Abstract

Background: Prior to high-stakes examinations, teachers may use value-promoting messages (VPMs) to communicate to students the value and importance of their forthcoming exams in the hope that they will adopt adaptive learning and study behaviours. These messages can focus on achieving success (gain-framed) or avoiding failure (loss-framed).

Aims: This study examined how secondary school students appraised hypothetical gain and loss-framed VPMs, and how these appraisals differed according to self-reported levels of attainment value (AV) and academic self-efficacy (ASE).

Samples: 539 secondary schools students (284 male, 255 female, mean age 14.8 years) participated in this study.

Methods: Participants completed self-report measures of AV and ASE, and appraised hypothetical VPMs as challenging, threatening or irrelevant (disregard). Participants were randomly assigned to a gain or loss-framed condition.

Results: A challenge appraisal was greater in students with higher AV and ASE. A threat appraisal was greater in students with higher AV and lower ASE. A disregard appraisal was higher in students with lower AV. Message frame did not interact with AV or ASE in the appraisal of VPMs as challenging, threatening, or irrelevant.

Conclusions: Educational practitioners should consider the characteristics of their students before using VPMs. In particular, they may not be effective for students high in AV and low in ASE. They are likely to be ineffective for students low in AV.

Keywords: value-promoting messages; fear appeals, subjective task value, academic self-efficacy, message frame

The role of attainment value, academic self-efficacy and message frame in the appraisal of value-promoting messages

Prior to high-stakes examinations, teachers may use value-promoting messages (VPMs) to communicate to students the value and importance of their forthcoming exams (Putwain & Roberts, 2012). Teachers use such messages in an attempt to encourage their students to adopt the learning and study behaviours required to achieve success and/or avoid failure (Putwain & Roberts, 2012). Accordingly, VPMs may focus on the consequences of either success or failure, and we refer to these here as gain-framed and loss-framed value-promoting messages, respectively.

A small, but growing body of research has linked the use of VPMs, and loss-framed messages specifically, to negative educational outcomes, such as lower academic performance (Putwain & Best, 2012; Putwain & Symes, 2011a). These negative outcomes appear more likely if students appraise the messages as threatening (Putwain & Symes, 2011b). Recent studies have examined the role that subjective task value and academic self-efficacy (ASE) may play in the appraisal of VPMs (Putwain & Symes, 2014; Putwain, Remedios & Symes, 2015). It remains unclear whether subjective task value and ASE play a similar role in the appraisal of gain-framed messages, or whether such messages are appraised as more or less threatening than loss-framed messages. To address this gap, the current study examined how secondary school students appraised hypothetical gain and loss-framed VPMs, and how these appraisals differed according to self-reported levels of subjective task value, ASE and message frame.

Loss-framed Value-promoting Messages (Fear Appeals)

Loss-framed VPMs constitute a 'fear appeal' (Putwain & Roberts, 2009; Sprinkle, Hunt, Simonds, & Comadena, 2006). Fear appeals are persuasive messages that show how particular courses of action can lead to unwanted and aversive outcomes, and how alternative

courses of action can be utilised to avoid these negative outcomes (Maloney, Lapinski & Witte, 2011; Witte & Allen, 2000). Accordingly, loss-framed VPMs used by teachers may focus on the consequences of exam failure in the hope that students will engage in positive study behaviours that will increase the likelihood of them avoiding failure. Indeed, teachers report the use of fear appeals prior to important exams (Putwain & Roberts. 2012), particularly those that are especially high-stakes (Putwain, Remedios & Symes, 2014).

Despite their prominence, teacher use of fear appeals has been relatively overlooked in the educational psychology literature. This is concerning, since the limited research that has been conducted indicates that fear appeals may be related to a number of negative student outcomes, such as higher test anxiety (Putwain & Best, 2011; Putwain & Symes, 2011a), reduced intrinsic motivation (Putwain & Remedios, 2014), and lower academic performance (Putwain & Best, 2012; Putwain & Symes, 2011b). Negative outcomes are most evident in those students who perceive fear appeals as being more threatening (Putwain & Symes, 2011a). The latter finding suggests that it is not simply exposure to fear appeals that is responsible for the negative outcomes associated with their use. The extent to which individual students appraise these messages as threatening appears to play a mediating role. Consequently, identifying those factors which influence the appraisal of fear appeals is vital if the impact of these messages is to be better understood.

