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ORIGINAL ARTICLE

The Control-Value Theory of Achievement Emotions: Assumptions, Corollaries, and Implications for Educational Research and Practice

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Abstract This article describes the control-value theory of achievement emotions and its implications for educational research and practice. The theory provides an integrative framework for analyzing the antecedents and effects of emotions experienced in achievement and academic settings. It is based on the premise that appraisals of control and values are central to the arousal of achievement emotions, including activity-related emotions such as enjoyment, frustration, and boredom experienced at learning, as well as outcome emotions such as joy, hope, pride, anxiety, hopelessness, shame, and anger relating to success or failure. Corollaries of the theory pertain to the multiplicity and domain specificity of achievement emotions; to their more distal individual and social antecedents, their effects on engagement and achievement, and the reciprocal linkages between emotions, antecedents and effects; to the regulation and development of these emotions; and to their relative universality across genders and cultures. Implications addressed concern the conceptual integration of emotion, motivation, and cognition, and the need to advance mixed-method paradigms. In closing, implications for educational practice are discussed.

Keywords Achievement emotions · Academic emotions · Joy · Anger · Anxiety · Hopelessness

Introduction

Research on emotions in education, and on human emotions more generally, is in a state of fragmentation. While theories and studies prevail which address single emotions (e.g., test anxiety; Zeidner, 1998), or single functions of emotions (e.g., their impact on cognitive processes; Ashby, Isen, & Turken, 1999), more integrative approaches are largely lacking. The control-value theory of achievement emotions (Pekrun, 2000; Pekrun, Frenzel, Goetz, & Perry, in press; Pekrun, Goetz, Titz, & Perry, 2002a,b) offers an integrative framework

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for analyzing the antecedents and effects of emotions experienced in achievement and academic contexts. Initially, the theory focused on an expectancy-value model of anxiety (Pekrun, 1984, 1988, 1992a). Later, it was extended to include assumptions concerning the antecedents of multiple achievement emotions, and hypotheses pertaining to their effects on academic engagement, self-regulation, and achievement (Pekrun, 1992b, 2000; Pekrun *et al*., 2002a). In its present version, the theory integrates assumptions from expectancy-value approaches to emotions (Pekrun, 1992a; Turner & Schallert, 2001), attributional theories of achievement emotions (Weiner, 1985), theories of perceived control (Patrick, Skinner, & Connell, 1993; Perry, 1991), and models involving the effects of emotions on learning and performance (Fredrickson, 2001; Pekrun *et al*., 2002a; Zeidner, 1998).

In the first section of this article, a definition of achievement emotions is presented, and basic assumptions of the theory concerning the appraisal antecedents of these emotions are described. Next, I discuss corollaries and extensions of the theory pertaining to the multiplicity and domain specificity of achievement emotions, their goal antecedents, personality determinants and social antecedents, and their reciprocal linkages with academic learning and achievement. Also, implications for the regulation and development of achievement emotions, and for their universality across cultures and genders, are discussed. Having outlined the theory, I address implications for the conceptual integration of research on emotion, motivation, and cognition, and for the advancement of methodology in educational research on achievement emotions. In closing, the implications of the control-value theory for educational practice are explored.

Basic Assumptions on Appraisal Antecedents of Achievement Emotions

Definition of Achievement Emotions

In line with dynamic systems component definitions of emotions (Damasio, 2004; Scherer, 1984), *emotions* are seen as multi-component, coordinated processes of psychological subsystems including affective, cognitive, motivational, expressive, and peripheral physiological processes. Affective processes are assumed to be central to emotions, and to be physiologically bound to subsystems of the limbic system (Fellous & LeDoux, 2005). Taking anxiety as a case in point, examples of related components include uneasiness and nervous feelings (affective component), worries (cognitive), avoidance motivation (motivational), anxious facial expression (expressive), and peripheral physiological activation (physiological). Low-intensity emotions (emotional *moods*) can also comprise these components, implying that they should be regarded as emotions, even if not all of their components are represented in conscious awareness.[1]

[1] Some authors make a categorical distinction between emotion and mood implying that moods are conceptually distinct from emotions in being less intense, lasting longer, and having a less clear object focus, or no focus at all (see the discussion by Rosenberg, 1998). However, how should we deal with affective states cutting across these conceptual boundaries? For example, how should affective states be categorized that are intense and short without having a clear focus, or intense and focused, but long-lasting? In my view, intensity, duration and the specificity of object focus can be seen as dimensional rather than dichotomous characteristics. This is most obvious for intensity and duration, but it also pertains to object focus. The cognitive components of emotions representing their object focus may often be less aware in low-intensity emotional states because of lack of cognitive activation, but in most cases, they likely are present in these states as well (see also Reisenzein, 2001). By implication, moods and intense emotions can be conceptualized as parts of one and the same multi-dimensional space of emotions, rather than as distinct categories.

Achievement emotions are defined as emotions tied directly to achievement activities or achievement outcomes. In past research, studies on achievement emotions typically focused on emotions relating to achievement outcomes. The definition presented here implies that emotions pertaining to achievement-related activities are also considered as achievement emotions. The enjoyment arising from learning, boredom experienced in classroom instruction, or frustration and anger when dealing with difficult tasks are but a few examples of activity-related achievement emotions. Two types of achievement emotions differing in object focus can thus be distinguished: *activity emotions* pertaining to ongoing achievement-related activities, and *outcome emotions* pertaining to the outcomes of these activities (Pekrun *et al*., 2002a; Pekrun, Elliot, & Maier, 2006a). The latter include prospective, anticipatory emotions (e.g., hope for success, anxiety of failure) as well as retrospective emotions (e.g., pride or shame experienced after feedback of achievement; see Table I).

As emotions more generally, achievement emotions can be conceptualized as momentary occurrences within a given situation at a specified point of time (*state achievement emotions*; e.g., state test anxiety experienced before an exam). Alternatively, they can be conceptualized as habitual, recurring emotions typically experienced by an individual in relation to achievement activities and outcomes (*trait achievement emotions*; e.g., trait test anxiety; Spielberger, Anton, & Bedell, 1976). The defining characteristic separating trait from state achievement emotions is temporal generality rather than situational generality, since trait achievement emotions can be situation-specific as well (e.g., trait mathematics emotions pertaining to habitual emotional feelings experienced in mathematics-related situations).

