# Control-value appraisals, achievement emotions, and foreign language performance: a latent interaction analysis

Kaiqi Shao, Reinhard Pekrun, Herbert W. Marsh, Kristina Loderer

# Control-value appraisals, achievement emotions, and foreign language performance: A latent interaction analysis

Kaiqi Shao[a], Reinhard Pekrun[b,c,d,*], Herbert W. Marsh[c,e], Kristina Loderer[f]

[a] *School of Foreign Language Studies, Hangzhou Dianzi University, China*
[b] *Department of Psychology, University of Essex, United Kingdom*
[c] *Institute for Positive Psychology and Education, Australian Catholic University, Sydney, Australia*
[d] *Department of Psychology, University of Munich, Germany*
[e] *Department of Education, University of Oxford, United Kingdom*
[f] *Department of Psychology, University of Augsburg, Germany*

## 1. Introduction

Achievement emotions play a vital role in learning in general and foreign language (FL) learning in particular. Positive emotions such as enjoyment, hope, and pride can promote students' motivation to learn, attention, use of deep learning strategies, and academic achievement, whereas negative emotions such as anxiety, anger, and boredom can compromise learning (Dewaele, Witney, Saito, & Dewaele, 2018; Pekrun & Perry, 2014). Given the relevance of achievement emotions for students' FL learning, it is important to acquire knowledge about their antecedents. Such knowledge is pivotal for designing emotionally sound learning environments that can enhance both students' psychological wellbeing and their performance.

Contemporary appraisal theories consider appraisals as proximal antecedents that elicit emotions (Moors, Ellsworth, Scherer, & Frijda, 2013). For achievement emotions, Pekrun's (2006, 2018, in press) control-value theory (CVT) suggests that these emotions are closely linked to appraisals of achievement-related control and value. When students feel in control over their learning and value achievement, positive emotions such as enjoyment of learning, hope, and pride are promoted, and negative emotions such as anxiety, hopelessness, or boredom are reduced. Moreover, CVT proposes that control and value impact emotions not only by means of simple, independent effects, but rather by exerting joint, synergistic effects. The extant studies, however, have examined perceived control and value as independent antecedents of emotion and failed to examine their interaction, with few exceptions (see Putwain et al., 2018). Furthermore, CVT implies that achievement emotions can mediate the effects of control and value appraisals on performance (Pekrun, 2006). To date, no studies have tested whether the joint influence of perceived control and perceived value on performance is mediated by emotions.

Of relevance for research in the FL context, the little work on emotions that exists in language learning has focused on language anxiety (see Swain, 2013; Teimouri, Goetze, & Plonsky, 2019), but has neglected other emotions. This stands in contrast to research on student emotions in other domains such as the STEM (science, technology, engineering, and mathematics) subjects which considers a wide range of emotions (e.g., Frenzel, Thrash, Pekrun, & Goetz, 2007; Pekrun, Lichtenfeld, Marsh, Murayama, & Goetz, 2017). Research has yet to explore a broader spectrum of emotions in FL learning and to investigate their relations with antecedent appraisals and learning outcomes (Fallah, 2017; Shao, Pekrun, & Nicholson, 2019).

---

* Corresponding author. Department of Psychology, University of Essex, Wivenhoe Park, Colchester CO4 3SQ, United Kingdom.

*E-mail addresses:* shaokaiqi@aliyun.com (K. Shao), pekrun@lmu.de (R. Pekrun), Herb.Marsh@acu.edu.au (H.W. Marsh), kristina.loderer@phil.uni-augsburg.de (K. Loderer).

In the present research, we aimed to address these deficits in the literature. Based on CVT and using a prospective design, we examined additive and interactive effects of control and value on eight different emotions including students' enjoyment, hope, pride, anger, anxiety, shame, hopelessness, and boredom. Furthermore, we investigated the joint and mediated effects of control-value appraisals and emotions on students' performance. Extending previous work, we focused on emotions in FL learning. As noted, this is a subject domain that has received scant attention by emotion researchers despite its pivotal importance for students' educational trajectories and later occupational careers.

### 1.1. Concept of achievement emotions

Achievement emotions are defined as emotions related to achievement activities or achievement outcomes (Pekrun, 2006). The systematic study of diverse emotions related to learning and achievement can be traced back to Weiner's (1985, 2018) attributional research and Pekrun's exploratory research into students' emotions (Pekrun, Goetz, Titz, & Perry, 2002). In a series of qualitative and quantitative studies, Pekrun and colleagues (2002) identified a number of emotions (enjoyment, hope, pride, anger, anxiety, shame, hopelessness, and boredom) that were most commonly reported by students in academic achievement settings. These emotions were classified using a three-dimensional taxonomy considering the dimensions of valence, activation, and object focus. In terms of valence, positive emotions can be distinguished from negative emotions, such as pleasant enjoyment versus unpleasant anxiety. As for activation, physiologically activating emotions can be differentiated from deactivating emotions, such as activating hope versus deactivating hopelessness. In terms of object focus, activity emotions can be differentiated from outcome emotions, such as activity-related boredom versus outcome-related shame. As emotions in general, achievement emotions can be conceptualized as traits (e.g., habitual test anxiety) or states (e.g., anxiety experienced an hour before a specific exam).

Achievement emotions tend to be organized in domain-specific ways (Goetz, Frenzel, Pekrun, Hall, & Lüdtke, 2007; Goetz, Pekrun, Hall, & Haag, 2006). For example, Goetz et al. (2006) investigated secondary school students' enjoyment, anxiety, and boredom across six different subjects: Latin, English, German, math, music, and sports. Results showed that all three emotions varied substantially across these subjects. By implication, it is best to conceptualize and measure achievement emotions, their antecedents, and their outcomes in domain-specific ways. Building on this work, the present study examined students' habitual experiences of emotions together with their appraisal antecedents and performance outcomes in relation to FL learning.

### 1.2. Control and value appraisals as antecedents of achievement emotions

It has long been recognized that it is not events themselves but rather their subjective perception that prompts emotions (Lazarus, 1991). For achievement emotions, CVT (Pekrun, 2006, 2018, in press; Pekrun & Perry, 2014) proposes that individuals experience these emotions when they feel in control of, or out of control over, achievement activities and outcomes that are subjectively important, implying that control and value appraisals are the proximal determinants of these emotions. Higher levels of perceived control and positive value are posited to elicit positive emotions such as hope, enjoyment or pride, whereas lower levels of control are expected to elicit negative emotions such as anxiety or hopelessness. As such, CVT implies that control has differential effects on positive versus negative emotions. In contrast, value (i.e., importance) is thought to generally amplify both types of emotions.

However, as long asserted by appraisal theorists, specific emotional experiences depend on combinations of discrete appraisals rather than single appraisals alone (Roseman, 2001). In the same vein, CVT proposes that appraisals of both control and value are necessary for an achievement emotion to be instigated. More specifically, positive achievement emotions are posited to be a multiplicative function of the perceived controllability and the value of academic activities or outcomes. For example, if a student values certain learning material and believes she will be able to master it, she will enjoy learning that material. In contrast, unpleasant achievement emotions (except for boredom; see below) are assumed to be a joint function of perceived lack of control and high value. For example, if a student perceives failure at an upcoming exam to be possible and not sufficiently controllable, and judges the exam to be important because of its consequences for attaining career goals, he will be afraid of the exam. For most emotions, emotional intensity increases with increasing control (in positive emotions) or lack of control (in negative emotions), and with increasing subjective value. If one of the two is lacking, the emotion will not be induced. By implication, it follows from CVT that value moderates the effects of control on achievement emotions: The higher the perceived value of achievement activities or outcomes, the stronger the influence of control on emotions (Pekrun & Perry, 2014).

Boredom is an exception from this pattern of presumed effects. According to CVT, boredom can be due both to low levels of control (over-challenge) or to high levels of control (under-challenge) and is generally triggered by lack of value (Acee et al., 2010). This implies a curvilinear relationship between control and boredom (Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010). However, in most academic contexts, task demands are high and pose challenges for attainment, making it unlikely for most students that individual levels of perceived control are sufficiently high to induce boredom. Therefore, we expected the relationship between control and boredom to be negatively linear rather than curvilinear in the present research.

Regarding value, we focus on positive task value in the present study, similar to previous research on value and students' achievement emotions (e.g., Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011). As such, we expected to find positive relations between perceived value and positive emotions, and negative relations between perceived value and negative emotions. This expectation is in line with previous studies that found positive links between (positive) value and positive achievement emotions, but negative links with negative emotions (summary of findings in Pekrun & Perry, 2014).

While CVT proposes that achievement emotions are a joint function of control and value, only three studies have tested this core proposition. Goetz, Frenzel, Stoeger, and Hall (2010) examined the relations between university students' momentary control-value appraisals and three positive emotions (enjoyment, pride, and contentment) in everyday achievement and non-achievement settings. Supporting CVT assumptions, the results showed that perceived value amplified the positive relations between perceived control and each of the positive emotions. Bieg, Goetz, and Hubbard (2013) investigated the links between appraisals of control and value, their interaction, and three discrete emotions (pride, anxiety, and boredom) using both trait and state assessments across four subject domains (mathematics, physics, German, and English). The domains were not differentiated in the analysis. Results from multilevel analyses showed that control, value, and their interaction predicted the emotions in the expected directions. Finally, Putwain et al. (2018) investigated the interactive effects of control-value appraisals on students' enjoyment and boredom in mathematics. Latent interaction analyses showed that achievement value amplified the positive relation between perceived control and enjoyment, and intrinsic value reduced the negative relation between perceived control and boredom.

