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Fear Appeals Prior to a High-stakes Examination Can Have a Positive or Negative

Impact on Engagement Depending on How the Message is Appraised

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Abstract

Previous studies have shown that teachers may use messages that focus on the importance of avoiding failure (fear appeals) prior to high-stakes examinations as a motivational tactic. The aim of this study was to examine whether fear appeals, and their appraisal as challenging or threatening, impacted on student engagement. Data were collected from 1373 students, clustered in 46 classes, and 81 teachers responsible for instruction in those classes, prior to a high-stakes mathematics secondary school exit examination. Data were analyzed in a multilevel structural equation model. The appraisal of fear appeals as challenging lead to greater student engagement and as threatening to lower student engagement. The impact of fear appeals on engagement was mediated by a threat appraisal. The effectiveness of fear appeals as a motivational strategy depends on how they are interpreted by students.

Keywords: Fear appeals, challenge, threat, engagement, behavioral engagement, emotional engagement.

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1. Introduction

This study examines how fear appeals used by teachers prior to a high-stakes mathematics examination, and their appraisal, relates to student engagement. Fear appeals are messages that highlight a negative outcome in order to persuade the recipient to take action to avoid that outcome (e.g., Maloney, Lapinski, & Witte, 2011; Ruiter, Kessels, Peters, & Kok, 2014). In the present study, fear appeals concern failure in the mathematics examination and the consequences of failure. Fear appeals are used by teachers as a motivational tactic, to try and elicit an adaptive fear that will result in students making greater efforts to avoid failure by preparing thoroughly for the forthcoming examination (Putwain & Roberts, 2012; Sprinkle, Hunt, Simonds, & Comadena, 2006). Previous studies have shown that how the message is interpreted, or appraised, by the student is critical in establishing linkages with a variety of salient educational outcomes. For instance, when the fear appeal is appraised as a threat it is related to a variety of negative outcomes including lower examination scores and higher test anxiety (e.g., Putwain & Symes, 2011a, 2011b). Studies have only recently begun to examine how the appraisal of fear appeals as a challenge could be related to positive outcomes, such as subjective task value and academic self-efficacy (Putwain, Remedios, & Symes, 2015). Furthermore, studies have yet to establish how fear appeals, or their appraisal, may relate to student engagement. In the present study we set out to address this question. Over two waves, we collected data on teacher-reported use of fear appeals in the classroom and student-reported message appraisal, and engagement.

1.1 Messages Used by Teachers Prior to High-stakes Examinations

In many educational systems throughout the developed world, the outcomes of high-stakes tests and examinations can have profound consequences for students. These include

progression or retention within the program of study (Allensworth, 2005; Carnoy, 2005; Jacob, 2005), entry to the labor market (Bishop & Mane, 2001; Heath, Rothon, & Kilpi, 2008), selection for post-compulsory education (Cumming & Maxwell, 2004; Gregory & Clarke, 2003; Leathwood, 2005), and students' self-worth and motivation (Denscombe, 2000; Harlen, 2005; Jones, 2007; Ryan & Weinstein, 2009). In England, where the present study was conducted, secondary school exit examinations, the General Certificate of Secondary Education (GCSE), are taken at the end of Year (Grade) 11, at the of age of 16 years. A minimum pass grade in English and mathematics is typically required for entry into any form of post-compulsory education or training (academic, vocational, or technical) and for entry into the workforce for anything beyond routine or manual labor (Onion, 2004; Roberts, 2004). The results of GCSEs and particularly those of English and mathematics represent a bona fide high-stakes test.

Several studies have identified ways in which teachers prepare students for high-stakes tests and examinations. Although there are differences in approaches and emphases at different stages of education (e.g., younger children in primary/ elementary education and older students in secondary education) commonalities include a narrowing of the curriculum to focus on tested material, regular test practice and feedback, teaching test-taking and study-taking skills, and timetabling additional preparation sessions (Au, 2007; Barksdale-Ladd & Thomas, 2000; Boyle & Bragg, 2006, 2008; Gulek, 2003; Putwain, 2008; Johnson & Crisp, 2009; Troman, 2008). It is perhaps, no surprise that teachers and school managers also communicate to students the importance of performing well on high-stakes tests and examinations; how they can influence one's life trajectory, one's sense of self-worth, and helping to fulfill one's educational or occupational aspirations (Putwain, 2009; Putwain & Roberts, 2009). It is these communications that we focus on in the present study. They are theorized as a motivational strategy; a tactic used by teachers to encourage or persuade

students to invest time and effort in preparing for forthcoming tests by highlighting the value to the student of success or failure (Putwain & Symes, 2014).

To date, research has focused on messages that highlight the potential negative consequences of failure (e.g., Putwain & Remedios, 2014a). For instance, a teacher could say to a class "If you don't pass GCSE mathematics, you'll find it hard to get a good job and go to college". These 'scare tactics' have been likened to the types of 'fear appeals' commonly found in the health promotion literature (Putwain & Roberts, 2009; Sprinkle et al., 2006). Fear appeals are persuasive messages designed to highlight the negative consequences of a particular course of action and how those negative consequences can be avoided by adopting an alternate course of behavior (Maloney et al., 2011; Peters, Ruiter, & Kok, 2013; Popova, 2012; Witte & Allen, 2000). They are commonly used to promote, for example, smoking cessation, safe sex practices, and self-examination for breast and testicular cancer (Anderson, 2000; Cismaru, Nagpal & Krishnamurthy, 2009; Umphrey, 2004).

A survey of 234 English school teachers showed that respondents' endorsement of the use of fear appeals, prior to high-stakes examinations, differed according to the severity of the message (Putwain & Roberts, 2012). For example, 81.6% of respondents either agreed or strongly agreed that students should be reminded that they would fail if they did not thoroughly prepare for forthcoming examinations and 76.5% agreed or strongly agreed that students should be made aware that progression to college or university would not be possible following failure. Only 36.3% agreed or strongly agreed that students should be told they would not get a good job if their failed their examinations.

