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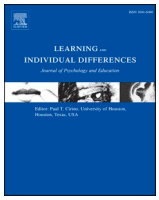

COVID-19 meets control-value theory: Emotional reactions to canceled high-stakes examinations

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ABSTRACT

In many countries, examinations scheduled for summer 2020 were canceled as part of measures designed to curb the spread of the COVID-19 pandemic. To examine how four retrospective emotions about canceled examinations (relief, gratitude, disappointment, and anger) and one prospective emotion (test anxiety) were related to control-value appraisals, a sample of 474 participants in the UK aged 15–19 years, who would have taken high-stakes examinations if they had not been canceled, self-reported measures of control, value, retrospective emotions and test anxiety. Data were analysed using the confirmatory factor analysis within exploratory structural equation modeling (EwC) approach. Relief, gratitude, and anger were predicted from expectancy × value interactions. Disappointment was related to expectancy only. Test anxiety was predicted independently by expectancy and positive/negative value. Findings offer broad support for Control-Value Theory and show how the appraisals underpinning achievement emotions can differ when focused on canceled examinations rather than success or failure.

1. Introduction

Events in which a person's performance or competence is judged are ubiquitous in various domains of life (e.g., education, sporting competitions, and job selection). Due to the personal stakes and investment involved, these achievement opportunities can arouse strong emotions. These emotions have been widely researched in the educational, sports, and occupational psychology literatures, and have been found to profoundly influence performance and psychological health (e.g., Hanin, 2007; Pekrun, 2021; Raccanello, 2015).

The non-occurrence of scheduled achievement opportunities is not uncommon. A person may experience illness, injury, or numerous unforeseen circumstances (e.g., travel disruption) making their attendance at the scheduled achievement event impractical or unfeasible. Furthermore, the event may be canceled by organizations or their regulators. The emotions experienced in relation to lost achievement opportunities, however, have received scant attention in the literature. In the present study we focus on the lost achievement opportunities arising from high-stakes secondary school examinations being canceled due to the COVID-19 pandemic. Although the pandemic was unprecedented in contemporary society, some of the effects (such as missed achievement opportunities) have parallels in other areas of life. Thus, findings of the present study have implications beyond the context of the COVID-19 pandemic. In addition, as we outline below, the emotions experienced in relation to canceled examinations can have profound impacts on one's future motivation and behavior.

In 2020, the world witnessed the start of a pandemic of the coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). In the UK, the first confirmed case was reported on 22nd January 2020, and infections and hospitalizations rapidly spread throughout February and March. On March 20th, all regions of the UK introduced a series of stringent measures (colloquially referred to as 'lockdown') designed to slow the transmission of COVID-19. Measures included the closure of hospitality and leisure venues and most types of retail businesses accompanied by legally enforceable restrictions on the freedom of movement. Schools in all

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regions of the UK closed to the majority of students but remained open to a small number of students who were deemed vulnerable or were the children of key workers (e.g., healthcare workers, emergency service workers). Similar measures were taken in other countries worldwide.

As a consequence of schools closing, and the associated disruptions caused to education, high-stakes examinations scheduled to take place over May and June of the school year, which runs August–September to June–July in England, Wales, and Northern Ireland, were canceled. Year 11 secondary school students (aged 15–16 years) were due to take secondary school exit examinations (General Certificate of Secondary Education: GCSE), and Year 13 students (aged 17–19 years) were due to take General Certificate of Education: Advanced Level (A Level), or Business and Technology Education Council (BTEC), examinations.

These examinations are high stakes. GCSE grades determine access to different forms of upper secondary education and training (vocational, technical, and academic courses studied at school or college, or work-based apprenticeships). Furthermore, minimum GCSE pass grades are required for entry into all but routine and manual occupations (Shackleton, 2014). A Levels and BTECs are studied by students in an academic tier of upper secondary education, and grades are used to determine access to undergraduate university courses.

In 2020, examination grades were replaced by grades based on existing teacher assessments, or by grades from 'mock' examinations (practice examinations taken under standardized conditions that are commonly used in UK schools) that were taken earlier in the school year. The decision to cancel exams was followed by months of conjecture among media commentators and school leaders over students' emotional experiences of having such important, and potentially life-changing, examinations canceled. On occasion, commentaries were accompanied with vox pop interviews with parents and school staff. The perspective of students themselves, however, was either absent or given scant consideration. Consequently, much of the commentary was not evidence-based and highly speculative.

To address this concern, we conducted a study of students aged 15 to 19 years who would have taken the aforementioned examinations over May and June 2020 had they not been canceled. Drawing on Control-Value Theory (CVT; Pekrun, 2021) we examined four retrospective emotions (relief, gratitude, disappointment and, anger), and one prospective emotion (test anxiety). The aim of the present study was to examine how the aforementioned emotions arose from appraisals of control, value and their interaction, as a result of the high stakes examinations being canceled.

Moreover, the retrospective emotions experienced by students about their canceled exams could have important consequences for their wellbeing and subsequent educational trajectory. All things being equal, positive emotions are associated with greater, negative emotions with lower, wellbeing (e.g., Le Nguyen & Fredrickson, 2017). Gratitude, especially, is strongly linked to happiness and good physical health whereas anger has the opposite effect (Barrett et al., 2013; Wood et al., 2010). In addition, emotions exert a profound impact on subsequent study behavior and achievement (Pekrun, 2021). Positive emotions like relief are positively, and anger negatively, associated with surface and deep learning strategies and achievement (Pekrun et al., 2011). Thus, the emotions experienced as a result of exams being canceled could have important consequences for the future study behaviours and strategies of the students concerned.

1.1. Control-value theory of achievement emotions

In CVT, emotions that relate to achievement activities or achievement outcomes are defined as *achievement emotions* (Pekrun, 2006, 2018, 2021). Pekrun (2006) proposed a three-dimensional taxonomy of discrete achievement emotions based on the dimensions of *valence*, *activation*, and *focus* (achievement activities or outcomes). Outcome-focused emotions can be further disaggregated into *prospective* or *retrospective* emotions.

