Development of Achievement Emotions

http://doi.org/10.1093/oxfordhb/9780198855903.013.36

Development of Achievement Emotions

Reinhard Pekrun

University of Essex, Australian Catholic University, and University of Munich

Citation: Pekrun, R. (2022). Development of achievement emotions. In D. Dukes, A. C. Samson, & E. A. Walle (Eds.), *The Oxford handbook of emotional development.* (pp. 446-462). Oxford University Press.

Abstract

Children and adolescents frequently experience emotions such as enjoyment, hope, pride, anger, anxiety, shame, or boredom at school. Similarly, achievement situations at work or in sports during adulthood are infused with emotions. Using Pekrun's (2006) control-value theory of achievement emotions as a theoretical framework, I review developmental research on these emotions. The findings show that achievement emotions develop early and continue to unfold during childhood and adolescence. This development is shaped by success and failure on achievement tasks, related cognitive appraisals, and social environments at school, at work, and in the family. Achievement emotions, in turn, influence individuals' attention, motivation, use of strategies, self-regulation when performing tasks, and long-term achievement outcomes. I also discuss how achievement emotions, their outcomes, and their antecedents are linked by reciprocal causation over time, how they can be regulated, and to what extent they are universal. In closing, I outline directions for future research.

Keywords: Achievement emotion, enjoyment, pride, anxiety, shame, boredom, control, value, achievement, control-value theory

Author: Reinhard Pekrun, Department of Psychology, University of Essex, Colchester, United Kingdom; address: Wivenhoe Park, Colchester CO4 3SQ, Essex, UK; Email pekrun@lmu.de

15-20 word biography: Reinhard Pekrun, PhD, is Professor for Psychology at the University of Essex and a leading scholar in research on achievement emotions.

Success and failure in performing activities and attaining outcomes are critically important for human development. This is true over the lifespan and across domains, such as education, work, and sports. Given their importance, achievement settings are infused with emotions, such as enjoyment of learning, hope for success, pride about accomplishments, anger about unreasonable task demands, fear of failure, shame about poor evaluations, or boredom during monotonous lectures. Throughout the lifespan, achievement emotions are among the most frequently occurring and intense emotions. Furthermore, these emotions can exert profound effects on learning, performance, educational and occupational trajectories, and psychological as well as physical health. As such, developmental science should consider these emotions.

Traditionally, research on achievement emotions has focused on test anxiety but has neglected emotions other than anxiety. Specifically, research on test anxiety begun in the 1930s (Brown, 1938), started to flourish in the 1950s (Mandler & Sarason, 1952), and has generated more than 2,000 empirical studies to date. More recently, however, researchers have recognized that a broader range of emotions, both negative and positive, can occur in achievement settings. Furthermore, across disciplines it is acknowledged that emotions are more than mere epiphenomena of achievement in these settings. Rather, they can profoundly influence important outcomes. In fact, in disciplines such as educational science and management research, it has been noted that there is an affective turn in research (Barsade, Brief, & Spataro, 2003; Pekrun & Linnenbrink-Garcia, 2014a). Nevertheless, research on achievement emotions beyond anxiety is still at a preliminary stage.

In this chapter, I use the control-value theory (CVT) of achievement emotions (Pekrun, 2006, 2018; Pekrun & Perry, 2014) as a theoretical framework to discuss the development of achievement emotions. I first outline the concept of achievement emotion. Next I address their

individual origins and developmental trajectories, and the role of social environments. I then discuss their developmental linkages with learning and performance. In the next sections, I address reciprocal causation, emotion regulation, and the relative universality of achievement emotions across genders and socio-cultural contexts. In conclusion, directions for future research are outlined.

(h1) Concept of Achievement Emotion

Achievement emotions are defined as emotions that relate to achievement activities and their success and failure outcomes (Pekrun, Goetz, Titz, & Perry, 2002). This definition makes it possible to distinguish different types of achievement emotions according to their object focus. *Activity emotions* relate to achievement activities, such as enjoyment of learning or boredom when reading repetitive texts. *Outcome emotions* relate to success and failure resulting from these activities, such as hope and pride related to success, or anxiety, shame, and hopelessness related to failure. Combined with the dimensions of emotional valence (positive vs. negative, or pleasant vs. unpleasant) and activation (activating vs. deactivating), this distinction renders a three-dimensional taxonomy of achievement emotions (see Table 1).

Achievement emotions are not the only type of emotions that can be prompted in achievement settings. Topic emotions, epistemic emotions, and social emotions can also play a major role in these settings. *Topic emotions* relate to the contents of learning materials or a project at work, such as anger about climate change dealt with in science class. *Epistemic emotions* relate to the knowledge-generating qualities of cognitive tasks and activities. These emotions serve the generation of new knowledge and can be triggered by discrepant information and cognitive incongruity. Prototypical epistemic emotions are surprise about unexpected events, curiosity about new information, and confusion occurring when discrepancies cannot be

resolved. *Social emotions* relate to others who are present in the setting, such as enjoyment of interacting with peers or anger about one's supervisor. Different categories of emotions in achievement settings can overlap. An example is social achievement emotions like admiration, compassion, or contempt that relate to the success and failure of other persons.