1.2 The Appraisal of Messages Used by Teachers Prior to High-stakes Examinations

The critical question for educational researchers is what effects fear appeals have, if any, on student's effort, persistence, and engagement prior to high-stakes examinations. Putwain and Symes (2014) propose that the answer to this question depends on how fear

appeals are appraised. Appraisals refer to the perception and interpretation of environmental events; whether they have personal significance for one's goals, wellbeing and commitments (Folkman, 2008; Lazarus, 2006; Skinner & Brewer, 2002). In the context of our study, appraisals refer to the ongoing and moment-by-moment way in which a fear appeal is perceived and interpreted by the recipient. Such perceptions and interpretations are dynamic and involved in an ongoing cycle of appraisal and reappraisal. Appraisal is a two-part process whereby the fear appeal is judged by its personal relevance and the resources or options available for responding (Putwain & Symes, 2014).

If the fear appeal is judged as relevant and the student believes that they are capable of responding or performing the course(s) of action required to avoid the negative outcome, a challenge appraisal is most likely. In a challenge appraisal, the fear appeal is interpreted as an opportunity for mastery, personal growth and to obtain rewards; with effort the outcome highlighted in the fear appeal (avoiding failure and, de facto, attaining success) can be met. A challenge appraisal is accompanied by positive emotions, such as optimism, and positive behavioral intentions, such as making an effort (e.g., Hijzen, Boekaerts, & Vedder, 2007; McCarthy, 2011; Shiota, Neufeld, Yeung, Moser, & Perea, 2011).

When a fear appeal is judged as relevant but the student does not believe that they can avoid the negative outcome a threat appraisal is most likely. In a threat appraisal, the fear appeal is interpreted as a risk to one's wellbeing, self-identity or self-worth; failure is anticipated. A threat appraisal is accompanied by negative emotions, such as anxiety, and self-worth protection strategies as a strategic withdrawal of effort (e.g., Covington, 2009; Meijen, Jones, McCarthy, Sheffield & Allen, 2013; Roseman, 2013). If a fear appeal is judged as being of low relevance (i.e., a student has disengaged from their academics, or is alienated from school) then it will be ignored or disregarded; neither a challenge or threat appraisal will occur."

Studies have operationalized personal relevance through attainment and utility value; central concepts in expectancy value theory (Eccles, 2007; Eccles, O'Neill & Wigfield, 2005; Wigfield, Tonks, & Klauda, 2009). Attainment value refers to the perceived importance of a particular task, or an examination grade in a particular subject, for ones sense of identity and utility value refers to whether a particular task, or an examination grade in a particular subject is instrumental for reaching short or long-term goals (Eccles et al., 2005; Wigfield & Eccles, 2005; Wigfield et al., 2009). Judgments concerning one's resources and options for responding to the demands presented in the fear appeal have been established through academic self-efficacy, the belief that one can learn or perform a particular task (Bandura, 1997; Schunk & Pajares, 2002), and expectancy of success, the belief that one is capable of effecting a successful outcome on a particular task (Eccles et al., 2005; Wigfield & Eccles, 2000; Wigfield et al., 2009). Studies have shown that challenge appraisal follows from *high* attainment/ utility value and *high* academic self-efficacy/ expectancy of success whereas threat appraisal follows from *high* attainment/ utility value with *low* academic self-efficacy/ expectancy of success (Putwain & Remedios, 2014b; Putwain & Symes, 2014; Putwain, Remedios, & Symes, 2014).

1. 3 Fear appeals Appraisals and Educational Outcomes

Studies have shown that when appraised as threatening, fear appeals correlate positively with test anxiety and performance-avoidance goals (to avoid performing worse than one's classmates), and negatively correlate with intrinsic motivation and scores on high-stakes examinations in cross-sectional and longitudinal designs (Putwain & Remedios, 2014a; Putwain & Symes, 2011a; 2011b). Less research has examined the outcomes of a challenge appraisal. One study, however, has shown that when appraised as a challenge, fear appeals predict higher academic self-efficacy and attainment value (and threat, lower academic self-efficacy and attainment value) beyond the variance explained by prior self-

efficacy and attainment value (Putwain, Remedios, & Symes, 2015). From the research

conducted to date, the way in which fear appeals are interpreted by students is critical in

determining whether they are associated with positive or negative outcomes. Furthermore,

studies have yet to examine whether the appraisal of fear appeals is related to student

engagement. Since fear appeals are primarily conceptualized as a strategy to encourage and

persuade students to engage in purposeful activity to prepare for forthcoming examinations

(Putwain & Roberts, 2009), it is surprising that research has yet to examine engagement as an

outcome.

1. 4 Defining Student Engagement

Student engagement has been described in multifaceted ways to capture how students

maximize learning opportunities and complete their program of study (for reviews see

Fredericks, Blumenfeld, & Paris, 2004; Jimerson, Campos, & Gried, 2003; Reschly &

Christenson, 2012). Classic models of engagement propose behavioral and affective

components (Reschly & Christenson, 2012). Behavioral engagement refers to participation

and involvement in lessons and other school activities (Appleton, Christenson, Kim, &

Reschly, 2006; Fredricks, McColskey, Meli, Mordica, Montrosse, & Mooney, 2011; Martin,

2007; Voelkl, 2012). Indicators include attendance, on-task behavior in lessons and

persistence on challenging tasks. Affective, or emotional, engagement refers to positive or

negative reactions to teachers, peers, lesson activities and school (Appleton et al., 2006;

Fredricks et al., 2011; Martin, 2007; Voelkl, 2012). Indicators include interest, enjoyment and

a sense of belongingness. This classic two-component approach is the one adopted in this

study, however it should be noted that other models have proposed an additional cognitive

component referring to the level of personal investment and involvement in learning

(Appleton et al., 2006; Fredricks et al., 2011; Martin, 2007; Voelkl, 2012). Indicators include

valuing of school and education, self-efficacy and self-regulation. Due to the overlap in

construct definition and operationalization with subjective-task value and self-efficacy, that are central to the appraisal of fear appeals, we chose to focus solely on behavioral and emotional engagement in this study.

1.5 Fear Appeals, Appraisals, and Student Engagement

The central question of the present study is whether fear appeals influence student engagement prior to a high-stakes examination. Student engagement is theorized as a malleable construct that is responsive to contextual, task, and individual influences (Finn & Zimmer, 2012; Martin, 2012). Accordingly, models of student engagement propose that the classroom and school environment, as well as factors pertinent to the teacher, can exert a critical influence on student engagement (e.g., Fredricks, 2011; Reschly & Christenson, 2012; Ryan & Patrick, 2001; Upadyaya & Salmela-Aro, 2013). Field studies of effective teachers as well as larger-scale quantitative studies have highlighted how myriad teacher factors, including teacher support, coercive teacher behaviors, mastery-orientated classrooms, and a positive social-emotional climate, can enhance or detract from student engagement (e.g., Dotterer & Lowe, 2011; Lam, Wong, Yang, & Liu, 2012; Pianta, Hamre, & Allen, 2012; Roehrig & Christesen, 2010; Roehrig, Guidry, Bodur, Guan, Guo, & Pop, 2008; Wang & Holcombe, 2010; Wang & Eccles, 2012). In the present study, this line of research is extended to include fear appeals made by the classroom teacher prior to the high-stakes GCSE mathematics examination.