To provide a balance of positively and negatively valenced, and activating and deactivating, retrospective emotions we selected four plausible emotions for canceled examinations based on the counterfactual emotion literature (Beck et al., 2014); one from each of the four categories of positive and negative, activating and deactivating, emotions. These emotions were relief (positive, deactivating), gratitude (positive, activating), disappointment (negative, deactivating), and anger (negative, activating). Other counterfactual emotions, such as regret and shame, require some action on the part of the individual (e.g., feigning illness) to result in the missed achievement opportunity; such emotions are less relevant to the present circumstances of canceled examinations due to COVID-19.

In addition to the four retrospective emotions, we also included test anxiety as a prospective outcome-focused activating negative emotion. Canceled examinations meant that students were unable to use feedback from examination grades to confirm, or disconfirm, self- and response-efficacy beliefs. Students may have lost a valuable mastery opportunity required to strengthen self-efficacy (Bandura, 1997) – a component of control. Uncertainties over control may be carried forward to future programs of study involving examination-based assessment, and might even be exacerbated by a higher tier of study characterized by more difficult examinations.

CVT posits that discrete emotions arise from different combinations of perceived control and value (Pekrun, 2006, 2018; Pekrun & Perry, 2014). Perceived control can take prospective and retrospective forms. Prospective control includes action-control expectancy, or self-efficacy (i.e., the belief one can successfully perform a specific action or task), and action-outcome expectancy, or response efficacy (i.e., whether the action will result in the desired outcome). Retrospective control refers to judgments of the causes of success or failure; whether they were attributed to internal or external causes, and to controllable or uncontrollable causes (see Weiner, 2018).

In CVT, perceived value has positive and negative facets and can be intrinsic or extrinsic (Pekrun, 2006). An achievement activity can be positively valued when it is interesting (positive intrinsic value) or contributes to desired outcomes (positive extrinsic value). In other words, positive intrinsic value refers to inherent interest and curiosity and positive extrinsic value to the instrumentality of an action for one's goals or aspirations.[1] An activity can be negatively valued when it takes too much effort and time, costs money, or comes with a loss of other opportunities (this type of negative value of an activity has been called "cost" in Eccles's expectancy-value theory; e.g., Eccles & Wigfield, 2020). The negative value we focused on in the present study were the sacrifices associated with the time and effort of studying, along with loosing opportunities for alternative activities.[2]

1.2. Retrospective emotions when exams are canceled

Test-related relief, gratitude, disappointment, and, anger, have not been widely studied in CVT. Three studies have shown weak equivocal relations between test-related relief and control/value appraisals, and small to moderate negative relations between test-related anger and control/value (Peixoto et al., 2017; Pekrun et al., 2004, 2011). No CVT studies have examined how control and value interact to determine relief and anger or, thus far, examined test-related gratitude or

[1] Some CVT studies that we review used terms and scales from Eccles's expectancy-value theory. Intrinsic and extrinsic value as defined in CVT broadly correspond to intrinsic and attainment/utility values, respectively, in Eccles's theory (e.g., Wigfield & Eccles, 2000).

[2] We used items assessing perceived cost as a measure of negative value. Although developed from the perspective of Eccles's expectancy-value theory (e.g., Wigfield & Eccles, 2000), this scale captures important components of negative value (i.e., that a task may make considerable demands in terms of time, effort, and lost alternatives).

disappointment.

Accordingly, we highlight how CVT can be used to explain emotions in this different context. In doing so, we draw on a conceptual distinction central to CVT but which has not received wide attention; the distinction between positive and negative facets of value (i.e., cost). In addition, we examine how control and value appraisals interact - a central proposition of CVT that has also not been widely studied.

Relief follows from a disconfirmed expectation of failure, and disappointment follows from a disconfirmed expectation of success. Both emotions are thought to be stronger when achievement is appraised as important. We hypothesized that relief will arise from the combination of low expectancy and high negative value and disappointment will arise from the combination of high expectancy and high positive value. Gratitude will arise when either failure is anticipated, or the amount of time, effort, and missed opportunities for alternate valued activities, required to avoid failure is anticipated to be very high. Anger will arise when canceled examinations were positively valued; that is, students were angry for being denied the opportunity to take highly valued examinations that they may have worked very hard towards. We hypothesized gratitude to arise from the combination low expectation of success with high negative value. In contrast, we hypothesized anger would arise from the combination of high expectation of success with high positive value of the exams.

1.3. Test anxiety and canceled examinations

Although test anxiety is theorized in CVT to arise from the combination of low expectancy and higher value, studies have found test anxiety to show negative relations with expectancy and value (Peixoto et al., 2017; Pekrun et al., 2004, 2011). The negative relation shown between test anxiety and value can be attributed to using measures of intrinsic value and interest rather than specifically assessing an extrinsic value such as how much success, or avoiding failure, is valued. Like other emotions studied from the perspective of CVT, studies testing control-value interactions and test anxiety are largely lacking. In two notable exceptions the highest levels of test anxiety arose from combinations of low expectancy with high task importance (Nie et al., 2011) and high intrinsic/utility value (Song & Chung, 2020). Task importance and utility value are forms of extrinsic value that imply success is valued.

Following CVT, we expect that control and value will interact to predict test anxiety, and that the highest test anxiety will be found in combinations of low expectancy with high positive/negative value. Previous studies have only examined test anxiety in relation to positive value. We expect that test anxiety would be more strongly related to negative than to positive value; negative value is a more direct indicator of the subjective importance of failure than positive value which is more success focused.

1.4. Aim of the present study

In the present study, we examined students' emotions in relation to high-stakes examinations that were canceled in summer 2020, due to restrictions designed to slow the transmission of COVID-19. The study had three aims. First, we sought to further our understanding of retrospective achievement emotions, using CVT as a conceptual framework. In doing so, we studied emotions that have thus far not received wide attention in the literature on test emotions, namely relief, gratitude, disappointment, and anger. Second, we make a novel contribution to the achievement emotions literature by examining how control-value interactions predict these four emotions, by distinguishing between positive and negative facets of value. Third, we sought to study the aforementioned emotions in circumstances that have, hitherto, not been widely considered, namely where an outcome opportunity was denied.

We tested the following four hypotheses on the role of expectancy of success on the canceled exams, and the value of the exams:

Hypothesis 1. Relief is predicted by low expectancy, high negative value, and an expectancy × negative value interaction; the highest relief will be found from the combination of *low expectancy* with *high negative value*.