(h1) Individual Origins and Developmental Trajectories

As emotions more generally, the development of achievement emotions can be influenced by various individual factors including genetic dispositions, situational perceptions and appraisals, neurohormonal processes, etc. (Pekrun & Linnenbrink-Garcia, 2014b; Zeidner, 1998). Among these factors, cognitive appraisals of task demands, individual competencies, and the likelihood of success and failure are thought to be of primary importance for situational arousal and long-term development of achievement emotions. According to CVT, two types of appraisals are especially important: *perceived control* over one's achievement activities and their outcomes, and the *perceived value* of these activities and outcomes. Perceived control comprises expectancies to be able to successfully perform an achievement activity (self-efficacy expectations) and to attain success and avoid failure (outcome expectations) as well as causal attributions of success and failure. Perceived value includes intrinsic values of achievement activities (e.g., interest value) and achievement outcomes (attainment value) as well as the extrinsic, instrumental value of activities and outcomes to attain further outcomes.

Prospective, anticipatory outcome emotions are thought to be prompted by perceptions of control over success and failure in upcoming achievement situations. For example, anticipatory enjoyment of success is prompted if there is full control over performance and success seems certain, and hopelessness when there is a complete lack of control. With an intermediate level of control and resulting uncertainty about the outcome, hope and anxiety can be triggered, with

hope being prompted when the attentional focus is on possible success, and anxiety when the focus is on failure. *Retrospective outcome emotions* such as joy and frustration can immediately follow success and failure, respectively, without further cognitive mediation by control and value appraisals. In contrast, more complex self-conscious and social emotions are expected to depend on causal attributions of achievement outcomes (Weiner, 1985). Pride and shame are induced by attributions of success and failure to internal factors such as ability or lack of ability, respectively, and gratitude and anger are triggered by attributions of success and failure to the actions of other persons. In addition, all of these outcome emotions depend on perceived value, with value amplifying these emotions. Finally, *activity emotions* like enjoyment of learning or boredom depend on perceptions of control over the current activity and the value of the activity. For example, students can enjoy learning if they feel competent to master the learning material and perceive the material as interesting.

Empirical evidence confirms these proposed relations between control-value appraisals and emotions (see Pekrun & Perry, 2014). For example, numerous studies document that students' test anxiety relates to perceived lack of self-efficacy and low self-concepts of ability. In addition, research has shown that perceived control over achievement relates positively to students' enjoyment, hope, and pride, and negatively to their anger, anxiety, shame, hopelessness, and boredom (for a summary of findings, see Pekrun & Perry, 2014). Research has also shown that the perceived value of achievement relates positively to achievement emotions, confirming that these emotions are intensified when success and failure are subjectively important. Boredom is an exception. For boredom, negative links with value have been found, corroborating the idea that boredom is reduced when individuals value achievement (e.g., Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010). Finally, studies have confirmed that control

and value interact in the arousal of achievement emotions, as positive emotions are especially pronounced when both control and value are high, and negative emotions when value is high but control is lacking (e.g., Goetz, Frenzel, Stoeger, & Hall, 2010; Lauerman, Eccles, & Pekrun, 2017; Putwain et al., 2018).

Given that achievement emotions are closely linked to cognitive appraisals, the development of these emotions over the years is related to the development of achievement-related appraisals. Between two to three years of age, children are able to express pride and shame when successfully solving tasks or failing to do so, suggesting that they are able to differentiate internal versus external causation of success and failure (Stipek, 1995; Tracy & Robins, 2004). During the early elementary school years, children additionally acquire capabilities to distinguish between different types of internal and external causes, such as ability and effort, to develop related causal expectancies, and to cognitively combine expectancies, attributions, and value-related information (Heckhausen, 1991). By implication, children have developed the cognitive competencies to experience all major types of achievement emotions early in their educational career.

However, empirical evidence on the development of achievement emotions over the lifespan is scarce and largely limited to the school years. Specifically, studies have shown that average scores for test anxiety are low at the beginning of elementary school, but increase dramatically during the elementary school years (Hembree, 1988). This development is congruent with the decline in academic self-concepts during this period, and is likely due to increasing realism in academic self-perceptions, to the cumulative failure feedback students may receive across the years, and to the increasing importance of academic success. After elementary school, average anxiety scores stabilize and remain at high levels throughout middle school, high

school, and college. However, stability at the group level notwithstanding, anxiety can change in individual students. One important source of individual dynamics is the change of reference groups implied by transitions between schools and classrooms (Zeidner, 1998). All things being equal, the likelihood of low achievement relative to peers is higher in high-ability classrooms and lower in low-ability classrooms. Therefore, moving from a low-ability to a high-ability classroom can increase anxiety, whereas the reverse may apply upon entering a low-ability classroom.

While anxiety increases in the average student, positive emotions such as enjoyment of learning seem to decrease across the elementary school years (Helmke, 1993; Lichtenfeld, Pekrun, Stupnisky, Reiss, & Murayama, 2012). The decrease of enjoyment can continue through the middle school years (Pekrun et al., 2007), which is consistent with the decline of average scores for subject-matter interest, mastery goals, and general attitudes toward school (e.g., Fredricks & Eccles, 2002; Scherrer, Preckel, Schmidt, & Elliot, 2020; Watt, 2004). Important factors responsible for this development may be an increase of teacher-centered instruction and academic demands in middle school and the stronger selectivity of subject-matter interest that is part of adolescent identity formation (Fredricks & Eccles, 2002; also see Hidi & Renninger, 2006). However, to date, these assumptions are speculative because empirical studies testing their validity for emotions are largely lacking.