Following the appraisal model of fear appeals proposed by Putwain and Symes (2014) and research showing how relations with outcomes depend on how fear appeals are appraised (Putwain & Remedios, 2014a; Putwain, Remedios, & Symes, 2015; Putwain & Symes, 2011a; 2011b) we propose that any possible linkages between fear appeals and student engagement would not be direct but mediated by how fear appeals are appraised. A challenge appraisal, characterized by positive emotions and sense of growth and mastery is followed by

a sense of valuing attainment on the forthcoming examination and a belief that one is capable of success. These are critical variables that are likely to enhance subsequent engagement. Studies have shown that perceived task importance, or value, and perceptions of competence (control beliefs, academic self-concept, and academic self-efficacy) lead to greater engagement (Jang, 2008; Skinner et al., 2009; Walker & Greene, 2009; Wang & Eccles, 2013) and lower boredom, which is often used as an indicator of emotional (dis)engagement (Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010). Accordingly we would expect students who appraise fear appeals as a challenge to show higher student engagement.

Since a threat appraisal results in lower valuing of attainment and an expectation of failure we would expect students who appraise fear appeals as a challenge to show lower engagement. Furthermore, the negative emotions that would be expected to accompany a threat appraisal are also related to lower student engagement (Assor, Kaplan, Kanat-Maymon, & Roth, 2005; Dettmers, Trautwein, Lüdtke, Goetz, Frenzel, & Pekrun, 2011; Linnenbrink-Garcia, Rogat, & Koskey, 2011; Reyes, Brackett, Rivers, White, & Salovey, 2012). Thus, any impact of fear appeals on student engagement would be indirect and mediated by their appraisal as a challenge or a threat.

1.6 Fear appeals, Appraisals, and the Multilevel Question

The fear appeals made by a teacher to a particular class represent a classroom climate, or environment (L2), construct. They are common to all of the students in that class. Whether measured through the report of a teacher or observer, or the multiple reports of students in that class, the appropriate unit of analysis is at the classroom level (see Marsh et al., 2009, 2012; Morin et al., 2014). The appraisal of fear appeals, however, is a student-level (L1) or self-system construct (see Martin, Bobis, Anderson, Way, & Vellar, 2011). That is, a fear appeal may be common to the whole class but students within that class may appraise the message in different ways; as more or less threatening and challenging. Accounting for both

fear appeals (L2) and appraisals (L1) in a single study requires careful consideration of differing levels at which constructs are conceptualized.

Although appraisals are primarily a L1 construct it is possible that appraisals, like other self-system student-level variables including subjective task value, effort, and engagement (e.g., Dietrich, Dicke, Kracke, & Noack, 2015; Reyes et al., 2012) may also show between-class variance. That is, the average challenge and threat appraisals for students in one class differ to others. Accordingly, we adopt a multilevel analytic strategy to examine relations between fear appeals appraisals at both student (L1) and classroom (L2) levels. At the student (L1) level we examine the linkages between student-reported challenge and threat appraisals and student-reported engagement. At the classroom (L2) level we also examine the linkages between teacher-reported use of fear appeals and class-average challenge and threat appraisals. In this way, we can establish if the use of fear appeals by the class teacher is related to particular classes showing greater or lesser engagement, via the mediating role of challenge and threat appraisals, as well as the as the idiosyncratic appraisal of fear appeals as more or less challenging and threatening by students within a class. Accounting for the multilevel structure of the data in this way allows two analytic foci. First, whether teacher-reported fear appeals relates to class-average engagement via the mediating role of class-average challenge and threat appraisals. Second, whether a student's individual challenge and threat appraisal of fear appeals is related to their individual engagement.

1.7 The Mediating Role of Classroom-level Appraisals

Persuasive messages are perceived as more influential and have greater influence when they are used more frequently (e.g. Cacioppo & Petty, 1989; Garcia-Marques & Mackie, 2001; Moons, Mackie, & Garcia-Marques, 2009). When fear appeals are used more frequently by a classroom teacher, they are associated with greater class-average challenge and threat appraisals (Putwain, Remedios, & Symes, 2014). The fear appeal prompts students

to make judgments regarding the value of their mathematics course and/ or grade as well as their likely ability to succeed. The more often that fear appeals are made, the more often such judgments are prompted. In a similar way, interventions from the positive psychology literature have shown that reflecting on ones strengths can improve subsequent self-beliefs (Oades, Robinson, Green, & Spence, 2011; Sin & Lyubomirsky, 2009; Waters, 2011). It may seem counter-intuitive that more frequent fear appeals could give rise to both challenge and threat appraisals. However, a key antecedent of both challenge and threat appraisals is the attainment and utility value of mathematics. Students reflecting on the value of mathematics would be likely to appraise messages as more threatening or challenging (depending on ability and competence beliefs). An indirect relationship would therefore be expected between L2 fear appeals and L2 class-average student engagement that would be mediated by L2 class-average challenge and threat appraisals.

1.8 Aims and Hypotheses of the Present Study

The aim of the present study was to examine how fear appeals, and their appraisal, relate to student engagement. In the extant literature, engagement has been conceptualized and measured in domain-general (e.g., in relation to the school context) and domain-specific ways (e.g., in relation to a specific class or school subject). In the present study we focused on a single subject, mathematics, for two reasons. First, mathematics is a compulsory subject in English secondary education, hence would potentially contribute to a larger sample size from participating schools than subjects that are chosen from a list of options. Second, obtaining a pass grade (grade C) in mathematics is a minimal requirement for post-secondary educational and training, as well as entry into the labor market. To ensure an appropriate level of domain congruence between the various constructs in our study (see Swann, Chang-Schneider, & McClarty, 2007) fear appeals, appraisals, and engagement, were all

conceptualized and measured as being specific to GCSE mathematics. The following

hypotheses were tested:

H_{1A}: At L1 challenge appraisal is positively related to student engagement.