Hypothesis 2. Gratitude is predicted by low expectancy, high negative value, and an expectancy × negative value interaction; the highest gratitude will be found from the combination of *low expectancy* and *high negative value*.

Hypothesis 3. Disappointment is predicted by high expectancy, high positive value, and an expectancy × positive value interaction; the highest disappointment will be found from the combination of *high expectancy* with *high positive value*.

Hypothesis 4. Anger is predicted by high expectancy, high positive value, and an expectancy × positive value interaction; the greatest anger will be found from the combination of *high expectancy* and *high positive value*.

In addition, we examined how control-value appraisals predicted a prospective emotion, namely test anxiety. Few studies have previously investigated control-value interactions for anxiety. Notably, our study is the first to consider positive and negative forms of value in relation to test anxiety. Following CVT, we expected that test anxiety will arise from expectancy × value interactions. We tested the following hypothesis:

Hypothesis 5. Test anxiety is predicted by low expectancy, high positive/negative value, and an expectancy × positive/negative value interaction; the highest test anxiety will be found from the combination of *low expectancy* with *high positive/negative value*.

Hypothesized relations from expectancy, positive value, and negative value, to the five aforementioned achievement emotions, are shown in Fig. 1. For a complete diagram of CVT see, for example, Pekrun (2006, p. 328, and 2021, p. 19).

2. Method

2.1. Participants and procedure

The sample comprised 474 participants (male = 87, female = 379, prefer not to say = 4, and other = 4). At the time of data collection, the majority of participants were in Year 12 (n = 393); for these students, GCSE examinations were canceled when in Year 11. A smaller number of participants were undertaking undergraduate studies (n = 81); for these students, A Level/BTEC examinations were canceled when in Year 13.[3] Participants were aged between 16 and 19 years (M = 16.5, SD = 0.81). The ethnic heritage of participants was largely white Caucasian (n = 314), followed by Asian (n = 80), black (n = 36), other (n = 24), dual/multiple heritage (n = 17), and Chinese (n = 3). There were 81 participants eligible for free school meals (FSM; a proxy for low income) in the previous school year (i.e., when GCSE and A Level/BTEC examinations were canceled; Years 11 or 13, respectively).

The study was hosted on an electronic survey platform accessed via a uniform resource locator (URL). The webpage contained information about the aims of the study and ethical information (that participation was voluntary and anonymous, and how to withdraw participation). The URL was hosted on social media platforms and distributed by staff at English, Welsh, and Northern Irish universities and schools, contacted by the research team between September and November 2020. A URL at

[3] In England, Wales, and Northern Ireland, General Certificate of Secondary Education (GCSE) examinations are taken at the end of secondary school aged 16 years (Year 11). General Certificate of Education: Advanced Level (A Level) and Business and Technology Education Council (BTEC) examinations are taken at the end of upper secondary education aged 18 years (Year 13).

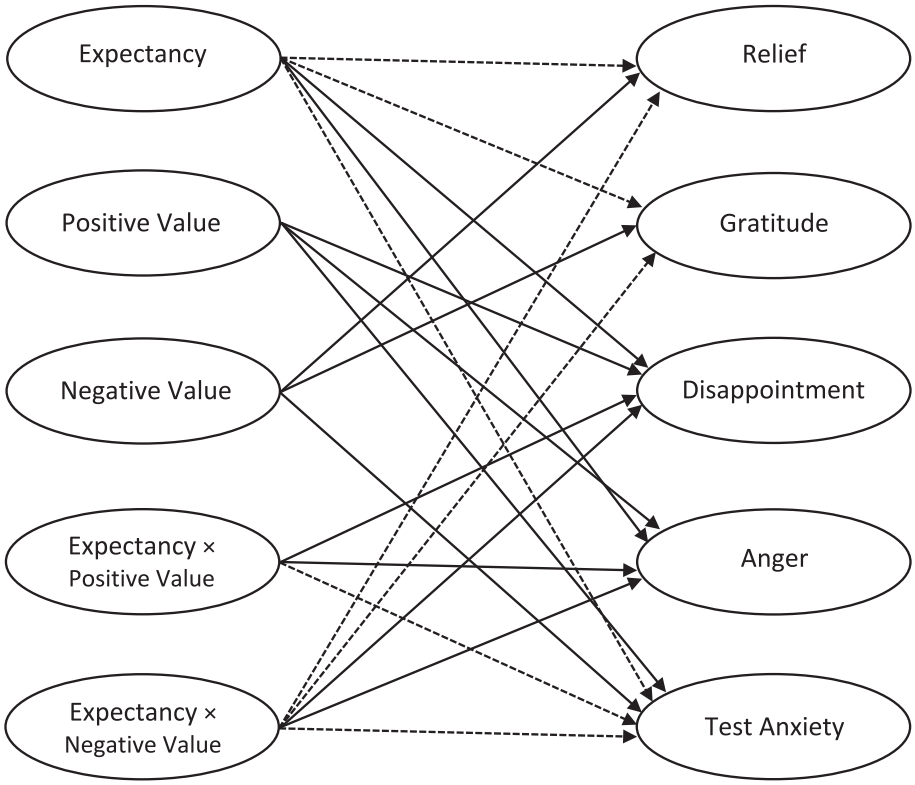

Fig. 1. Linkages from control-value appraisals to the achievement emotions included in the present study
Note. Positive relations depicted as solid, and negative relations as dashed, lines.

the end of the first webpage linked to the actual survey, and continuation to the survey indicated informed consent. Participants were prompted if they had not completed a question hence there were no missing data. The study was approved by an institutional research ethics committee at the institution of the first author (20EDN015).

Participants were expected to be drawn from a large pool of different schools or colleges. Accordingly, we did not collect data pertaining to the school or college participants were attending at the point when examinations were canceled. The small number of participants from each school or college would have rendered comparisons for schools or colleges obsolete. It is also germane to highlight that the point at which examinations were canceled was two weeks before the Easter break at which schools and colleges would have completed their two-year GCSE and A Level/BTEC courses. Thus, it is unlikely that the wider educational disruption resulting from COVID-19 would have greatly influenced participants' beliefs and emotions about the canceled examinations; they had more or less already completed their courses.