Although these findings provide promising support for the interaction assumption, there are a number of limitations. First, the three studies were limited to a small number of emotions. Second, they examined relations between control-value appraisals and emotions, but did not consider the joint influence of appraisals and emotions on students' performance. Third, two of the three studies (Bieg et al., 2013; Goetz et al., 2010) used ordinary least squares regression analysis with

manifest variables, thus not controlling for measurement error and possibly underestimating the strength of interactive effects. In the present research, we included a broad range of emotions, considered students' performance, and used latent interaction analysis (Maslowsky, Jager, & Hemken, 2015) to attend to these issues.

### 1.3. Effects of emotions on learning and achievement

The cognitive-motivational model of emotion effects (Pekrun, 2006) that is part of CVT posits that the influence of emotions on learning and achievement depends on the interplay between various cognitive and motivational mechanisms. Empirical data from cross-sectional and longitudinal studies suggest that positive activating emotions, such as enjoyment, hope, and pride, positively affect learning and performance by strengthening interest, motivation, effort, self-regulation of learning, use of flexible learning strategies, and the availability of cognitive resources for task purposes (e.g., Goetz et al., 2012; Loderer, Pekrun, & Lester, 2018; Pekrun et al., 2017). Conversely, negative emotions such as anxiety, anger, shame, boredom and hopelessness typically undermine interest and motivation, compromise self-regulation, prompt the use of more rigid or shallow learning strategies, and cause irrelevant thinking, which reduces the cognitive resources available for task performance (Daniels et al., 2009; Pekrun et al., 2017; Pekrun, Hall, Goetz, & Perry, 2014). Although a few studies have shown that negative activating emotions such as anxiety and shame may promote learning in some students by inducing extrinsic motivation to invest effort to avoid failure (e.g., Lane, Whyte, Terry, & Nevill, 2005; Turner & Schallert, 2001), negative emotions are likely to be detrimental to overall academic performance in the vast majority of students (see Pekrun et al., 2011).

According to CVT, these effects of emotions on achievement should be similar across academic domains. However, past research on achievement emotions has focused on domain-general emotion variables, such as general test anxiety, or on students' math-related emotions (e.g., Frenzel et al., 2007; Luo, Lee, Ng, & Ong, 2014; Peixoto, Sanches, Mata, & Monteiro, 2016), but has neglected the influence of students' emotions on their FL learning outcomes. In the FL context, research on emotions and achievement has focused on language anxiety, leaving a broad spectrum of other emotions unconsidered (Bown & White, 2010; Swain, 2013; Teimouri et al., 2019). While some studies have reported null relations between students' language anxiety and academic performance (e.g., Dewaele, 2002), the majority of this work suggests language anxiety is negatively related to learners' FL performance (Cheng, Horwitz, & Schallert, 1999; Dewaele, Petrides, & Furnham, 2008; MacIntyre & Gardner, 1994; Shao, Yu, & Ji, 2013). For example, in a longitudinal study, Shao et al. (2013) examined the associations of FL anxiety with learning outcomes in English classes among Chinese college students and found that language anxiety negatively predicted self-reported English proficiency as well as exam performance.

Although researchers have long argued that emotions other than anxiety are also fundamentally important for motivation, self-regulation, and performance in FL learning (MacIntyre, 2002; Scovel, 2000), empirical research addressing the impact of diverse emotions, especially positive emotions such as enjoyment, hope, or pride, on language learning has just begun to emerge (Dewaele et al., 2018; Saito, Dewaele, Abe, & In'nami, 2018). For instance, Dewaele et al. (2018) examined FL enjoyment among British high school students learning various foreign languages at school. Results showed that students' FL enjoyment was positively related to their performance. Lee (2014) explored German and Korean high school students' language learning emotions from a cross-cultural perspective. In both samples, enjoyment, hope, and pride were positively related to FL performance, whereas the relations for anxiety, anger, shame, boredom, and hopelessness were negative. However, while this study marks an important step towards expanding the empirical focus to a broader range of language learning

emotions, it is preliminary due to small sample size and low reliability of the FL achievement measure ($\alpha < 0.5$). As such, there is an urgent need for research on the relation between students' diverse emotions and performance in FL learning.

### 1.4. Joint and mediated effects of control-value appraisals and emotions on achievement

As described earlier, CVT suggests that different combinations of cognitive appraisals elicit different emotions, which, in turn, affect learning and performance (Pekrun, 2006). Combined with the influence of emotions on students' achievement, the effects of control-value appraisals on emotions imply that these appraisals should impact achievement through emotions. As such, emotions can function as mediators in the relation between appraisals and performance (see also Luo, Ng, Lee, & Aye, 2016).

Students' perceived control and value may predict academic outcomes in a similar interactive fashion as they stimulate different achievement emotions. Specifically, using the CVT logic to explain the role of appraisals for students' performance, we propose that students who value academic success will benefit more from perceived control over performance (see also Nagengast et al., 2011; Trautwein et al., 2012). In other words, the higher the subjective value of achievement, the stronger the influence of perceived control on performance should be. This assumption is supported by empirical evidence on the related construct of academic self-concept demonstrating that self-concept and value interacted in explaining students' achievement in STEM subjects (Guo, Parker, Marsh, & Morin, 2015). In general, both competence-related perceptions and value are seen to be essential for students to attain optimal performance (Nagengast, Trautwein, Kelava, & Ludtke, 2013; Trautwein et al., 2012). Therefore, it is reasonable to hypothesize that students' perceived academic control and value may have a multiplicative impact on students' FL performance as well. Further, considering the role of emotions as possible mediators in the relation between appraisals and performance, we posit that the interactive influence of perceived control and value on performance will also be mediated by achievement emotions.

Studies addressing the influence of appraisals on FL learning are scarce. Initial evidence indicates that students' self-efficacy and self-concept tend to be positively related to their language learning strategies, motivation, self-regulation and performance, and are negatively related to their FL anxiety (Arens & Jansen, 2016; Kim, Wang, Ahn, & Bong, 2015). Research also has shown that FL tasks that are valued by students can facilitate their emotional engagement, interest, and performance, and can reduce their anxiety, suggesting that positive value has beneficial effects (Laufer & Rozovski-Roitblat, 2011; Phung, 2017). In addition, two recent studies suggested that anxiety mediates the relation between FL self-efficacy and students' use of pronunciation learning strategies (Sardegna, Lee, & Kusey, 2018) and the relation between perceived task value and FL achievement (Varasteh, Ghanizadeh, & Akbari, 2016). To the authors' knowledge, no studies have investigated the interactive effects of control and value appraisals either on emotion or performance in FL learning.

### 1.5. Aims and hypotheses of the present study

The present study aims to test core assumptions of CVT about the interactive effects of control-value appraisals on students' achievement emotions and performance. The study tested these propositions in the context of FL learning. In doing so, it expands upon previous research by unveiling the interactive and mediational mechanism underlying the links between appraisal antecedents, achievement emotions, and learning outcomes. Further, the study considered a broad range of both positive and negative emotions that occur frequently during learning and are important for students' performance (Pekrun & Perry, 2014). Specifically, the study included students' enjoyment, hope, pride, anger,
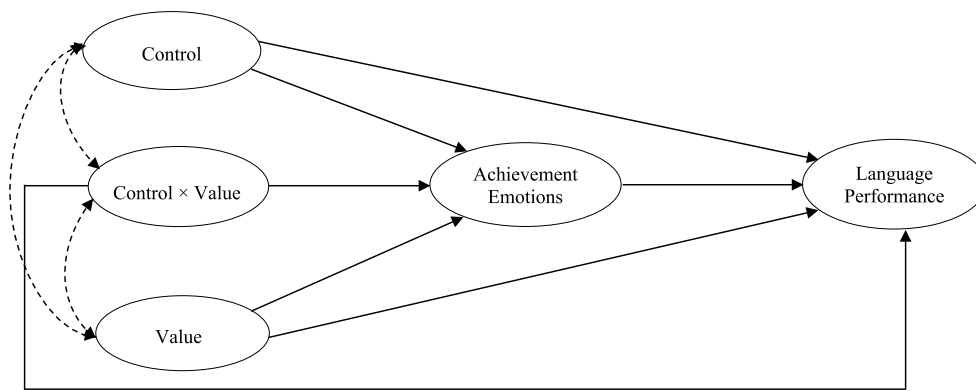
**Fig. 1.** Theoretical model of appraisals, achievement emotions, and FL performance.

anxiety, shame, hopelessness, and boredom during FL learning. Finally, unlike most previous studies, we conducted latent interaction analyses to control for measurement error and provide a more accurate estimation of interaction effects.

Based on CVT as outlined earlier, Fig. 1 depicts a conceptual model summarizing the proposed relations between appraisals, emotions, and FL performance. Succinctly stated, we tested the following hypotheses:

**Hypothesis 1.** Perceived control and value are positive predictors of positive emotions and performance, and negative predictors of negative emotions.

**Hypothesis 2.** Perceived control and value interact to predict the eight focal emotions. Specifically, control exerts a stronger predictive effect on emotions when value is high.

**Hypothesis 3.** Perceived control and value interact to predict performance. Specifically, control has a stronger predictive effect on performance when value is high.

**Hypothesis 4.** Emotions are mediators in the links between perceived control and value, on the one hand, and performance, on the other.

## 2. Method

### 2.1. Participants and procedure

Participants were $N = 550$ freshmen (498 female, 50 male, and 2 unidentified) attending a foreign language studies university in Southeastern China (age: $M = 19.66$ years; $SD = 0.76$). All participants were native Chinese speakers who were majoring in English and enrolled in a required comprehensive English course. English majors represent one of the largest foreign language learning populations in higher education in China and worldwide (annual graduation rates in China are approx. 300,000; see http://www.moe.gov.cn). The gender distribution in the sample is typical for English major students in China. Participation rates were >95% across assessments. Students were informed about the purpose and the voluntary nature of participating in this research by their teachers at the beginning of the semester. For all assessments, participants were assured that their responses would remain confidential. Institutional Review Board approval was obtained, and the research was conducted in accordance with the American Psychological Association's ethical principles regarding research with human participants.

