-.63**	-.05	-.33**	.29**	.11	-.18^	.21*
Relief (4) [a]				--	.06	-.19*	.40**	.11	.03	.19*	.24*	.16
Anger (5)					--	.68**	.28**	.63**	-.15	.09	.36**	-.12
Shame (6) [a]						--	.38*	.49**	-.30**	.05	.69**	-.52**
Anxiety (7)							--	.32**	.04	-.04	.20*	-.08
Hopelessness (8)								--	-.20*	-.01	.38**	-.22*
Achievement Goals												
Mastery (9)									--	-.01	-.17^	.32**
P- Approach (10)										--	.44**	-.11
P- Avoidance (11)											--	-.27**
Exam Grade (12)												--
Mean	2.37	3.22	3.14	4.01	2.33	3.23	2.65	2.40	4.80	2.52	2.16	53.42
SD	.83	.74	.80	.72	.88	.81	.89	.92	.73	.88	.78	14.73
Cronbach's α	.72	.40	.73	.48	.79	.39	.77	.85	.84	.82	.76	--

* $p<.05$; ** $p<.01$, ^ = .06
[a] r values corrected for Cronbach's α coefficient $<.7$

ance-avoidance $p<.001$). Cronbach's α coefficients were below the acceptable level ($<.7$) for three test emotions: hope, pride and shame. Low reliability coefficients can result in an underestimation of Pearson's r coefficients, increasing the possibility of making a type 2 error, that is concluding no relationship is present when in actuality, there is. Pearson's r coefficients for these subscales were corrected for this possibility using the calculation provided by Kline (2000): $r_o / (\sqrt{r_{s1}} \times \sqrt{r_{s2}})$ where r_o is the observed value of r, and r_{s1} and r_{s2} represent the Cronbach's α coefficients of the two scales. These values, however, should be interpreted with caution.

Bivariate correlations

Table 2 also reports the Pearson's r correlations for test emotions, achievement goals and examination performance. With the exception of relief, pleasant test emotions were positively related with each other. Relief was inversely related to joy and hope. Unpleasant test emotions were positively related to each other and, in general, inversely related to pleasant test emotions. Exceptions were noted for the relationships for relief with anger and hopelessness, and anxiety with pride. Pride was positively related with examination performance, shame and hope were inversely related.

Performance-approach and performance-avoidance goals were positively related and an inverse relationship between a mastery and performance-approach goal approached significance. Mastery and performance-approach goals were unrelated. A mastery goal was positively related to examination performance and a performance-avoidance goal inversely related. A performance-approach goal was unrelated to examination performance. Several significant relationships were observed between achievement goals and test emotions. A mastery goal was positively related to pride and inversely related with shame and hopelessness. A performance-avoidance goal was inversely related to pleasant emotions, with the exception of relief, and positively related

to unpleasant emotions. A performance-approach goal was positively related to two pleasant emotions: hope and relief.

Mediational Analysis

A further aim of this study was to establish if a hierarchical model of test anxiety and performance goals could be expanded to incorporate other test emotions, both positive and negative, and mastery goals. In this model, achievement goals are theorised as mediating the relationship between test emotions and performance (Elliot & MgGregor, 1999; Pekrun et al., 2002). The analytic rationale used in this study for establishing a mediating variable follows the modus operandi suggested by Baron & Kenney (1986) who suggest this analysis should be conducted in three steps. First, establish if the predictor variable (test emotions) is related to the mediating variable (achievement goals). Second, establish if the mediator is related to the outcome variable (examination performance). Third, establish if any reduction in the direct relationship between test emotions and examination performance arises when the mediating variable, achievement goals, is entered into the model. A reduction in the direct relationship would indicate achievement goals as a mediating variable. A Sobel test of z scores can be used to establish if this reduction in direct relationship is significant.

The first two criteria were assessed using Table 2 for guidance suggesting three possible mediational tests: 1. Does mastery mediate the relationship between pride and examination performance? 2. Does performance-avoidance mediate the relationship between shame and examination performance? 3. Does performance-avoidance mediate the relationship between hopelessness and examination performance? In order to test these mediational hypotheses, three hierarchical regression analyses were conducted (one each for pride, shame and hopelessness) in two steps. In the first step, examination performance was predicted from the test emotion and in the second step, the relevant achievement goal was

Table 3: Meditational analyses

| Outcome/ Mediator	β	R^2	ΔR^2
1. *Mastery as a mediator of pride and examination performance*			
Step 1 Pride	.21*	.04	
Step 2 Pride	.12 (ns)	.12	.08**
Mastery	.29**		
2. *Performance avoidance as a mediator of shame and examination performance*			
Step 1 Shame	-.33***	.11	
Step 2 Shame	-.27**	.14	.03*
Performance avoidance	-.18*		
3. *Performance avoidance as a mediator of hopelessness and examination performance*			
Step 1 Hopelessness	-.22*	.05	
Step 2 Hopelessness	-.13 (ns)	.09	.04*
Performance avoidance	-.22*		

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

added to the model. Table 3 reports the findings from these analyses.