2.2. Measures

Participants responded to all items on a five-point scale (1 = *strongly disagree,* 3 = *neither*, 5 = *strongly agree*) which are listed in the Supplementary Materials (where the number of items can also be found). Internal consistency for all scales was good (Cronbach's $\alpha \geq 0.72$; McDonald's $\omega \geq 0.73$; Table 1).

2.2.1. Control and value appraisals

The Expectancy-Value-Cost Scale (EVCS: Kosovich et al., 2015) was used to measure the expectancy dimension of control, positive intrinsic and extrinsic values, and the costs associated with effort, time, and missed alternatives as a proxy for negative value. This scale was chosen due to its brevity (10 items in total) and because the scales were inclusive of the positive and negative values as theorized by CVT. As we did not theorize relations for different aspects of positive and negative value, scales representing more specific dimensions of value were not

Table 1
Descriptive statistics for the study variables.

	Mean	SD	α	ω	Skewness	Kurtosis	Factor loadings
Control-value appraisals							
Expectancy	3.96	0.86	0.76	0.76	−0.76	1.54	0.65–0.81
Positive Value	4.17	0.66	0.80	0.80	−1.23	3.41	0.64–0.85
Negative Value	2.79	0.78	0.72	0.73	0.27	−0.19	0.54–0.70
Retrospective emotions							
Relief	3.19	0.84	0.84	0.84	0.16	−0.36	0.49–0.73
Gratitude	3.49	0.89	0.86	0.86	0.52	−0.26	0.57–0.80
Disappointment	3.41	0.95	0.89	0.89	0.38	−0.23	0.59–0.87
Anger	3.05	0.91	0.80	0.81	0.07	−0.24	0.43–0.81
Test anxiety	3.66	0.77	0.93	0.76	−0.45	0.24	0.65–0.83

Note. Hierachical Omega (ω_H) was used to estimate McDonald's ω for test anxiety due to the higher-order factor structure.

required. All items were adapted to refer to the previously canceled exams rather than present instructional or testing contexts. Kosovich et al. (2015) showed good internal consistency, strong construct validity, and gender and longitudinal invariance for EVCS data (Kosovich et al., 2015).

2.2.2. Retrospective test emotions

Relief and anger were measured using items from the Achievement Emotions Questionnaire (AEQ; Pekrun et al., 2011) that have shown good internal consistency and construct validity in previous studies (e.g., Pekrun et al., 2004, 2011; Peixoto et al., 2017). Disappointment was measured using items from the AEQ test hope and test pride scales that were modified to reflect the experience of 'effort invested in vain' (Van Dijk & Zeelenberg, 2002). Gratitude was measured using the Gratitude Questionnaire (McCullough et al., 2002). Items were adapted to reflect the retrospective nature of the canceled examinations and participants instructed to respond to the instruction, "Please tell us how you felt about your cancelled GCSE, A Level, or BTEC, exams".

2.2.3. Test anxiety

Test anxiety was measured using the Multidimensional Test Anxiety Scale (MTAS; Putwain et al., 2021; Putwain, von der Embse, et al., 2021) comprising one higher-order factor and four lower-order factors: Tension, physiological indicators, worry, and cognitive interference. Strong internal consistency, test-retest reliability, construct validity, and invariance for gender and FSM eligibility have been shown for the MTAS in previous studies (Putwain et al., 2021; Putwain, von der Embse, et al., 2021; von der Embse et al., 2021). Participants were instructed to respond about future examinations in general, rather than towards a specific examination, with the instruction, "Please think about how you usually think and feel when taking a test or exam". For students in Year 12, this would be A Level or BTEC examinations, and for undergraduate students this would be examinations at university.

2.2.4. Demographic variables

Gender (0 = male, 1 = female), age, and current level of study (0 = Year 12, 1 = undergraduate), were included as covariates in the analyses.

2.3. Analytic plan

Data were analysed in three steps. First, a measurement model was constructed using the confirmatory factor analysis within exploratory structural equation modeling (EwC) approach (see Marsh et al., 2020). EwC models allow for the benefits of exploratory structural equation modeling (i.e., allowing items to load on non-target factors) with advantage of allowing test anxiety to be modeled as a higher-order factor structure. Second, a structural equation model (SEM) was used to estimate the additive (i.e., independent) influences of control and value antecedents on retrospective emotions and test anxiety. Third, a latent-interaction SEM (LI-SEM) model were used to estimate the interactive effects of control and value antecedents on retrospective emotions and test anxiety.

Demographic covariates were added to the models as additional predictors of control-value appraisals and emotions. All models were estimated using maximum likelihood estimation with robust standard errors (MLR) in M*plus* v.8 (Muthén & Muthén, 2017). A detailed analytic plan and preliminary analyses (the development of a measurement model and latent bivariate correlations) are included in the Supplementary Materials.

3. Results

Descriptive statistics for the study variables are shown in Table 1. All constructs showed skewness and kurtosis within ±1 with the exception of expectancy (leptokurtic distribution) and positive value (negative skewness and a leptokurtic distribution). The additive latent SEM showed a reasonable fit to the data, $\chi^2(1171) = 2234.43$, $p < .001$, RMSEA = 0.044, SRMR = 0.058, CFI = 0.914, TLI = 0.898. Standardized path coefficients are reported in Table 2. Greater relief and gratitude were predicted by higher negative value; Greater disappointment was predicted by higher expectancy and positive value. Greater anger was predicted by positive value, and greater test anxiety predicted by lower expectancy and higher positive/negative value. The LI-SEM showed a reasonable fit to the data, $\chi^2(1474) = 2592.82$, $p < .001$, RMSEA = 0.040, SRMR = 0.057, CFI = 0.914, TLI = 0.901.

Standardized path coefficients are reported in Table 2. Expectancy interacted with positive value to predict relief, gratitude, and anger; greater disappointment was predicted by higher expectancy only and test anxiety additively by lower expectancy and higher positive/negative value. Interactions were probed with simple slopes at ±1*SD* next (please note that M*plus* estimates simple slopes for unstandardized coefficients). As control × value interactions in CVT are synergistic, and to facilitate interpretation, we estimated simple slopes for each interaction once with expectancy as the moderator and again with value as the moderator (Table 3).

