Fear appeals used prior to a high-stakes examination: What makes them threatening?

Abstract

Prior to high-stakes examinations teachers use messages that focus on avoiding failure as a motivational strategy. Such messages, referred to as fear appeals, have been linked with negative outcomes. The strength of that link is determined by whether fear appeals are appraised by students as threatening. The aim of this study was to examine whether the threat appraisal of fear appeals was predicted from frequency of message use, academic self-efficacy and subjective values (intrinsic, attainment and extrinsic). 544 secondary school students clustered in thirty mathematics classes completed measures of academic self-efficacy, subjective values and fear appeals (both frequency and threat). Fear appeals were appraised as more threatening when students reported lower academic self-efficacy, were in classes where their teacher made more frequent fear appeals concerning the consequences of failure and when the class was composed of students with low intrinsic, but high extrinsic, values. Students differ in the extent to which they appraise fear appeals as threatening. Teachers and instructors would be advised to consider how they convey the importance of high-stakes examinations to students as well as how messages might be received by different students.

Keywords: Fear appeals; persuasive messages; classroom environment; academic self-efficacy; subjective value

Introduction

Fear appeals are persuasive messages designed to elicit a change in behaviour to avoid some kind of unwanted outcome (Maloney, Lapinski, & Witte, 2011; Witte & Allen, 2000). The majority of work conducted on fear appeals, to date, has focused on attempts in the health literature to promote behaviour change (e.g., smoking cessation, safe sex practices) by varying the degree of threat and efficacy beliefs in the alternative course(s) of action required to avoid that threat (e.g. Ruiter, Abraham, & Kok, 2001; Peters, Ruiter, & Kok, 2013; Smerecnik & Ruiter, 2010). However, there is a small emerging literature concerning the use of fear appeals in an educational and instructional context as a means to motivate and engage students by highlighting the consequences of examination failure and the associated unwanted outcomes that may follow failure. Research has shown how fear appeals, used in this educational context, have unanticipated negative consequences including higher test anxiety, lower motivation and lower academic performance, especially when appraised as threatening (e.g., Putwain & Best, 2011; Putwain & Remedios, 2014; Sprinkle, Hunt, Simonds, & Comadena, 2006). In this study, we examine the important question of why some students might appraise fear appeals as more threatening.

Classroom fear appeals: What are they and what is their relevance?

Prior to high-stakes examinations, teachers and school leaders communicate messages to students about the importance of academic credentials for their future life trajectories (Putwain, 2009). Teachers may specify, for instance, how entry requirements for college or entry into the labour market may depend on particular grades or clusters of grades. Fear appeals are examples of such messages that focus on the possibility of failure, what outcomes might arise from failure (e.g., difficulty in finding a job, not being able to further one's education) and how such outcomes can be avoided (e.g., paying attention in class, making an effort to prepare for forthcoming exams) (Putwain & Roberts, 2009, 2012). They are

persuasive messages attempting to motivate students to engage in those activities likely to avoid failure (Sprinkle et al., 2006). Both teachers and students report that they are used relatively frequently prior to high-stakes tests such as the General Certificate of Secondary Education[1] (Putwain & Remedios, 2014; Putwain & Roberts, 2012).

Although fear appeals may be intended as a motivational tactic the emerging evidence suggests that they are having a range of unanticipated and unwanted educational outcomes. The use of fear appeals prior to examinations has been associated with increased test anxiety (Putwain & Best, 2011, 2012), increased performance avoidance goals (Putwain & Symes, 2011a,b), decreased self-determined motivation (Putwain & Remedios, 2014) and a decrease in examination performance (Putwain & Best, 2011, 2012; Putwain & Remedios, 2014; Putwain & Symes, 2011a). These findings are consistent with research findings from adjacent areas of educational research showing that punishment and threat-based approaches to instruction and classroom interaction are associated with reduced motivation and increased negative affect (e.g., Assor & Kaplan, 2001; Assor, Kaplan, Kanat-Maymon, & Roth, 2005; Kearney, Plax, Richmond and McCroskey, 1985; Mainhard, Brenkelmans, & Wubbels, 2011; Plax & Kearney, 1992; Reeve, 2009; Richmond, 1990; Richmond, McCroskey, Kearney, & Plax, 1990; Ryan & Deci, 2000).