Participants completed the measures in three different sessions. Perceived control and perceived value were assessed in the fifth week of the semester, at a point in time when students will have formed appraisals for the course. Achievement emotions were measured in week 17 of the semester, when students were studying for their exam (six days before the exam). In week 18, participants completed the final

course exam. Exam performance data and prior English achievement scores were obtained from the head teacher of the course at the end of the semester. This prospective design provided a clear temporal ordering of all measures while controlling for prior achievement.

The appraisal and emotion self-report scales used in the present study were translated from English into Chinese and back-translated by a team of bilingual researchers. One expert in educational psychology and one translation expert further reviewed and revised the wording of the items to reach the closest possible linguistic equivalence across the English and Chinese versions. Participants answered the Chinese scales, but were also provided with the original English scales to enable them to further check the original meaning of items whenever needed (see Supplementary Materials for the items).

### 2.2. Measures

#### 2.2.1. Control and value appraisals

Students' perceived control was assessed by the eight-item version of Perry et al.'s (2001) *Perceived Academic Control Scale.* The scale assesses students' self-perceived ability to influence academic performance. Items were adapted to reflect perceived control in the current course (e.g., "I have a great deal of control over my academic performance in this English exam"). Participants responded using a five-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*; α = 0.82). Perceived course value was assessed with the eight-item version of the *Task Value Questionnaire* (Pekrun & Meier, 2011). The scale measures students' intrinsic, attainment, and utility value. Items were adapted to assess the perceived value of preparing for the course exam (e.g., "In general, I find learning for this exam very interesting"; "It is very important to me to get good grades in this English exam"; "In general, I think studying for this exam is useful"; 1 = *not at all true of me*, 5 = *very true of me*; α = 0.80).

#### 2.2.2. Achievement emotions

The learning-related emotion scales of the *Achievement Emotions Questionnaire* (Pekrun et al., 2011) were used to assess participants' emotions when preparing for the exam. The scales assess both activity emotions (enjoyment, anger, boredom) and outcome emotions (hope, pride, anxiety, shame, hopelessness) related to learning. Using a situation-reaction questionnaire format, the instructions asked respondents to report how they felt about preparing for the exam. Overall, the scales assess eight different emotions: enjoyment (ten items; e.g., "I enjoy dealing with the course material"), hope (six items; e.g., "I feel confident when studying"), pride (seven items; e.g., "I'm proud of myself"), boredom (eight items; e.g., "Studying for my course bores me"), anger (eight items; e.g., "I get angry while studying"), anxiety (eight items; e.g., "I get tense and nervous while studying"), hopelessness (eight items; e.g., "I feel hopeless when I think about studying"), and shame (eight items; e.g., "I feel ashamed"). Participants

**Table 1**
Confirmatory factor analyses: Factor loadings and fit indices.

| | Factor loadings | $\chi^2$ (df) | CFI | TLI | RMSEA | SRMR |
|---|---|---|---|---|---|---|
| Control | .43–.66 | 64.31 (20) | .950 | .930 | .064 | .036 |
| Value | .35–.69 | 59.84 (20) | .950 | .928 | .063 | .039 |
| Enjoyment | .54–.83 | 102.95 (36) | .969 | .959 | .062 | .036 |
| Hope | .70–.82 | 19.44 (9) | .993 | .989 | .047 | .016 |
| Pride | .66–.82 | 28.30 (14) | .971 | .957 | .076 | .031 |
| Anger | .59–.71 | 50.98 (20) | .973 | .960 | .056 | .030 |
| Anxiety | .49–.64 | 39.23 (20) | .975 | .965 | .042 | .030 |
| Shame | .53–.72 | 42.80 (20) | .975 | .966 | .046 | .031 |
| Hopelessness | .60–.72 | 69.79 (20) | .957 | .937 | .039 | .023 |
| Boredom | .61–.76 | 38.91 (20) | .985 | .979 | .042 | .025 |

*Note.* Factor loadings are standardized coefficients. All factor loadings and $\chi^2$ values are significant at $p < .001$.

responded on a 1 (*not at all*) to 5 (*very much*) scale, and the scores were summed to form the emotion indexes (enjoyment α = 0.88, hope α = .86, pride α = .83, boredom α = 0.85, anger α = 0.85, anxiety α = 0.81, hopelessness α = .87, shame α = 0.84).

### 2.2.3. Exam performance

Participants' score on their final course exam was used as a measure of performance. The exam was developed and scored by the course teachers based on the textbook of the course and included 20 open-ended questions, 15 cloze test items, 25 multiple-choice items, and writing an essay. It focused on testing students' reading and writing skills in response to the course content. Performance on the different parts of the exam was combined by the respective course instructors to form a summative score (range 0–100; α = 0.82).

### 2.2.4. Covariates

Students' gender and prior English achievement were controlled for in the analysis. Gender was included because previous research has shown that female and male students tend to report different levels of achievement emotions (Pekrun et al., 2011). For example, reading for enjoyment was reported more frequently by girls in 64 out of 65 countries participating in the PISA 2009 assessments (OECD, 2010). Prior achievement has been shown to predict control and value appraisals as well as emotions and performance in educational settings (Pekrun et al., 2010, 2014). Prior English achievement was measured by students' College Entrance Exam (CEE) scores in English. This exam is a national high-stakes exam that is designed by experts from the CEE panel. The exam tests students' reading comprehension ability, use of English vocabulary and grammar, and writing ability. Items include multiple choice questions, cloze-test items, paragraph correction, and essay writing. Scores range from 0 to 120, and the reliability of the test for participants in the present study was α = 0.91 (National Education Examinations Authority, 2016).

### 2.3. Data analysis

Data were analyzed in three stages using latent structural equation modeling (SEM) with Mplus 8.0 (Muthén & Muthén, 1998 – 2017). SEM makes it possible to use latent constructs composed of multiple observed variables and to estimate relations between the constructs while controlling for measurement error (Byrne, 2011). Moreover, it permits the simultaneous estimation of direct, indirect, and conditional effects. First, a series of confirmatory factor analyses were performed to check the measurement properties of each construct. Second, latent interaction structural equation models using the *latent moderated structural equations* (LMS) approach (Klein & Moosbrugger, 2000) were estimated to test predictive effects of perceived control, value, and their interaction on each emotion and language performance while controlling for gender and prior achievement. LMS results in unbiased, efficient estimates of interaction effects that are robust to deviations from normality

and have unbiased standard errors. Third, mediational LMS models were estimated. In these models, control, value, and their interaction served as predictors, emotion as the mediator, and language performance as the outcome while controlling for gender and prior achievement. Given the multicollinearity among the emotions (Table 2), we estimated separate models for the different emotions. The mediational models included direct and indirect effects of perceived control, value, and their interaction on emotions and performance, as well as direct effects of emotions on performance (see Fig. 1). Based on these models, we estimated conditional indirect effects of perceived control on performance at different levels of value as mediated by emotion.

There were a few missing data (2.07%) that were primarily due to some students not having participated in the emotion assessment. The full information maximum likelihood (FIML) approach implemented in Mplus was used to handle missing data (Enders, 2010), and the robust maximum likelihood (MLR) estimator was used to estimate parameters. FIML, especially when used in conjunction with the MLR estimator, has been found to result in unbiased parameter estimates even with high numbers of missing data and to outperform traditional methods of listwise or pairwise deletion (Schafer & Graham, 2002). MLR has been found to be efficient in the estimation of latent-variable models based on either normally or non-normally distributed scores and items rated on scales including five or more response categories (Rhemtulla, Brosseau-Liard, & Savalei, 2012).

## 3. Results

### 3.1. Preliminary analysis

Factor loadings and goodness of fit indexes from confirmatory factor analyses are reported in Table 1. Model fit was good for all latent constructs based on traditional cutoff criteria indicative of excellent and adequate fit, respectively: (a) comparative fit index (CFI) and Tucker–Lewis index (TLI) ≥ 0.95 and ≥0.90, respectively; (b) root mean square error of approximation (RMSEA) ≤ 0.06 and ≤0.08; and (c) standardized root mean square residual (SRMR) ≤ 0.08 and ≤0.10 (Chen, 2007; Hu & Bentler, 1999).

Table 2 presents descriptive statistics and Pearson product-moment correlations for the study variables. In line with Hypothesis 1, perceived control correlated significantly positively with the positive emotions and FL performance, and significantly negatively with the negative emotions. To test possible curvilinear components in the relation between control and boredom as discussed earlier, we examined this relation by including both linear and quadratic components in a simultaneous multiple regression analysis. Control had a significant negative linear effect on boredom (β = −0.30, $p < .001$). There was no significant effect for the quadratic term. This finding indicates that the relationship between control and boredom takes linear rather than quadratic forms, in line with our earlier reasoning and previous research (Pekrun et al., 2010, 2014). As expected, perceived value correlated positively with the positive emotions and FL performance. However, perceived value was negatively related to the negative emotions, except for the correlation between value and anxiety which was nonsignificant.