Although we tested a relatively large number of interactions in this LI-SEM (10 in total), these were conducted within a single model that reduces the chance of finding false positive interactions. Nonetheless, the likelihood of spurious interactions can be increased with multicollinearity (Lavery et al., 2019). We are confident the interactions shown here are not spurious, for four reasons. First, they are consistent with theory. Second, the model including interactions showed a marginally better fit than the plausible alternative (i.e., the additive model; see Daryanto, 2019). Third, testing interactions using latent variable modeling reduces measurement error in the interaction term which contributes to spurious interactions (Jaccard & Wan, 1995). Fourth, we did not rely solely on a statistically significant interaction term for identifying interactions, but probed simple slopes. Slopes that significantly differ from zero are helpful in confirming that interactions are not erroneous.

3.1. Relief

With positive value as the moderator, a negative relation was shown between expectancy and relief at -1*SD* ($B = -0.26$, $SE = 0.15$, $p = .08$), which became stronger at mean ($B = -0.50$, $SE = 0.16$, $p = .001$) and + 1*SD* ($B = -0.74$, $SE = 0.20$, $p < .001$) positive value. Simple slopes are graphed in Fig. 2. Lower expectancy was related to higher relief. Higher positive value amplified that negative relation such that the highest relief was found from the combination of low expectancy and high positive value. With expectancy as the moderator, a positive relation with positive value was shown at -1*SD* ($B = 0.32$, $SE = 0.15$, $p = .02$) expectancy, which became weaker at mean ($B = 0.09$, $SE = 0.11$, $p = .41$) and negative at +1*SD* ($B = -0.15$, $SE = 0.13$, $p = .25$).

3.2. Gratitude

With positive value as the moderator, a negative relation was shown between expectancy and gratitude at -1*SD* ($B = -0.26$, $SE = 0.15$, $p = .08$) positive value, which became stronger at mean ($B = -0.50$, $SE = 0.16$, $p = .001$) and + 1*SD* ($B = -0.74$, $SE = 0.20$, $p < .001$) positive value. Simple slopes are graphed in Fig. 3. Lower expectancy was related to higher gratitude. Higher positive value amplified that negative relation such that the highest gratitude was found from the combination of low expectancy and high positive value. With expectancy as the moderator, a positive relation was shown between positive value and gratitude at -1*SD* ($B = 0.35$, $SE = 0.14$, $p = .01$), which became weaker at mean ($B = 0.09$, $SE = 0.11$, $p = .543$) and negative at +1*SD* ($B = -0.17$, $SE = 0.14$, $p = .120$) expectancy.

Table 2
Standardized EwC path coefficients for independent effects of control-value appraisals on emotions.

	Expectancy	Positive value	Negative value	Relief	Gratitude	Disappoint-ment	Anger	Test anxiety
Expectancy				−0.12 (0.10)	−0.13 (0.11)	0.27 (0.14)*	0.08 (0.11)	−0.32 (0.13)*
Positive value				−0.04 (0.09)	−0.04 (0.09)	0.23 (0.11)*	0.29 (0.09)*	0.43 (0.12)***
Negative value				0.35 (0.08)***	0.36 (0.08)***	−0.03 (0.08)	0.13 (0.09)	0.42 (0.09)***
Gender	−0.01 (0.06)	0.08 (0.06)	0.04 (0.05)	−0.05 (0.05)	−0.03 (0.05)	0.19 (0.05)***	0.25 (0.05)***	0.25 (0.07)***
Age	−0.19 (0.16)	−0.22 (0.17)	−0.21 (0.08)**	−0.16 (0.09)	−0.12 (0.09)	−0.01 (07)	−0.01 (0.07)	−0.02 (0.08)
Level of study	0.10 (0.09)	0.18 (0.09)	0.07 (0.06)	−0.04 (0.06)	−0.08 (0.07)	0.01 (0.06)	−0.06 (0.07)	0.01 (0.08)

Note. Standard errors in parentheses.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 3
Standardized EwC path coefficients for first-order and interactive effects of control-value appraisals on emotions.

	Expectancy	Positive value	Negative value	Relief	Gratitude	Disappoint-ment	Anger	Test anxiety
Expectancy (EX)				−0.39 (0.10)***	−0.41 (0.12)**	0.57 (0.13)***	0.33 (0.12)**	−0.48 (0.12)***
Positive value (PV)				0.09 (0.11)	0.09 (0.11)	−0.02 (0.09)	0.10 (0.12)	0.54 (0.12)***
Negative value (NV)				0.25 (0.10)**	0.25 (0.09)**	0.12 (0.10)	0.26 (0.09)**	0.27 (0.08)**
EX × PV				−0.25 (0.10)**	−0.27 (0.10)**	0.07 (0.06)	0.15 (0.07)*	−0.05 (0.09)
EX × NV				0.01 (0.07)	0.01 (0.06)	−0.06 (0.07)	−0.11 (0.07)	−0.04 (0.07)
Gender	0.02 (0.06)	0.09 (0.06)	0.04 (0.05)	−0.06 (0.05)	−0.05 (0.05)	0.19 (0.04)***	0.26 (0.05)***	0.20 (0.06)**
Age	−0.16 (0.16)	−0.21 (0.17)	−0.22 (0.08)**	−0.07 (0.07)	−0.03 (0.07)	−0.01 (0.07)	−0.01 (0.08)	0.01 (0.06)
Level of study	0.13 (0.08)	0.18 (0.09)*	0.04 (0.06)	−0.08 (0.07)	−0.12 (0.07)	−0.01 (0.06)	−0.05 (0.07)	−0.01 (0.06)

Note. Standard errors in parentheses.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