The Appraisal of Loss-framed Value-promoting Messages

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 VPMs, appraisals refer to the ongoing and moment-by-moment way in which a VPM is perceived and interpreted by the recipient. Drawing on cognitive-appraisal models of the stress process (e.g. Folkman, 2008; Lazarus, 2006), Putwain and Symes (2014) conceptualise the appraisal of VPMs as a two-

stage process. In a reciprocal cycle of appraisal and reappraisal, a VPM is appraised in terms of its personal relevance to the student receiving it (primary appraisal) and on the basis of the options and resources available to the student to respond to the demands posed in the message (secondary appraisal). If a student regards the contents of the VPM as personally relevant, and believes him or herself as being able to respond effectively to the demands of the message (e.g., they can work harder, or perform the tasks and activities required of them in a particular subject), then a challenge appraisal will occur. A challenge appraisal is characterised by a sense of mastery and the belief that, with effort, a positive outcome can be achieved.

If a student regards the contents of a fear appeal as personally relevant, but does not perceive him or herself as being able to respond effectively to the demands of the message, then a threat appraisal will occur. A threat appraisal is characterised by the anticipation that a negative outcome cannot be avoided and the associated loss to one's sense of well-being and self-worth. If the content of a fear appeal is not perceived to be personally relevant, it will be disregarded, and no further processing will take place (Witte, 1992). A disregard appraisal will likely be characterised by a lack of interest and off-task behaviours, and be accompanied by negative emotions, such as boredom.

In the present study, personal relevance and response options were operationalised using two key constructs from expectancy-value theory (Eccles, 2005, 2007; Wigfield & Eccles, 2000; Wigfield, Tonks, & Klauda, 2016). Personal relevance was operationalised using attainment value (AV), referring to the perceived importance of performance on a particular task, or the importance of a particular grade in a school subject, to one's sense of self-identity (Eccles et al., 2005; Wigfield & Eccles, 2000; Wigfield et al., 2009). Although expectancy-value theory contains other types of values (utility, intrinsic and cost) we focused on AV as the most germane to one's academic performance. Response options were

operationalised using ASE. ASE refers to domain-specific beliefs that one is capable of learning or performing those actions required to succeed at a particular task (Bandura, 1997; Schunk & Pajares, 2002), such as whether or not a student believes they can master the material required to achieve a pass grade. In expectancy-value theory, values interact with expectancy beliefs to influence academic choices, motivation and achievement (Nagengast, Marsh, Scalas, Xu, & Trautwein, 2011)

The findings from cross-sectional and experimental studies in secondary school students have shown how AV and ASE relate to the appraisal of VPMs. A challenge appraisal is most likely when AV and ASE are high, a threat appraisal is most likely in students with high AV but low ASE, and a disregard appraisal is most likely when AV is low, irrespective of ASE (Putwain & Remedios, 2014; Putwain, Remedios, & Symes, 2014, 2015; Putwain and Symes, 2014, 2016). The combined evidence suggests that AV and ASE are potential antecedents of challenge, threat and disregard appraisals of loss-framed VPMs made prior to high-stakes examinations. However, current findings are limited in that they have relied on perceptions of loss-framed messages only, and have not always included disregard appraisals. Furthermore, the only studies to-date that examined interactions between AV and ASE in the appraisal of fear appeals used vignettes of fictional characters rather than naturalistic data. We address these concerns in the present study by using naturalistic data, including disregard, as well as challenge and threat appraisals, and by examining gain, as well as loss-framed VPMs.

The Appraisal of Gain-framed Value-promoting Messages

Whilst there is a growing body of research examining the impact of loss-framed VPMs used by teachers prior to important exams, and the mechanisms underlying the appraisal of such messages, much less is known about gain-framed messages. Gain-framed messages are messages that emphasise the potential positive outcomes of compliance with the

content of the message, compared with loss-framed messages which emphasise the potential negative outcomes of noncompliance with the message content (O'Keefe & Jensen, 2007). Given the different valence of the messages, it is likely that they may be appraised differently, and indeed, there is some evidence to support this assumption from the health literature. Importantly, as with loss-framed messages, individual differences in personal relevance and response options seem to interact with message frame to influence the impact of gain-framed messages

In a study looking at the impact of VPMs on adolescent drug use, for example, it was reported that loss-framed messages were more likely to lead to the intention to not take drugs in students who had already taken drugs, or had friends who had (higher personal relevance), whilst gain-framed messages were more effective for those who had not (Cho & Boster, 2008). Furthermore, gain-framed messages in health contexts (e.g., skin cancer prevention) have been shown to be more effective in promoting compliance with the message content and positive behavioural change when one's self-efficacy is high, and the stakes of not engaging in the behaviour are high (high personal relevance, Rothman & Salovey, 1997; Rothman, Martino, Bedell, Detweiler, & Salovey, 1999). Conversely, for individuals with low efficacy beliefs, loss-framed messages are more effective than gain-framed messages (Hwang, Cho, Sands & Jeong, 2011).