We would argue that the relevance of fear appeals as an educational practice worthy of investigation can be established on two grounds. First, they may be having unwanted and possibly damaging consequences. Second, they are used relatively frequently. A critical finding to emerge from the fear appeals research cited above is that degree of perceived threat by the student determines the strength of the outcome. That is, fear appeals predict higher test anxiety and performance-avoidance goals and lower self-determined motivation and

[1] The General Certificate of Secondary Education (GCSE) is the school leaving qualification taken in England, Wales and Northern Ireland. The GCSE programme of study is usually taken over Years 10 and 11 (the final two years of secondary education) and students sit exams at the end of Year 11 (aged 15-16 years).

examination performance when they are appraised as threatening by students. If the impact of fear appeals depends, in part, on how they are appraised it therefore becomes imperative to establish what influences the appraisal of fear appeals as more or less threatening by students.

Frequent classroom fear appeals leads to increased threat

Previous research has reported that when teachers make more frequent fear appeals those fear appeals are appraised as more threatening (Putwain & Best, 2011; 2012; Putwain & Roberts, 2009; Putwain & Symes, 2011a,b). This finding fits with long-standing evidence from the social-psychological literature that repetition of persuasive messages can lead to greater impact (e.g., Cacioppo & Petty, 1989; Garcia-Marques & Mackie, 2001; Moons, Mackie & Garcia-Marques, 2009). The frequency of teachers' fear appeals is ostensibly a classroom environment, or climate, construct (cf. Marsh et al., 2012); the referent is the (verbal) behaviour of the teacher that is common across the class. However, the classroom-based fear appeals research cited above has not used the appropriate techniques to aggregate self-reports from individual students to create a classroom level construct. There is a danger that classroom level influences might have been wrongly attributed to idiosyncratic student perceptions of the environment. In this study we correct this limitation by aggregating student reports of the frequency of fear appeals across different classes and using a multilevel approach to the modelling of data.

Individual predictors of threat: subjective value and academic self-efficacy

Appraisal is considered a two-part process (Carver & Scheier, 1998; Folkman, 2008; Lazarus, 2006). Primary appraisal is judged through the meaning or significance of an event and secondary appraisal is judged through the resources or options available to deal with that event. This framework is consistent with health-based models of fear appeals, such as the extended parallel process model (Maloney et al., 2011; Witte & Allen, 2000), and models of appraisal specific to educational settings, such as the control-value theory (e.g., Pekrun, 2006;

Pekrun, Frenzel, Goetz, & Perry, 2007; Pekrun, Goetz, Titz & Perry, 2002). According to the extended parallel process model the threat content of the messages is established through an appraisal of the importance of the negative outcome and one's capability of performing those actions required to avoid failure (Anderson, 2000; Cismaru, Nagpal, & Krishnamurthy, 2009; Feng & Burleson, 2008; Umphrey, 2004). Similarly, control-value theory suggests that in competence-evaluative situations appraisals are made on the basis of the subjective value of the activity or outcome and one's capacity to effect and control the desired outcome (Frenzel, Pekrun, & Goetz, 2007; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Pekrun, Goetz, Perry, Kramer, Hochstadt,,& Molfenter, 2004).