The positive emotions showed positive intercorrelations, as did the negative emotions. The correlations between the two groups of emotions were negative, in line with previous research on achievement emotions (e.g., Pekrun et al., 2011). Overall, the correlations were stronger among emotions of the same valence. Furthermore, all of the positive emotions correlated positively with FL performance, and all of the negative emotions correlated negatively with performance. As expected, prior achievement was positively related to control, value, positive emotions, and FL performance, and negatively related to shame and hopelessness. Gender was positively linked to the positive emotions and FL performance and negatively linked to anger, hopelessness, and boredom, indicating that female students reported more positive

**Table 2**
Descriptive statistics and Pearson product-moment correlations of the study variables.

| | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Control | 3.33 | .63 | | | | | | | | | | | | |
| 2 Value | 3.36 | .62 | .27 | | | | | | | | | | | |
| 3 Enjoyment | 3.11 | .62 | .58 | .47 | | | | | | | | | | |
| 4 Hope | 3.07 | .67 | .58 | .39 | .78 | | | | | | | | | |
| 5 Pride | 3.26 | .66 | .53 | .40 | .81 | .76 | | | | | | | | |
| 6 Anger | 2.36 | .66 | -.38 | -.09 | -.41 | -.46 | -.35 | | | | | | | |
| 7 Anxiety | 2.67 | .58 | -.41 | -.01 | -.37 | -.46 | -.31 | .64 | | | | | | |
| 8 Shame | 2.47 | .61 | -.42 | -.10 | -.41 | -.45 | -.36 | .58 | .70 | | | | | |
| 9 Hopelessness | 2.04 | .59 | -.47 | -.17 | -.48 | -.51 | -.41 | .67 | .71 | .69 | | | | |
| 10 Boredom | 2.48 | .65 | -.46 | -.21 | -.55 | -.57 | -.44 | .70 | .65 | .60 | .75 | | | |
| 11 Performance | 66.50 | 8.76 | .43 | .28 | .46 | .42 | .42 | -.16 | -.20 | -.25 | -.35 | -.29 | | |
| 12 Gender | .91 | .29 | .09 | .05 | .16 | .13 | .12 | -.10 | -.07 | -.06 | -.14 | -.12 | .12 | |
| 13 Prior achievement | 86.79 | 16.70 | .12 | .12 | .19 | .11 | .19 | .01 | .07 | -.14 | -.10 | -.08 | .32 | .11 |

*Note.* $p < .05/.01/.001$ for $|r| > .09/.11/.14$.

### 3.2. Effects of control-value appraisals on emotions

To test Hypotheses 1 and 2 addressing predictive effects of perceived control and value on achievement emotions, latent moderated structural equation models were estimated. Perceived control and value were standardized prior to entering them into the models. As shown in Table 3, perceived control and value had significant positive predictive effects on enjoyment, hope, and pride, in line with Hypothesis 1. Furthermore, perceived control had significant negative effects on anger, anxiety, shame, hopelessness, and boredom. Perceived value had significant positive effects on anxiety and shame.

Above and beyond these first-order effects, there were significant predictive effects of the control × value interaction on all eight emotions, supporting Hypothesis 2. The interactive effects of perceived control and value were significantly positive for enjoyment, hope, and pride, and significantly negative for the five negative emotions. To interpret these interaction effects, Fig. 2 presents the simple slopes for the relation between control and emotion at low (-1SD), mean (0SD), and high (+1SD) levels of value (Cohen, Cohen, West, & Aiken, 2003). As can be seen from the figure, the positive relations between control and the three positive emotions (enjoyment, hope and pride) were stronger when value was high. Students with high control and value reported stronger positive emotions than those with either low control or value. Similarly, the negative associations between control and the five negative emotions (anger, anxiety, shame, hopelessness, and boredom) were stronger when value was high.

### 3.3. Effects of control-value appraisals and emotions on performance

Hypothesis 3 predicts interactive effects of perceived control and value on FL performance. Employing the same latent modeling procedure as with the emotions, control and value had significant positive effects on FL performance (Table 3). These first-order effects were further qualified by a positive effect of the control × value interaction on FL performance comparable with the effects of the interaction term on positive emotions. As shown in Fig. 2, the relation between control and FL performance was stronger for higher levels of value. Consistent with our hypothesis, performance scores where highest when both control and value were high.

Hypothesis 4 proposes that the effects of perceived control and value on FL performance are mediated by emotions. To test this hypothesis, mediational latent interactions models were estimated to examine the direct and indirect effects of perceived control, value and their interaction on performance via emotion (Table 4). The direct effects of perceived control on performance were positive and significant in each model, while controlling for value, emotion, and the covariates (gender, prior achievement). The indirect effects of control on FL performance through emotions were positive and significant for the models targeting enjoyment, hope, pride, and hopelessness, but nonsignificant for anger, anxiety, shame, and boredom. Both the direct and indirect effects of value on performance were nonsignificant in these models.

However, the effect of the control × value interaction on performance was again significant in all models. In the enjoyment, hope, pride, and hopelessness models, the indirect effect of the interaction on performance was significant, whereas the direct effect was not significant, supporting Hypothesis 4 stating that the effect should be mediated by emotion. In the anger, anxiety, shame, and boredom models, the direct effect of the interaction was significant, whereas the indirect effect was not significant. This pattern of findings can be explained by the effects of emotions on performance, which were significant for enjoyment, hope, pride, and hopelessness, and nonsignificant for the other emotions.

To further inspect the mediated effects of the control × value interaction, and following Hayes and Preachers' (2013) recommendations, the LMS approach was used to estimate the conditional indirect effects of control on performance through emotions at low ($-1$ SD), mean (0 SD) and high ($+1$ SD) levels of value. All appraisal and emotion variables were standardized prior to the analysis. The indirect

**Table 3**
Structural equation modeling: Effects of appraisals on emotions and FL performance.

| | Enjoyment | Hope | Pride | Anger | Anxiety | Shame | Hopelessness | Boredom | Performance |
|---|---|---|---|---|---|---|---|---|---|
| *Predictor* | ß (SE) | ß (SE) | ß (SE) | ß (SE) | ß (SE) | ß (SE) | ß (SE) | ß (SE) | ß (SE) |
| Control | .42 (.03) | .57 (.04) | .50 (.04) | -.45 (.04) | -.53 (.04) | -.51 (.04) | -.53 (.04) | -.48 (.04) | .37 (.04) |
| Value | .31 (.03) | .24 (.04) | .29 (.04) | .07 (.04) | .21 (.04) | .08 (.04) | .02 (.04) | -.04 (.04) | .19 (.04) |
| Control x Value | .26 (.04) | .21 (.05) | .17 (.05) | -.14 (.06) | -.16 (.05) | -.15 (.05) | -.15 (.05) | -.19 (.05) | .08 (.03) |
| $R^2$ | .55 (.05) | .52 (.05) | .45 (.05) | .21 (.04) | .28 (.05) | .27 (.05) | .30 (.05) | .39 (.05) | .24 (.04) |

*Note.* Coefficients are standardized path coefficients. Standard errors (*SE*) are in parentheses. $p < .05, .01,$ and $0.001$ for coefficients higher than 1.96, 2.58, and 3.29 *SE*, respectively.
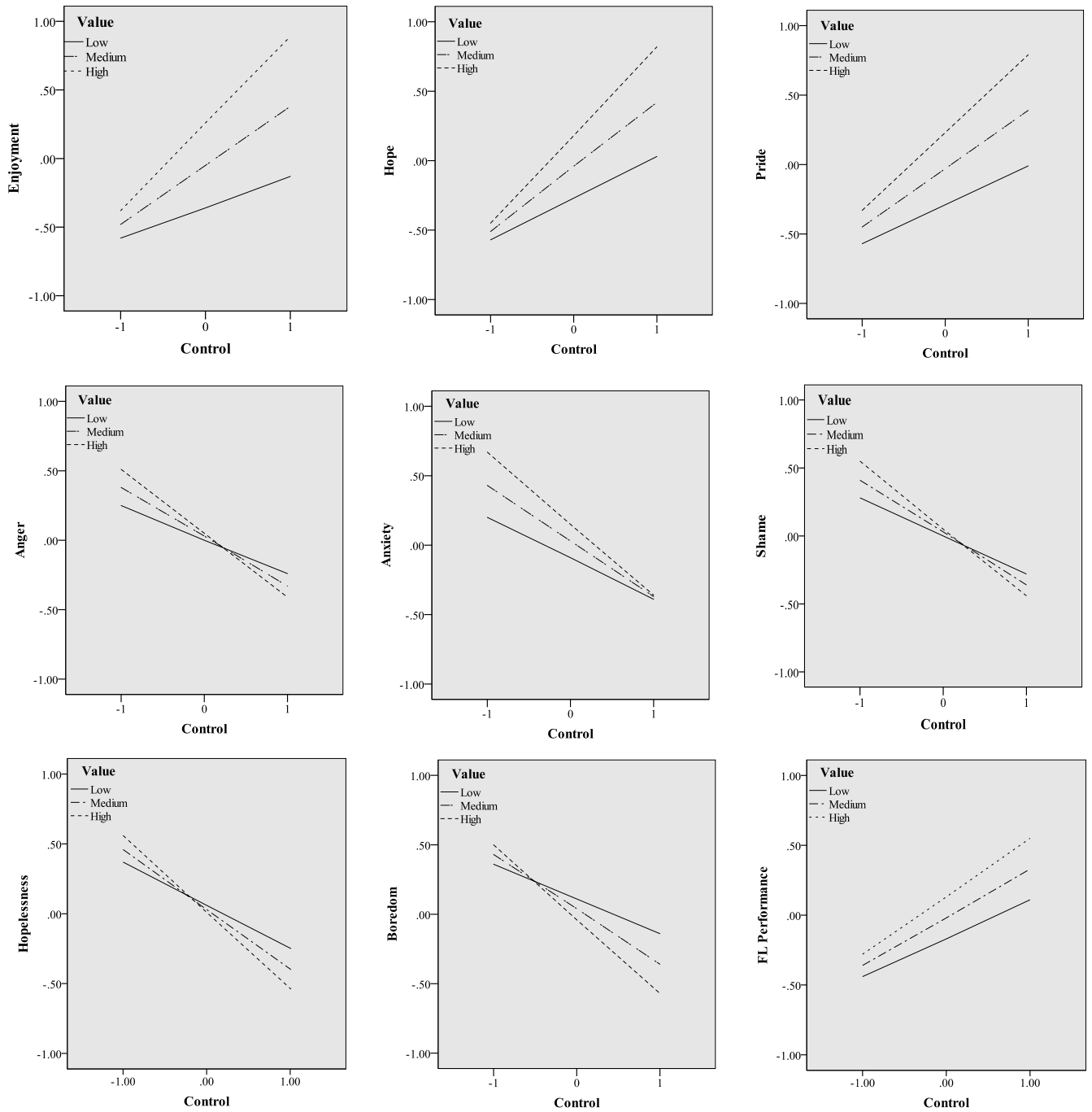
**Fig. 2.** Interaction effects of control and value on achievement emotions and FL performance. The x-axis depicts control, the y-axis represents emotions and FL performance at low ($-1$ *SD*), medium (0 *SD*) and high ($+1$ *SD*) levels of value.