Relating the above findings to VPMs used in a classroom setting, and the appraisal model proposed by Putwain and Symes (2014), we suggest that gain-framed messages will lead to a higher challenge appraisal, whilst loss-framed messages will lead to a higher threat appraisal. This is supported by studies that have found that gain-framed messages are linked to positive emotions (indicative of a challenge appraisal) and loss framed messages are linked to negative emotions (indicative of a threat appraisal) (Shen & Dillard, 2007; Schneider et al., 2001; van't Riet, Ruiter, Werril, Cabdel & de Vries, 2010). Furthermore, message frame will

interact with ASE so that a challenge appraisal will be higher for a gain-framed message in students with high ASE and threat appraisal will be higher for a loss-framed message in students with low ASE. We do not anticipate that either message frame would have an effect on a disregard appraisal, since in both cases the message would still be appraised as having limited personal relevance (Witte, 1992).

Aims of the Present Study

The current study aims to increase understanding of the impact of VPMs used by teachers prior to important exams. It does so by examining how secondary school students appraise hypothetical gain and loss-framed messages, and how these appraisals differ according to self-reported levels of AV and ASE. The following four hypotheses are tested: (H_1) a challenge appraisal will be higher when both AV and ASE are high; (H_2) a threat appraisal will be higher when AV is high and ASE is low; (H_3) a disregard appraisal will be higher when AV is low, irrespective of ASE and message frame; (H_4) ASE and message frame will interact so that a challenge appraisal will be highest for gain-framed messages, and a threat appraisal will be highest for loss-framed messages.

Method

Participants

The participants in the study were 539 students (284 = male, 255 = female) with a mean age of 14.8 years (*SD* = 0.63), drawn from two English secondary schools, following a programme of study leading to the General Certificate of Secondary Education (GCSE) in mathematics. GCSEs are the school leaving qualification in England, and students in mainstream schools typically study between eight and ten GCSE subjects over the final two years of secondary education. English and mathematics are compulsory, and examinations in these subjects are considered to be high-stakes since access to any type of post-compulsory education is dependent on a student achieving at least a past grade. In our sample, 366

participants were in Year 10 (the penultimate year of secondary education) and 173 participants were in Year 11 (the final year of secondary education). The ethnic heritage of participants was predominantly white (92.9%, *n* = 501) with small numbers of participants reporting themselves to be of Asian (2.2%, *n* = 12), Black (1.3%, *n* = 7), other (0.9%, *n* = 5) or dual heritage (2.7%, *n* = 13).

Design

A cross-sectional design with one between-participants manipulated independent variable (gain vs. loss-framed messages) and two covariates (academic self-efficacy, attainment value) was used. Participants were randomly allocated individually to a condition with a gain or loss-framed message. The two covariates were measured via self-report questionnaires. The dependent variable was appraisal of VPMs (challenge, threat, disregard). Appraisals were measured using a visual analogue scale.

Materials

Academic self-efficacy.

Academic self-efficacy was measured using three items from the *Motivated Strategies of Learning Questionnaire* (Pintrich et al., 1993). Items were adapted to make them specific to GCSE mathematics rather than academic self-efficacy in general. Participants responded to items (e.g. ‘‘I think I will receive a good grade in my maths GCSE’) on a five-point scale (1 = Strongly Disagree, 3 = Uncertain, 5 = Strongly Agree). A higher score on this metric represents higher academic self-efficacy. Many studies attest to excellent internal reliability, factorial validity, and predictive validity for data collected using this scale (e.g., Garcia-Duncan & McKeachie, 2005; Pintrich et al., 1993). The internal reliability coefficient for the present study was excellent (Cronbach’s α =.90).

Attainment value.

Attainment value was measured using three items adapted from the *Michigan Study of Adolescent Life Transitions* scales (Eccles et al., 2005) by Putwain and Remedios (2014). All items refer specifically to mathematics GCSE (e.g., 'How important is it to you to get a good grade in GCSE maths?'). Participants responded on a five-point scale (1 = Not Very Important, 3 = Neither, 5 = Very Important). A higher score on this metric represents higher attainment value. The internal reliability, validity, and predictive validity of data collected using this revised instrument have been evidenced in previous studies (Putwain & Symes, 2014; Putwain, Remedios, & Symes, 2014). The internal reliability coefficient in the present study was moderate (Cronbach's α =.65).