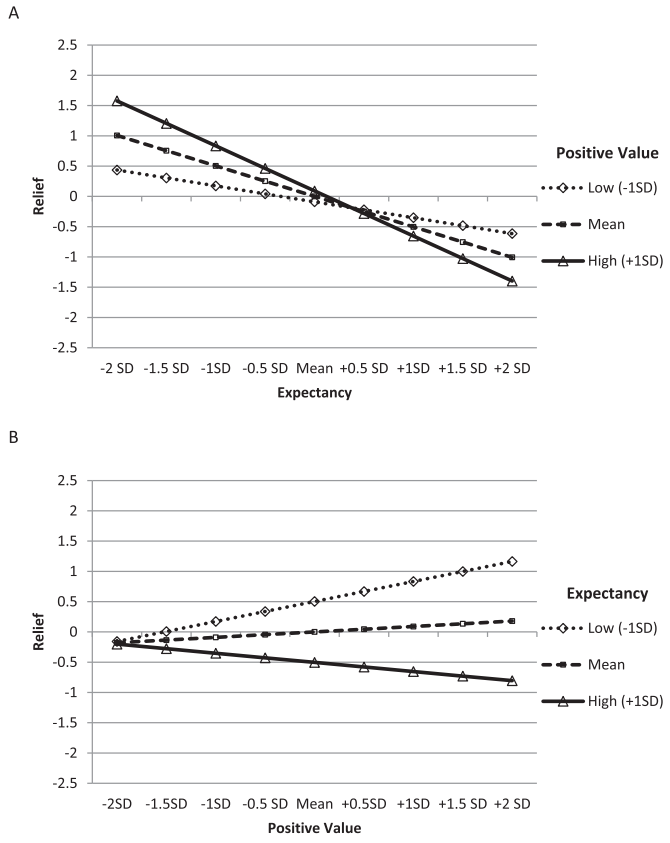

Fig. 2. Model-implied simple slopes to show the expectancy × positive value interaction for relief
Note. Panel A: Positive value as the moderator. Panel B: Expectancy as the moderator.

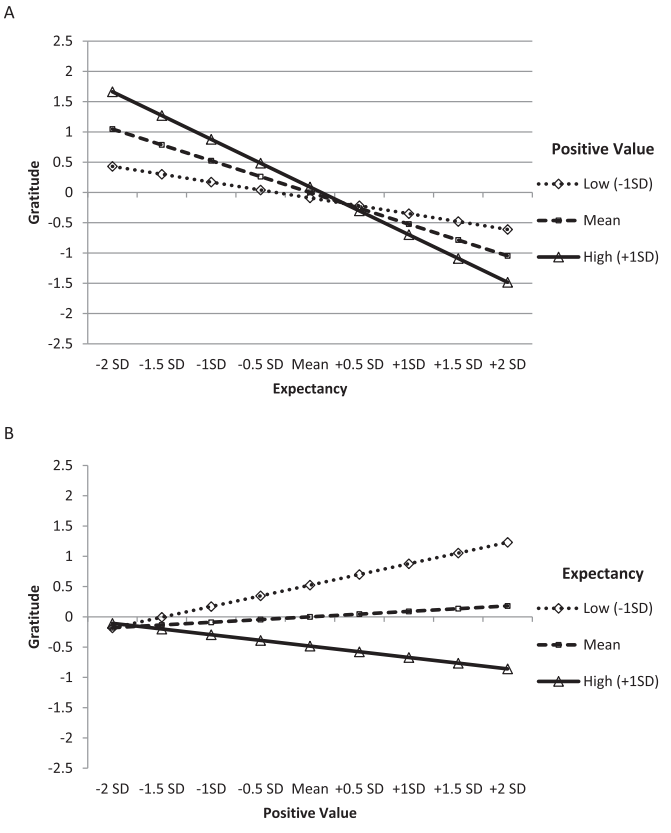

Fig. 3. Model-implied simple slopes to show the expectancy × positive value interaction for gratitude
Note. Panel A: Positive value as the moderator. Panel B: Expectancy as the moderator.

3.3. Anger

With positive value as the moderator, a positive relation was shown between expectancy and anger at -1SD ($B = 0.28$, $SE = 0.16$, $p = .07$) positive value. This relation became stronger at mean ($B = 0.42$, $SE = 0.15$, $p = .007$) and + 1*SD* ($B = 0.79$, $SE = 0.20$, $p < .001$) positive value. Simple slopes are graphed in Fig. 4. Higher expectancy was related to higher anger. Higher positive value amplified that positive relation such that the highest anger was found from the combination of high expectancy and high positive value. With expectancy as the moderator, a negative relation between positive value and anger was shown at -1*SD* ($B = -0.04$, $SE = 0.12$, $p = .876$), that became positive at mean ($B = 0.10$, $SE = 0.12$, $p = .42$), and stronger at +1*SD* ($B = 0.24$, $SE = 0.15$, $p = .11$) expectancy.

3.4. Summary of findings

Relief and gratitude after the exams had been canceled were predicted by low expectancy of success and high negative value. When the expectancy to succeed was low, high positive value of the exams further exacerbated relief and gratitude. In contrast, disappointment and anger were predicted by high expectancy. Anger was also predicted by negative value and the positive relation with high expectancy was further enhanced when positive value was also high. Test anxiety was predicted by low expectancy as well as high positive and negative value.

4. Discussion

The aim of this study was to examine how retrospective emotions about canceled examinations (relief, gratitude, disappointment and anger) and one prospective emotion (test anxiety) related to control-value appraisals in a sample of students aged 15–19 years who had had important exams canceled as a result of measures to curb the spread of COVID-19. Relief and gratitude were related to an expectancy × positive value interaction and to negative value. These findings provide partial support for *Hypotheses 1 and 2*. Disappointment was related to expectancy only, providing partial support for *Hypothesis 3*. Anger was predicted by an expectancy × positive value interaction as well as negative value. These findings provide support for *Hypothesis 4*. Test anxiety was related to expectancy, positive value, and negative value, in an additive rather than interactive fashion. These findings provide partial support for *Hypothesis 5*.