**Table 4**
Direct and indirect effects of perceived control, value, the control × value interaction, and the emotions on FL performance.

| | Direct effects | | | | | | | Indirect effects | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | C→E | V→E | C × V→E | C→P | V→P | C × V→P | E→P | C→P | V→P | C × V→P |
| Enjoyment | .30(.09) | .11(.09) | .26(.05) | .26(.06) | .06(.06) | .02(.04) | .22(.07) | .10(.04) | .05(.04) | .19(.08) |
| Hope | .41(.07) | .07(.08) | .20(.04) | .25(.06) | .07(.06) | .05(.04) | .17(.06) | .10(.04) | .03(.03) | .11(.05) |
| Pride | .35(.08) | .14(.08) | .16(.05) | .27(.06) | .06(.06) | .05(.04) | .17(.06) | .09(.04) | .05(.03) | .09(.05) |
| Anger | -.34(.08) | .19(.08) | -.14(.05) | .33(.06) | .07(.06) | .09(.04) | .03(.04) | -.02(.02) | .01(.02) | -.01(.02) |
| Anxiety | -.40(.08) | .34(.09) | -.15(.05) | .32(.06) | .08(.06) | .09(.04) | -.01(.05) | .01(.03) | -.01(.03) | .01(.02) |
| Shame | -.36(.08) | .24(.09) | -.16(.05) | .32(.06) | .06(.06) | .10(.04) | .02(.05) | -.01(.03) | .01(.03) | -.01(.03) |
| Hopelessness | -.37(.08) | .16(.09) | -.15(.05) | .26(.06) | .10(.06) | .06(.04) | -.17(.05) | .10(.03) | -.06(.04) | .09(.04) |
| Boredom | -.32(.11) | .13(.11) | -.19(.07) | .31(.06) | .08(.06) | .08(.04) | -.05(.05) | .02(.02) | -.01(.02) | .03(.03) |

*Note.* Values are standardized coefficients from structural equation models. Standard errors (*SE*) are in parentheses. C = control; V = value; E = emotion; P = performance. *p* < .05, .01, and 0.001 for coefficients higher than 1.96, 2.58, and 3.29 *SE*, respectively.

**Table 5**
Conditional indirect effects of perceived control on FL performance through emotions.

| Emotion | Perceived value | Effect | SE | p | 95% Confidence interval |
|---|---|---|---|---|---|
| Enjoyment | -1SD | .080 | .073 | .270 | [-.223; .063] |
| | 0SD | .101 | .044 | .025 | [.012; 189] |
| | +1SD | .282 | .107 | .008 | [.072; .419] |
| Hope | -1SD | .006 | .031 | .846 | [-.080 .696] |
| | 0SD | .095 | .043 | .027 | [.011; .180] |
| | +1SD | .196 | .090 | .029 | [.021; .372] |
| Pride | -1SD | .002 | .037 | .964 | [-.075; .071] |
| | 0SD | .079 | .036 | .027 | [.099; .148] |
| | +1SD | .159 | .073 | .029 | [.016; .302] |
| Anger | -1SD | .003 | .013 | .817 | [-.028; .022] |
| | 0SD | .004 | .054 | .358 | [-.074; .027] |
| | +1SD | .045 | .048 | .350 | [-.138; .049] |
| Anxiety | -1SD | .000 | .005 | .938 | [-.010; .009] |
| | 0SD | .002 | .028 | .937 | [-.057; .053] |
| | +1SD | .004 | .051 | .937 | [-.105; .097] |
| Shame | -1SD | .000 | .001 | .974 | [-.002; .002] |
| | 0SD | .001 | .028 | .973 | [-.157; .155] |
| | +1SD | .002 | .056 | .973 | [-.111; .108] |
| Hopelessness | -1SD | .012 | .036 | .739 | [-.058; .082] |
| | 0SD | .080 | .034 | .021 | [.012; .147] |
| | +1SD | .174 | .064 | .022 | [.021; .273] |
| Boredom | -1SD | .006 | .019 | .742 | [-.044; .031] |
| | 0SD | .020 | .025 | .416 | [-.028; .068] |
| | +1SD | .046 | .058 | .420 | [-.066; .159] |

*Note.* Effects are standardized coefficients. *SE* = standard error.

effects of control on performance through emotion were significant in all three positive emotion models at both mean and high levels of value (Table 5). Among the negative emotion models, the conditional indirect effects were significant for hopelessness as a mediator at mean and high

levels of value. In other words, higher levels of perceived value coincided with stronger relations between control and emotions (positive for enjoyment, hope, and pride; negative for hopelessness), which in turn predicted higher levels of performance.

To visualize the four significant conditional indirect effects, a figure was plotted that displays the conditional indirect effect of control on performance at different levels of value (Fig. 3), using the graphing technique proposed by Hayes and Preacher (2013). As can be seen from the figure, the conditional indirect effects of control on FL performance mediated through enjoyment, hope, pride and hopelessness were consistently positive. However, they were clearly stronger with higher value.

To explain, this pattern of findings implies the following. First, as noted earlier, the relation between control and emotions was stronger at higher levels of perceived value (positive for enjoyment, hope, and pride; negative for hopelessness). This is in line with the hypothesis that the interaction of control and value predicts the emotions. Combined with the effects of the emotions on performance, the effects of the control-value interaction imply that the interaction also predicts performance (indirectly, via emotions). For enjoyment, hope, and pride, the effects of the control-value interaction on emotion were positive, and the effects of emotion on performance were positive as well, such that the indirect effects of the interaction on performance mediated by these emotions were positive. For hopelessness, the effect of the control-value interaction was negative. Combined with the negative effect of hopelessness on performance, the indirect effect of the interaction on performance as mediated by hopelessness was positive as well.

## 4. Discussion

The present study explored the relations among appraisal antecedents, achievement emotions, and FL performance. Specifically, the
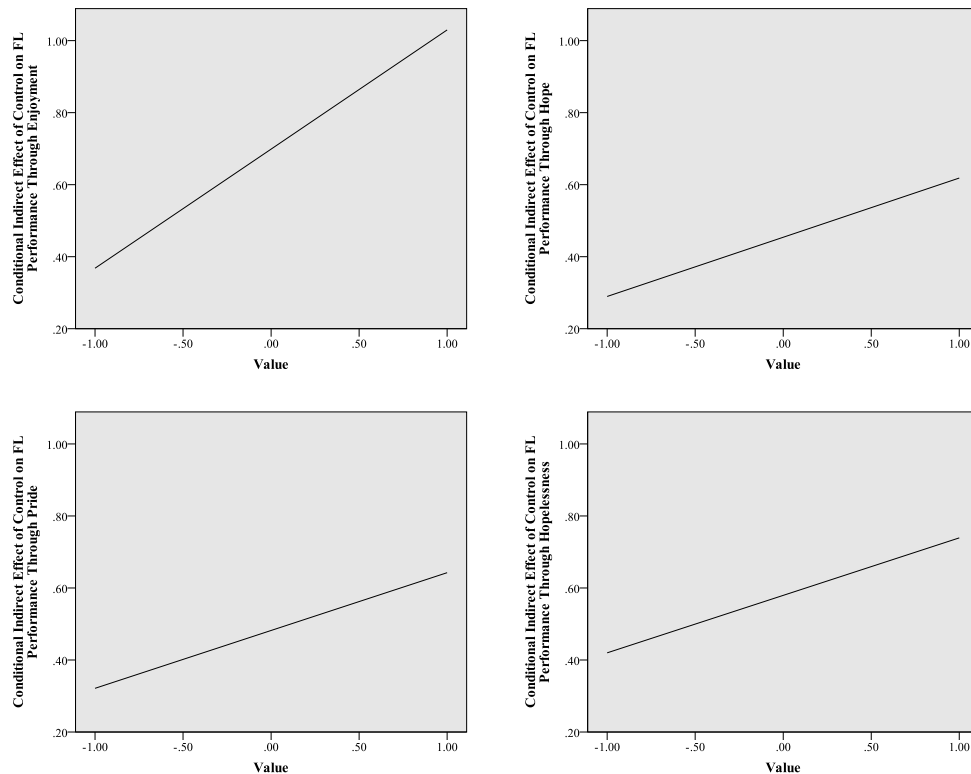


**Fig. 3.** Conditional indirect effects of control on FL performance mediated through four achievement emotions (enjoyment, hope, pride and hopelessness) as a function of value. The Y-axis corresponds to the estimated differences in FL performance between students at relatively low (-1SD) versus high (+SD) levels of control. The slopes of the lines depict the extent to which the indirect effect of perceived control on FL performance mediated by emotion is influenced by perceived value.

study evaluated both the independent and the interactive effects of control and value appraisals on achievement emotions and FL performance. Furthermore, we investigated mediation of the effects of control-value appraisals on FL performance through achievement emotions.

### 4.1. First-order effects of control-value appraisals on emotions and performance

Consistent with Hypothesis 1 and previous work (Artino & Jones, 2012; Burić & Sorić, 2012), perceived control was a positive predictor of the positive emotions (i.e., enjoyment, hope, and pride) and a negative predictor of the negative emotions. Control was negatively related not only to anger, anxiety, hopelessness, and shame, but also to boredom, in line with our expectations. The negative link between control and boredom may be explained by the nature of the achievement context under study. Task demands and exam-related workload are usually high for first-year university students, such as the students in this study. Consequently, situations of under-challenge as considered in CVT (Pekrun & Perry, 2014) are unlikely to occur in this context, suggesting that linear rather than curvilinear relations between control and boredom are to be expected. In the present study, this explanation is further supported by the students' mean score of FL performance, which was only 66.50% (which is considered low). As such, the observed linear relation between control and boredom is plausible. It is also in line with previous findings in other samples of university student (e.g., Pekrun et al., 2010, 2014).