H_{1B}: At L2 class-average challenge appraisal is positively related to class-average student

engagement.

H_{2A}: At L1 threat appraisal is negatively related to student engagement.

H_{2B}: At L2 class-average threat appraisal is negatively related to class-average student

engagement.

H_3: At L2 more frequent fear appeals will positively relate to class-average challenge and

threat appraisal. Class-average challenge and threat appraisals will mediate relations between

the frequency of fear appeals and class-average student engagement.

2. Method

2.1 Participants

The participants in this study consisted of 1373 secondary school students and 46

secondary school teachers from six secondary schools. There were 693 male students (51%)

and 665 female students (49%). 15 students chose not to disclose their gender. All students

were in the final two years of secondary education (Years 10 and 11; aged 14–16 years) with

a mean age of 14.6 years ($SD = .61$). In Year 10 there were 695 students (50.6%) and in Year

11 there were 678 students (49.4%). The majority of students came from a Caucasian ethnic

heritage ($n = 1179$, 86.1%) and smaller numbers were from Asian ($n = 104$, 7.6%), Black (n

$= 21$, 1.5%), Other ($n = 31$, 2.3%) and mixed heritage backgrounds ($n = 35$, 2.6%). Three

students chose not to disclose their ethnic heritage. One hundred and twenty three students

(9.7% of the sample) were eligible for free school meals (FSM) due to low parental income

(eight participants did not disclose their FSM eligibility).

The teacher sample consisted of 22 male teachers (47.8%) and 24 female teachers (52.2%) with a mean age of 40.1 years (SD = 11.2). There were 41 teachers from a Caucasian ethnic heritage (89.1%), 4 from an Asian heritage (8.7%) and 1 from a Black heritage (2.2%). Students were following the program of study leading to the high-stakes GCSE in mathematics and clustered into 81 classes (Mean = 16.7 students per class) that were grouped for ability. Teachers were responsible for the instruction of mathematics in these classes and may have taught more than one class per school (most commonly one Year 10 class and one Year 11 class).

2.2 Measures

2.2.1 Fear appeals.

Teachers reported the frequency with which they used fear appeals in a specific mathematics class using three items from the *Revised Teachers Use of Fear Appeals Questionnaire* (Putwain & Symes, 2014). Items were adapted for teacher self-report (see Putwain, Remedios, & Symes, 2014) and to be domain-specific for mathematics GCSE (in the UK mathematics is colloquially referred to as 'maths'). Participants responded to items (e.g., 'How often do you tell your class that they will find it difficult to get a good job if they fail GCSE maths?') on a five-point scale (1 = never, 3 = sometimes, 5 = most of the time). The reliability and construct validity of data collected using these scales has been established in previous studies (Putwain & Symes, 2014; Putwain, Remedios, & Symes, 2014) and in the present study the internal reliability was acceptable (see Table 1).

2.2.2 Fear appeals appraisal.

The appraisal of value-promoting messages by students was measured using six items from the *Revised Teachers Use of Fear Appeals Questionnaire* (Putwain & Symes, 2014) that were adapted to be specific for GCSE mathematics. Three items pertained to a challenge appraisal (e.g., 'Do you want to make an effort to pass GCSE maths when your teacher tells

you that you need to attain at least a grade C to get into college or 6th form?'[1]) and three items

to a threat appraisal (e.g., 'Do you feel worried when your teacher tells you that maths GCSE

is important in order to get a good job?'). Participants responded on a five point-scale (1 =

never, 3 = sometimes, 5 = most of the time). The reliability and construct validity of data

collected using these scales has been established in previous studies (Putwain & Symes,

2014; Putwain, Remedios, & Symes, 2014) and in the present study the internal reliability

was acceptable (see Table 1).

2.2.3 Student engagement.

Student engagement was measured using three items each from the behavioral

engagement and emotional engagement subscales from the *Engagement vs. Dissatisfaction*

with Learning Questionnaire (Skinner et al., 2009). Items were adapted to be specific to

GCSE mathematics. Exemplar items include 'I participate in the activities and tasks in my

GCSE maths class' (behavioral engagement) and 'When we work on something for GCSE

maths, I feel interested' (emotional engagement). Participants responded on a five point-scale

(1 = strongly disagree, 3 = neither agree nor disagree, 5 = strongly agree). Prior research has

established the construct validity, predictive validity, and internal consistency of data

collected using the full (Skinner, Furrer, Marchand, & Kinderman, 2008; Skinner et al., 2009)

and reduced (Skinner & Chi, 2012) versions of this scale. A preliminary analysis of the data

collected for this study suggested some original items (5 items per subscale) cross-loaded on

adjacent scales hence analyses were based on a shorter version with three items per scale.

Items were chosen partly on the basis of their face validity, that they would not show item

content that could relate to an alternate scale, and partly because none of the items cross-

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[1] 6th form is a term used in England, Wales and Northern Ireland to refer to Years (Grades) 12 and 13 and may be undertaken at a secondary school or a separate unaffiliated college. School and college 6th forms typically make minimum entry requirements of students that include a pass (grade C or above) in English and mathematics and the specific subjects to be studied (usually three or four subjects at General Certificate of Education Advanced Level or 'A Level').

loaded on a non-target factor ($\lambda > .4$). The shorter version showed acceptable internal reliability in the present study (see Table 1).

2.3 Procedure

Time 1 (T_1) data were collected early during the school year (October 2014) and Time 2 (T_2) data four months later (February 2015). Student engagement data were measured at both waves of measurement and teacher value-promoting messages, and student appraisals, at the second wave only. Data were collected from student participants during a period of the school timetable used for pastoral and administrative purposes (referred to as Form Period) so not to interfere with regular teaching and instruction. Questionnaires were administered by the regular form teacher who was provided with a set of instructions to read out to students. These included information about the purpose of the study, ethical concerns (e.g., participation was voluntary, how to withdraw participation retrospectively, and so on), and emphasized that the questions were not part of a test (students could ask for help with reading). Students, therefore, did not complete questionnaires in the presence of their regular mathematics teacher. Questionnaires were accompanied with an instruction sheet, that re-emphasized the instructions read out by the form tutor, a consent sheet, and a demographics form. Teacher data were collected during a mathematics department team meeting. Questionnaires included an instruction sheet and demographics form, and asked teachers to complete a separate set of questionnaires for every mathematics class they taught in Year 10 and 11 (if more than one).