Value-promoting messages.

VPMs began with the prompt "Imagine that at the beginning of every mathematics lessons your teacher tells the class how important mathematics is for their future lives". In the gain-framed condition, this was followed with the statement "GCSE mathematics is really important as most jobs which pay well require GCSE mathematics and if you want to go to college you will also need a pass in GCSE mathematics. It's really important to try your hardest". In the loss-framed condition this was followed with an alternate statement "If you fail GCSE mathematics, you will find it harder to get a good job or go to college. You need to work hard in order to avoid failing".

Challenge, threat, and discounting appraisals.

Appraisals were measured using analogue scales. A challenge appraisal was prompted with the sentence: "When the teacher says this, how much would you be motivated to work hard for GCSE mathematics?" Participants responded by placing an X on a 180mm scale that was anchored at each end with 'very motivated' vs. 'not at all motivated'. A threat appraisal was prompted with the sentence: "When the teacher says this, how much would you be

worried about failing GCSE mathematics?" Participants responded by placing an X on a 180mm scale that was anchored at each end with 'very worried vs. 'not at all worried'. A disregard appraisal was prompted with the sentence: "When the teacher says this, how much would you think: what the teacher says isn't relevant to me?" Participants responded by placing an X on a 180mm scale that was anchored at each end 'very relevant vs. 'not at all relevant'. Using this metric, a higher score would indicate greater challenge, threat, or disregard appraisal, respectively. We chose to use single item measures to keep the time required for data collection to a minimum. Participating schools placed strict conditions on data collection, namely that measures could only be collected on a single occasion, in a fifteen-minute window. We acknowledge that the use of single item measures can be controversial. However they can provide a time and resource efficient alternative to measuring motivational and affective constructs in educational settings, whilst still retaining psychometric rigour (Gogol et al., 2014; Gorard, 2010).

Procedure

Participants completed a pack that contained a consent form, demographic information, self-report questionnaires, and appraisals of VPMs. ASE and AV items were randomised and presented first. These were followed by the presentation of a gain or loss-framed VPM and the analogue scales for the appraisal of VPMs were presented last. The pack was administered during a period of the school day timetabled for administrative purposes by the regular teacher. The teacher was instructed to read out standardised instructions to the class from a script that included the aims of the study (these were also found on the front of the student pack), ethical details (the study was anonymous, participation was voluntary, consent was required, etc.), and the fact that it was not a 'test', and there were no 'correct' answers. Participants were randomly allocated individually to gain and loss-framed conditions by the teacher, and were asked to write a memorable word on the front of the pack (e.g., the

combined name of a pet and a sports team) that they could use to facilitate retrospective withdrawal, although none took up the offer. Institutional consent was provided by the Head Teacher of the participating schools.

Results

Analytic Approach

In order to examine the interactions between ASE, AV, and message frame in a single model, data were analysed using a combination of latent moderated structural equation modelling and multiple group analysis. This approach has the advantage over traditional moderational analysis of controlling for measurement error and being able to model all three outcome variables in a single analysis, hence accounting for the potential covariance between outcomes. Our analysis proceeded in the following sequence: First, in a series of preliminary analyses, a measurement model built to establish the properties of the latent variables, and bivariate correlations estimated. Second, we examined latent interactions between ASE and AV in a structural equation model. Finally, a multiple group analysis was used to examine the moderating role of message frame. Descriptive data are shown in Table 1.

[Table 1 here]

Preliminary Analyses

Measurement model.

A measurement model with three indicators for attainment value and three indicators of academic self-efficacy was built and examined in M*plus* version 7.3 (Muthén & Muthén, 2013) using the MLR estimator to account for the positively skewed distribution of attainment value. The fit of this and all other subsequent latent variable analyses were judged using the indices provided by M*plus*. These include the root mean square error of approximation (RMSEA), standardised root mean square residual (SRMR), comparative fit index (CFI), and the Tucker-Lewis index. RMSEA and SRMR indices of $\leq .08$/ $\leq .05$, and CFI

and TLI indices of ≥.90/ ≥.95, are indicative of a reasonable and good fitting model respectively (Marsh, Hau, & Grayson, 2005; Marsh, Hau, & Wen, 2004). By these criteria the measurement model showed a largely good fit: χ^2 (8) = 31.20, p = .07, RMSEA = .060, SRMR = .038, CFI = .980, and TLI = .963. Factor loadings, estimated using the STDYX command, for AV ranged from .49–.78, and for ASE ranged from .75–.88.