Further in support of Hypothesis 1, perceived value also was a positive predictor of the positive emotions. In addition, value positively predicted anxiety and shame, which is in line with CVT reasoning and suggests that high perceived importance of learning and achievement can intensify these emotions. Moreover, students who felt competent and valued learning also attained higher scores on their final FL course exams. As such, our findings expand upon the emerging body of literature on appraisals and emotions in FL learning by showing that perceived control and value, as well as positive emotions, are positively linked with FL performance, and that negative emotions are negatively related to FL performance.

As noted earlier, in interpreting the findings for value it needs to be considered that perceived value was operationalized as positive task value in the present as well as previous research (see Pekrun & Perry, 2014). CVT (Pekrun, 2006) proposes that the negative value of failure amplifies negative outcome emotions such as anxiety, shame, and hopelessness. This proposition was not tested in the present study and needs to be addressed in future work.

### 4.2. Interactive effects of control and value appraisals

In line with Hypothesis 2, the interaction of perceived control and value predicted all eight focal emotions. For positive emotions, the interaction effect was positive, suggesting that the positive influence of perceived control is stronger when students value learning and achievement. Conversely, for negative emotions the interaction effect was negative, suggesting that the negative impact of perceived control on these emotions was stronger with higher value. In other words, lack of control prompts more negative emotions when learning and achievement are perceived as important. Taken together, these interaction effects support CVT propositions about the multiplicative impact of control and value appraisals on achievement emotions. To our knowledge, the present study is the first to provide empirical support for these interactive effects for a broader range of positive and negative achievement emotions.

Furthermore, supporting Hypothesis 3, we also found a positive effect of the control × value interaction in the prediction of FL performance. This effect suggests that students' perceived control has a stronger influence on FL performance when language learning is

deemed important. Alternatively, this interaction effect can also be read as signifying that students' perceived value has more pronounced effects on performance for those who feel to have greater control over their learning (see Fig. 2). This finding is consistent with CVT as well as recent research on the interactive effects of self-concept and value on academic performance (e.g., Guo, et al., 2015; Nagengast et al., 2013). To our knowledge, this interaction has not been empirically investigated in the context of language learning.

Finally, the findings suggest that the interactive effects of perceived control and value on FL performance were mediated by enjoyment, hope, pride, and hopelessness, which provides partial support for Hypothesis 4. The conditional indirect effects of control on performance mediated by these emotions may be due to the interactive effects of control and value on the emotions, coupled with the effects of these emotions on performance. In other words, students' perceptions of control exert a stronger influence on enjoyment, hope, pride and hopelessness when learning is deemed important; in turn, higher levels of joy, hope, and pride, as well as lower levels of hopelessness contribute to higher exam scores.

The indirect effects of the control-value interaction on L2 performance were not significant for the other four negative emotions as mediators. This is likely due to the small size of the effects of these emotions on performance (Table 4). For the negative activating emotions anger, anxiety, and shame, a possible explanation is that these emotions can exert variable effects on achievement through undermining attention and intrinsic motivation while strengthening motivation to invest effort in order to avoid failure, as noted earlier (Pekrun, 2006). Small overall effects of these emotions on performance are also in line with recent studies showing that the links between students' emotions and their FL performance are higher for positive activating emotions (e.g., enjoyment) than negative activating emotions (e.g., anxiety; Dewaele et al., 2018; Satio et al., 2018).

Overall, these finding are in line with the cognitive-motivational model of emotion effects that is part of CVT (Pekrun & Perry, 2014) as well as recent cross-sectional research that highlights the mediational role of emotions in the link between appraisals and academic achievement (Peixoto et al., 2016; see also; Luo et al., 2016). The present study is the first to extend this line of reasoning to emotions as mediators in the link between control-value interactions and achievement which is at the core of the CVT architecture.

### 4.3. Limitations and future directions

Several limitations of the present study should be taken into account and can be used to derive directions for future research. First, although the present research adopted a prospective design to examine the influence of appraisals on emotions and the joint influence of appraisals and emotions on FL performance, the data structure is correlational in nature, thus precluding any firm causal inferences. As detailed by Pekrun and Perry (2014), linkages between emotions and achievement are typically reciprocal: Students' emotions can impact their academic achievement which, in turn, can reciprocally influence students' appraisals of control and value that shape their future emotional experiences (Marsh & Ayotte, 2003; Peixoto et al., 2016; Pekrun et al., 2014, 2017). As such, adopting developmental perspectives and conducting more extensive multiple assessments of learners' appraisals, emotions, and achievement will allow for examining how the mediational mechanisms examined in this study unfold over time.

Second, the present study focused on eight emotions that are deemed to be especially important for students' learning. However, there are other emotions that can also be relevant during learning. Specifically, in terms of the dimensions valence and activation (Pekrun, 2006), we focused on three groups of emotions: positive activating (enjoyment, hope, pride); negative activating (anger, anxiety, shame); and negative deactivating (hopelessness, boredom). Future research should also consider positive deactivating emotions such as students'

relief or contentment during learning.

Third, the present study used students' course-specific exam scores as a measure of FL performance. The exam provided a combined score for students' reading and writing proficiency in the target language (English). Despite the moderate to high correlations among different language skills, it is important to consider that receptive skills (i.e., listening and reading) are generally acquired more readily than productive skills (i.e., speaking and writing; e.g., Lund, 1991). These differences in ease of acquisition may result in different appraisals and emotions for the different language skills (Arens & Jansen, 2016; Cheng et al., 1999). For example, Chinese learners of English as a foreign language tend to lack control and worry most about their speaking skills compared with other language abilities, likely due to the limited opportunities for authentic communication practice (Shao et al., 2013). Future studies need to verify whether the present findings are applicable to different dimensions of language learning, and whether there are differences with respect to the relations among appraisals, emotions and performance between these subskills.

In addition, there was a high proportion of female students in the present sample. Although this is typical for English major students in China, the distribution may be more balanced in students enrolled in English programs in other countries. CVT predicts that the functional relations of achievement emotions with appraisal antecedents and performance outcomes are equivalent across genders, despite differences in the frequency and intensity of these emotions (see Pekrun, 2018, for supporting empirical evidence). Larger samples of male students are needed to test this proposition for students' FL emotions.

Finally, the study employed an interindividual approach to investigate relations between appraisals, emotions, and performance over time. Future research should examine whether the observed relations can be replicated using intraindividual analysis. Drawing conclusions about intraindividual functioning from interindividual data can be problematic as between- and within-person relations between psychological variables can differ (Murayama et al., 2017). One possibility would be to extend previous study protocols using experience sampling (see Goetz et al., 2010) to replicate the present findings using intraindividual analysis.

### 4.4. Implications for educational practice

The present findings bear important applications for educators. First, our data suggest that perceived control is a critical antecedent of emotions and FL performance. Accordingly, FL intervention designers should consider implementing teaching methods and including intervention tasks that foster students' perceptions of control over their learning program so as to promote FL achievement both directly through enhancing perceptions of control, and indirectly through cultivating positive emotions and reducing negative emotions (Hamm, Perry, Chipperfield, Murayama, & Weiner, 2017). For example, by adopting problem-oriented coping strategies and goal-oriented training methods, teachers can gradually enable students to become more confident and satisfied with their language learning, which can lead to higher proficiency (Shao, Yu, & Ji, 2012).

Second, our findings also indicate that value perceptions can influence emotions and FL performance. This suggests that in developing learning tasks, teachers should try to incorporate material and topics that bear personal relevance for students and thereby increase positive intrinsic value (e.g., Rouhani, 2008). For example, current tertiary-level English courses at Chinese universities are required to use the same textbook for all students who do not have English as a major. Using instructional materials tailored to special learning subjects may be more beneficial for both students' emotional experiences and their language learning. Moreover, college educators can try to integrate real-world tasks into their language training (Ellis, 2003). Such efforts should help to promote positive, meaningful learning experiences and student engagement.

Third, the observed additive and interactive effects of control and value imply that the most effective way to foster students' emotional experience and learning would involve programs that promote both appraisals. For example, personal value-based writing programs aiming at enhancing motivation and emotional health (Hulleman & Harackiewicz, 2009; Shao et al., 2012) may be incorporated into existing attributional retraining and growth mindset interventions that encourage greater perceived control (e.g., Hall et al., 2007). Alternatively, given the impact of perceived value on emotions and emotion-related cognitive processing, control-enhancing programs may be more effective in boosting adaptive emotions in settings that are of greater personal value to students (such as major courses), suggesting that educators should focus on implementing them in such settings.

Finally, in addition to incorporating designated appraisal-focused interventions into classrooms, the present research suggests that teachers should be explicitly informed about the importance of students' perceptions of control and value for their emotional experiences and academic learning (Pekrun, 2014; Shao et al., 2019). Specifically, to cultivate adaptive emotional experiences, teachers should be encouraged to create learning environments and implement instructional practices that provide opportunities for students both to experience mastery in the classroom and to experience learning as personally meaningful (Dewaele et al., 2018). This can be achieved, for instance, by supporting autonomy and cooperation, adopting cognitive and emotional scaffolding, building clear goal structures, and fostering self-regulation (Patall et al., 2018). Through translating such knowledge into practice, teachers can provide students with a cognitively stimulating and emotionally sound environment that ultimately promotes language learning and personal development.