A fear appeal made prior to a high-stakes examination would be appraised as significant and meaningful if the examination outcome was valued. Drawing on expectancy-value theory (Eccles, 2007; Eccles, O'Neill, & Wigfield, 2005) perceived value judgements can be made in relation to intrinsic, attainment or extrinsic values. Intrinsic value is when a task or subject is seen as enjoyable and interesting in itself. Attainment value is when performance and grade outcomes are perceived to be important for core personal values. Extrinsic (or utility) value is when a task or subject is viewed as instrumental in reaching short- or long-term goals. Psychological threat is higher when extrinsic goals are valued over intrinsic goals (e.g., Kasser, 2002; Sheldon & Kasser, 2008) and intrinsic value has been shown to protect against out-group threat in adolescent students (Duriez, Meeus, & Vansteenkiste, 2012). Fear appeals are appraised as more threatening when attainment value is high because failure threatens personal aspirations and goals (Putwain & Symes, 2014). Thus, variations in subjective values (intrinsic, attainment and extrinsic) might be an important explanation of whether appraisals are perceived as threatening.

The appraisal of a fear appeal as more or less threatening would also depend on academic self-efficacy; the belief that one is capable of performing actions required to effect

a particular outcome (Bandura, 1997). If a student holds competence beliefs that they are capable of passing or performing well on the examination in which fear appeals are being made (i.e. they have control over the outcome), they are less likely to appraise the fear appeal as threatening, even if valued for extrinsic or attainment reasons. Research has shown that test anxiety, which is indicative of a threat appraisal (see Zeidner & Matthews, 2005), is lower when students hold efficacious beliefs indicative of success rather than failure (Pekrun, Goetz, Perry, Kramer, Hochstadt,& Molfenter, 2004; Preiss, Gayle & Allen, 2006), even when task importance and value is high (Nie, Lau, & Liau, 2011). The evidence, therefore, strongly suggests that self-efficacy should play at least some, if not a critical, role in determining the likelihood of threat appraisals.

Contextual predictors of threat

Subjective value and academic self-efficacy may explain variance in the threat appraisal of fear appeals at both individual and classroom levels (referred to as a contextual predictor). Classroom fear appeals and contextual subjective value/ academic self-efficacy are all class-level constructs that can be built out of aggregated student reports, but differ in their referent (Marsh et al., 2012). The student is the referent for contextual subjective value/ academic self-efficacy and the teacher's (verbal) behaviour is the referent for fear appeals (as a classroom environment/climate construct). Classic work into contextual predictors (the 'big-fish, little pond' effect) has shown how a positive relationship can exist between academic self-concept and academic achievement at the student level, but a negative relationship at the class level (e.g., Marsh, 2006; Marsh & Martin, 2011). Thus it is possible that the threat appraisal of a fear appeal may be influenced by the overall composition of class subjective value and academic self-efficacy in an direction opposite to that expected by extended parallel process model and control-value theory.

Aim of the study

The aim of the study was to examine those factors that might lead to the appraisal of fear appeals as threatening using a multilevel approach. We hypothesised (H_1) that fear appeals would be appraised as more threatening when teachers made more frequent fear appeals. As the frequency of fear appeals was a classroom environment variable, this would account for between-class variance in threat appraisal of fear appeals. We hypothesised (H_2) that fear appeals would be appraised by individual students as more threatening when students had low intrinsic value, high attainment value and high extrinsic value. As this hypothesis pertained to individual student perceptions, it would account for within-class variance in threat appraisal of fear appeals. We also explored whether subjective value and academic self-efficacy had a contextual effect (i.e. explained any between-class variance in threat appraisal of fear appeals) but do not offer any specific hypotheses.

Given that the constructs in this study are highly sensitive to different subject domains (Bandura, 1997; Bong, 2001), we focused on a single academic subject, mathematics. We chose to focus on mathematics partly as it is a statutory subject, hence providing a larger target sample and partly due to the high-stakes nature of mathematics. A pass grade is required as a basic requirement for entry to the labour market and access to post-compulsory vocational or academic education, irrespective of whether the programme of study includes mathematics content (Onion, 2004; Roberts, 2004). Thus we reasoned, fear appeals might be more prevalent and carry more weight in the context of mathematics, than in subjects that were not critical for labour market entry or entry to post-compulsory education. Although English carries the same high-stakes nature as mathematics (it is also required for any post-compulsory education and for entry to the labour market) both of our participating schools preferred to focus on mathematics.