3. Results

3.1 Descriptive Statistics

The descriptive characteristics of study variables are reported in Table 1. Students reported higher behavioral than emotional engagement at both T_1 and T_2. Furthermore, students' behavioral engagement was negatively skewed and leptokurtic, at T_1 and T_2. The

internal reliability coefficients were acceptable (Cronbach's α >.7) and the factor loadings

from the measurement model described below were satisfactory (λ > .4). The intraclass

correlation coefficients (ρ_I) show the proportion of variance attributable to the class-level.

Approximately 7 – 9% of the variance in engagement at T_1 and T_2 was attributable to the

class level and approximately 17 – 22% of variance in the appraisal of fear appeals at T_2 was

at the class level. A modeling approach was required that is both sensitive to violations of

normality and capable of representing the multilevel nature of the data.

[Table 1 here]

3.2 Measurement Model and Bivariate Correlations

A multi-level measurement model was built that included teacher-reported fear

appeals as a classroom-level (L2) construct only, and with student-reported engagement

(behavioral and emotional engagement), and student-reported appraisals (challenge and

threat), as both student- (L1) and classroom-level (L2) constructs. Student-reported appraisals

and engagement were class-averaged for L2. Analyses were performed using M*plus* version

7.3 (Muthén & Muthén, 2013). M*plus* reports the following model fit indices: Comparative

fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation

(RMSEA), and the standardized root mean square residual at within-class ($SRMR_W$) and

between-class levels ($SRMR_B$). CFI and TLI values $\geq$ .95, RMSEA values $\leq$ .05, and SRMR

values $\leq$ .08 are typically considered to be indicative of a good fitting single-level model

(Marsh, Hau, & Grayson, 2005; Marsh, Hau, & Wen, 2004). Interpretive guidelines and

rules-of-thumb for multi-level models have yet to be established. The measurement model

was estimated using the maximum-likelihood estimator with robust standard errors (MLR) to

correct for non-normality in some study variables. Having established that missing data were

unrelated to any substantive variables or covariates, missing data were handled using full-

information maximum likelihood.

The measurement model included correlated residual variance between three pairs of challenge and threat items with the same referent (entry to college, entry to the labor market, and failure in general). The measurement model showed a good fit to the data: χ^2 (270) = 502.30, p <.001, RMSEA = .021, $SRMR_W$ = .029, $SRMR_B$ = .082, CFI = .980, and TLI = .974. Although the $SRMR_B$ statistic was >.08 the RMSEA, CFI and TLI indices, that refer to both within and between portions of the model, suggested a good fit to the data. Trautwein et al. (2012) recommend that a model is accepted if at least two model fit criteria are fulfilled. The standardized factor loadings are reported in Table 1 and latent bivariate correlations in Table 2.

[Table 2 here]

3.3 Structural Equation Modelling

Hypotheses 1 – 3 were examined using a multilevel structural equation model. At the within-level portion of the model paths were specified from T_2 threat and challenge to T_2 behavioral and emotional engagement. To control for autoregressive relations, we also include paths from T_1 behavioral and emotional engagement to T_2 threat and challenge, and also included stability paths from T_1 to T_2 behavioral and emotional engagement. Gender (0 = male, 1 = female) and age were included as within-level covariates. The between-level portion of the model was replicated for the substantive constructs and also included paths from T_2 fear appeals to T_2 challenge and threat appraisals, and from T_2 fear appeals to T_2 behavioral and emotional engagement. Year group (0 = Year 10, 1 = Year 11) was included as a between-level covariate. The multilevel structural equation model showed a good fit to the data, χ^2 (313) = 587.66, p <.001, RMSEA = .021, $SRMR_W$ = .029, $SRMR_B$ = .079, CFI = .977, and TLI = .966.

For the within-portion of the model a T_2 challenge appraisal predicted greater T_2 behavioral (β = .36, p <.001) and emotional (β = .23, p <.001) engagement over and above

the variance accounted for by prior T_1 behavioral and emotional engagement. A T_2 threat appraisal predicted lower T_2 behavioral ($\beta = -.21$, $p <.001$) and emotional ($\beta = -.21$, $p <.001$) engagement over and above the variance accounted for by prior T_1 behavioral and emotional engagement. Furthermore, statistically significant stability paths were shown from T_1 to T_2 behavioral engagement ($\beta = .51$, $p <.001$) and emotional ($\beta = .58$, $p <.001$) engagement. T_1 behavioral engagement predicted T_2 challenge ($\beta = .22$, $p <.001$) but not T_2 threat appraisal ($\beta = .09$, $p =.10$). T_1 emotional engagement predicted T_2 threat ($\beta = -.19$, $p <.001$) but not T_2 challenge appraisal ($\beta = -.04$, $p =.49$). Coefficients for covariates are reported in the Appendix. Statistically significant coefficients for the within-portion of the model are shown in Figure 1.

[Figure 1 here]

For the between-portion of the model, a T_2 challenge appraisal predicted greater T_2 behavioral engagement ($\beta = .55$, $p =.01$), over and above the variance accounted for by prior T_1 behavioral engagement. A T_2 challenge appraisal was not a significant predictor of T_2 emotional engagement ($\beta = -.01$, $p =. 98$). A T_2 threat appraisal predicted lower T_2 behavioral engagement ($\beta = -.79$, $p =.003$), over and above the variance accounted for by prior T_1 behavioral engagement. A T_2 threat appraisal was not a significant predictor of T_2 emotional engagement ($\beta = -.19$, $p =. 40$). More frequent T_2 fear appeals predicted greater T_2 challenge ($\beta = .67$, $p <.001$) and threat appraisal ($\beta = .70$, $p <.001$). Direct paths from T_2 fear appeals frequency to T_2 behavioral ($\beta = .46$, $p =.13$) and emotional ($\beta = .15$, $p =.63$) engagement were not statistically significant. Statistically significant stability paths were shown from T_1 to T_2 behavioral engagement ($\beta = .55$, $p =.006$) and emotional engagement ($\beta = .59$, $p <.001$). T_2 challenge appraisals were not predicted by either T_1 behavioral ($\beta = .28$, $p =.14$) or emotional engagement ($\beta = -.17$, $p =.42$). Similarly T_2 threat appraisals were unrelated to T_1 behavioral ($\beta = .03$, $p =.89$) or emotional engagement ($\beta = -.17$, $p =.42$). Coefficients for year group are

reported in the Appendix. Statistically significant coefficients for the within-portion of the

model are shown in Figure 2.