Bivariate correlations.

To estimate bivariate correlations, message frame (0 = gain-frame, 1= loss-frame), appraisals (challenge, threat, and disregard), gender (0 = male, 1 = female), and Year Group (0 = Year 10, 1 = Year 11) were added to the measurement model as manifest variables and examined in M*plus* version 7.3 using the MLR estimator. This model showed a good fit to the data: χ^2 (28) = 61.24, p <.001, RMSEA = .045, SRMR = .031, CFI = .977, and TLI = .955. Standardised bivariate Pearson correlations, estimated using STDYX command, are shown in Table 2.

[Table 2 here]

Latent Interaction Structural Equation Modelling

Three latent indicators for interaction terms were created using matched pairs of mean-centred AV and ASE items. In order to allow model identification, the means of AV and ASE were fixed to zero and the mean of their interaction fixed to equal the covariance of AV and ASE (see Marsh, Wen, & Hau, 2004; Steinmetz, Davidov, & Schmidt, 2011). Gender and Year Group were added as covariates. This model, using the MLR estimator, showed a largely good fit to the data: χ^2 (72) = 117.84, p < .001, RMSEA = .034, SRMR = .049, CFI = .962, and TLI = .945. Standardised beta coefficients, estimated using STDYX command, showed main effects of AV on challenge (β = .74, p <.001), threat (β = .44, p <.001), and disregard (β = -.63, p <.001) appraisals. Main effects of ASE were shown on challenge (β = .29, p =.005) and threat (β = -.44 p <.001), and not a disregard (β = -.15, p

=.14) appraisal. The interaction for AV×ASE was shown for threat (β = -.21, *p* =.002), but not challenge (β = .01, *p* =.98) or disregard (β = -.02, *p* =.76) appraisals. Table 3 reports the standardised beta coefficients from the latent interaction structural equation model.. Statistically significant coefficients and covariances are diagrammed in Figure 1.

[Table 3 here]

[Figure 1 here]

Simple slope analyses were used to probe the AV×ASE interaction (M*plus* output provides only unstandardised beta coefficients). The negative relationship between AV and threat at low (-1SD) academic self-efficacy (*B* = 46.01, *p* <.001) became weaker at mean (*B* = 26.50, *p* <.001) and high (+1SD) academic self-efficacy (*B* = 6.99, *p* =.54). This relationship is graphed in Figure 2.

Multiple Group Structural Equation Modelling

In order to examine whether message frame moderated main effects for AV and ASE, and the AV×ASE interaction, a multiple group analysis was performed on message frame using the MLR estimator. A model where the measurement components (factor structure, loadings, and intercepts) and regression paths for main effects (AV and ASE) and the AV×ASE interaction were held invariant across the gain and loss-frame conditions showed a reasonable fit to the data: χ^2 (141) = 229.78, *p* < .001, RMSEA = .048, SRMR = .079, CFI = .927, and TLI = .907. A model in which regression paths were allowed to vary, χ^2 (132) = 216.81, *p* < .001, RMSEA = .049, SRMR = .076, CFI = .930, and TLI = .905, did not show a statistically significant better fit: $\Delta\chi^2(9) = 12.97$, *p* >.05. Message frame did not moderate the main effects of AV and SE, and the AV×ASE interaction, on challenge, threat, and disregard appraisals.

Discussion

The current study examined how secondary school students following a program of study towards a high-stakes mathematics examination appraised hypothetical gain and loss-framed messages, and how these appraisals differed according to self-reported levels of AV and ASE. The reported findings partially supported the four hypotheses tested in this study. AV and ASE interacted to predict a threat appraisal and low AV predicted a disregard appraisal. However, the pattern of relations between AV and ASE was additive, rather than interactive, for a challenge appraisal. Furthermore, message frame did not show any statistically significant interactions with AV or ASE in relation to challenge, threat or disregard appraisals. The study findings are now discussed in more detail, before considering the limitations and implications of this research.

According to their model detailing the appraisal of VPMs, Putwain and Symes (2014) argue that a challenge appraisal will be highest when both AV and ASE are high. However, results from this study did not show the expected interaction. Instead, AV and ASE were additive. A challenge appraisal for students with high ASE does not vary greatly as a result of higher AV, and students with high ASE can appraise VPMs as more challenging even when AV is low. Similarly, students with high AV can appraise VPMs as more challenging even when ASE is low.