Method

Participants

A total of 544 (271 male, 273 female) students attending two English secondary schools participated in the study. Participants were grouped for instructional purposes into thirty different mathematics classes on the basis of their mathematics ability (average class size n = 18.3 students). Students were following the eighteen-month GCSE programme of study (Year 10, *n* = 197, Year 11, *n* = 344, 3 not reported). The mean age of participants was 14.95 years (*SD* = .63). They were not offered any incentive for participation.

Measures

Academic self-efficacy.

Academic self-efficacy, in the context of mathematics, was measured using the nine items from the *Motivated Strategies for Learning Questionnaire* (Pintrich & DeGroot, 1990). As the original items did not correspond to a particular subject domain, items and instructions were adapted to refer specifically to the mathematics GCSE instruction. Participants responded to items (e.g. 'I think I will receive a good grade in my mathematics GCSE') on a five-point scale (1 = strongly disagree, 3 = either agree nor disagree, 5 = strongly agree) so that a higher score represents greater academic self-efficacy. The internal reliability coefficient (see Table 1) was acceptable ($\alpha \geq .7$).

Subjective value.

The subjective value of mathematics was measured using a modified version of the *Michigan Study of Adolescent Life Transitions* scales (Eccles et al., 2005). Items were adapted to refer specifically to GCSE mathematics and two additional items were newly written to ensure three items per scale. Extrinsic value was measured using adapted versions of the two original items and one additional item ('How useful is learning GCSE mathematics for getting a job or going to college?'). Attainment value was measured using adapted versions of the three original items (e.g. 'How important is it to you to get good grades in GCSE mathematics?'). Intrinsic interest value was measured using adapted versions of the two

original items and one additional item ('In general, I find GCSE mathematics lessons…very boring/ very interesting'). Participants rated their endorsement on a 5-point scale (1 = very boring/ not important, 3 = neither, 5 = very interesting/ very important). Internal reliability coefficients (see Table 1) were acceptable ($\alpha \geq .7$).

Fear appeals.

The perceived frequency and threat of fear appeals were measured using the fourteen-item *Teachers' Use of Fear Appeals Questionnaire* (Putwain & Roberts, 2009) in which instructions and items were made specific to the context of GCSE mathematics. This instrument provides scores on three scales: the perceived frequency with which fear appeals are made regarding the consequences of failure (e.g., 'How often do your teachers tell you that unless you work hard you will fail your mathematics GCSE?'), the perceived frequency with which fear appeals are made regarding the timing of forthcoming assessments (e.g., 'How often are you told the number of weeks or months until your mathematics GCSE exam by your teachers?') and the extent to which such messages are appraised as threatening (e.g. 'Do you feel worried when your teachers tell you that mathematics GCSE is important in order to get a good job?). Participants respond to items on a five-point scale (1 = never, 3 = sometimes, 5 = most of the time) so that a higher score represents greater frequency of fear appeals or appraisal of fear appeals as threatening. Internal reliability coefficients (see Table 1) were acceptable ($\alpha \geq .7$).

Procedure

Self-report data were collected in two waves. Academic self-efficacy and value (in a counterbalanced order) were measured in the first wave of data collection during December, one third of the way through the academic year. Perceived threat was measured in the second wave of data collection, approximately three months later during in February. Data were collected in school during a form period, a short timetabled lesson used for administrative

and pastoral activities. Form tutors were responsible for administering and collecting questionnaires and provided with a series of instructions detailing the purpose of the study, ethical considerations and a script which emphasised that the questionnaires did not constitute a test. Thus, questionnaires were not necessarily completed in the presence of regular mathematics classmates or teachers. Consent was provided by the Head Teacher at each participating school and we obtained individual student consent at both waves of measurement. All students who consented to participate in the first wave of data collection also participated in the second wave and no students took up our offer to retrospectively withdraw data. Parents were informed of the study via a letter and invited to respond if they did not wish for their son or daughter to participate.