A significant direct relationship between pride and examination performance ($p=.02$) became non-significant ($p=.17$) when a mastery goal was added to the model suggesting that mastery fully mediated this relationship. A Sobel test indicated this effect was significant ($z=1.89$, $p=.03$). The significance of the direct relationship between shame and examination performance ($p<.001$) was reduced ($p=.004$) when a mastery goal was added to the model suggesting that a performance approach goal was a partial mediator of this relationship. A Sobel test indicated this effect was significant ($z=1.77$, $p=.03$). A significant direct relationship between hopelessness and examination performance ($p=.02$) became non-significant ($p=.18$) when a performance avoidance goal was added to the model suggesting that performance avoidance fully mediated this relationship. A Sobel test indicated this effect was significant ($z=2.09$, $p=.02$). These relationships are diagrammed in Figure 1. The mediated relations between test emotions and examination performance are reported in parenthesis.

Discussion

The aim of this study was to establish the relations between test emotions, achievement goals and examination performance using an expanded integrative hierarchical model. Findings indicated that self-reported pleasant test emotions and unpleasant test emotions were clustered together and inversely related to one another. A mastery goal was positively related to pride and inversely related to shame and hopelessness. A performance-avoidance goal was positively related with pleasant test emotions, with the exception of relief, and inversely related to unpleasant test emotions. A performance-approach goal was positively related to hope and relief. Students who reported stronger shame, hopelessness and a performance-avoidance goal performed worse in their examination and students who reported greater pride and a mastery goal performed better. The mediational analysis reported that the pride – examination performance relationship was attributable to students holding a mastery orientation, the shame – examination performance relationship was partly attributable to students holding a performance-avoidance

1. *Mastery as a mediator of pride and performance*
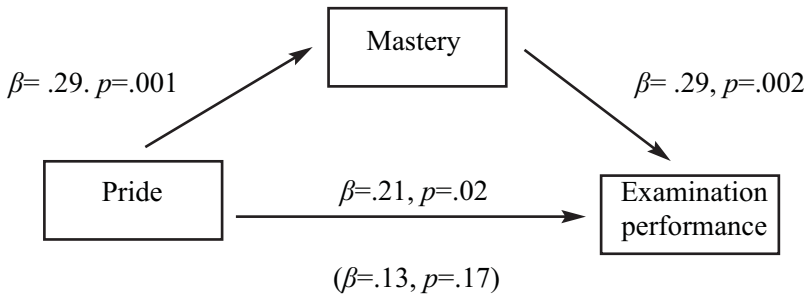
$\beta= .29. p=.001$ Mastery $\beta= .29, p=.002$

Pride $\beta=.21, p=.02$ Examination performance

$(\beta=.13, p=.17)$

2. *Performance avoidance as a mediator of shame and examination performance*

$\beta= .37. p<.001$ Performance avoidance $\beta= -.18, p=.05$

Shame $\beta= -.33, p<.001$ Examination performance

$(\beta= -.27, p=.004)$

3. *Performance avoidance as a mediator of hopelessness and examination performance*