(h1) The Role of Social Environments

Given the role of control and value appraisals as proximal antecedents of achievement emotions, the impact of social environments is likely to be mediated by these appraisals. Variables in the environment that affect these appraisals should influence the resulting emotions

as well. According to CVT, the following groups of factors may be relevant for a broad variety of achievement emotions (Figure 1).

(h2) Cognitive quality. The cognitive quality of environments at home, in education, and at work as defined by their structure, clarity, and potential for cognitive stimulation, likely has a positive influence on perceived control and the perceived value of achievement tasks, thus positively influencing achievement emotions. In addition, task demands impact the likelihood of successful performance, thus influencing perceived control and resulting emotions. Furthermore, the match between demands and competences can influence perceived task value, thus also influencing emotions. If demands slightly exceed current competencies, the task can be perceived as a challenge that is enjoyable (see also Vygotsky, 1978). In contrast, if the demands are too high (over-challenge) or too low (under-challenge), the incentive value of a task may be reduced to the extent that boredom is experienced (Csikszentmihalyi 1975; Pekrun et al. 2010).

(h2) Motivational quality. Teachers, supervisors, coaches, parents, and peers deliver messages about the controllability and value of tasks, thus influencing individuals' emotions. For example, perceived value can be promoted by explaining the relevance of learning materials (Harackiewicz, Tibbetts, Canning, & Hyde, 2014). However, increasing perceived importance can boost not only positive emotions but negative emotions as well. For example, reminding students of the importance of exams is a double-edged sword - "fear appeals" can exacerbate achievement anxiety (Putwain, Remedios, & Symes, 2015). More indirect ways to increase value include deploying tasks that relate to individuals' interests and shaping achievement environments such that they fulfill needs for autonomy and social relatedness, which can increase the perceived value of achievement activities and foster positive activity-related emotions (see also Tsai, Kunter, Lüdtke, & Trautwein, 2008). Environments that reduce negative

consequences of failure, fulfil these needs, and boost the intrinsic reward value of achievement activities may be especially helpful. An example is educational environments that stimulate playful learning, such as learning with computer-based games (see Loderer & Pekrun, in press).

(h2) Emotional quality. Emotions can be directly transmitted to others nonverbally. Facial, gestural, and postural expressions of emotion can be automatically mimicked by others so that the others experience the same emotion. Such "emotional contagion" (Hatfield, Cacioppo, & Rapson, 1994) likely plays a major role in daily interaction, with emotions being transmitted from teachers to students, from students to teachers, from supervisors to employees, etc. Supporting this view, a few studies suggest that teachers' enjoyment can strongly facilitate students' enjoyment of class and that this process is mediated through teachers' displayed enthusiasm (Frenzel, Becker-Kurz, Pekrun, Goetz, & Lüdtke, 2018; Frenzel, Goetz, Lüdtke, Pekrun, & Sutton, 2009).

(h2) Goal structures and social expectations. Different goal structures imply different standards for evaluating achievement (Johnson & Johnson, 1974; Murayama & Elliot, 2009). In *individualistic goal structures*, achievement is based on absolute (task mastery) or individual standards (individual improvement over time). *Competitive goal structures* define individual achievement relative to the achievement of others. In *cooperative goal structures*, individual achievement is a positive function of the achievement of others. These goal structures define opportunities for experiencing success. For example, competitive structures imply that some individuals have to experience failure, thus inducing anxiety and hopelessness (Pekrun, Elliot, & Maier, 2006). Similarly, the demands implied by an important other's unrealistic expectancies for achievement can lead to negative emotions. For example, if parents hold overly high aspirations for their children's academic success, they can reduce children's sense of control,

which can prompt anxiety and ultimately prevent the very attainment that parents had hoped for in the first place (Murayama, Pekrun, Suzuki, Marsh, & Lichtenfeld, 2016).

(h2) Feedback and consequences of achievement. Success can strengthen perceived control, and cumulative failure undermines control, thus influencing the development of achievement emotions. In addition, the consequences of success and failure are important, since they are key to the instrumental value of achievement. Positive outcome emotions (e.g., hope for success) can be increased if success produces beneficial long-term outcomes (e.g., future career opportunities), provided sufficient contingency between one's own efforts, success, and these outcomes. Negative consequences of failure (e.g., unemployment), on the other hand, may increase achievement-related anxiety and hopelessness (Pekrun, 1992a). As such, high-stakes testing is likely to amplify students' test-related emotions and to exacerbate their negative emotions if failure cannot be avoided.

(h2) Composition of groups. The ability level of reference groups determines the likelihood of performing well relative to other group members. All else being equal, chances for performing well relative to others are reduced when being in a high-achieving group, thus perceived control tends to be reduced as well. In contrast, being in a low-achieving group offers more chances to be successful, enabling a sense of competence. Due to these effects on perceived control, positive emotions such as enjoyment can be reduced, and negative emotions such as anxiety exacerbated, when being in a high-achieving group. Pekrun, Murayama, Marsh, Goetz, and Frenzel (2019) call this the "happy fish-little pond effect" - all other things being equal, it may be preferable to be a "happy fish" in a "little pond" rather than an unhappy fish in a big pond of high achievers. Empirical evidence supports these propositions (Pekrun et al., 2019).

The negative effects of membership in a high-achieving classroom pose a conundrum for composing groups at school, at work, and in sports. Placing individuals in high-ability groups provides them with peers who are role models for strong performance. However, these possible benefits need to be weighed against the psychosocial costs of such a placement, including the risk for a reduction of self-confidence and increase in negative emotions. Furthermore, it may be that the possible beneficial effects do not even occur. For example, when controlling for measurement error, the effects of class-average achievement on individual students' achievement can be negative as well (Dicke et al., 2019), implying that being in a high-achieving class neither benefits a student's emotions nor their cognitive learning.