Results

Preliminary analyses

Descriptive data are reported in Table 1. Internal reliability coefficients were all acceptable ($\alpha \geq .7$). Academic self-efficacy in mathematics was reported to be moderate to good. The attainment value of mathematics was valued most highly, followed by extrinsic value and intrinsic interest. Students reported their teachers making fear appeals *some* of the time to *quite a lot* of the time, which were reported to be threatening *some* of the time.

[Table 1 here]

Bivariate and intraclass correlations are reported in Table 2 for individual level variables. Intraclass correlation coefficients, ρ_I or ICC_1 (see Lüdtke, Robitzsch, Trautwein, & Kunter, 2009), were estimated from 'empty' multilevel models (i.e. with no predictors) using maximum likelihood estimation in SPSS v.20. Variance is portioned at individual (σ^2_W) and group levels (σ^2_B) allowing for the estimation of the variance attributable to differences between groups as a proportion of the total variance. Five percent of the variance in self-efficacy is attributable to the class-level, between 6-11% of variance value and between 10-

24% of the variance in fear appeals. Lee (2000) suggests that a hierarchical approach to data modelling is required when the proportion of variance in the outcome variable is ≥ 10%.

[Table 2 here]

Multilevel modelling of data

The appraisal of fear appeals as threatening was predicted from the frequency of teachers' fear appeals, students' academic self-efficacy and students' subjective values in mathematics using random-intercept multilevel regression models in SPSS v.20 with maximum likelihood estimation. The frequency of fear appeals, as a classroom environment construct, was created by aggregating individual student responses. In order to establish the extent to which student perceptions of the frequency of teachers' fear appeals were reliable we calculated intraclass correlation coefficients (ICC_2 as distinct from the ρ_I or ICC_1 – see Lüdtke et al., 2009) in which values ≥ .7 are adequate. ICC_2 coefficients for the perceived threat of fear appeals relating to both consequences and timing were calculated at .83 indicating that students were consistent in their reporting of teachers' frequency of fear appeals within a class. Academic self-efficacy and students' subjective values in mathematics were group-mean centred for individual student responses and aggregated when treated as a contextual predictor.

The results of the hierarchical regression analysis are shown in Table 3. Model 0 is an empty model which contained no predictors and shows the variance partition components. Model 1 adds in academic self-efficacy and subjective values as individual-level predictors. The change in model fit can be established using the change in in the -2 log likelihood (-2LL) statistic in which the number of model parameters correspond to a χ^2 distribution. Model 1 offered a significantly better fit, $\Delta\chi^2(4) = 118.27$, $p < .001$, which accounted for a reduction of 6.6% of the individual-level variance[2]. The appraisal of fear appeals as more threatening was

[2] The proportional reduction of variance at individual or class-levels is referred to as a local effect size (see Peugh, 2009)

predicted by lower academic self-efficacy (B = -.295, p <.001). Model 2, added group level contextual and environmental predictors, showed offered a significantly better fit, $\Delta\chi^2(6)$ = 32.51, p <.001, in which virtually all of the group level variance was accounted for. The appraisal of fear appeals as more threatening was predicted by lower intrinsic value (B = -.337, p <.05), higher extrinsic value (B = .562, p <.05) and more frequent use of fear appeals by the class teacher (B = .572, p <.001).