This finding is contrary to the two-step model proposed by Putwain and Symes (2014), which implies that higher AV is required for a challenge appraisal. However, control-value theory (CVT, Pekrun, 2006), can offer a potential explanation. According to CVT, students' affective experiences are determined by their efficacy beliefs (control) and the extent to which they value the outcome of an activity (value). Control beliefs determine the valence of task and outcome-related emotions, whilst value influences the intensity. Thus, it is possible

that students high in ASE (which implies high action-control beliefs) could appraise VPMs as a low-intensity challenge irrespective of whether AV was high or low.

In line with the Putwain and Symes (2014) model, a threat appraisal was highest in the current study when AV was high and ASE was low. The relationship between AV and a threat appraisal became stronger at low ASE, and weaker at high ASE. Findings relating to disregard appraisals were also as expected: disregard appraisals were highest in students with low AV and ASE was not a statistically significant predictor. Taken together, the findings from the current study provide partial support for Putwain and Symes' (2014) model of the appraisal of VPMs based on naturalistic data, rather than responses of participants to fictional characters.

The finding that message frame did not significantly interact with ASE to produce higher threat or challenge appraisals was surprising, although it suggests that the model proposed by Putwain and Symes (2014) can account for the appraisal of both loss and gain-framed value promoting messages. Based on previous research in the health field (e.g., Latimer, 2007), it was predicted that gain-framed messages would result in stronger challenge appraisals, especially for those students with higher ASE, and loss-framed messages would result in a stronger threat appraisal, especially for those students with lower ASE. This was based on findings that individual factors, such as perceived efficacy and experience can differentially influence the appraisals of gain and loss-framed messages (Cho & Boster, 2008; Hwang et al., 2011).

Evidence relating to the relative effectiveness of gain and loss-framed messages is, however, mixed. Studies have found evidence for the superiority of gain-framed messages (Latimer et al., 2008), loss-framed messages (Rothman et al., 1999) or neither message frame (O'Keefe & Jensen, 2007). These differences may be because the impact of message frame is dependent on individual perceptions of the severity of the outcome (Hwang et al., 2011). It is

possible that there were no message frame effects for VPMs used prior to important exams because the perceived stakes of such exams were equally high for all students (that is, the gains and losses for all students are pervasive and salient). Furthermore, the emotional vocal tone used in the message delivery may be as important as message content in manipulations designed to effect challenge or threat appraisals (Blascovitch & Mendes, 2000). As our study manipulated message frame purely using visual text, accompanying emotional vocal tone was absent. This may have limited the impact of message frame, or differences between appraisals of gain and loss-framed messages.

Given that the pattern of relations between AV and ASE for challenge, threat, and disregard appraisals did not differ by message frame, the findings of the study provide partial support for one of the key propositions of expectancy-value theory, that expectations of success will interact with subjective task values (e.g., Eccles, 2005, 2007; Wigfield & Eccles, 2000; Wigfield et al., 2016). However, much of the empirical data in support of expectancy value theory has not examined this key proposition (e.g., Wigfield & Meece, 1988; Meece, Wigfield & Eccles, 1990). In a recent exception, Nagengast et al. (2012) showed intrinsic value to interact with academic self-concept to predict science career choices and aspirations. Our finding that AV and ASE interacted for a threat appraisal adds to the body of work supporting the propositions of EVT.

Study Limitations

The current study attempted to address some of the limitations of previous research in the field of VPMs in an educational context, namely through experimentally manipulating the VPMs the students were exposed to, and considering the appraisal of both loss and gain-framed messages. Despite this, the study still has some limitations of its own, and these are considered here. Firstly, it makes use of hypothetical, rather than actual, VPMs. Measuring the gain and loss-framed messages used by teachers in naturalistic settings would increase the

ecological validity of the findings. Secondly, we focused on a single subject only. Whilst mathematics GCSE was chosen due to the important role it can play in a student's future life trajectory, it is acknowledged that this reduces the generalisability of the results to other subjects. It is possible that the relationship between AV and ASE, and the role of message frame, differs in subjects with lower stakes, and further research is needed to examine this. Thirdly, no measure of treatment fidelity was included. Hence we are unable to establish the extent to which participants were able to accurately differentiate between the gain and loss-framed messages. Including a measure of treatment fidelity would increase confidence in the effectiveness of the message frame manipulation.