$\beta= .38. p<.001$ Performance avoidance $\beta= -.18, p=.05$

Hopelessness $\beta= -.22, p=.02$ Examination performance
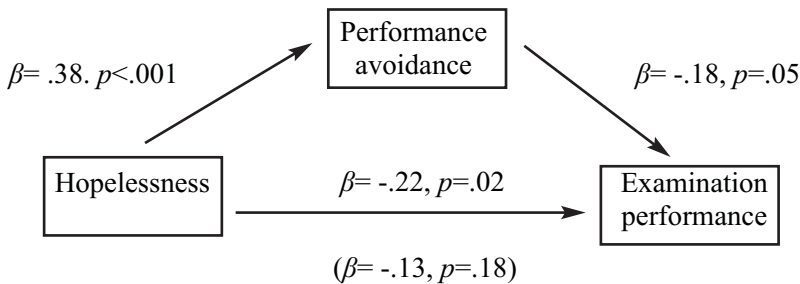
$(\beta= -.13, p=.18)$
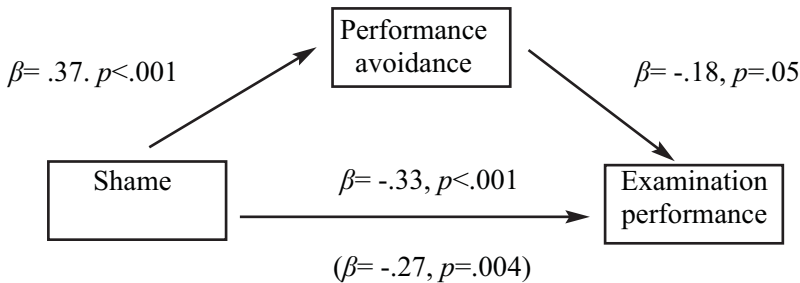
Figure 1: Diagrammatic representation of mediational tests

orientation, and the hopelessness – examination performance relationship was attributable to students holding a performance-avoidance orientation.

The pattern of relations between test emotions is largely consistent with Pekrun et al. (2004) who also reported inconsistent effects for relief; significant in some studies,

but not in others. The reliability coefficients for hope, relief and shame are much lower than those reported by Pekrun et al. (2004) and although adjustments were made, findings for these scales should be considered as provisional and replicated before the conclusions offered in this study are accepted. It is not wholly clear why Cronbach's α coeffecients are lower in this study, and the test emotions questionnaire may require further scrutiny and revalidation for use in a UK higher education context. The relationships between test emotions and examination performance only partially replicate the previous findings of Pekrun et al. (2004). Of the pleasant test emotions, only pride showed a significant relationship with examination performance in contrast with Pekrun et al. who found significant relationships with joy and hope as well (the relationships with relief were mixed). Significant inverse relations were reported between examination performance and shame and hopelessness whereas Pekrun et al. also found significant inverse relations with anxiety and anger.

The relationships between achievement goals and examination performance support predictions that only mastery and performance-avoidance goals would be related to examination performance due to task type (problem, rather than recall, based) and are consistent with the literature suggesting that a mastery orientation is adaptive for learning and a performance-avoidance goal is associated with negative outcomes. Although mastery goals may be associated with positive outcomes other than achievement (see Elliot, 2005) such as academic efficacy (e.g. Anderman & Young, 1994; Midgley, Anderman & Hicks, 1995; Midgley & Urdan, 1995; Wolters et al., 1996), effective learning strategies (e.g. Ames & Archer, 1988; Anderman & Young, 1994; Wolters et al., 1996) and help-seeking behaviour (e.g. Ryan & Pintrich, 1997), the results of this study did find a positive relation with performance. However, the finding that a performance-approach goal was unrelated to performance is not consistent with literature usually showing a

positive relation with performance (e.g. Elliot & Church, 1997) but can be accounted for by Butler's (2007) hypothesis that the association between achievement goals and performance is determined by the task type.

The predicted pattern of relations between achievement goals and test emotions was partially supported. Predictions for a performance-avoidance goal were unequivocal where positive relations were observed with anxiety, hopelessness and shame. Predictions for a performance-approach goal were unequivocal where a positive relation was observed with hope, but not pride and do not provide empirical support for Elliot and Pekrun's (2007) suggestion that in principle performance-approach goals could be related to threat affect. Predictions for a mastery goal were also equivocal where an inverse relation was observed with anger but not joy. These findings provide partial support for Pekrun et al.'s (2002) cognitive-motivational model and suggest that is may be possible to include a broader range of relations between discrete test emotions and achievement goals than was previously thought. The strongest relations observed in this study were between a performance-avoidance goal and test emotions, suggested a general trend whereby a performance-avoidance goal is inversely related to challenge affect and positively related to threat affect.