[Table 3 here]

Discussion

The aim of this study was to examine the threat appraisal of fear appeals from the frequency of fear appeals used by the teacher and students' academic self-efficacy and subjective values. Having established that 10% of the variance in threat appraisal occurred at the classroom level, we used a modelling approach that accounted for the hierarchical nature of the data. Our hypothesis that fear appeals would be appraised as more threatening when used more frequently (H_1) was partially supported. Students in classes where the teacher made more frequent fear appeals referring to the consequences of failure reported fear appeals to be more threatening. Fear appeals referring to the timing for forthcoming examinations were unrelated to threat appraisal. Our hypothesis that fear appeals would be appraised as more threatening when individual students had lower academic self-efficacy and intrinsic value, but higher extrinsic and attainment value (H_2) was partially supported. Students with lower academic self-efficacy reported fear appeals to be more threatening. Students' individual intrinsic, attainment and extrinsic values were unrelated to threat appraisal. However, students in classes composed of lower intrinsic, but higher extrinsic, values reported fear appeals to be more threatening.

The finding that fear appeals are appraised as more threatening when used more frequently supports findings from previous research (Putwain & Best, 2011; 2012; Putwain &

Roberts, 2009; Putwain & Symes, 2011a,b). Importantly, the use of a multilevel analytic approach in the present study used aggregated reports from individual students to appropriately construct fear appeals as a classroom level variable. The proportion of between-class variance (ρ_I or ICC_1) in classroom environment constructs is often less than .10 and rarely greater than .30 (e.g., Bliese, 2000; Marsh, Martin, & Cheng, 2008). The finding than between class variance for the frequency of teachers' fear appeals were .20 and .24 (for consequences and timing respectively) would suggest that teacher fear appeals are a classroom environment variable of substance and not attributable solely to idiosyncratic student perceptions of the environment. In other words, when teachers use fear appeals, pupils in their classes recognize them. Our findings also clarify that, at a between-class level, fear appeals must refer to failure and the consequences of failure to be appraised as threatening. Reminding students about the timing of forthcoming examinations is unrelated to threat even when those messages are used frequently. Indeed it could be questioned whether messages that are simply reminders of forthcoming examination that do not contain any explicit reference to threat should be considered as fear appeals at all.

The finding that students with low academic self-efficacy appraise fear appeals as more threatening supports our hypothesis derived from the extended parallel process model and control value theory. In the extended parallel process model (Maloney et al., 2011; Witte & Allen, 2000), students with low academic self-efficacy may perceive themselves to be more susceptible to the negative consequences presented in fear appeals (failure is more likely) and its outcomes (difficulty in obtaining further academic education or vocational training) or students may hold beliefs which indicate that they are unable to perform those behaviours (i.e., learning, effort and persistence) to avoid failure. In terms of control value theory (Pekrun, 2006; Pekrun et al., 2002, 2007), students with low self-efficacy believe they are not able to control the likelihood of success or avoid failure and this uncertainty over the

outcome leads to appraisal of fear appeals as threatening. This finding is also consistent with the test anxiety research showing that poor competence beliefs is associated with higher test anxiety, indicative of a threat appraisal (Pekrun et al., 2004; Preiss et al., 2006).

Results indicated that intrinsic and extrinsic values were a contextual, rather than individual level, predictor of threat appraisal. These findings are in line with previous research suggesting that intrinsic values protect against and extrinsic values can enhance perceived threat (e.g., Duriez et al., 2012; Kasser, 2002; Sheldon & Kasser, 2008). They are also consistent with a longstanding body of work in social psychology explaining the influence of social-environmental cues and norms on behaviour (e.g., Cialdini, Reno & Kallgre, 1990; Deutsch & Gerard, 1955) and emotions (e.g., Fischer, Manstead & Zaalberg, 2004; Frijda & Mesquita, 1994). The values salient in a particular class provide an important social-environmental source of information, and perhaps influence, over the meaning and significance of the forthcoming mathematics examination. For example, avoiding failure in GCSE mathematics is critical if you want to want to continue in post-compulsory education. The contextual influence of extrinsic value results in higher threat as the value presented in the fear appeal (e.g., mathematics is required to enter the labour market) matches one's personal value (e.g., to enter the labour market). The possibility of failure could threaten one's aspirations. The contextual influence of intrinsic value results in lower threat as the value presented in the fear appeal does not match one's personal value (e.g., mathematics problems are interesting). The possibility of failure does not threaten the interesting nature of mathematics problems.