Appraisal Antecedents of Achievement Emotions

Within contemporary perspectives on the psychology of emotion, self-related and situational appraisals are assumed to be important proximal determinants of human emotions (Scherer, Schorr, & Johnstone, 2001). From an educational perspective, appraisals are important as well, since they can be assumed to mediate the impact of situational factors, and can be targeted by educational interventions intended to foster positive emotional development.

A number of appraisal dimensions have been proposed to describe human emotions, including valence and goal congruency, expectedness and probability, controllability and coping potential, self- vs. other causation, and normative significance of emotion-arousing events (Roseman, 2001; Roseman, Antoniou, & Jose, 1996; Scherer, 2001). The control-value theory described here posits that two groups of appraisals are of specific relevance for achievement emotions: (1) *subjective control* over achievement activities and their outcomes (e.g., expectations that persistence at studying can be enacted, and that it will lead to success); and (2) the *subjective values* of these activities and outcomes (e.g., the perceived importance of success).

The term "subjective control" is used here to refer to the perceived causal influence of an agent over actions and outcomes (Skinner, 1996). The term "subjective value" denotes the perceived valences of actions and outcomes. As for subjective control, expectancies and attributions pertaining to causal relations between an achievement situation, the self, one's own achievement activities, and their outcomes are held to be important. Causal expectancies and causal attributions can pertain to the same cause–effect relations, but from different perspectives. Causal expectancies are prospective cognitions addressing relations between causes and their future effects (e.g., the impact of current effort on performance at an upcoming exam). Causal attributions, on the other hand, are retrospective cognitions relating to the causes of a given effect (e.g., the causes of success on a recent exam). The following

appraisals of control and values are assumed to be important for the instigation of achievement emotions (for a more detailed discussion, see Pekrun, 1988).

Situation–outcome expectancies Situation–outcome expectancies imply that the situation will produce positive outcomes without any need for self action, or will produce negative outcomes if no countermeasures are taken (see Bolles, 1972; Heckhausen, 1977). Situation–outcome expectancies imply appraisals of external control over outcomes. An example would be the expectation that an exam is failed if no effort is invested.

Action–control and action–outcome expectancies Action–control expectancies are expectancies that an action can be initiated and performed (Pekrun, 1988). Various terms have been used to denote these expectancies (Skinner, 1996). The term "self-efficacy expectation" proposed by Bandura (1977) became most popular, but has the disadvantage of being easily misunderstood as implying the overall agency of an individual, including his or her efficacy to produce outcomes, instead of simply denoting appraisals of being able to produce an action. *Action–outcome expectancies* imply that one's own actions will produce some positive outcome, or will prevent, reduce, or terminate a negative outcome. Historically, the term "control" was first used to refer to action–outcome expectancies in psychology (e.g., in the locus of control and learned helplessness paradigms; see Skinner, 1996).

Total outcome expectancies It is assumed that situation–outcome, action–control and action–outcome expectancies are used to appraise the overall controllability and probability of an achievement outcome. For positive outcomes, the total outcome expectancy is posited to be high when either the situation–outcome expectancy is high, or the expectancy that one can produce the outcome oneself is high, or both. A person who expects to get money irrespective of his or her own accomplishments, for example, can hold favorable overall outcome expectancies that are based on high situation–outcome expectancies. A student expecting that he or she is able to invest effort, and that effort will lead to success, will have positive outcome expectancies that are based on favorable action–control and action–outcome expectancies.

For negative outcomes like failure, the total outcome expectancy is posited to be high when the situation–outcome expectancy is high, and the action–control and/or action–outcome expectancies are low (see Pekrun, 1988). The expectancy of failure is thus assumed to be high if (a) failure is perceived as being likely if no preventive action is performed, and (b) there is low perceived internal control over achievement because action–control or action–outcome expectancies for preventive action are unfavorable. For example, a student who believes that he or she will not be able to adequately prepare for an upcoming exam will expect failure (low action–control expectancy). Similarly, a student who believes that preparation is not sufficient to get good grades because of biased grading practices will also expect failure (low action–outcome expectancies).

In achievement situations, a person's efforts are needed to attain success or prevent failure. Therefore, situation–outcome expectancies will typically be low for success, and high for failure. By implication, expectancies of achievement can be assumed to depend primarily on perceived internal control over achievement, as implied by achievement-related action–control and action–outcome expectancies.

Causal attributions of outcomes Causal achievement attributions imply retrospective appraisals of the causes of success and failure, such as one's own actions, the self, external

circumstances, or other persons. In terms of the structure of assumed cause–effect relationships, external attributions are equivalent to situation–outcome expectancies, and internal attributions to action–control and action–outcome expectancies. In attributional theories of achievement emotions, various dimensions of perceived causes such as locus, stability, and controllability are considered to be important for achievement emotions (Weiner, 1985). In contrast, in the control-value theory, these dimensions of causes are not thought to be important per se. Rather, they are assumed to play a role by influencing the amount of perceived control over the *actions* and *outcomes* to which achievement emotions relate in the first place (Pekrun, 1988; see also Skinner's discussion of the role of agent-ends and means-ends beliefs in causal attributions; Skinner, 1996, p. 559).

Values of actions and outcomes Appraisals of *intrinsic values* refer to the value of an activity or outcome per se. Such an appraisal can imply to value academic studying and the learning material for its own sake, irrespective of the grade one may get in return. Similarly, the perceived intrinsic value of academic success pertains to valuing success per se, even if it is not instrumental in attaining more long-term goals. Appraisals of *extrinsic values* relate to the instrumental usefulness of actions or outcomes for the attainment of other goals. Examples would be the value of persistence at studying for attaining recognition from parents and teachers, or the value of academic grades for achieving future career goals.

The intrinsic and extrinsic subjective values of outcomes are presumed to be combined to an appraisal of the overall value of the outcome (*outcome value*). Success, for example, will be appraised as being more important if it is not only valued per se, but in addition, as being instrumental for pursuing a career.

Linking Appraisals and Achievement Emotions

The control-value theory implies that prospective outcome emotions, retrospective outcome emotions, and activity emotions are determined by different appraisal antecedents. These groups of emotions are characterized by different object focus and different time frames, so that appraisals of control and values serve different functions.

In *prospective outcome emotions* such as hope, anxiety, or hopelessness, the crucial question concerning control is whether success can be attained or failure avoided, and what the impact of available means to these ends will be. The success of any attempts to exert control can be subjectively certain or uncertain, and more or less probable in the case of uncertainty. In contrast, in *retrospective outcome emotions*, the primary question on control concerns whether the outcome was caused by the self, or by other persons and external circumstances. Whereas the causes of a past outcome can be open to interpretation, the outcome as such has either occurred or not, implying that occurrence or non-occurrence are certain events.