### CRediT authorship contribution statement

**Kaiqi Shao:** Conceptualization, Methodology, Formal analysis, Writing - original draft. **Reinhard Pekrun:** Supervision, Conceptualization, Writing - review & editing. **Herbert W. Marsh:** Conceptualization, Writing - review & editing. **Kristina Loderer:** Conceptualization, Writing - review & editing.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.learninstruc.2020.101356.

### References

Acee, T. W., Kim, H., Kim, H. J., Kim, J.-I., Chu, H.-N. R., Kim, M., ... Boredom Research Group (2010). Academic boredom in under- and over-challenging situations. *Contemporary Educational Psychology, 35*, 17–27. https://doi.org/10.1016/j.cedpsych.2009.08.002.

Arens, A. K., & Jansen, M. (2016). Self-concepts in reading, writing, listening, and speaking: A multidimensional and hierarchical structure and its generalizability across native and foreign languages. *Journal of Educational Psychology, 108*, 646–664. https://doi.org/10.1037/edu0000081.

Artino, A. R., & Jones, K. D. (2012). Exploring the complex relations between achievement emotions and self-regulated learning behaviors in online learning. *The Internet and Higher Education, 15*, 170–175. https://doi.org/10.1016/j.iheduc.2012.01.006.

Bieg, M., Goetz, T., & Hubbard, K. (2013). Can I master it and does it matter? An intraindividual analysis on control-value antecedents of trait and state academic emotions. *Learning and Individual Differences, 28*, 102–108. https://doi.org/10.1016/j.iheduc.2012.01.006.

Bown, J., & White, C. J. (2010). Affect in a self-regulatory framework for language learning. *System, 38*, 432–443. https://doi.org/10.1016/j.system.2010.03.016.

Burić, I., & Sorić, I. (2012). The role of test hope and hopelessness in self-regulated learning: Relations between volitional strategies, cognitive appraisals and academic achievement. *Learning and Individual Differences, 22*, 523–529. https://doi.org/10.

1016/j.lindif.2012.03.011.

Byrne, B. M. (2011). *Structural equation modeling with Mplus: Basic concepts, applications, and programming.* New York: Routledge/Taylor & Francis.

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*, 464–504. https://doi.org/10.1080/10705510701301834.

Cheng, Y.-s., Horwitz, E. K., & Schallert, D. L. (1999). Language anxiety: Differentiating writing and speaking components. *Language Learning, 49*, 417–446. https://doi.org/10.1111/0023-8333.00095.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Erlbaum.

Daniels, L. M., Stupnisky, R. H., Pekrun, R., Haynes, T. L., Perry, R. P., & Newall, N. E. (2009). A longitudinal analysis of achievement goals: From affective antecedents to emotional effects and achievement outcomes. *Journal of Educational Psychology, 101*, 948–963. https://doi.org/10.1037/a0016096.

Dewaele, J.-M. (2002). Psychological and socio-demographic correlates of communicative anxiety in L2 and L3 production. *International Journal of Bilingualism, 6*, 23–38. https://doi.org/10.1177/13670069020060010201.

Dewaele, J.-M., Petrides, K. V., & Furnham, A. (2008). Effects of trait emotional intelligence and sociobiographical variables on communicative anxiety and foreign language anxiety among adult multilinguals: A review and empirical investigation. *Language Learning, 58*, 911–960. https://doi.org/10.1111/j.1467-9922.2008.00482.x.

Dewaele, J.-M., Witney, J., Saito, K., & Dewaele, L. (2018). Foreign language enjoyment and anxiety: The effect of teacher and learner variables. *Language Teaching Research, 22*, 676–697. https://doi.org/10.1177/1362168817692161.

Ellis, R. (2003). *Task-based language learning and teaching.* Oxford, UK: Oxford Applied Linguistics.

Enders, C. K. (2010). *Applied missing data analysis.* New York: Guilford Press.

Fallah, N. (2017). Mindfulness, coping self-efficacy and foreign language anxiety: A mediation analysis. *Educational Psychology, 37*, 745–756. https://doi.org/10.1080/01443410.2016.1149549.

Frenzel, A. C., Thrash, T., Pekrun, R., & Goetz, T. (2007). Achievement emotions in Germany and China: A cross-cultural validation of the Academic Emotions Questionnaire–Mathematics. *Journal of Cross-Cultural Psychology, 38*, 302–309. https://doi.org/10.1177/0022022107300276.

Goetz, T., Frenzel, A. C., Pekrun, R., Hall, N. C., & Lüdtke, O. (2007). Between- and within-domain relations of students' academic emotions. *Journal of Educational Psychology, 99*, 715–733. https://doi.org/10.1037/0022-0663.99.4.715.

Goetz, T., Frenzel, A. C., Stoeger, H., & Hall, N. C. (2010). Antecedents of everyday positive emotions: An experience sampling analysis. *Motivation and Emotion, 34*, 49–62. https://doi.org/10.1007/s11031-009-9152-2.

Goetz, T., Nett, U. E., Martiny, S. E., Hall, N. C., Pekrun, R., Dettmers, S., et al. (2012). Students' emotions during homework: Structures, self-concept antecedents, and achievement outcomes. *Learning and Individual Differences, 22*, 225–234. https://doi.org/10.1016/j.lindif.2011.04.006.

Goetz, T., Pekrun, R., Hall, N. C., & Haag, L. (2006). Academic emotions from a social cognitive perspective: Antecedents and domain specificity of students' affect in the context of Latin instruction. *British Journal of Educational Psychology, 76*, 289–308. https://doi.org/10.1348/000709905X42860.

Guo, J., Parker, P. D., Marsh, H. W., & Morin, A. J. S. (2015). Achievement, motivation, and educational choices: A longitudinal study of expectancy and value using a multiplicative perspective. *Developmental Psychology, 51*, 1163–1176. https://doi.org/10.1037/a0039440.

Hall, N. C., Perry, R. P., Goetz, T., Ruthig, J.c., Stupnisky, R. H., & Newall, N. E. (2007). Attributional retraining and elaborative learning: Improving academic development through writing based interventions. *Learning and Individual Differences, 17*, 280–290. https://doi.org/10.1016/j.lindif.2007.04.002.

Hamm, J. M., Perry, R. P., Chipperfield, J., Murayama, K., & Weiner, B. (2017). Attribution-based motivation treatment efficacy in an online learning environment for students who differ in cognitive elaboration. *Motivation and Emotion, 41*, 600–616. https://doi.org/10.1007/s11031-017-9632-8.

Hayes, A. F., & Preacher (2013). Conditional process modeling: Using structural equation modeling to examine contingent casual processes. In R. H. Gregory, & R. O. Mueller (Eds.). *Structural equation modeling: A second course* (pp. 219–266). (2nd ed.). Charlotte, NC: Information Age Publishing.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55. https://doi.org/10.1080/10705519909540118.

Hulleman, C. S., & Harackiewicz, J. M. (2009). Promoting interest and performance in high school science classes. *Science, 236*, 1410–1412. https://doi.org/10.1126/science.1177067.

Kim, D.-H., Wang, C., Ahn, H. S., & Bong, M. (2015). English language learners' self-efficacy profiles and relationship with self-regulated learning strategies. *Learning and Individual Differences, 38*, 136–142. https://doi.org/10.1016/j.lindif.2015.01.016.

Klein, A., & Moosbrugger, H. (2000). Maximum likelihood estimation of latent interaction effects with the LMS method. *Psychometrika, 65*, 457–474. https://doi.org/10.1007/BF02296338.

Lane, A. M., Whyte, G. P., Terry, P. C., & Nevill, A. M. (2005). Mood, self-set goals and examination performance: The moderating effect of depressed mood. *Personality and Individual Differences, 39*, 143–153. https://doi.org/10.1016/j.paid.2004.12.015.

Laufer, B., & Rozovski-Roitblat, B. (2011). Incidental vocabulary acquisition: The effects of task type, word occurrence and their combination. *Language Teaching Research, 15*, 391–411. https://doi.org/10.1177/1362168811412019.

Lazarus, R. S. (1991). *Emotion and adaption.* New York: Oxford University Press.

Lee, M. (2014). *Achievement goals, emotions, and foreign language performance in German and Korean students.* Unpublished doctoral dissertation. Munich, Germany: University of Munich.

Loderer, K., Pekrun, R., & Lester, J. C. (2018). Beyond cold technology: A review of research on emotions in technology-based learning environments. *Learning and Instruction.* https://doi.org/10.1016/j.learninstruc.2018.08.002 Advance online publication.

Lund, R. J. (1991). A comparison of second language listening and reading comprehension. *The Modern Language Journal, 75*, 196–204. https://doi.org/10.1111/j.1540-4781.1991.tb05350.x.

Luo, W., Lee, K., Ng, P. T., & Ong, J. W. (2014). Incremental beliefs of ability, achievement emotions and learning of Singapore students. *Educational Psychology, 34*, 619–634. https://doi.org/10.1080/01443410.2014.909008.

Luo, W., Ng, P. T., Lee, K., & Aye, K. M. (2016). Self-efficacy, value, and achievement emotions as mediators between parenting practice and homework behavior: A control-value theory perspective. *Learning and Individual Differences, 50*, 275–282. https://doi.org/10.1016/j.lindif.2016.07.017.

MacIntyre, P. D. (2002). Motivation, anxiety and emotion in second language acquisition. In P. Robinson (Ed.). *Individual differences and instructed language learning* (pp. 45–68). Philadelphia, PA/Amsterdam, The Netherlands: John Benjamins.

MacIntyre, P. D., & Gardner, R. C. (1994). The subtle effects of language anxiety on cognitive processing in the second language. *Language Learning, 44*, 283–305. https://doi.org/10.1111/j.1467-1770.1994.tb01103.x.

Marsh, H. W., & Ayotte, V. (2003). Do multiple dimensions of self-concept become more differentiated with age? The differential distinctiveness hypothesis. *Journal of Educational Psychology, 94*, 687–706. https://doi.org/10.1037/0022-0663.95.4.687.