(h2) Implications for practice. Evidence on the impact of achievement environments is still scarce. As such, firm recommendations for practice cannot yet be derived. However, it seems likely that the following factors can help to develop adaptive achievement emotions and prevent or reduce maladaptive emotions (Pekrun, 2014): (1) cognitively stimulating tasks that slightly exceed current capabilities but are still manageable; (2) achievement environments that are aligned with individual interests and fulfil needs for autonomy and social relatedness; (3) enthusiasm displayed by teachers, supervisors, and coaches; (4) a reduction of the negative consequences of failure, combined with an achievement culture that considers errors as opportunities to improve rather than indicators of inability; (5) cooperative goal structures; and (6) achievement expectations that are challenging but can be met. In addition, it can be helpful to provide guidance on how to regulate one's achievement emotions, as provided in programs of social-emotional learning (see Brackett & Rivers, 2014).

(h1) Developmental Linkages with Learning and Achievement

Emotions can profoundly influence a broad range of cognitive and behavioral processes (Barrett, Lewis, & Haviland-Jones, 2016; Clore & Huntsinger, 2007). For individuals' learning and achievement, effects on attention, motivation, use of learning and problem-solving strategies, and self-regulation of achievement activities may be most important, as depicted in the cognitive-motivational model of emotion effects that is part of CVT (Pekrun, 1992b, 2006). As for *positive emotions*, activating emotions like enjoyment focus attention on the current activity, promote motivation to learn and achieve, and facilitate use of deep strategies and self-regulation. As such, these emotions are thought to have positive short- and long-term effects on learning and achievement. In contrast, positive emotions that do not relate to the current task, such as romantic feelings when thinking about one's love, can draw attention away, reduce effort, and lower overall performance. Similarly, deactivating positive emotions, like relief and relaxation, may not always have positive effects on achievement.

As for *negative emotions*, activating emotions, such as anxiety, anger, or confusion, distract attention and reduce interest, intrinsic motivation, and use of deep strategies, but they can strengthen extrinsic motivation to avoid failure. For example, if you are afraid of failing an impending exam, you may be highly motivated to invest effort in order not to fail. As such, the effects of these emotions on achievement can be variable. Deactivating negative emotion such as hopelessness and boredom, on the other hand, generally undermine attention, motivation, and strategy use, suggesting that they uniformly impair achievement. If you are bored by a lecture, your mind starts wandering, you cannot focus your attention on the lecture anymore, your motivation to continue is undermined, and when you are tested on the contents, you won't remember the material.

Links between emotions and achievement outcomes have been best researched for students' test anxiety (Hembree, 1988; Zeidner, 1998), but recent studies have also addressed emotions other than anxiety. Across studies, positive emotions such as enjoyment of learning and work, hope, and pride typically correlated positively with students' achievement at school as well as employees' performance at the workplace. For negative emotions such as anxiety, anger, shame, hopelessness, and boredom, correlations were negative (Pekrun & Stephens, 2012).

Furthermore, there is longitudinal evidence demonstrating that students' emotions impact the long-term development of their achievement. Longitudinal investigations of achievement anxiety found that anxiety had negative effects on achievement outcomes over the years while controlling for prior achievement (Meece, Wigfield, & Eccles, 1990; Pekrun, 1992a; Steinmayr, Crede1, McElvany, & Wirthwein, 2016). Similarly, students' boredom was found to negatively impact their performance (Pekrun, Hall, Goetz, & Perry, 2014). Furthermore, in an investigation of students' emotions in mathematics (Pekrun, Lichtenfeld, Marsh, Murayama, & Goetz, 2017), we found that math-related enjoyment and pride had positive effects on math grades and test scores across five years during secondary school, whereas anger, anxiety, shame, hopelessness, and boredom had negative effects, while controlling for the influence of prior achievement, gender, intelligence, and family socio-economic status.

This evidence confirms that emotions influence long-term achievement outcomes, over and above the impact of potentially confounding variables. However, across these longitudinal studies, it also turned out that achievement reciprocally influenced the development of students' emotions over time. Achievement had positive effects on positive emotions, and negative effects on negative emotions such as test and math anxiety. As such, the evidence suggests that emotions and achievement show reciprocal developmental linkages. Positive emotions are

drivers of learning and achievement; resulting success, in turn, strengthens the development of positive emotions, thus constituting virtuous circles of emotion and achievement. In contrast, negative emotions can undermine achievement, and resulting failure exacerbates negative emotions, implying vicious cycles of negative emotion and cumulative failure over time.

(h1) Reciprocal Causation and Emotion Regulation

Reciprocal developmental causation is likely to hold not only for emotions and achievement, but for the linkages between achievement emotions, their outcomes, and their origins more generally (Pekrun, 2006; see Figure 1). Reciprocal causation may involve a number of different feedback loops. In addition to the linkages between emotions and achievement, the following two feedback loops may be especially important. First, individuals' appraisals influence their achievement emotions, but these emotions can, in turn, influence both momentary appraisals and the development of underlying control and value beliefs. Second, achievement environments shape individual appraisals and emotions, but these emotions reciprocally affect environments and the behavior of teachers, supervisors, and coaches. For example, teachers' and students' enjoyment of classroom instruction are likely linked in reciprocal ways, with teachers' displays of enjoyment facilitating students' enjoyment of class, and students' emotional engagement strengthening teachers' enjoyment of teaching (Frenzel et al., 2018).