In *activity-related* emotions pertaining to achievement activities, control and values refer to the action. In these emotions, the attentional focus is on the action, not on outcomes, implying that appraisals of outcome control and outcome valences do not play a role. A student experiencing enjoyment and flow while engaged in learning, for example, focuses attention on the activity of learning, not on outcomes (Csikszentmihalyi, 2000).

In the following section, basic assumptions of the theory on linkages between appraisals and emotions of these three categories are outlined (see Table I for a summary overview; for more complete accounts of the assumptions, see Pekrun, 1984, 1988, 1992a, and for overviews of related empirical evidence, Pekrun *et al*., 2002a,b; Pekrun, Goetz, Perry, Kramer, & Hochstadt, 2004; Pekrun *et al*., 2006a; Pekrun *et al*., in press; Titz, 2001).

Table I The Control-Value Theory: Basic Assumptions on Control, Values, and Achievement Emotions

	Appraisals		
Object focus	Value	Control	Emotion
Outcome/prospective	Positive (success)	High	Anticipatory joy
		Medium	Hope
		Low	Hopelessness
	Negative (failure)	High	Anticipatory relief
		Medium	Anxiety
		Low	Hopelessness
Outcome/retrospective	Positive (success)	Irrelevant	Joy
		Self	Pride
		Other	Gratitude
	Negative (failure)	Irrelevant	Sadness
		Self	Shame
		Other	Anger
Activity	Positive	High	Enjoyment
	Negative	High	Anger
	Positive/Negative	Low	Frustration
	None	High/Low	Boredom

Prospective outcome emotions Prospective, anticipatory achievement emotions are assumed to be a function of outcome expectancy and outcome value. Depending on the type of emotion, the intensity is assumed to be a positive, curvilinear, or negative function of outcome expectancies, and a positive function of outcome value (higher emotion intensity with subjectively more important success or failure). Expectancy and value are assumed to combine in multiplicative ways, implying that both expectancy and value are necessary for a prospective emotion to be instigated.

High success expectancies resulting from subjective internal control and ensuing certainty about the occurrence of success are assumed to arouse *anticipatory joy*. Alternatively, if the non-occurrence of failure is the focus, *anticipatory relief* is predicted to be experienced. The intensity of joy and relief is seen as a positive monotonous function of outcome expectancy, reaching its maximum when the subjective probability of success, or of the non-occurrence of failure, is 100%, and of the value of success and failure. For example, if a student believes she will get an A+ on an upcoming important math exam, she may simply look forward to this success. Alternatively, if she focuses her attention on the prevention of failure, and anticipates that she will be able to pass the exam, she will experience relief. In contrast, if expectancies are unfavorable, or if achievement is subjectively unimportant, no joy or relief will be experienced.

If internal control is lacking and success unattainable, or failure unavoidable, the expectancy of success will typically be near zero, and the expectancy of failure high. For low expectancies of success as well as high expectancies of failure, *hopelessness* is posited to be the emotion experienced, provided that success or failure are subjectively important. This assumption implies that hopelessness can occur both as a consequence of lack of success (a positive outcome), and of certainty about failure (a negative outcome; Garber,

Miller & Abramson, 1980; see also Stöber, 2000). More precisely, hopelessness is assumed to be a negatively monotonic function of the expectancy of success, and a positively monotonic function of the expectancy of failure. This function can be assumed to be exponential rather than linear, since hopelessness will likely be intense in upper ranges of relative certainty only. For example, if a student becomes increasingly aware that he will not be able to pass an important final university exam, implying that he will not be able to attain any of his career goals, he will experience more and more hopelessness when anticipating the exam.

In case of moderate expectancies as implied by a partial lack of control, there will be *hope* if the focus is on success. If the focus is on failure, *anxiety* is assumed to be induced (Pekrun, 1984, 1988, 1992a). More precisely, both hope and anxiety are assumed to be a curvilinear function of outcome expectancy, implying that they are a function of uncertainty about the outcome. This assumption is in line with uncertainty theory of anxiety and related approaches (Miceli & Castelfranchi, 2005; Folkman & Lazarus, 1985). In addition, both emotions are assumed to depend on the subjective value of achievement. For example, if failure can happen at an important exam, but control seems not to be possible, anxiety will be experienced. If a student does not expect failure, or does not care about it, no anxiety will occur.

Since moderate control and resulting uncertainty about outcome probabilities imply opportunities for success as well as the threat of failure, the theory posits that simultaneous or alternating experiences of hope and anxiety may be quite common in risky achievement situations (see Folkman & Lazarus, 1985; Smith & Ellsworth, 1987, for evidence on the frequency of mixed emotions before exams). Whether hope or anxiety is experienced more intensively may depend on individual achievement goals, performance-approach goals facilitating hope, and performance-avoidance goals contributing to anxiety (Linnenbrink & Pintrich, 2002; Pekrun *et al*., 2006a).

In a more formalized way, this set of assumptions can be represented in the following equations capturing its logical structure. It should be noted, however, that these equations represent simplified versions of the assumptions, since they do not denote the exponential character of some of the assumed functions linking appraisals and the intensity of emotion.

Prospective Success Emotions

$$\begin{aligned} \text{Anticipatory Joy} &= f[E_s \times V_s] \\ \text{Hope} &= f[(E_s \times (1 - E_s)) \times V_s] \\ \text{Hopelessness} &= f[(1 - E_s) \times V_S] \end{aligned}$$

Prospective Failure Emotions

$$\begin{aligned} \text{Anticipatory Relief} &= f[(1 - E_F) \times V_F] \\ \text{Anxiety} &= f[(E_F \times (1 - E_F)) \times V_F] \\ \text{Hopelessness} &= f[E_F \times V_F] \end{aligned}$$

(where E_S = total expectancy of success, $0 \leq E_S \leq 1$; E_F = total expectancy of failure, $0 \leq E_F \leq 1$; V_S = value of success; V_F = value of failure)

The temporal order of the implied appraisal processes may vary according to situational conditions and cognitive availability. Taking prospective failure-related emotions as an example, a typical sequence of appraisals may imply that a situation–outcome expectancy is