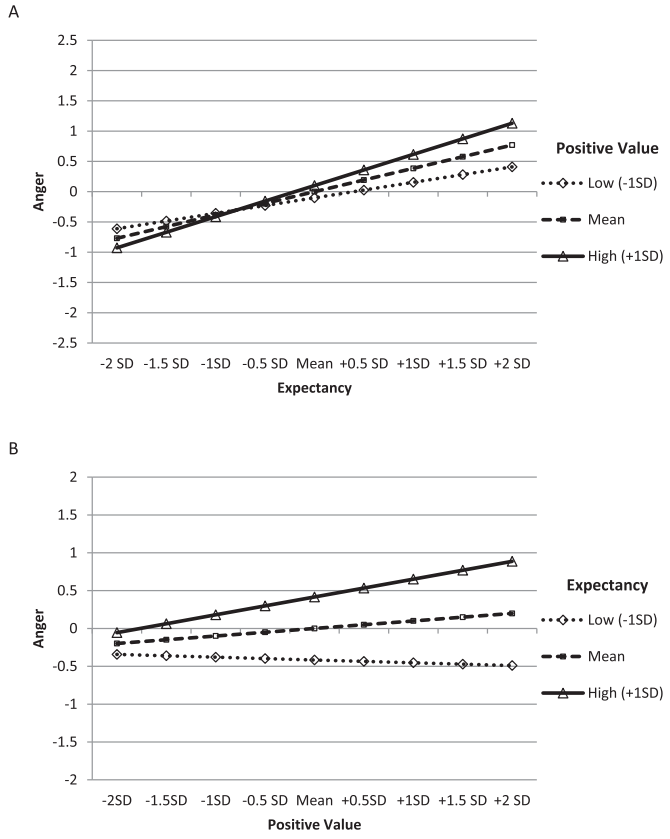

Fig. 4. Model-implied simple slopes to show the expectancy × positive value interaction for anger
Note. Panel A: Positive value as the moderator. Panel B: Expectancy as the moderator.

4.1. Relief and disappointment

As expected, relief was highest when students valued their examinations as important and useful (positive value), but expectations of success were low; students were relieved that they did not have to experience actual failure, which can damage goals, aspirations, and self-worth (e.g., Johnson et al., 2017). In addition, relief was also related to negative value of the exams. When students believed that the preparative efforts required for their exams and the opportunity costs in terms of lost time were too great, they were relieved when exams were canceled. High effort can be a 'double-edged' sword (see Marsh et al., 2016); the threat to self-worth following failure after high effort is so great that some students disengage from their study and withdraw effort (e.g., Jiang et al., 2020). This may be one reason why students experienced more relief when costs (i.e., effort, time, and missed opportunities) were deemed to be high.

In contrast, disappointment correlated positively with both expectancy and positive value. That is, students were disappointed that they did not have the opportunity to demonstrate their skills and/or learning that they had been working towards and may have invested significant effort in. However, expectancy and value did not interact. It is plausible that the relatively strong correlation between expectancy and positive value ($r = 0.57$) resulted in few participants with high expectations of success and high disappointment who did not also value the importance of the exams. There may have been insufficient variance in positive value at high levels of expectancy to find an interactive effect of expectancy and value on disappointment.

Nonetheless findings build on the existing studies showing bivariate correlations between relief and control-value appraisals (Pekrun et al., 2004, 2011) and through adding disappointment, thus providing a more complete analysis of these two counterfactual achievement emotions in an exam context. For control appraisals, CVT theorizes that relief and disappointment follow unexpected achievement outcomes (Pekrun, 2006; Pekrun & Perry, 2014). The present study provided a somewhat unique context within which to explore CVT where the focus of the emotion was the lost achievement opportunity rather than an actual achievement opportunity. Despite this atypical context, the predictions of CVT were still supported and imply that appraisals are not only relevant to actual achievement-related tasks and outcomes, but also to other achievement-related situations.

4.2. Gratitude and anger

Gratitude arose from low expectancy combined with high positive value, similar to relief. We suspect the similarity between relief and gratitude is provided by the focus of the study on canceled examinations. In more typical achievement situations (e.g., success or failure following an examination) gratitude is theorized in CVT to occur towards those who may have contributed towards success or avoiding failure (Pekrun, 2006; Pekrun & Perry, 2014). In the context of the COVID-19 pandemic, the retrospective focus of gratitude was for being released from the burden of preparing for and taking examinations. That is, being thankful for being allowed to avoid an unpleasant experience. In the context of

the COVID-19 pandemic the expectation of failure was of key relevance to the experience of gratitude.

Anger arose from high expectancy combined with high positive value. Students experienced anger about the cancellation of their exams when they valued the exams and had expected success. Anger was also related to higher negative cost. The findings on anger provide an interesting contrast to the extant research showing negative relations with control and positive value (Forsblom et al., 2021, 2022; Peixoto et al., 2017; Pekrun et al., 2004, 2011). In the present study, anger was *positively* related to expectancy and positive value. The difference in the findings can be attributed to the change in the referent of anger. In typical circumstances, anger would arise from failure when negative value (i.e., the importance of failure) was high, or from obstacles during an achievement activity that also represent negative value. Here, anger did not relate to failure but to being denied an opportunity to succeed hence anger was higher when that lost opportunity was highly valued and success judged to be likely.

4.3. Test anxiety

Findings largely supported CVT that high prospective test anxiety was found from low expectancy, and high positive/negative value. Thus, appraisals made about examinations canceled due to the COVID-19 pandemic were related to participants' anticipatory anxiety about future examinations. Although our sample contained students in Year 12 of upper secondary education as well as those in the first year of undergraduate education, both groups of students will have to take high-stakes examinations in the future and there were no differences in the groups for their level of study at the point that examinations were canceled. Accordingly, we believe that despite their levels of education (upper secondary vs. undergraduate) findings for prospective test anxiety are of equal relevance.

In the present study, expectancy and value were combined in an additive rather than interactive way. Previous studies have found control-value appraisals to interact for test anxiety (Nie et al., 2011), mathematics worry (Lauermann et al., 2017), and classroom anxiety (Shao et al., 2020). Other studies have found control-value appraisals to be additively related to classroom anxiety (Putwain et al., 2020, b). As such, the present findings are consistent with at least part of the extant literature. Both positive and negative facets of value related to test anxiety and in the two models including interaction terms, positive value showed the stronger relations. One possible explanation is multicollinearity between some of the variables included in these more complex models.