In line with perspectives of dynamic systems theory (Turner & Waugh, 2007), it is assumed that such reciprocal causation can take different forms and can extend over fractions of seconds (e.g., in linkages between appraisals and emotions), days, weeks, months, or years. Positive feedback loops likely are commonplace (e.g., supervisors' and employees' anger reciprocally reinforcing each other), but negative feedback loops can also be important (e.g.,

when a lost match induces anxiety in a soccer team, and anxiety motivates the team to avoid being defeated again in the next match).

Reciprocal causation has implications for the regulation of achievement emotions and related interventions. Since emotions, their antecedents, and their effects can be reciprocally linked over time, emotions can be regulated by addressing any of the elements involved in these cyclic feedback processes (Pekrun, 2006; see also Antoniadou & Quinlan, 2018; Harley, Pekrun, Taxer, & Gross, 2019). Regulation can target (a) the design of emotion-inducing tasks and achievement environments (*situation-oriented* regulation and intervention); (b) the control and value appraisals underlying emotions (*appraisal-oriented* regulation and intervention); (c) the competences determining individual agency (*competence-oriented* regulation and intervention; e.g., training of learning skills); and the emotional response itself (*response-oriented* regulation and intervention, such as using drugs and relaxation techniques to cope with anxiety or employing interest-enhancing strategies to reduce boredom (Sansone, Weir, Harpster, & Morgan, 1992). Empirical evidence on ways to regulate achievement emotions and their development is still largely lacking, with few exceptions (e.g., Nett, Goetz, & Hall, 2010).

(h1) Relative Universality of Achievement Emotions

As for emotions more generally, CVT proposes that general functional mechanisms of achievement emotions are bound to universal, species-specific characteristics of our mind (functional universality), thus following nomothetic principles. In contrast, reference objects, frequency, intensity, and developmental trajectories of these emotions are thought to vary widely across individuals, genders, achievement contexts, and cultures (Pekrun, 2009; 2018). For example, it has been found that the relationships between girls' and boys' appraisals and their achievement emotions in mathematics are structurally equivalent across the two genders

(Frenzel, Pekrun, & Goetz, 2007). However, perceived control in this domain was substantially lower for girls. As a consequence, girls reported less enjoyment in mathematics, as well as more anxiety and shame. Similarly, in a cross-cultural comparison of Chinese and German students' achievement emotions, we found that mean levels of emotions differed between countries, with Chinese students reporting more achievement-related enjoyment, pride, anxiety, and shame, and less anger (see Pekrun, 2018, for an interpretation of cross-cultural differences in achievement emotions). Nevertheless, the functional linkages of these emotions with perceived control, important others' expectations, and academic achievement were equivalent across cultures (Frenzel, Thrash, Pekrun, & Goetz, 2006).

Especially robust evidence for relative universality is provided by findings from the *Programme for International Student Assessment* (PISA) conducted by the Organization for Economic Co-operation and Development (OECD). In three-year cycles with representative samples, PISA assesses competences of 15-year olds in core academic subjects across a broad range of OECD and non-OECD countries. For example, mean scores for 15-year olds' mathematics anxiety, domain-general achievement anxiety, and science enjoyment differed substantially across countries in the PISA 2012 and 2015 assessments. These mean-level differences notwithstanding, the relations with students' performance were remarkably consistent. In the PISA 2012 assessment, students' anxiety and achievement in math correlated negatively in all of the 64 participating countries, and all of these correlations but one were significant (OECD, 2013). Similarly, in the PISA 2015 assessment, students' schoolwork-related anxiety showed negative correlations with their science performance in 52 of 55 countries participating in the assessment of anxiety (OECD, 2016). The robustness of relations with achievement also extends to positive emotions. In the PISA 2015 assessment, the relation

between students' enjoyment and performance in science was positive in all of the 68 countries for which this relation was examined.

In sum, this evidence suggests that levels of appraisals and emotions vary widely across genders and socio-cultural contexts, but that their relations with achievement are remarkably consistent. However, most of the extant evidence has been cross-sectional. It remains open to question whether long-term developmental trajectories of achievement emotions and their functional relations with outcomes and antecedents show similar patterns of relative universality versus specificity.

(h1) Conclusions and Future Directions

Achievement emotions are critically important for individuals' learning, short- and long-achievement, educational and occupational careers, and psychological as well as physical well-being. The available evidence suggests that control and value appraisals are prime determinants of achievement emotions, and that these emotions, in turn, impact attention, motivation to achieve, use of strategies, and achievement at school and at the workplace. There is also preliminary evidence for the role of social environments in the development of achievement emotions, and for the relative universality of these emotions and their functional relations across genders, countries, and cultural contexts.

Much of the existing evidence, however, is based on cross-sectional or short-term experimental studies. With few exceptions, longitudinal studies investigating the development of achievement emotions are still largely lacking (see Pekrun et al., 2017). Furthermore, the few existing longitudinal studies focussed on the development of emotions during the K-12 education years but did not consider the development of these emotions during adulthood. As such, more longitudinal data across the full lifespan are needed to better understand the development of

achievement emotions.