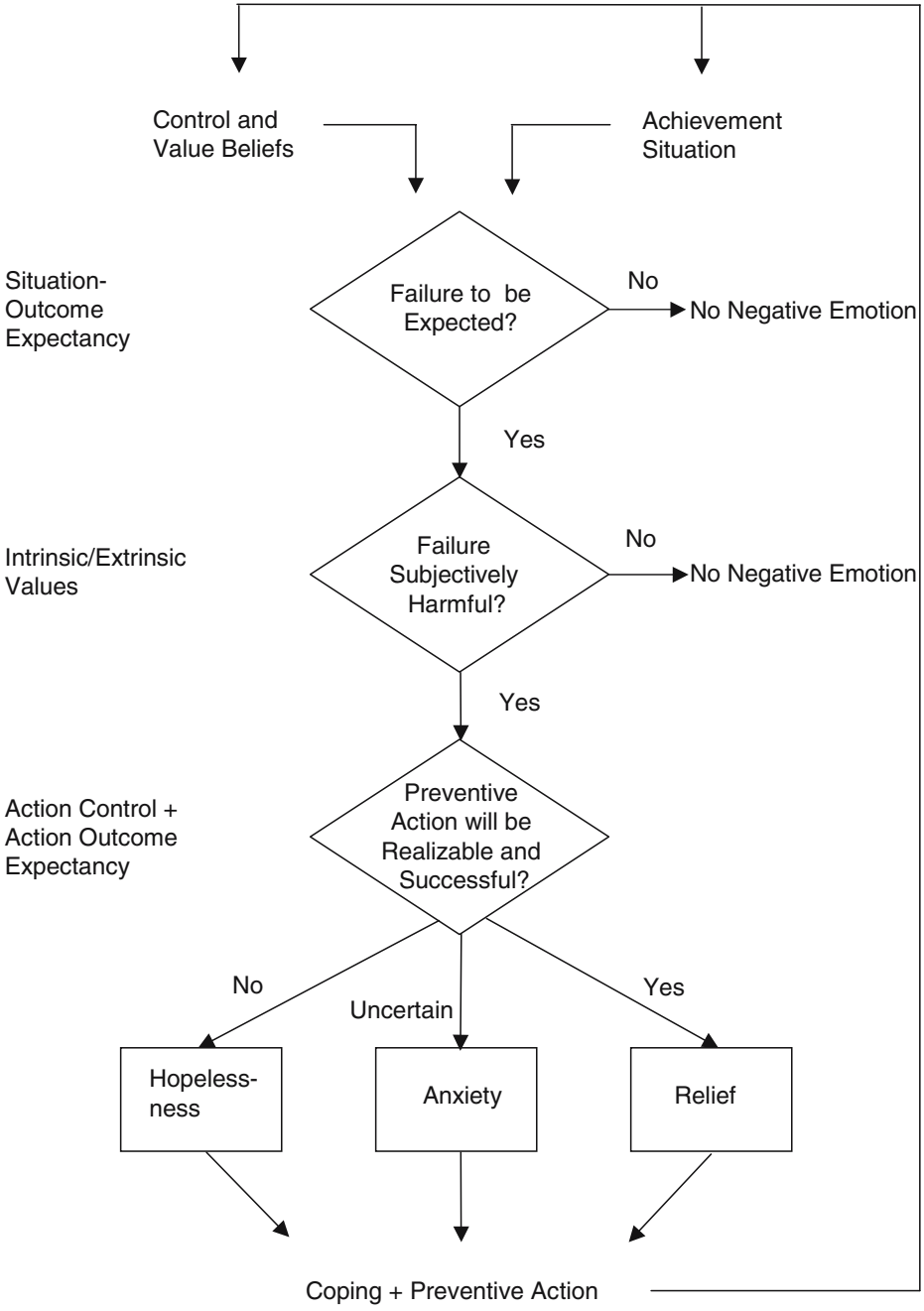

Fig. 1 Typical sequence of control appraisals, value appraisals, and negative achievement emotions.

formed first, before possible harm and the availability of counteractions are evaluated (see Fig. 1).

Retrospective outcome emotions When success or failure has occurred, retrospective outcome emotions are aroused. As argued by Weiner (1985), success is assumed to induce *joy*, and failure *sadness* and *frustration*. The non-occurrence of expected success is thought to arouse *disappointment*, and the non-occurrence of anticipated failure *relief*. These emotions are a product of event occurrence and follow appraisals of success or failure, but they may be independent of control appraisals (*control-independent emotions*; see Weiner's, 1985, related concept of attribution-independent emotions). In contrast, *pride*, *shame*, *gratitude*, and *anger* are assumed to be *control-dependent emotions*. Pride and shame are assumed to be induced if success or failure are judged to be caused by oneself, including attributions to one's own actions, attributes, and states as possible causes. This implies that both pride and shame can be instigated not only by failure that is perceived as being due to uncontrollable internal causes (like lack of ability), but also by failure that is due to controllable causes (like lack of effort; for a somewhat different view concerning shame, see Weiner, 1985). In line with Weiner's (1985) attributional assumptions, *gratitude* and *anger* are held to be aroused when success or failure, respectively, are perceived as having being caused by other persons.

As with prospective emotions, all of these emotions are assumed to also depend on the subjective value of success or failure. Pride and shame, for example, will be more intense if success and failure are more important. If a student does not care about academic achievement, no achievement pride or shame will be experienced. More specifically, concerning control-dependent retrospective emotions, the intensity of these emotions is assumed to be a multiplicative function of (a) the perceived extent to which the perceived cause contributed to the achievement outcome (perceived *causal impact* of the cause), and (b) the subjective value of the achievement outcome. The perceived impact of causes is assumed to play a similar role in retrospective emotions as perceived outcome probabilities are presumed to do in prospective emotions. The perceived impact of a cause likely depends on appraisals of the *causal power* of the cause (Buchner, Cheng, & Clifford, 2003).

Since several causes can be perceived has having worked together in producing an achievement outcome, mixtures of emotions will be quite typical in retrospective emotions as well (see also Smith & Ellsworth, 1987). An example would be a mixture of pride and gratitude when a scientist wins the Nobel price for his or her accomplishments, but also acknowledges the contributions of co-workers. The intensities of the different emotions in such mixtures can be assumed to depend on the relative contributions different causes are appraised to have made.