The expanded integrated hierarchical model of test emotions and achievement goals was partially supported. The relationships between three test emotions, namely pride, shame and hopelessness, and examination performance were mediated by achievement goals. It is important to specify at this point that for the remaining five test emotions, the model was not supported due to meditational tests with achievement goals proving inconclusive or non-significant, but because no direct relationships were observed with examination performance. The findings of Elliot and McGregor's (1999) original integrated hierarchical model regarding test anxiety and perform-

ance goals were not replicated as no direct relationship was observed between anxiety and performance. This particularly surprising given the test anxiety–performance relationship has been well established in the literature (e.g. Hembree, 1988; Seipp, 1991). Nonetheless, the understanding of how emotional and motivational mechanisms of performance interact has been furthered here by showing how some emotions are associated with approach motivations and other emotions with avoidant motivations. In some respects, the test of the expanded hierarchical model was limited by only three of the eight direct relationships being significant. As the previous findings of Pekrun et al. (2004) suggest that all eight relationships could be related to performance it would be prudent not to draw any firm conclusions regarding the expanded integrated hierarchical model and the mediating role of achievement goals until further data has been collected to establish equivocally whether all eight test emotions included in Pekrun et al.'s (2004) measure are related to performance, or whether relationships may occur under particular conditions.

An additional limitation of this study concerns the collection of both achievement goals and test emotion data at the same measurement point, thus precluding any kind of causal analysis. While the direction of paths has been mapped out in Figure 1 from test emotions to achievement goals and again to achievement, these should not be interpreted in causal terms. Pekrun et al. (2002), and others, have noted how test emotions and achievement goals would necessarily interact in a reciprocal fashion over time. For instance, a strong experience of pride following a particular assessment may facilitate a stronger mastery goal, which in turn would facilitate further challenge affect. Follow-up research would benefit by not only collecting achievement goals and test emotions data at different measurement points to effect a causal analysis, but also using multiple measurement points for each, to estab-

lish how they might interact reciprocally over time.

Nonetheless, these findings do begin to indicate ways in which different emotions are related to different motivations in a higher education context and how they relate to achievement. The finding which may of be most interest to those involved in the design, delivery and assessment of higher education courses relate to the relations between performance-avoidance goals and challenge/threat emotions. Although a mastery environment has been traditionally promoted in higher education, and indeed was endorsed more strongly than the other goals in this study, practitioners may wish to reflect on two questions in particular: First, why are students holding performance-avoidance goals/experiencing threat emotions? Second, how can performance-avoidance goals/threat emotions be reduced? The reciprocal model of test emotions and achievement goals suggests that either emotions or goals could be the point of change or intervention at which to break in to such a cycle. An explicit awareness that student's emotions and achievement goals may be playing an important role in student achievement may assist course administrators in providing additional opportunities for students to engage in activities designed to promote challenge affect or mastery experiences may help to effect a change. One such approach reported by Sumner, Ralley and Yale (2008) involved an action research cycle where the implicit 'psychological contract' between teaching staff and students was made explicit in an integrated first year curriculum for an undergraduate degree. Although the aim of this strategy was not to change achievement goals, per se, its broad aims where comparable: to stimulate mastery goals and independent learning for students in a widening participation higher education context with a high degree of tutorial/mentoring support to provide a 'safe' environment, a buffer against unpleasant emotions and avoidance motivation. It would make for interesting future research if these type of projects

included measures of achievement goals and test emotions when evaluating their impact.

This study has provided at least three suggestions for future research. First, further work is required to examine the construct validity and reliability of test emotions questionnaire, particularly in a UK higher education context. Second, future research should consider using different measurement points for achievement goals and test emotions to effect a causal analysis. Third, interventions and/or changes to higher education courses designed to promote challenge affect or approach motivation which included measures of achievement goals and test emotions may assist the evaluation of such programmes while helping to build a research base on which good practice can be based.

Conclusion

A complex pattern of results emerged in this study in which the predictions made by Pekrun et al.'s (2002) cognitive-motivational model and the expanded hierarchical model were partially supported. The lack of direct relationships between some test emotions and examination performance relationships meant that only a limited test of the expanded integrated hierarchical model was possible. It is not wholly clear why only some of the direct test emotions and examination performance relationships were significant in this study, but it is encouraging that all three of the meditational tests that it was possible to conduct in this study were supported. Low scale reliability coefficients reported in the study suggest that these findings should be considered provisional and replicated in future work.

Address for correspondence
Dr Dave Putwain AFBPsS, Senior Lecturer in Psychology, Department of Social and Psychological Sciences, Edge Hill University, St Helens Road, Ormskirk, L39 4Q. Tel: 01695 584498

References

Anderman, E. & Young, A. (1994). Motivation and strategy use in science: individual differences and classroom effects. *Journal of Research in Science Teaching, 31*(8), 811–831.

Ames, C. (1992). Classrooms: Goals, structures and student motivation. *Journal of Educational Psychology, 84*(3), 261–271.

Ames, C. & Archer, J. (1987). Mothers' beliefs about the role of learning and effort in school learning. *Journal of Educational Psychology, 79*(4), 409–414.