Maslowsky, J., Jager, J., & Hemken, D. (2015). Estimating and interpreting latent variable interactions: A tutorial for applying the latent moderated structural equations method. *International Journal of Behavioral Development, 39*, 87–96. https://doi.org/10.1177/0165025414552301.

Moors, A., Ellsworth, P. C., Scherer, K. R., & Frijda, N. H. (2013). Appraisal theories of emotion: State of the art and future development. *Emotion Review, 5*, 119–124. https://doi.org/10.1177/1754073912468165.

Murayama, K., Goetz, T., Malmberg, L.-E., Pekrun, R., Tanaka, A., & Martin, A. J. (2017). Within-person analysis in educational psychology: Importance and illustrations. In D. W. Putwain, & K. Smart (Eds.). *British Journal of Educational Psychology Monograph Series II: Psychological aspects of education – current trends: The role of competence beliefs in teaching and learning* (pp. 71–87). Oxford, UK: Wiley.

Muthén, L. K., & Muthén, B. O. (1998–2017). *Mplus user's guide.* Los Angeles, CA: Muthén & Muthén.

Nagengast, B., Marsh, H. W., Scalas, L. F., Xu, M. K., Hau, K.-T., & Trautwein, U. (2011). Who took the "×" out of expectancy-value theory? A psychological mystery, a substantive-methodological synergy, and a cross-national generalization. *Psychological Science, 22*, 1058–1066. https://doi.org/10.1177/0956797611415540.

Nagengast, B., Trautwein, U., Kelava, A., & Ludtke, O. (2013). Synergistic effects of expectancy and value on homework engagement: The case for a within-person perspective. *Multivariate Behavioral Research, 48*, 428–460. https://doi.org/10.1080/00273171.2013.775060.

National Education Examinations Authority (2016). *GaoKao NianBao [Annual report about college entrance examinations].* Beijing, China: Higher Education Press.

OECD (Organization for Economic Cooperation and Development) (2010). PISA 2009 results. *Learning to learn – student engagement, strategies and practices: Vol. 3.* Paris, France: OECD Publishing.

Patall, E. A., Steingut, R. R., Vasquez, A. C., Trimble, S. S., Pituch, K. A., & Freeman, J. L. (2018). Daily autonomy supporting or thwarting and students' motivation and engagement in the high school science classroom. *Journal of Educational Psychology, 110*, 269–288. https://doi.org/10.1037/edu0000214.

Peixoto, F., Sanches, C., Mata, L., & Monteiro, V. (2016). "How do you feel about math?": Relationships between competence and value appraisals, achievement emotions and academic achievement. *European Journal of Psychology of Education, 32*, 385–405. https://doi.org/10.1007/s10212-016-0299-4Pe 92.EVTA.

Pekrun, R. (2006). The control value theory of achievement emotions: Assumptions, corollaries, and implications for educational research and practice. *Educational Psychology Review, 18*, 315–341. https://doi.org/10.1007/s10648-006-9029-9.

Pekrun, R. (2014). *Emotions and learning (Educational Practices Series: Vol. 24).* Geneva, Switzerland: International Academy of Education (IAE) and International Bureau of Education (IBE) of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

Pekrun, R. (2018). Control-value theory: A social-cognitive approach to achievement emotions. In G. A. D. Liem, & D. M. McInerney (Eds.). *Big theories revisited 2: A volume of research on sociocultural influences on motivation and learning* (pp. 162–190). Charlotte, NC: Information Age Publishing.

Pekrun, R. (in press). Self-appraisals and emotions: A control-value approach. In T. Dicke, F. Guay, H. W. Marsh, R. G. Craven, & D. M. McInerney (Eds). *Self – a multidisciplinary concept.* Charlotte, NC: Information Age Publishing.

Pekrun, R., Goetz, T., Daniels, L. M., Stupnisky, R. H., & Perry, R. P. (2010). Boredom in achievement settings: Exploring control-value antecedents and performance outcomes of a neglected emotion. *Journal of Educational Psychology, 102*, 531–549. https://doi.org/10.1037/a0019243.

Pekrun, R., Goetz, T., Frenzel, A. C., Barchfeld, P., & Perry, R. P. (2011). Measuring emotions in students' learning and performance: The Achievement Emotions Questionnaire (AEQ). *Contemporary Educational Psychology, 36*, 36–48. https://doi.org/10.1016/j.cedpsych.2010.10.002.

Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educational Psychologist, 37*, 91–105. https://doi.org/10.1207/S15326985EP3702_4.

Pekrun, R., Hall, N. C., Goetz, T., & Perry, R. P. (2014). Boredom and academic achievement: Testing a model of reciprocal causation. *Journal of Educational Psychology, 106*, 696–710. https://doi.org/10.1037/a0036006.

Pekrun, R., Lichtenfeld, S., Marsh, H. W., Murayama, K., & Goetz, T. (2017). Achievement emotions and academic performance: Longitudinal models of reciprocal effects. *Child Development, 88*, 1653–1670. https://doi.org/10.1111/cdev.12704.

Pekrun, R., & Meier, E. (2011). *Task value questionnaire.* Unpublished instrument, Department of Psychology, University of Munich, Munich, Germany.

Pekrun, R., & Perry, R. P. (2014). Control-value theory of achievement emotions. In R. Pekrun, & L. Linnenbrink-Garcia (Eds.). *International handbook of emotions in education* (pp. 120–141). New York: Taylor & Francis.

Perry, R. P., Hladkyj, S., Pekrun, R., & Pelletier, S. T. (2001). Academic control and action control in the achievement of college students: A longitudinal field study. *Journal of Educational Psychology, 93*, 776–789. https://doi.org/10.1037/0022-0663.93.4.776.

Phung, L. (2017). Task preference, affective response, and engagement in L2 use in a US university context. *Language Teaching Research, 21*, 751–766. https://doi.org/10.1177/1362168816683561.

Putwain, D. W., Pekrun, R., Nicholson, L. J., Symes, W., Becker, S., & Marsh, H. W. (2018). Control-value appraisals, enjoyment, and boredom in mathematics: A longitudinal latent interaction analysis. *American Educational Research Journal, 55*, 1339–1368. https://doi.org/10.3102/0002831218786689.

Rhemtulla, M., Brosseau-Liard, P., & Savalei, V. (2012). When can categorical variables be treated as continuous? A comparison of robust continuous and categorical SEM estimation methods under suboptimal conditions. *Psychological Methods, 17*, 354–373. https://doi.org/10.1037/a0029315.

Roseman, I. J. (2001). A model of appraisal in the emotion system: Integrating theory, research and applications. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.). *Appraisal processes in emotion* (pp. 68–91). Oxford, UK: Oxford University Press.

Rouhani, A. (2008). An investigation into emotional intelligence, foreign language anxiety and empathy through a cognitive-affective course in an EFL context. *Linguistik Online, 34*, 41–57. https://doi.org/10.13092/lo.34.526.

Saito, K., Dewaele, J., Abe, M., & In'nami, Y. (2018). Motivation, emotion, learning experience, and second language comprehensibility development in classroom settings: A cross-sectional and longitudinal study. *Language Learning, 68*, 709–743. https://doi.org/10.1111/lang.12297.

Sardegna, V. G., Lee, J., & Kusey, C. (2018). Self-efficacy, attitudes, and choice of strategies for English pronunciation learning. *Language Learning, 68*, 83–114. https://doi.org/10.1111/lang.12263.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7*, 147–177. https://doi.org/10.1037/1082-989X.7.2.147.

Scovel, T. (2000). *Learning new languages: A guide to second language acquisition.* Boston, MA: Heinle & Heinle.

Shao, K. Q., Pekrun, R., & Nicholson, L. J. (2019). Emotions in classroom language learning: What can we learn from achievement emotion research? *System, 86*, 102–121. https://doi.org/10.1016/j.system.2019.102121.

Shao, K. Q., Yu, W. H., & Ji, Z. M. (2012). The relationship between EFL students' emotional intelligence and writing achievement. *Innovation in Language Learning and Teaching, 7*, 107–124. https://doi.org/10.1080/17501229.2012.725730.

Shao, K. Q., Yu, W. H., & Ji, Z. M. (2013). An exploration of Chinese EFL students' emotional intelligence and foreign language anxiety. *The Modern Language Journal, 97*, 919–931. https://doi.org/10.1111/j.1540-4781.2013.12042.x.

Swain, M. (2013). The inseparability of cognition and emotion in second language learning. *Language Teaching, 46*, 195–207. https://doi.org/10.1017/S0261444811000486.

Teimouri, Y., Goetze, J., & Plonsky, L. (2019). Second language anxiety and achievement: A meta-analysis. *Studies in Second Language Acquisition, 41*, 363–387. https://doi.org/10.1017/S0272263118000311.

Trautwein, U., Marsh, H. W., Nagengast, B., Ludtke, O., Nagy, G., & Jonkmann, K. (2012). Probing for the multiplicative term in modern expectancy-value theory: A latent interaction modeling study. *Journal of Educational Psychology, 104*, 763–777. https://doi.org/10.1037/a0027470.

Turner, J. E., & Schallert, D. L. (2001). Expectancy-value relationships of shame reactions and shame resiliency. *Journal of Educational Psychology, 93*, 320–329. https://doi.org/10.1037/0022-0663.93.2.320.

Varasteh, H., Ghanizadeh, A., & Akbari, O. (2016). The role of task value, effort-regulation, and ambiguity tolerance in predicting EFL learners' test anxiety, learning strategies, and language achievement. *Psychological Studies, 61*, 2–12. https://doi.org/10.1007/s1264.

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92*, 548–573. https://doi.org/10.1037/0033-295X.92.4.548.

Weiner, B. (2018). The legacy of an attribution approach to motivation and emotion: A no-crisis zone. *Motivation Science, 4*, 4–14. https://doi.org/10.1037/mot0000082.