Activity emotions If an achievement activity (e.g., studying) and the material to which it relates (e.g., learning material) are positively valued, and if the activity is perceived as being sufficiently controllable by the self, *enjoyment* is assumed to be instigated. Activity enjoyment can be essential for flow experiences fostering engagement and creative problem solving (Csikszentmihalyi, 2000). It includes excitement at challenging tasks, as well as more relaxed states when performing pleasant routine activities. If the activity is perceived as being controllable, but is negatively valued (e.g., when effort required by the activity is experienced as aversive), *anger* is expected to be aroused. If the activity is not sufficiently controllable, *frustration* will be experienced.

Finally, if the activity lacks any incentive value (positive or negative), *boredom* is induced. The incentive value of an activity determining the amount of boredom experienced may, in part, depend on perceived controllability. Specifically, the value of an activity can be reduced, and boredom be experienced, when there is a lack of control over the activity because demands exceed individual capabilities. Alternatively, boredom can result from high control/low-demands conditions implying no sufficient challenge, thus also reducing the incentive value of the activity (for related empirical evidence, see Titz, 2001).

Subconscious Appraisals and Habitualized Achievement Emotions

Appraisals need not be conscious, and they need not always take place for an emotion to be elicited. Specifically, recurring appraisal-based induction of emotions can habitualize (Pekrun, 1988; Reisenzein, 2001). Based on procedural schemes underlying habitualized achievement emotions, situational perceptions alone can be sufficient to induce, for example, anxiety in a student upon entering the classroom. Habitualized emotions may be quite typical for everyday academic emotional life. Whenever the situation changes, however, appraisals come into play again, and changes of appraisals may change habitualized emotions. Changing habitualized emotions by breaking up procedural schemes is assumed to be critical for any kind of educational intervention wanting to reduce negative emotions (Zeidner, 1998).

Conceptual Corollaries and Extensions of the Theory

In the following sections, I discuss the implications of the theory for the multiplicity and domain specificity of discrete achievement emotions, for goals and beliefs as antecedents of these emotions, and for their instructional, social, and cultural antecedents. Also, the effects of emotions on engagement and academic achievement are addressed, as well as the implications for reciprocal linkages between emotions, antecedents, and effects, for the regulation and development of achievement emotions, and for the universality of functional relations across cultures, genders, and individuals.

Multiplicity and Domain-Specificity of Achievement Emotions

The control-value theory implies that different achievement emotions are characterized by different appraisal determinants. Achievement emotions can be described by common, underlying dimensions like valence and activation (Pekrun *et al*., 2002a), but a full account of these emotions presupposes that the multiplicity of qualitative differences between discrete achievement emotions be taken into account.

Furthermore, adding to multiplicity, it follows from the control-value theory that students' achievement emotions are likely organized in domain-specific ways. In previous research, it has often been assumed that achievement emotions are equivalent to generalized personality traits. For example, many measures of test anxiety, and studies using these measures, rest on the assumption that test anxiety is a generalized trait predisposing individuals to experience anxiety whenever being confronted with an evaluative situation

(Zeidner, 1998). However, control- and value-related constructs like self-concepts of ability, achievement expectancies, and interest have been shown to be organized in domain-specific ways (e.g., Bong, 2001; Marsh, 1986). By implication, emotions depending on control and value appraisals should also show domain specificity (for empirical evidence corroborating this assumption, see Goetz, Frenzel, Pekrun, & Hall, in press; Goetz, Pekrun, Hall, & Haag, 2006; Pekrun, Goetz, Titz, & Perry, 2002c).

Individual and Social Determinants of Achievement Emotions

Achievement goals Achievement goals are assumed to exert a broad influence on students' cognition and affect (Elliot, 1999). More specifically, mastery goals can be assumed to focus students' attention on learning activities, and performance goals on performance outcomes. By implication, as argued by Pekrun *et al*. (2006a), achievement goals can be assumed to mediate students' appraisals relating to these activities and outcomes, thus influencing their achievement emotions. Mastery approach goals are posited to facilitate positive activity emotions (like enjoyment of learning), and to reduce negative activity emotions (like boredom). Performance approach goals are held to foster positive outcome emotions (such as hope and pride), and performance avoidance goals negative outcome emotions (such as anxiety and hopelessness). The findings of two studies using samples of U.S. and German university students were in line with these assumptions (Pekrun *et al*., 2006a; see also Linnenbrink & Pintrich, 2002, and Linnenbrink, in press, for informative reviews of the literature on achievement goals and students' affect).

Personality antecedents: Control and value beliefs Regarding the personality antecedents of achievement emotions, individual control and value beliefs underlying students' situational appraisals are held to be important, in addition to noncognitive factors like physiologically bound temperament. Beliefs are acquired during repeated exposure to achievement settings. If there is ongoing experience with specific settings (e.g., math exams), situation-specific beliefs will be developed (e.g., causal expectancy beliefs pertaining to math exams). If there is no sufficient experience, appraisals can be based on more generalized expectancies, including achievement-related optimism vs. pessimism, and optimism and pessimism more generally (Carver & Scheier, 2005).

Social and cultural antecedents The control-value theory postulates that the affective impact of social environments is mediated by control and value appraisals. Accordingly, it is assumed that features of environments delivering information related to controllability and academic values are of critical importance for students' emotions. Important variables include quality of instruction, induction of values, autonomy support, goal structures and achievement-related expectancies of significant others, as well as feedback and consequences of achievement (Pekrun, 2000, in press; see Fig. 2). One specific implication relating to perceived control in different learning environments is that students experience less positive emotions, and more negative emotions, in high-ability as compared to low-ability classrooms, other things being equal (Pekrun, Frenzel, Goetz, & Perry, 2006b). Beyond classroom instruction and students' proximal social environments, cultural values pertaining to the definition and relevance of achievement are also held to be important factors influencing achievement emotions.

Functions of Emotions for Learning, Achievement, and Life Satisfaction: Are Positive Emotions Always Beneficial, and Negative Emotions Always Detrimental?

Achievement emotions affect the cognitive, motivational, and regulatory processes mediating learning and achievement, as well as psychological well-being, happiness, and life satisfaction. As to learning and achievement, the following is assumed (see Pekrun *et al*., 2002a).

Cognitive resources Both positive and negative emotions can consume cognitive resources by focusing attention on the object of emotion, implying that they can reduce resources needed for task purposes, and impair cognitive performance needing such resources (for experimental evidence, see Meinhardt & Pekrun, 2003). An exception is positive emotions that focus attention on the task at hand (e.g., enjoyment of learning), thus benefiting performance.