4.4. Generalizability of the present findings

As we have noted, the context of the present study (canceled examinations resulting from the COVID-19 pandemic) is almost unparalleled in contemporary society. Examinations were canceled for all students in England, Wales, and Northern Ireland, as well as in many other countries. The lost achievement opportunity was not isolated to a smaller group of individuals as might typically be the case in the event of, for example, a school fire on the day of an examination, or missing a sporting event or competition through injury. Furthermore, educational disruption was widespread and not limited to canceled examinations (e.g., d'Orville, 2020). A key question is, therefore, the extent to which findings of the present study are unique to the COVID-19 context or generalizable to other situations where achievement opportunities are lost.

We believe that the findings of the present study do have relevance for lost achievement opportunities more widely, for two reasons. First, CVT is based on the principles of relative universality (Pekrun & Goetz, in press). Basic emotions and their appraisal antecedents, like those included in the present study are universal, however context can influence levels of antecedents and resulting emotions (e.g., Frenzel et al., 2007; Pekrun, 2018). Theoretically speaking one would expect to find links from expectancy and value to achievement emotions for both actual as well as hypothetical success and failure, and when examinations were canceled due to a pandemic as well as for alternative reasons. The few studies that have examined achievement emotions in the context of the COVID-19 pandemic found continued support for CVT (e.g., Stockinger et al., 2021).

Second, the COVID-19 pandemic may have been relatively unique and the consequences for society (including those for education) unprecedented. For the persons whose achievement and future were at stake, however, the reasons for a canceled achievement opportunity were less germane (at least in the short-term) than the actual cancellation and its consequences themselves (e.g., Scott et al., 2021; Woolf et al., 2021). The findings of the present study are likely, therefore, to be relevant to understanding the achievement emotions of persons in other settings where the reason for missed achievement opportunity was secondary to the missed opportunity itself. Of course, attributional judgments may play more of a role in situations where individuals or groups may miss an achievement opportunity (e.g., avoiding a sporting injury or avoiding transport disruption when travelling to an examination) than when the decision to cancel is taken by a regulating authority. Nonetheless, the counterfactual element remains ("what would have happened if…"), and in this respect our findings may apply also to missed achievement opportunities generally.

4.5. Limitations and directions for future research

The present study employed a robust, latent modeling approach to address a timely question about students' reactions to canceled examinations. In doing so, we have included emotions that have received negligible attention in the literature, and incorporated novel theoretical dimensions derived from CVT. However, there are also several limitations to highlight. First, the sample was biased in favor of female students and those presently in Year 12. Gender and level of study were included as covariates in all analyses, so that their influence was controlled for. Nonetheless, gender and level of study could moderate relations between control-value appraisals and emotions, and the small number of male students and more advanced students could limit the generalizability of the findings. The reason for the gender imbalance is not entirely clear. Female participants may have been more inclined to participate on receipt of an email invitation, or it may be that invitations to participate were distributed more widely by social science teachers at schools who have seen greater value in the project than teachers of other subjects. These subjects typically have greater numbers of female students.

Second, the sample contained two distinct groups of students at two different educational levels (upper secondary vs. undergraduate). Although there are similarities between the two groups of students in terms of the examinations that were canceled in their previous level of study (i.e., access to a higher level of study) there were also differences (e.g., difficulty of examination and greater choice over subjects studied for A Level/BTEC than GCSE). Positive value was the only difference found between two groups in the present study. Nonetheless, far fewer undergraduate students participated in the present study and a larger sample may have found other differences.

Third, the measure of negative value used in the present study focused on the costs of investing effort and time and the resultant loss of alternatives (and, by implication, the costs of failure if effort, time, and lost alternates, were invested in vain). While important, these costs are relatively narrow and focus on intrinsic facets of negative value. In future research, it would be useful to broaden the measurement of negative value to include the perceived importance of failure (or avoiding failure) and other costs and consequences associated with failure (see Lee et al., 2013).

Finally, although a cross-sectional design is sufficient to estimate control-value interactions, and the retrospective emotions included in

the present study could only be studied post-event, the study design places limits on interpreting the directionality of the relations we found. As data for control-value appraisals and retrospective emotions were collected simultaneously, it is also possible that emotions could have influenced retrospective recall of appraisals.

4.6. Implications for educational practice

Our findings have implications for students who missed examinations due to the COVID-19 pandemic. These implications may also be relevant for students (and others) who have missed achievement events where the reasons for cancellation were less relevant than the actual cancellation itself. In relation to the retrospective counterfactual ("what if") emotions, students experiencing strong negative emotions, like disappointment and anger, may benefit from support to help manage short-term distress. As we argue, these emotions may result in long-term benefit to remain focused on one's goals. Thus, we would caution against a simplistic approach to reduce negative emotions merely because they are unpleasant. Likewise, students experiencing positive emotions, like relief and gratitude, who do experience short term distress, may still benefit from support to assist them with keeping focused on longer-term goals. This may especially be the cause if relief and gratitude were underpinned by low expectancies. If students are experiencing high levels of anxiety about future examinations, there are several well-evidenced interventions based on cognitive-behavioral therapy (e.g., Putwain & von der Embse, 2021) that we would recommend are offered to students.

4.7. Conclusions

In keeping with the propositions of CVT, we found retrospective emotions about canceled examinations (relief, gratitude, disappointment, and anger) to be related to control-value appraisals. Relief and gratitude were related to the multiplicative combination of low expectancy of success and high value of the canceled exams, and anger was related to the multiplicative combination of high expectancy and high value. Disappointment was related only to high expectancy. Test anxiety was related to the additive combination of low expectancy and high value. These findings show how the control-value appraisals that underpin achievement emotions may differ when the referent of the emotion changes from success and failure to canceled examinations. Educational institutions should not dismiss students' concerns about canceled examinations, but discuss them with students in a respectful and sensitive manner.

CRediT authorship contribution statement

David W. Putwain: Conceptualization, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing, Project administration. **Wendy Symes:** Conceptualization, Investigation, Writing – original draft, Writing – review & editing, Project administration. **Zhané Marsh-Henry:** Conceptualization, Investigation, Writing – original draft. **Herbert W. Marsh:** Writing – original draft, Writing – review & editing. **Reinhard Pekrun:** Writing – original draft, Writing – review & editing.

Declaration of competing interest

We have no known conflict of interest to disclose. Study materials and the dataset on which the analyses presented in the manuscript are based are deposited at doi:10.17632/2v2dnbrp6c.2.

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