It is somewhat surprising that subjective value did not emerge as a predictor of individual-level variance in threat appraisal. Both the control value theory and extended parallel process model suggest that an event (e.g. a forthcoming examination) must be appraised by the individual as meaningful in order to be subsequently appraised as

threatening. However, this finding does highlight the value of attending to the multilevel nature of fear appeals. Without taking into account between-class differences, intrinsic and extrinsic values may have been misattributed as an individual-level predictor of threat appraisal (Heck & Thomas, 2009). It is also surprising that attainment value did not emerge as a predictor of threat appraisal at either the individual or class levels. Models of test anxiety (e.g., Lowe et al., 2008; Putwain, 2008; Zeidner & Matthews, 2005) suggest that significance and meaning of forthcoming tests and examinations are judged in relation to the perceived stakes of that test. Fear appeals, when used in this context, may be judged in relation to the perceived stakes rather than the subjective value. Thus, it is not necessarily that fear appeals were judged as lacking in significance and meaning in our study, but rather the significance and meaning were judged in relation to the perceived stakes (that we would suggest were high).

A substantial proportion of individual-student variance in threat appraisal is left unaccounted for. Prior research has indicated that test anxiety and a performance-avoidance achievement goal (where the goal is to avoid performing worse than one's classmates) are significant predictors of threat appraisal (Putwain & Best, 2012; Putwain & Symes, 2011a,b). It is possible that such variables would account for the residual student-level variance shown in this study. We also speculate that a student's beliefs about the nature of ability and effort, whether ability is fixed or responsive to effort (see Dweck, 2003; Dweck & Molden, 2005), would also be a worthwhile variable to investigate. Students who believe that ability is fixed may appraise fear appeals as more threatening. Bringing together these different variables and constructs in a single model would offer a powerful analytic approach with which to identify individual predictors for the threat appraisal of fear appeals.

The major limitation of our study is that it is not possible to draw inferences about the direction of effects from academic self-efficacy, subjective values and classroom fear appeals

to threat appraisal. Although we used a two-wave design to separate threat from academic self-efficacy and subjective values by approximately three months, it is possible that autoregressive relations may still exist between academic self-efficacy/ subjective values and threat appraisal. Similarly, the perceived frequency and threat of fear appeals were measured at the same point. It is, therefore, possible that students with a tendency to appraise fear appeals as more threatening also report them as more frequent. These 'chicken and egg' type questions can be rectified by using a multi-wave, multi-measure panel design where academic self-efficacy, subjective value, frequency and threat are measured in at least two temporally separated waves of measurement. Cross-lagged paths from academic self-efficacy/ subjective value/ frequency to the appraisal of fear appeals as threatening, and vice versa, can be examined, after controlling for the pre-existing paths between academic self-efficacy, subjective value and the frequency and threat of fear appeals. Such studies are notoriously difficult to execute because of practicalities and pragmatics. The current study represents an important shift in sophistication in terms of study execution but if researchers could adopt a multi-wave, multi-panel design, some of the concerns related to autoregression could be addressed even more precisely.

The educational implications of our study rest on the finding that some students may find messages that focus on the consequences of failure threatening, even if well-intentioned and intended to be motivating. Irrespective of the question of causality, these are students with low academic self-efficacy that are located in classes composed of low intrinsic, but high extrinsic, values. Because research has shown the appraisal of fear appeals is related to predominantly negative outcomes, we would advise teachers and instructors to be thoughtful and reflective when considering the motivational strategies they employ prior to high-stakes tests and examinations. In particular we would suggest the following be taken into consideration when communicating the values of the outcomes of high-stakes tests and

examinations: (i) students vary in their interpretation of messages, (ii) messages designed to be motivating may not be interpreted by students as they were intended to be and (iii), classes with certain characteristics (low intrinsic and high extrinsic value) are likely to interpret messages as threatening. We would not wish to suggest that teachers should not use messages which highlight value of GCSEs or other examinations that can, and so, influences life chances, but rather to use such messages in a fashion which is responsive to student and class characteristics to facilitate the most effective outcome.