[Figure 2 here]

3.4 The Mediating Role of Appraisals

The mediating effects of appraisals on the between-level relationships between fear

appeals and student engagement were assessed by creating 95% confidence intervals around

the estimate of the indirect effect. Confidence intervals that cross zero indicate a statistically

significant indirect effect ($p < .05$). The indirect relationships between T_2 fear appeals and T_2

behavioral engagement were mediated by T_2 challenge, $\beta = .37$, $SE = .16$, 95% CIs [.08, .69],

and T_2 threat appraisals, $\beta = -.55$, $SE = 20$, 95% CIs [-.18, -.98]. Fear appeals resulted in

higher behavioral engagement when appraised as a challenge and lower behavioral

engagement when appraised as a threat.

4. Discussion

The aim of this study was to examine if fear appeals made prior to a high-stakes

mathematics examination by the classroom teacher, or their appraisal by students as

challenging or threatening, impacted on students' engagement. We employed a multi-level

approach to model the data. The within-level (L1) portion of the model showed that when

fear appeals were appraised as challenging, they were related to greater behavioral and

emotional engagement (supporting H_{1A}). When fear appeals were appraised as a threat, they

were related to lower behavioral and emotional engagement (supporting H_{2A}). The between-

level (L2) portion of the model showed that a higher class-average challenge appraisal was

related to greater class-average behavioral engagement whereas a higher class-average threat

appraisal was related to lower class-average behavioral engagement (partial support for H_{1B}

and H_{2B}). More frequent use of fear appeals was related to greater class-average challenge

and threat appraisals. Furthermore, challenge and threat appraisals mediated the L2 relations

between fear appeals and behavioral engagement (supporting H$_3$). These findings clearly show that the relations between fear appeals and student engagement depends on how these messages were appraised.

4.1 Appraisals and Student Engagement

Models of student engagement are in general agreement that the classroom environment, which includes factors pertinent to the teacher, combine with other personal and contextual factors to influence engagement (Fredricks, 2011; Reschly & Christenson, 2012; Ryan & Patrick, 2001; Upadyaya & Salmela-Aro, 2013). Previous research has not always made a clear distinction between actual and perceived elements of classroom environment. Some research has used measures of teacher behavior reported by teachers themselves, students, or observers (e.g., Assor et al., 2005), whereas others used measures of students' feelings about or responses to their teacher's behavior (e.g., Wang & Eccles, 2013). It is important for the theoretical advancement of models of engagement to establish the relative contributions of teacher behavior and how they are interpreted in relation to student engagement. Our study shows that the frequency of fear appeals used prior to a high-stakes examination is not the critical variable in impacting on student behavioral engagement, but how students appraise that message. For some students it is a challenging message and leads to greater engagement. For others it is a threatening message and leads to lower engagement.

Our findings showed that some of the variance in the appraisal of fear appeals is idiosyncratic and varies between students within a particular class (L1). Prior research has shown that subjective task values, academic self-efficacy, the expectation of success or failure, and academic buoyancy (the perception that one can respond positively to examination pressures), are all important antecedents of how fear appeals are appraised (Putwain & Remedios, 2014a; Putwain, Remedios, & Symes, 2014; Putwain & Symes, 2014; Symes, Putwain, & Remedios, 2015). It would also be expected for prior achievement to

impact on the appraisal of fear appeals, although this has yet to be empirically demonstrated. Critically, our study also showed that the appraisal of fear appeals can differ between classes (L2) and this can predict class-level engagement. Given that the mathematics classes in our sample were grouped for ability, it is possible that the differences in class-level appraisal could be related to actual or perceived ability. Research has shown that both academic self-concept and achievement in mathematics differ between classes as well as individual students (e.g., Trautwein, Lüdtke, Marsh, & Nagy, 2009).

It is likely that other aspects of the classroom environment could also influence or moderate the appraisal of fear appeals. For instance, fear appeals could also be accompanied with efficacy appeals. Efficacy appeals are messages that focus on those behaviors (e.g., effort, persistence, attending class and paying attention) required for success and/ or the communication of encouragement or belief by the teacher that students are capable of performing these behaviors. If fear appeals are accompanied with efficacy appeals then it would be expected that the degree of threat is reduced and the degree of challenge enhanced (Sprinkle et al., 2006). Other elements of classroom context that are known to facilitate student motivation and engagement, such as teacher warmth, autonomy support and relatedness with students (e.g., Lam et al., 2012; Mainhard, Brekelmans, & Wubbels, 2011; Pianta et al., 2012; Reeve, 2009), would also likely impact on the way students appraise messages like fear appeals that focus on the possibility of failure (e.g., messages are interpreted like 'tough love').

It might seem curious why fear appeals lead to both challenge and threat when these appraisals are so markedly different in their nature and outcomes. We suggest that this is partly a result of subjective-task values being a common antecedent of fear appeals. The fear appeals must be perceived as personally meaningful and significant to be evaluated as challenging or threatening (Putwain, Remedios, & Symes, 2014; Putwain & Symes, 2014).

However, we also suggest that fear appeals could also serve as a reflective prompt for students. Seemingly simple interventions asking students to reflect on their strengths have been shown to have a powerful influence on achievement-related belief, motivation, and performance (Oades et al., 2011; Sin & Lyubomirsky, 2009; Waters, 2011). In a similar way, in response to the fear appeal, as part of the appraisal process, the student must judge the personal significance of the message (e.g., 'is it important for me not to fail GCSE mathematics?') and evaluate the likelihood of success of failure (e.g., 'I am not very good at mathematics'). The outcomes of the appraisal process then influence the person's subsequent test and achievement-related emotions, beliefs, motivations (e.g., Putwain & Symes, 2011a,b) and, as we have shown here, their engagement.

When the findings of this study are combined with those of other studies examining the outcomes of fear appeals, and their appraisals, used prior to tests and examinations a more elaborate model begins to emerge. The appraisal of fear appeals is critical in determining the strength and direction of relations with test anxiety, intrinsic motivation, achievement goals, subjective task-values, competence beliefs (i.e., academic self-efficacy and the expectancy of success), engagement, and academic performance (Putwain & Best, 2011, 2012; Putwain & Remedios, 2014; Putwain, Remedios, & Symes, 2015; Putwain & Symes, 2011a, 2011b). These relations, as we have shown between fear appeal appraisals and engagement in this study, are not merely an artifact of prior (autoregressive) relations. Rather, the appraisal process itself as, a reflective exercise, has the power to shape and influence subsequent achievement-related beliefs, emotions, and behaviors. The next challenge for researchers working in this area is to establish how these cognate outcomes are ordered and may interact as a result of appraisal process.