Furthermore, research on individuals' regulation of achievement emotions, which is especially important to elucidate their functions for human development, is still in its infancy and needs to be advanced. Similarly, while there is rich evidence on effective use of psychotherapy to reduce test anxiety, intervention studies targeting achievement emotions other than anxiety are still largely lacking. Effort needs to be invested to develop treatment interventions and to design tasks and shape achievement settings such that adaptive achievement emotions are facilitated and maladaptive emotions are prevented or reduced.

Finally, it is important to note that most of the existing studies used samples from Western countries. More research with diverse samples of participants is needed to more fully explore developmental trajectories, origins, outcomes, and the proposed relative universality of achievement emotions across multiple cultural contexts around the world. This also is true for intervention research and studies on the design of achievement settings, given that the developmental effects of interventions, environmental designs, and task designs could vary substantially across cultures.

References

Antoniadou, M., & Quinlan, K. M. (2018). Thriving on challenges: How immigrant academics regulate emotional experiences during acculturation. *Studies in Higher Education*. Advance online publication. https://doi:10.1080/03075079.2018.1512567

Barrett, F. L. Lewis, M., Haviland-Jones, J. M., (Eds.). (2016). *Handbook of emotions* (4th edition). New York: Guilford.

Barsade, S. G., Brief, A. P., & Spataro, S. E. (2003). The affective revolution of organizational behaviour: The emergence of a paradigm. In J. Greenberg (Ed.), *Organizational behaviour: The state of the science* (pp. 3-52). Mahwah, NJ: Erlbaum.

Brackett, M. A., & Rivers, S. E. (2014). Transforming students' lives with social and emotional learning. In R. Pekrun & L. Linnenbrink-Garcia (Eds.), *International handbook of emotions in education* (pp. 368-388). New York: Taylor & Francis.

Brown, C. H. (1938). Emotional reactions before examinations: II. Results of a questionnaire. *Journal of Psychology*, *5*, 11–26.

Clore, G. L., & Huntsinger, J. R. (2007). How emotions inform judgment and regulate thought. *Trends in Cognitive Sciences, 11,* 393-399.

Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety.* San Francisco, CA: Jossey-Bass.

Dicke, T., Marsh, H. W., Parker, P. D., Pekrun, R., Guo, J., & Televantou, I. (in press). Effects of school-average achievement on individual self-concept and achievement: Unmasking phantom effects masquerading as true compositional effects. *Journal of Educational Psychology, 110,* 1112-1126.

Fredricks, J. A., & Eccles, J. (2002). Children's competence and value beliefs from childhood through adolescence: Growth trajectories in two male-sex-typed domains. *Developmental*

Psychology, 38, 519-533.

Frenzel, A. C., Becker-Kurz, B., Pekrun, R., Goetz, T., & Lüdtke, O. (2018). Emotion transmission in the classroom revisited: A reciprocal effects model of teacher and student enjoyment. *Journal of Educational Psychology, 110,* 628-639.

Frenzel, A. C., Goetz, T., Lüdtke, O., Pekrun, R., & Sutton, R. (2009). Emotional transmission in the classroom: Exploring the relationship between teacher and student enjoyment. *Journal of Educational Psychology, 101,* 705-716.

Frenzel, A. C., Pekrun, R., & Goetz, T. (2007). Girls and mathematics – a "hopeless" issue? A control-value approach to gender differences in emotions towards mathematics. *European Journal of Psychology of Education, 22,* 497-514.

Frenzel, A. C., Thrash, T. M., Pekrun, R., Goetz, T. (2007). Achievement emotions in Germany and China: A cross-cultural validation of the Academic Emotions Questionnaire-Mathematics (AEQ-M). *Journal of Cross-Cultural Psychology, 38,* 302-309.

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.

Harackiewicz, J. M., Tibbetts, Y, Canning, E. A., & Hyde, J. S. (2014). Harnessing values to promote motivation in education. In S. Karabenick and T. Urden (Eds.), *Motivational interventions* (Advances in Motivation and Achievement, Vol. 18, pp. 71–105). Bingley, UK: Emerald Group Publishing.

Harley, J. M., Pekrun, R., Taxer, J. L., & Gross, J. J. (2019). Emotion regulation in achievement situations: An integrated model. *Educational Psychologist, 54,* 106-126.

Hatfield, E., Cacioppo, J. T. & Rapson, R. L. (1994). *Emotional contagion.* New York: Cambridge University Press.

Heckhausen, H. (1991). *Motivation and action.* Berlin, Germany: Springer.

Helmke, A. (1993). Die Entwicklung der Lernfreude vom Kindergarten bis zur 5. Klassenstufe [Development of enjoyment of learning from kindergarten to grade 5]. *Zeitschrift für Pädagogische Psychologie, 7,* 77-86.

Hembree, R. (1988). Correlates, causes, effects, and treatment of test anxiety. *Review of Educational Research, 58,* 47-77.

Hidi, S. & Renninger, A. (2006). A four-phase model of interest development. *Educational Psychologist, 41,* 111-127.

Johnson, D. W., & Johnson, R. T. (1974). Instructional goal structure: Cooperative, competitive or individualistic. *Review of Educational Research, 4,* 213-240.

Lauerman, F., Eccles, J. S., & Pekrun, R. (2017). Why do children worry about their academic achievement? An expectancy-value perspective on elementary students' worry about their mathematics and reading performance. *ZDM Mathematics Education, 49,* 339-354.

Lichtenfeld, S., Pekrun, R., Stupnisky, R. H., Reiss, K., & Murayama, K. (2012). Measuring students' emotions in the early years: The Achievement Emotions Questionnaire–Elementary School (AEQ-ES). *Learning and Individual Differences, 22,* 190-201.