Interest and motivation to learn Emotions can induce and modulate students' interest and motivation to learn. Activating positive emotions, such as enjoyment of learning, are assumed to strengthen intrinsic and extrinsic motivation, and deactivating negative emotions, such as boredom and hopelessness, are held to be detrimental. The effects of deactivating positive emotions like relaxation, and activating negative emotions like anger, anxiety, or shame, are assumed to be more complex. Anxiety, for example, can impair interest and intrinsic motivation, while at the same time inducing extrinsic motivation to invest effort in order to avoid failures.

Use of learning strategies Based on findings of experimental mood research (Isen, 2000), it is assumed that activating positive emotions facilitate the use of flexible, creative learning strategies, and activating negative emotions (e.g., anxiety) more rigid strategies like simple rehearsal. Deactivating emotions (e.g., boredom) are held to lead to superficial, shallow ways of processing information.

Self-regulation vs. external regulation of learning Similarly, positive emotions like enjoyment of learning are assumed to facilitate students' self-regulation of learning, since self-regulation presupposes cognitive flexibility in using meta-cognitive, meta-motivational, and meta-emotional strategies for adapting learning to goals and task demands (Wolters, 2003). Negative emotions, on the other hand, are assumed to facilitate reliance on external guidance.

Academic achievement The overall effects of emotions on academic achievement are assumed to depend on the interplay between these different mechanisms, and on interactions between these mechanisms, on the one hand, and task demands, on the other. This implies that the net effects of emotions on achievement will inevitably be complex and over-determined. For most task conditions, however, the effects can be assumed to be beneficial for activating positive emotions like enjoyment of learning, detrimental for deactivating negative emotions like boredom and hopelessness, and more ambivalent for both deactivating positive emotions such as relaxation, and activating negative emotions such as anxiety (see e.g. Pekrun *et al*., 2002a).

These assumptions imply that positive achievement emotions do not always exert positive effects, and negative achievement emotions do not always produce negative effects, on academic learning and achievement. In a similar vein, ambivalence can also be assumed for the impact of these emotions on happiness, psychological well-being, and life satisfaction more generally. On the one hand, positive emotions and the absence of intense negative emotions are core elements of happiness and well-being — by definition, positive emotions are experienced as being pleasant, and negative emotions as unpleasant, thus contributing positively or negatively to overall happiness. On the other hand, since positive emotions can sometimes be detrimental for important outcomes like achievement, and negative emotions beneficial, positive emotions are not always adaptive, and negative emotions not always maladaptive. Thus, from the perspective of outcome attainment and future well-being, the pattern is more complex than simplistic hedonism would suggest.

Dynamics Over Time: Feedback Loops of Emotions, Antecedents, and Effects

Control and value appraisals are posited to be antecedents of emotions, but emotions can reciprocally affect these appraisals. Similarly, the social environment is supposed to shape emotions, but the emotions displayed by students have an influence on the social environment within the classroom. Furthermore, emotions are assumed to affect learning and achievement, but success at learning influences students' appraisals and emotions. By implication, emotions, their individual and social antecedents, and their effects are linked by reciprocal causation over time (see Fig. 2). Reciprocal causation can consist of positive feedback loops (e.g., enjoyment of learning and mastery at learning reinforcing each other). However, negative feedback loops may also be quite typical (e.g., test anxiety inducing motivation to avoid failure, and resulting success reducing test anxiety). The dynamics of feedback loops can take place within fractions of seconds (e.g., reciprocal loops between appraisals and emotions as a function of multidirectional pathways between cortical and sub-cortical neuronal structures), within learning episodes, or over days, weeks, and years.

Regulation and Development of Achievement Emotions

As argued above, emotions can be helpful for academic goal attainment and well-being, but they can also be quite deleterious. Emotion regulation can be used to improve the role that one's emotions are playing. Typically, but not always, emotion regulation strives to increase positive emotions, and to decrease negative emotions (coping with negative emotions; Zeidner & Endler, 1996). Basic components of regulation are recognition and understanding of one's own emotions, managing these emotions by inducing, modulating, or preventing them, and using emotions for action and goal attainment (Matthews, Zeidner, & Roberts, 2002). The assumptions of the control-value theory imply that attempts to manage one's own emotions can focus on any of the elements involved in the cyclic feedback processes linking emotions, their antecedents, and their effects, as addressed above (see Fig. 2).

Regulation can thus (a) directly address components of achievement emotions (*emotion-oriented regulation*; e.g., focusing attention on the emotion or distracting it away, using relaxation techniques, or taking drugs); (b) address the control and value antecedents of emotions (*appraisal-oriented regulation*; e.g., restructuring expectancies and attributions); (c) focus on improving academic learning and achievement underlying perceived control

(*problem-oriented regulation*; e.g., acquiring study skills); and (d) attempt to change situational circumstances defining controllability and values (e.g., by asking for a reduction of task demands, or by dropping out of a course).

The *development* of individual achievement emotions can be assumed to depend on the same set of factors, including cognitive appraisals, situational antecedents, individual learning, and academic achievement. The cognitive capacity needed to generate achievement-related causal expectancies and attributions, and related value appraisals, are acquired in the preschool and early elementary years. In later stages of students' educational