Although not related to our substantive hypotheses, we also found statistically significant paths from T_1 engagement to the T_2 appraisal of fear appeals. Notwithstanding the

caveat that we did not control for prior appraisal of fear appeals, these results may provide some additional clues for individual antecedents of the appraisal of fear appeals. That is, students who are already behaviorally and emotionally engaged, possibly as a function of subjective-task value and strong competence beliefs, are more likely to appraise fear appeals in a challenging way and less likely to appraise them in a threatening way.

4.2 Limitations and Future Directions

There are five limitations that we would like to highlight. First, data were collected in a two-wave design. This allowed us to examine how fear appeals, and their appraisal, related to student engagement while controlling for previous student engagement. However, we were not able to control for prior challenge and threat appraisals. A third wave of measurement could allow for a more sophisticated design to control for this possibility. Second, this study focused on a single subject, mathematics, placing a limit on the generalizability of findings. It would be useful to establish if similar findings emerged for other school subjects that are required for as a general entry to college or the labor market (e.g., English) as well as those subjects that might be relevant to fulfilling one's personal aspirations. Third, although student engagement is considered to be an important outcome in its own right, it can also be considered as a mediator of achievement (Reschly & Christenson, 2012). It would make a useful extension for future research to examine whether challenge and threat appraisal of fear appeals influenced student performance resulting from differential engagement.

Fourth, as some of the teachers who participated in this study were keen to highlight, fear appeals are just one of a repertoire of messages that might be used. Other messages might, for instance, focus on the benefits of success as well as losses of failure. In the social psychology literature these are referred to as 'gain' and 'loss' framed messages (e.g., Gallagher & Updegraff, 2012; Moreton, Rabinovich, Marshall & Bretschneider, 2011) and this may be a useful extension for the body of work examining classroom-based messages.

Furthermore, the severity of the threat message may also be important to consider. Research in the health context has shown an interaction between message frame and message severity (Cho & Boster, 2008; Hwang, Cho, Sands & Jeong, 2011). It would be useful for future research to consider extending the fear appeals measure to include judgements of severity as well as frequency. Fifth, and finally, it would be useful for future studies to consider innovative ways of collecting data to supplement self-report questionnaires. For instance, real-time reporting of fear appeals by teachers using personal digital assistants and modelling intrapersonal as well as interpersonal change in student appraisals. Such approaches have the potential to make a novel contribution to the literature.

4.3 Implications for Practice

Teachers, instructors, and other educational professionals should know that fear appeals can be interpreted in very different ways. They may have the desired effect as a motivational tactic with some students and classes, and students subsequently become more engaged in preparing for their examinations. However, the opposite effect may happen for other students. We recommend that colleagues involved in initial teacher education, and the continuing professional development of qualified teachers, consider these points in curricula and learning outcomes associated with the psychology of student motivation and the relational support of students. It would be beneficial for practicing teachers to consider what student characteristics determine message appraisal in order to ensure that fear appeals are being used with those students likely to interpret them positively, as a challenge. There may also be a role for school counsellors and psychologists involved in the design and implementation of interventions designed to improve student motivation and/ or engagement, advising teachers on effective classroom engagement strategies, or providing support for individual students who may be disengaged from their education.

4.4 Conclusion

This study has extended the body of work examining the use of fear appeals prior to high-stakes examinations. The results are consistent with those from previous research showing how linkages with various psychoeducational outcomes including test anxiety, achievement goals, and motivation depend on how fear appeals are appraised. While earlier studies focused solely on a threat appraisal, the present study extended this nascent body of literature by including challenge as well as threat appraisals, and including engagement as an additional outcome of fear appeals appraisals. Fear appeals can have a positive or negative impact on student engagement depending on how the message is appraised.

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Table 1

Descriptive statistics for student-reported engagement at T_1 and T_2, teacher-reported use of fear appeals at T_2, and student-reported appraisal at T_2

	Range	Mean	SD	α	ρ_I	Skewness	Kurtosis	Factor Loadings w	Factor Loadings B
T_1 Behavioral Engagement	1 – 5	4.21	0.63	.77	.07	-0.97	2.18	.67 – .79	.73 – .92
T_1 Emotional Engagement	1 – 5	3.08	0.97	.87	.07	-0.10	-0.47	.80 – .88	.88 – .96
T_2 Behavioral Engagement	1 – 5	4.07	0.68	.76	.08	-0.75	1.07	.66 – .74	.70 – .80
T_2 Emotional Engagement	1 – 5	3.01	0.99	.87	.09	-0.12	-0.51	.79 – .88	.86 – .90
T_2 Fear Appeals	1 – 5	2.02	1.00	.83	—	0.82	-0.48	—	.76 – .83
T_2 Challenge Appraisal	1 – 5	3.43	1.02	.79	.17	-0.43	-0.53	.70 – .76	.79 – .92
T_2 Threat Appraisal	1 – 5	2.74	1.08	.84	.22	0.19	-0.82	.76 – .83	.86 – .93

Table 2

Standardized latent bivariate correlations between student-reported engagement at T_1 and T_2, teacher-reported use of fear appeals at T_2, and student-reported appraisal at T_2

	1.	2.	3.	4.	5.	6.	7.
1. T_1 Behavioral Engagement	—	.56	.56	.32	—	.21	$-.02^\dagger$
2. T_1 Emotional Engagement	.70	—	.36	.63	—	$.08^\dagger$	-.14
3. T_2 Behavioral Engagement	.53	$.23^\dagger$	—	.53	—	.33	$.01^\dagger$
4. T_2 Emotional Engagement	$.44^b$	.54	.62	—	—	.16	$-.12^b$
5. T_2 Fear Appeals	$-.17^\dagger$	$-.02^\dagger$	$.19^\dagger$	$-.04^\dagger$	—	—	—
6. T_2 Challenge Appraisal	.04	-.04	$.24^\dagger$	$-.08^\dagger$	.64	—	.65
7. T_2 Threat Appraisal	$-.21^a$	$-.19^\dagger$	$-.11^\dagger$	$-.22^\dagger$	.70	.79	—