Loderer, K., Pekrun, R., & Plass, J. L. (in press.). Emotional foundations of game-based learning. In J. L. Plass, B. D. Homer, & R. E. Mayer (Eds.), *Handbook of game-based learning.* Cambridge, MA: MIT Press.

Mandler, G., & Sarason, S. B. (1952). A study of anxiety and learning. *Journal of Abnormal and Social Psychology, 47,* 166–173.

Meece, J. L., Wigfield, A., & Eccles, J. S. (1990). Predictors of math anxiety and its influence on young adolescents course enrollment intentions and performance in mathematics. *Journal of Educational Psychology, 82,* 60-70.

Murayama, K., Pekrun, R., Suzuki, M., Marsh, H. W., & Lichtenfeld, S. (2016). Don't aim too high for your kids: Parental over-aspiration undermines students' learning in mathematics. *Journal of Personality and Social Psychology, 111,* 166-179.

Murayama, K., & Elliot, A. J. (2009). The joint influence of personal achievement goals and classroom goal structures on achievement-relevant outcomes. *Journal of Educational Psychology, 101,* 432-447.

Nett, U. E., Goetz, T., & Hall, N. C. (2011). Coping with boredom in school: An experience sampling perspective. *Contemporary Educational Psychology, 36,* 49-59.

OECD (Organization for Economic Cooperation and Development). (2013). *PISA 2012 results (Volume 3): Ready to learn. Students' engagement, drive and self-beliefs*. Paris, France: OECD Publishing.

OECD (Organization for Economic Cooperation and Development). (2016). *PISA 2015 results (Volume 1): Excellence and equity in education.* Paris, France: OECD Publishing.

Pekrun, R. (1992a). Expectancy-value theory of anxiety: Overview and implications. In D.G. Forgays, T. Sosnowski, & K. Wrzesniewski (Eds.), *Anxiety: Recent developments in self-appraisal, psychophysiological and health research* (pp. 23-41). Washington, DC: Hemisphere.

Pekrun, R. (1992b). The impact of emotions on learning and achievement: Towards a theory of cognitive/motivational mediators. *Applied Psychology: An International Review, 41,* 359-376.

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.

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

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., Elliot, A. J., & Maier, M. A. (2009). Achievement goals and achievement emotions: Testing a model of their joint relations with academic performance. *Journal of Educational Psychology, 101,* 115-135.

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,* 91-106.

Pekrun, R. (2009). Global and local perspectives on human affect: Implications of the control-value theory of achievement emotions. In M. Wosnitza, S. A. Karabenick, A. Efklides, & P. Nenniger (Eds.), *Contemporary motivation research: From global to local perspectives* (pp. 97-115). Cambridge, MA: Hogrefe.

Pekrun, R., Goetz, T., Daniels, L. M., Stupnisky, R. H., & Perry, R. P. (2010). Boredom in achievement settings: Control-value antecedents and performance outcomes of a neglected emotion. *Journal of Educational Psychology, 102,* 531-549.

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.

Pekrun, R., vom Hofe, R., Blum, W., Frenzel, A. C., Goetz, T. & Wartha, S. (2007). Development of mathematical competencies in adolescence: The PALMA longitudinal study. In M. Prenzel (Ed.), *Studies on the educational quality of schools* (pp. 17-37). Münster, Germany: Waxmann.

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.

Pekrun, R., & Linnenbrink-Garcia, L. Pekrun, R., & Linnenbrink-Garcia, L. (2014a). Conclusions and future directions. In R. Pekrun & L. Linnenbrink-Garcia (Eds.), *International handbook of emotions in education* (pp. 659-675). New York: Taylor & Francis.

Pekrun, R., & Linnenbrink-Garcia, L. (Eds.) (2014b). *International handbook of emotions in education*. New York: Taylor & Francis.

Pekrun, R., Murayama, K., Marsh, H. W., Goetz, T., & Frenzel, A. C. (2019). Happy fish in little ponds: Testing a reference group model of achievement and emotion. *Journal of Personality and Social Psychology.* Advance online publication. doi: 10.1037/pspp0000230

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.

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.

Pekrun, R., & Stephens, E. J. (2012). Academic emotions. In K. R. Harris, S. Graham, T. Urdan , S. Graham, J. M. Royer, & M. Zeidner (Eds.), *APA educational psychology handbook* (Vol. 2, pp. 3-31). Washington, DC: American Psychological Association.

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

Putwain, D. W., Remedios, R., & Symes, W. (2015). Experiencing fear appeals as a challenge or a threat influences attainment value and academic self-efficacy *Learning and Instruction*, *40*, 21–28.

Scherrer, V., Preckel, F., Schmidt, I., & Elliot, A. (2020). Development of achievement goals and their relation to academic interest and achievement in adolescence: A review of the literature and two longitudinal studies. *Developmental Psychology, 56*, 795-814.

Steinmayr, R., Crede1, J., McElvany, N., & Wirthwein, L. (2016). Subjective well-being, test anxiety, academic achievement: Testing for reciprocal effects. *Frontiers in Psychology*, *6*, Article 1994r.

Stipek, D. (1995). The development of pride and shame in toddlers. In J. P. Tangney & K. W. Fischer (Eds.), *Self-conscious emotions: The psychology of shame, guilt, embarrassment, and pride* (pp. 237-252). New York: Guilford.