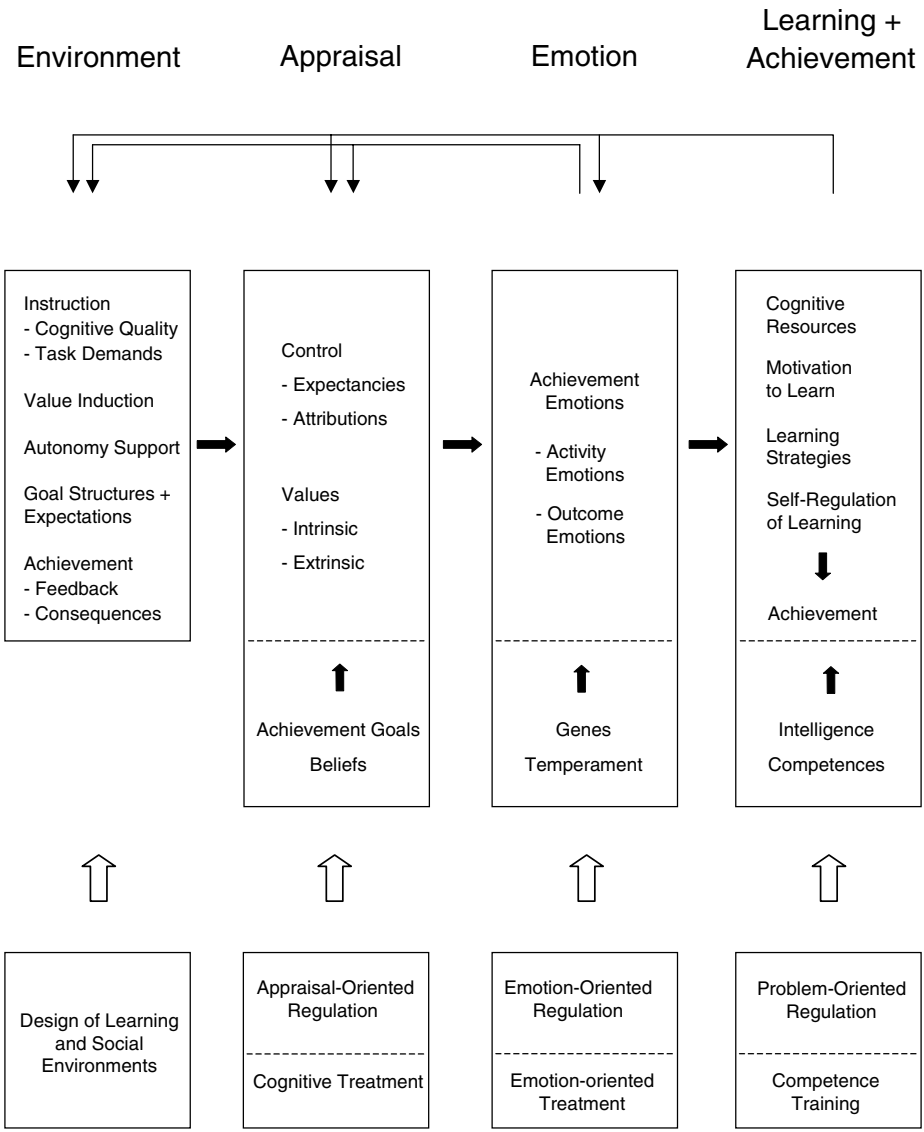

Fig. 2 The control-value theory of achievement emotions: Reciprocal linkages between antecedents, emotions, and effects.

career, the continuing development of appraisals and achievement emotions is likely driven by educational environments and the student's agency in these environments. For example, cumulative success and failure can be assumed to build up related achievement expectancies that in turn influence the development of success- and failure-related emotions (for corroborating evidence on cycles of failure, failure expectancies, and students' test anxiety, see Pekrun, 1992a).

Socio-Cultural Context, Gender, and the Individual: Relative Universality of Achievement Emotions

The control-value theory is based on the assumption that general functional mechanisms of human emotions are bound to universal, species-specific characteristics of our mind. In contrast, specific contents of emotions, as well as specific values of process parameters such as the intensity of emotions, may be specific to different cultures, genders, and individuals. This assumption implies that the basic structures and causal mechanisms of emotions follow general nomothetic principles, whereas contents, frequency, and intensity of emotions can differ.

For example, concerning gender differences, it follows from the theory that relations between control and value appraisals, on the one hand, and girls' and boys' achievement emotions, on the other, should be structurally equivalent: Emotions depend on control and value appraisals in both girls and boys. However, to the extent that perceived control and academic values differ between girls and boys, resulting emotional experiences can differ as well. For example, in a recent study on gender differences in upper elementary students' achievement emotions in mathematics, relations between appraisals and emotions were structurally equivalent across the two genders (Frenzel, Pekrun, Goetz, & vom Hofe, 2006). However, mean scores for perceived control were substantially lower in girls. As a consequence, girls reported less enjoyment in mathematics, as well as more anxiety and shame. Corroborating assumptions of the control-value theory, these differences in emotions proved to be mediated by the gender differences of appraisals.

Similarly, relations between appraisals and emotions can be assumed to be structurally equivalent across different groups of students within a country (e.g., ethnically diverse student groups in countries like the U.S.), and across countries and cultures. The mean levels and specific contents of appraisals and emotions, on the other hand, can differ. In a cross-cultural comparison of Chinese and German middle school students' achievement emotions, we found structurally equivalent relations of appraisals and emotions. Mean levels of emotions, however, differed between cultures. The Chinese students reported significantly more achievement-related enjoyment, pride, anxiety, and shame, and significantly less anger, than the German students (Frenzel, Thrash, Pekrun, & Goetz, in press).

Implications: I. How Can We Integrate Emotion, Motivation, and Cognition?

Cognitive emotion theories like the control-value theory described here imply that emotions are closely and reciprocally linked to their cognitive and motivational antecedents, as well as to their cognitive and motivational effects. Furthermore, contemporary component definitions of emotions imply that cognitive and motivational processes are integral parts of the emotion per se. The anxious wish of a student to escape from an exam, for example,

may be regarded as emotion (anxiety), cognition (cognitive representation of a desired state), and motivation (escape motivation).

Does this imply that emotion, motivation, and cognition are inseparable? From the perspective of the control-value theory, the answer is "no". These three Platonic categories represent psychological reality that often occurs in integrated ways, but can also occur separately, and should be treated conceptually as separate. Relations between cognitive appraisals and emotions can be used as an example. Entering the classroom, an individual student may appraise the situation as offering specific opportunities to learn that are valuable by matching capabilities and needs, and may experience prospective enjoyment as a result of this appraisal. After enjoyment has been induced, the student may continue appraisal-related cognitive processing, which now becomes part of the emotion enjoyment. This sequence implies that "cold" cognitive appraisal is transformed into "hot" cognition as part of the emotion enjoyment. As cold cognition, the appraisal stands alone, as hot cognition, it becomes a component of an emotion (Pekrun, 1988; Roseman & Smith, 2001).

Becoming "hot" implies that appraisals acquire an emotional quality. Furthermore, the emotion may change a number of processing characteristics of the appraisal. An example is the specific characteristics of worry cognitions in anxiety, as compared to "cold" cognitive estimates of outcome probabilities of failure (Stöber, 1998). Seen from a neuropsychological perspective, the initiating cognitive appraisal is triggered by cortical pathways, whereas the emotion is induced, and the appraisal becomes "hot", by cortical–limbic feedback loops.