Note. All coefficients statistically significant at $p \leq .001$ unless [a] $p \leq .05$, [b] $p \leq .01$, or [†] $p > .05$. Coefficients for the within-level (L1) portion of the model are reported above the diagonal, coefficients for the between-level (L2) portion of the model below the diagonal.
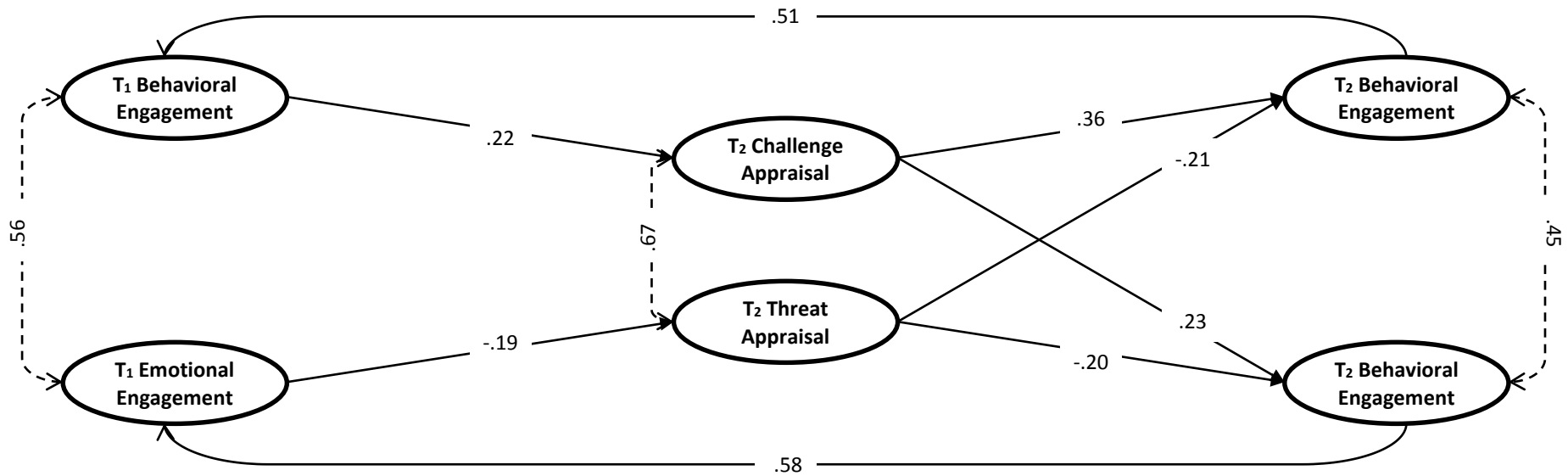
Figure 1. Statistically significant standardized coefficients from the within-level (L1) portion of the multilevel structural equation model showing hypothesized paths from T_2 appraisal of fear appeals, to T_2 behavioral and emotional engagement, controlling for T_1 behavioral and emotional engagement. Dashed double-headed paths represent covariance and single-headed arrows represent structural paths.
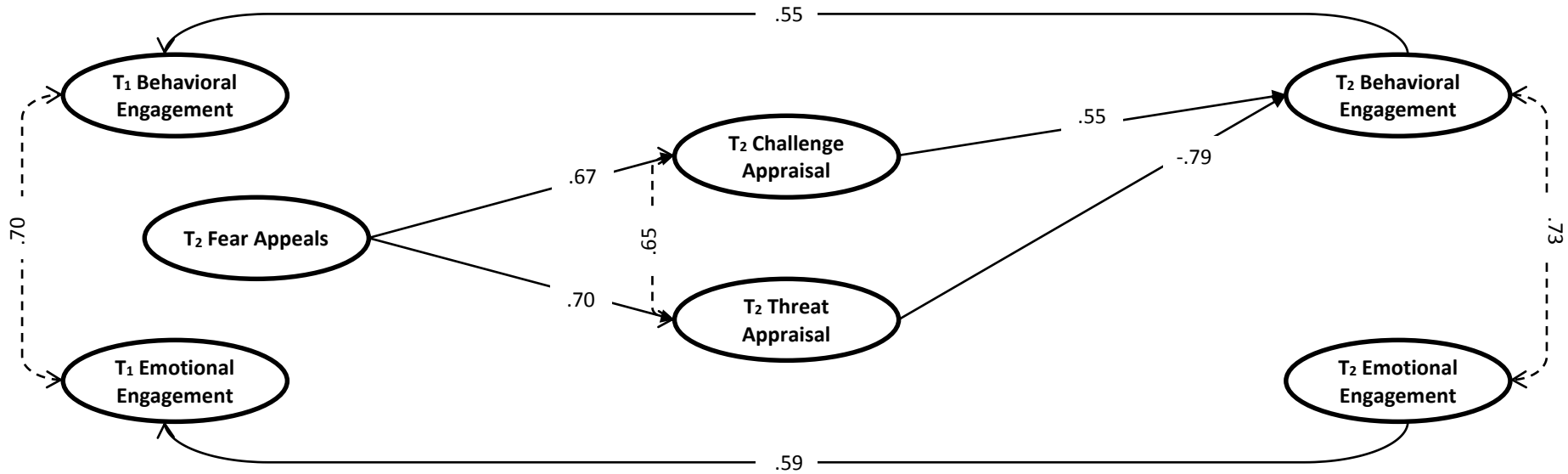
Figure 2. Statistically significant standardized coefficients from the between-level (L1) portion of the multilevel structural equation model showing hypothesized paths from T_2 fear appeals, and their appraisal, to T_2 behavioral and emotional engagement, controlling for T_1 behavioral and emotional engagement. Dashed double-headed paths represent covariance and single-headed arrows represent structural paths.

Appendix

Standardized coefficients for covariates in the multilevel structural equation model

	Gender	Age	Year Group
T_1 Behavioral Engagement	.03	-.13*	-.23
T_1 Emotional Engagement	-.06	-.05	.57*
T_2 Behavioral Engagement	.16**	.18*	.01
T_2 Emotional Engagement	-.12*	.02	.19
T_2 Fear Appeals	—	—	-.25
T_2 Challenge Appraisal	-.10	.04	-.10
T_2 Threat Appraisal	.19***	-.09	.19

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