Ames, C. & Archer, J. (1988). Achievement goals in the classroom: Students learning strategies and motivational processes. *Journal of Educational Psychology, 30*(3), 260–267.

Baron R.M. & Kenny, D.A. (1986). The moderator-mediator variable distinction in social psychological research: conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173–1182.

Beard, C., Clegg, S. & Smith, K. (2007). Acknowledging the affective in higher education. *British Educational Research Journal, 33*(2), 253–271.

Butler, R. (2006). Are mastery and learning goals adaptive? Evaluation, initial goal construction and the quality of task engagement. *British Journal of Educational Psychology, 76*(3), 595–611

Chouinard, R., Karsenti, T. & Roy, N. (2007). Relations among competence beliefs, utility value, achievement goals, and effort in mathematics. *British Journal of Educational Psychology, 77*(3), 501–517.

Covington, M.V. & Omelich, C.L. (1988) Achievement dynamics: the interaction of motives, cognitions and emotions over time. *Anxiety Research, 1*(3), 165–183.

DeBacker, T.K. & Crowson, H.M. (2006). Influences on cognitive engagement and achievement: Personal epistemology and achievement motives. *British Journal of Educational Psychology, 76*(3), 535–551.

DeBacker, T.K. & Nelson, R.M. (1999). Variations on an expectancy-value model in science. *Contemporary Educational Psychology, 24*(2), 71–94.

DeBacker, T.K. & Nelson, R.M. (2000). Motivation to

learn science: Differences related to gender, class type, and ability level. *Journal of Educational Research, 93*(4), 245–254.

Dweck, C.S. & Leggett, E.L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*(2), 256–273.

Elliot, A.J. (1997). Integrating the classic and contemporary approaches to achievement motivation: A hierarchical model of approach and avoidance achievement motivation. In M.L. Maehr & P.R. Pintrich (Eds.) *Advances in motivation and achievement* (vol. 10, pp. 143–179). Greenwich, CT: JAI Press.

Elliot, A.J. (1999). Approach and avoidance motivation and achievement goals. *Educational Psychologist, 34*(3), 169–189.

Elliot, A.J. (2005). A conceptual history of the achievement goals construct. In A.J. Elliot & C.S. Dweck (Eds.) *Handbook of competence and motivation.* London: Guildford Press.

Elliot, A.J. & Church, M. (1997) A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 72*(1), 218–232.

Elliot, A. J. & Harackiewicz, J.M. (1996). Approach and avoidance achievement goals and intrinsic motivation: A mediational analysis. *Journal of Personality and Social Psychology, 70*(3), 461–475.

Elliot, A.J. & McGregor, H.A. (1999). Test anxiety and the hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 76*(4), 628–644.

Elliot, A.J. & McGregor, H.A. (2001). A 2 x 2 achievement goal framework. *Journal of Personality and Social Psychology, 80*(3), 501–519.

Elliott E.S. & Dweck, C.S. (1988). Goals: An approach to motivation and achievement. *Journal of Personality and Social Psychology, 54*(1), 5–12.

Eysenck, M.W. Santos, R., Derekeshan, N. & Calvo, M.G. (2007). Anxiety and cognitive performance: Attentional control theory. *Emotion, 7*(2), 336–353.

Femollar, P., Román, S. & Cuestas, P.J. (2007). University students' academic performance: An integrative conceptual framework and empirical analysis. *British Journal of Educational Psychology, 77*(4), 873–892.

Fredrickson, B.L. (2001). The role of positive emotions in positive psychology: The broaden and build theory of positive emotions. *American Psychologist, 56*(3), 218–226.

Fredrickson, B.L. (2004) The broaden and build theory of positive emotions. *Philosophical Transactions of the Royal Society of London B, 359*(9), 1367–1377.

Greene, B.A., DeBacker, T.K., Ravindran, B. & Krows, A.J. (1999). Goals, values, and beliefs as predictors of achievement and effort in high school mathematics classes. *Sex Roles, 40*(5), 421–458.

Greene, B.A. & Miller, R.B. (1996). Influences on

achievement: Goals, perceived ability, and cognitive engagement. *Contemporary Educational Psychology, 21*(2), 181–192.

Hagtvet, K.A., & Benson, J. (1997). The motive to avoid failure and test anxiety responses: Empirical support for integration of two research traditions. *Anxiety, Stress and Coping, 10*(1), 35–57.