Implications for Practice

The findings from the current study have important implications for a number of educational professionals, such as teacher educators and trainees, practicing teachers, and school and educational psychologists. Of greatest importance is the finding that VPMs may not always be appraised as intended (i.e., as challenging), and can in fact be appraised as threatening. Thus, teachers should adopt a student-centred approach when using such messages, and attempt to understand how their messages may be interpreted by different students. For example, students high in AV, but low in ASE, may not benefit from a VPM if they appraise it as threatening. These students may benefit more from efficacy-based messages that focus on strategy and communicate encouragement and belief from the teacher (Putwain & Roberts, 2012; Sprinkle et al., 2006), or teaching and instructional practices aimed at developing student ASE. However, for students that are high in ASE, VPMs are likely to be more effective in that they are associated with lower threat and higher challenge appraisals. For students low in AV, VPMs are not likely to be effective. The challenge for secondary school teachers is to be able to judge individual students' AV and ASE accurately.

Here, educational and school psychologists can play an important role in assessing students, providing guidance for teachers and, where necessary, motivational interventions.

Conclusion

The current study examined how secondary school students following a programme of study towards a high-stakes mathematics examination appraise hypothetical gain and loss-framed VPMs. In line with predictions, a higher threat appraisal was more likely when AV was high and ASE was low, and a higher disregard appraisal was more likely when AV was low. However, for a challenge appraisal, AV and ASE were statistically significant predictors but did not interact. Message frame (gain or loss) did not influence the interactions between AV and ASE. Thus, a key issue for the appraisal of VPMs is not the message characteristics (whether they are gain or loss-framed) but the motivational beliefs and values of individual students.

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Table 1

Descriptive statistics for academic self-efficacy, attainment value, and appraisal of value-promoting messages

	Actual Range	Observed Range	Mean	SD	Skewness	Kurtosis
Academic self-efficacy	1–5	1–5	3.51	0.62	-0.47	0.66
Attainment Value	1–5	1–5	4.07	0.66	-1.08	1.67
Disregard Appraisal	0–180	0–180	65.39	38.84	0.46	0.11
Challenge Appraisal	0–180	0–180	111.84	38.93	-0.50	0.21
Threat Appraisal	0–180	0–180	119.41	46.77	-0.54	-0.46

Table 2

Standardised bivariate correlations and descriptive data for attainment value, academic self-efficacy, message frame, and appraisal of value-promoting messages

	1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**
1. Attainment value	—	.61***	-.10*	.35***	.08	-.35***	.16**	.12*
2. Academic self-efficacy		—	-.09	.52***	-.12**	-.14**	.23***	.07
3. Message frame			—	.03	.06	-.01	—	—
4. Challenge appraisal				—	.26***	-.43***	-.08	.07
5. Threat appraisal					—	-.21	-.28***	.14***
6. Disregard appraisal						—	-.02	-.09
7. Gender							—	-.01
8. Year group								—

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

Table 3

Standardised beta coefficients from the latent moderated structural equation model

	AV	ASE	Challenge	Threat	Disregard
Gender	.15**	.24***	-.15	-.23***	.01
Year Group	.13*	.02	-.02	.09*	-.01
AV			.74***	.44***	-.63***
ASE			.29***	-.44***	-.15
AV x ASE			.01	-.21**	.01

Note. AV = Attainment value; ASE = Academic self-efficacy; AV × ASE = the interaction between attainment value and academic self-efficacy; Gender and Year Group are covariates
*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