In summary, our study has shown that students are more likely to appraise fear appeals used prior to a high-stakes mathematics examination as threatening when they have low academic self-efficacy and when they are in classes with low extrinsic value, high extrinsic value and in which teachers use fear appeals relating to consequences more frequently. Our results are in line with extended parallel process model and control value theory, although at the individual-level, perceived stakes may be a more salient variable in the interpretation of fear appeals as threatening when used prior to a high-stakes examination than subjective value. These findings have implications for the ways in which teachers and instructors communicate the value and importance of failure prior to high-stakes tests and examinations.

4.1 Conclusion

This study builds on a nascent literature examining fear appeals in an educational/ instructional context. It shows how fear appeals are appraised as more threatening when teachers use messages highlighting the consequences of failure more frequently, when students have low academic self-efficacy and when students in classes with low intrinsic value but high extrinsic value. The two-wave research design and multilevel modelling techniques in our study not only confirm extant theorising but most importantly for educators

helps identify the types of students and classes that might be most vulnerable to the negative consequences of fear appeals.

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Table 1
Descriptive data for academic self-efficacy in mathematics, subjective value of mathematics, fear appeals and motivation (n = 544)

Scale	Range	*M*	*SD*	α	Skewness	Kurtosis
Academic self-efficacy in mathematics	1-5	3.56	0.65	.90	-0.52	0.69
Perceived Value of Mathematics						
Extrinsic value	1-5	3.81	0.89	.74	-0.73	0.21
Attainment value	1-5	4.06	0.72	.68	-1.09	1.72
Intrinsic interest	1-5	2.81	1.02	.86	-0.18	-0.72
Fear Appeals:						
Consequence Frequency	1-5	2.84	0.91	.88	0.31	-0.55
Timing Frequency	1-5	3.43	0.86	.75	-0.04	-0.65
Perceived Threat	1-5	2.68	1.01	.83	0.25	-0.67

Table 2

Bivariate and intraclass correlations for academic self-efficacy in mathematics, subjective value of mathematics and fear appeals (n = 544)

	1.	2.	3.	4.	5.	6.	7.
1. Academic self-efficacy	—	.55**	.56**	.46**	-.15**	-.07	-.19**
2. Intrinsic value		—	.47**	.51**	-.09*	-.07	-.15**
3. Attainment value			—	.67**	-.09*	-.01	-.06
4. Extrinsic value				—	-.04	-.01	.01
5. Consequence Frequency					—	.52**	.63**
6. Timing Frequency						—	.42**
7. Perceived Threat							—
ρ_I	.05	.11	.06	.09	.20	.24	.10

*p <.05, **p <.01

Table 3
Predicting perceived threat from academic self-efficacy, subjective value and frequency of fear appeals (n = 544)

	Model 0		**Model 1**		**Model 2**	
	B	***SE***	***B***	***SE***	***B***	***SE***
Intercept	2.726***	.074	2.721***	.073	3.127*	1.267
Student level fixed effects						
Academic Self-efficacy			-.295***	.087	-.295***	.087
Intrinsic Value			-.088	.057	-.088	.057
Attainment Value			.058	.089	.058	.089
Extrinsic Value			.074	.071	.074	.071
Contextual fixed effects						
Self-efficacy					.179	.374
Intrinsic Value					-.337*	.150
Attainment Value					-.314	.413
Extrinsic Value					.562*	.236
Environmental fixed effects						
Consequence Frequency					.572***	.129
Timing Frequency					.127	.134
Variance Components						
Residual σ^2_W	.920***		.860***		.857***	
Residual σ^2_B	.103*		.095*		<.01	
ρ_I	.099					
-2LL	1504.04 (3)		1385.67 (5)		1353.16 (13)	

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