Tracy, J. L., & Robins, R. W. (2004). Putting the self into self-conscious emotions: A theoretical model. *Psychological Inquiry, 15,* 103–125.

Tsai, Y.-M., Kunter, M., Lüdtke, O., & Trautwein, U. (2008). What makes lessons interesting? The role of situational and individual factors in three school subjects. *Journal of Educational Psychology, 100,* 460-472.

Turner, J. E., & Waugh, R. M. (2007). A dynamical systems perspective regarding students' learning processes: Shame reactions and emergent self-organizations. In P. A. Schutz & R. Pekrun (Eds.), *Emotions in education* (pp. 125-145). San Diego, CA: Academic Press.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Watt, H. M. G. (2004). Development of adolescents' self-perceptions, values, and task perceptions according to gender and domain in 7th- through 11-th grade Australian students. *Child Development, 75,* 1556-1574.

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92,* 548-573.

Zeidner, M. (1998). *Test anxiety: the state of the art.* New York: Plenum.

Table 1

A Three-Dimensional Taxonomy of Achievement Emotions

	Positive [a]		Negative [b]	
Object Focus	Activating	Deactivating	Activating	Deactivating
Activity	Enjoyment	Relaxation	Anger Frustration	Boredom
Outcome / Prospective	Hope Joy [c]	Relief [c]	Anxiety	Hopelessness
Outcome / Retrospective	Joy Pride Gratitude	Contentment Relief	Shame Anger	Sadness Disappointment

[a] Positive = pleasant emotion. [b] Negative = unpleasant emotion. [c] Anticipatory joy / relief.

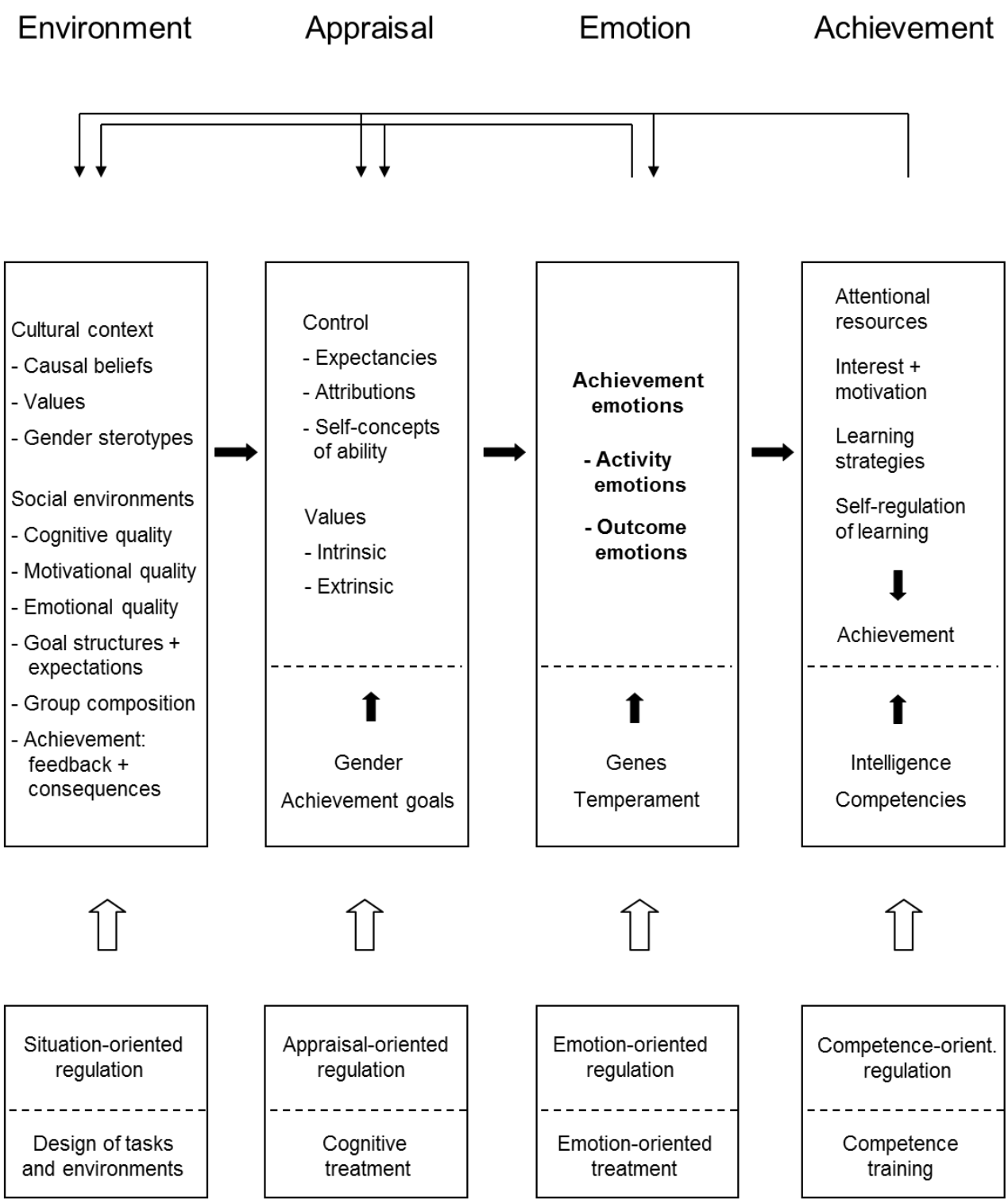

Figure 1. Basic propositions of the control-value theory of achievement emotions.