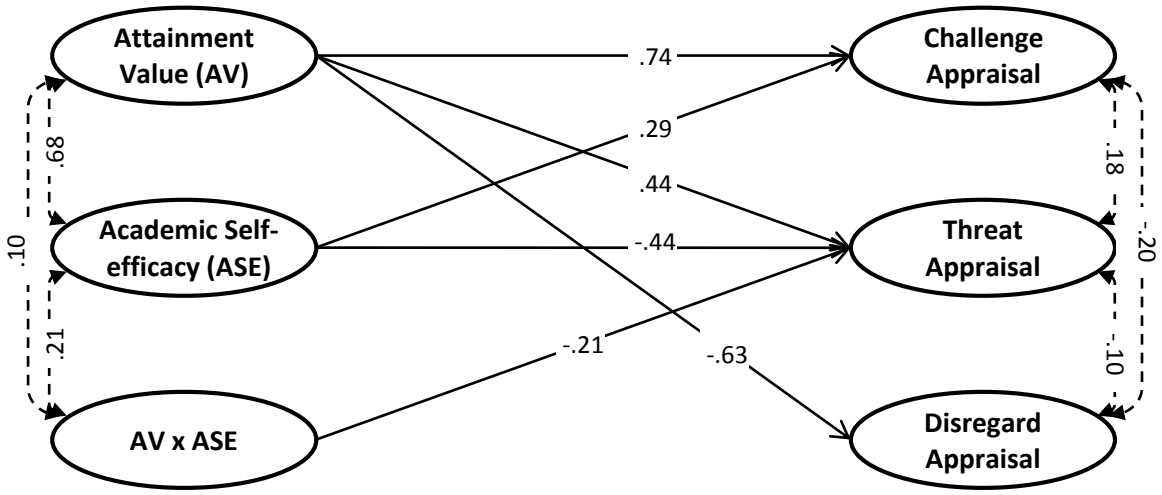

Figure 1. Standardised beta coefficients for the paths from attainment value, academic self-efficacy, and their interaction, to challenge, threat, and disregard, appraisals (covariances in dashed lines). For expediency, covariates (gender and Year Group are omitted).

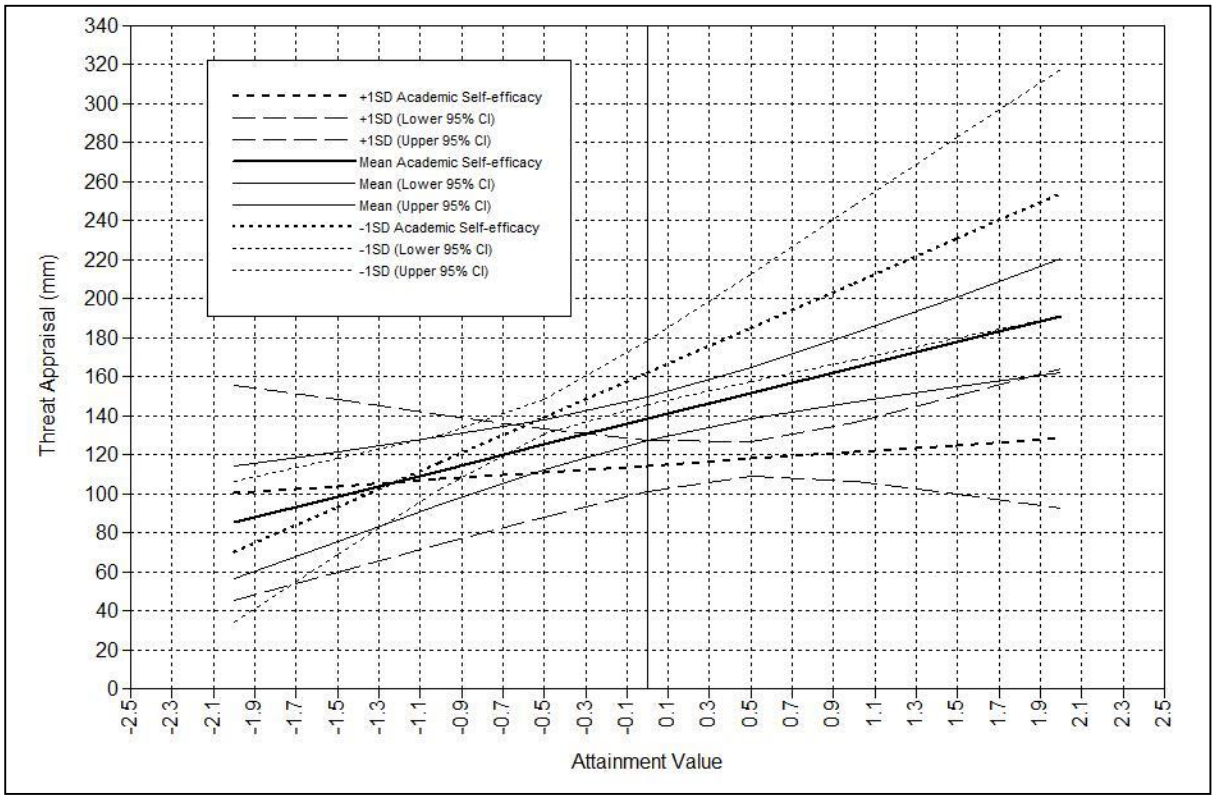

Figure 2. The relationship between threat appraisal and attainment value at different levels of academic self-efficacy (-1SD, mean, and +1SD).