Harackewicz, J.M., Baron, K.E. & Elliot, A.J. (1998). Rethinking achievement goals: When are they adaptive for college students and why? *Educational Psychologist, 33*(1), 1–21.

Hembree, R. (1988). Correlates, causes, effects and treatment of test anxiety. *Review of Educational Research, 58*(1), 47–77.

Hill, K.T. & Wigfield, A. (1984). Test anxiety: Major educational problem and what can be done about it. *The Elementary School Journal, 85*(1), 105–126.

Hong, E. (1999). Test anxiety, perceived test difficulty, and test performance: Temporal patterns of their effects. *Learning and Individual Differences, 11*(4), 431–447.

Kline, P. (2000). *A psychometrics primer.* London: Free Association Books.

Lau, K.L. & Lee, J.C.K. (2008). Validation of a Chinese achievement goal orientation questionnaire. *British Journal of Educational Psychology, 78*(2), 331–353.

Lowe, P.A., Lee, S.W.,Witteborg, K.M., Pritchard, K.W., Luhr, M.E. et al. (2008). The Test Anxiety Inventory for Children and Adolescent. *Journal of Psycheducational Assessment, 26*(3), 215–230.

McDonald, A.S. (2001). The prevalence and effects of test anxiety in school children. *Educational Psychology, 21*(1), 89–101.

Meijer, J. (2001). Learning potential and anxious tendency: Test anxiety as a bias factor in educational testing. *Anxiety, Stress and Coping, 14*(4), 337–362.

Middleton, M. & Midgley, C. (1997). Avoiding the demonstration of lack of ability: an under explored aspect of goal theory. *Journal of Educational Psychology, 89*(4), 710–718.

Midgley, C., Anderman, E.M. & Hicks, L. (1995). Differences between elementary and middle school teachers and students: A goal theory approach. *Journal of Early Adolescence, 15*(1), 90–113.

Midgley, C., Kaplan, A. & Middleton, M. (2001) Performance-approach goals: Good for what, for whom, and under what circumstances, and at what cost? *Journal of Educational Psychology, 93*(1), 77–86.

Midgley, C. & Urdan, T. (2005) Predictors of middle school students' use of self-handicapping strategies. *Journal of Early Adolescence, 15*(4), 389–411.

Pekrun, R., Goetz, T., Perry, R.P., Kramer, K., Hochstadt, M. & Molfenter, S. (2004). Beyond test anxiety: Development and validation of the Test Emotions Questionnaire (TEQ). *Anxiety, Stress and Coping, 17*(3), 287–316.

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.

Ryan, A.M. & Pintrich, P.R. (1997). 'Should I ask for help?' The role of motivation and attitudes in adolescents' help-seeking in math class. *Journal of Educational Psychology 89*(2), 329–341

Sammons, P., Day, C., Kington, A., Gu. Q., Stobart, G. & Smees, R. (2007). Exploring variations in teachers' work, lives and their effects on pupils: key findings and implications from a longitudinal mixed-method study. *British Education Research Journal, 33*(5), 681–701.

Seipp, B. (1991). Anxiety and academic performance: A meta-analysis of recent findings. *Anxiety Research, 4*(1), 27–41.

Schunck, D. (1996) Goals and self-evaluative influences during children's cognitive skill learning. *American Educational Research Journal, 33*(2), 359–382.

Spielberger, C.D. & Vagg, P.R. (1995). Test anxiety: A transactional process model. In C.D. Speilberger & P.R. Vagg (Eds.) *Test anxiety: Theory, assessment and treatment.* Bristol: Taylor & Frances.

Sumner, L., Ralley, R. & Yale. A. (2008). *Empowering student learning.* Poster presented at the British Psychological Society Education Section Conference, 31 October – 2 November 2008, Milton Keynes.

Urdan, T. & Turner, J.C. (2005). Competence motivation in the classroom. In A.J. Elliot and C.S. Dweck (Eds.) *Handbook of competence and motivation* (pp. 297–317). London: Guildford Press.

Tobias, S. (1992). The impact of test anxiety on cognition in school learning. In K.A. Hagtvet & T.B. Johnsen (Eds.) *Advances in Test Anxiety Research, 7* (pp. 18–31). Lisse, The Netherlands: Swets & Zeitlinger.

Wolters, C.A., Yu, S.L. & Pintrich, P.R. (1996). The relation between goal orientation and students' motivational beliefs and self-regulated learning. *Learning and Individual Differences, 8*(3), 211–238.

Zeidner, M. (1998) *Test anxiety: The state of the art.* New York: Plenum.