Similar arguments can be made for relations between cognition and motivation, and between emotion and motivation. By implication, the three categories of cognition, emotion, and motivation can and should be separated for scientific purposes, for both psychological and neurological reasons (see Damasio, 2004, for a similar view).

However, the close conceptual and empirical links between the three categories represent a challenge for empirical research that cannot sufficiently be met to date. To analyze these links, it would be necessary to have empirical indicators available that show discriminant validity, such that the three types of processes can be separated not only conceptually, but empirically as well. Omnibus indicators not having sufficient resolution are in danger of producing tautological relations (e.g., test anxiety measures including items on appraisals; see e.g. Nicholls, 1976). Furthermore, to disentangle the constructs and analyze their interlinkages presupposes integrating research traditions from different fields that have not sufficiently been connected to date. In the first decades of the 20th century, comprehensive theories were developed (e.g., Allport, 1938; Lewin, 1935). Today, there seems to be a proliferation of small constructs and mini-theories in many research fields of psychology and education, including research on human emotions (see Lewis & Haviland-Jones, 2000). As a result, there is a lack of theoretical integration that has to be overcome if cumulative theoretical and empirical progress is to be made.

Implications: II. Advancing Methodology in Research on Achievement Emotions

Different methodologies in the study of emotions have multiple, complementary advantages and disadvantages. In research on achievement emotions, a multi-perspective methodological paradigm is required that integrates qualitative vs. quantitative approaches, experimental vs. non-experimental designs, as well as laboratory vs. field studies. In addition, there is a need to develop better measures and dynamic modeling methods allowing for an analysis of appraisals and emotional processes over time. Finally, a specific challenge is to

develop strategies integrating intraindividual (idiographic) and interindividual (nomothetic) perspectives on achievement emotions.

Toward Integrative Mixed-method Paradigms

Traditionally, psychological research on emotions was primarily based on quantitative, experimental approaches analyzing emotions in the laboratory (Lewis & Haviland-Jones, 2000). However, to fully explore the richness of emotions experienced in classroom settings, we need field studies, non-experimental approaches, and qualitative data as well. There is a clear need for advancing mixed-method paradigms integrating these different methodologies in research on achievement emotions.

Integrating quantitative and qualitative approaches Qualitative research may be best suited to explore and describe emotion phenomena and to generate hypotheses, whereas rigorous quantitative methodology is needed to test hypotheses on the antecedents and effects of emotions. In our own program of research, we first carried out a number of qualitative studies exploring students' achievement emotions (Pekrun, 1992c; Pekrun *et al*., 2002a). We then developed quantitative measures (specifically, the Achievement Emotions Questionnaire, AEQ; Pekrun *et al*., 2002a; Pekrun, Goetz, & Perry, 2005; and the Test Emotions Questionnaire, TEQ; Pekrun *et al*., 2004), and used these measures to do quantitative studies testing assumptions of the control-value theory.

Integrating experimental vs. non-experimental designs, and laboratory vs. field studies Controlled experiments provide the best opportunities to study causality. Laboratory experiments can assess the basic mechanisms of mood and human emotions, and field experiments can monitor the effectiveness of educational intervention. Laboratory experiments on emotions, however, are often of limited value because of ethical constraints and problems of ecological validity. Specifically, to the extent that experimental settings in the laboratory are artificial and do not represent real-life settings, laboratory experiments are in danger of representing *potential* causality which is readily demonstrated in the laboratory, but rarely outside the experimental setting. To date, it is quite unclear whether the results of laboratory-based mood studies can be transferred to the real-life, context-bound, and occasionally very intense achievement emotions experienced by students in academic settings. There is a clear need to complement laboratory experiments with field experiments, as well as non-experimental field studies, in research on achievement emotions.

Measures of Emotions and their Components

To analyze dynamic processes of component systems of appraisals, achievement emotions, and learning, there is urgent need for more sophisticated measures of emotions and their components, as well as methods for analyzing multivariate functional relationships over time. Concerning trait emotions, self-report measures like the AEQ should be complemented by more precise, aggregated state measures based on state self-report scales, observation, and assessment of neuropsychological affective processes. With respect to state emotions, self-report is the only way to capture the subjective contents of emotional experience. Self-report, however, has a number of distinct disadvantages. Self-report cannot

render real-time estimates of emotional processes, and self-report measures are difficult to construct so that they render interval or ratio scales that accurately capture more complex, non-linear relationships. Furthermore, self-report may be subject to response biases, and is not well suited to assess emotional processes that have limited access to consciousness.

By implication, behavioral and neuropsychological measures may be needed as well. Four different methods are available to date: Systems of observing facial and postural emotional expression (e.g., the FACS and its variants; Ekman & Rosenberg, 1997), peripheral physiological measures (assessment of heart rate, skin conductance, etc.), EEG methods, and functional imaging (Murphy, Nimmo & Lawrence, 2003). EEG and functional imaging (fMRI, PET) provide the most direct real-time access to the cognitive and affective processes implied by emotions.

Research on achievement emotions should make an attempt to adapt all of these methodologies for its purposes. For example, there is a clear need for adapting observational systems like the FACS such that they can be integrated into video-based classroom observation, and be used for analyzing students' and teachers' ongoing emotions in the classroom. Furthermore, concerning some of these methodologies, further genuine methodological development is required as well. For example, whereas EEG provides an excellent temporal resolution of processes, it is limited to cortical sites and does not render a more precise spatial resolution. The reverse is true for functional imaging, implying that there is a need for developing methods allowing for an estimation of processes in temporally *and* spatially precise ways (Szabolcs, 2004).

Modeling Dynamic Systems of Appraisals, Emotions, and Learning

The control-value theory implies that appraisals, emotions, and learning show complex, sometimes nonlinear interrelations over time. If one wants to model complex systems over time, real-time estimates of processes are required, as well as mathematical modeling procedures (e.g., differential equations systems) to analyze the resulting data. A milestone in using such procedures for modeling affective processes was Atkinson's and Birch's dynamic action theory (Atkinson & Birch, 1970). With few exceptions (Kuhl & Blankenship, 1979), however, this theory was never tested empirically, probably due to the lack of precise measures of process parameters. In view of the significant advances in real-time assessment, it would be useful to pursue Atkinson's and Birch's approach as well as more recent computational process approaches to emotions (Wehrle & Scherer, 2001), and to construct suitable dynamic models for emotional processes in education.

Intraindividual and Interindividual Perspectives: How Should We Study the Psychological Functions of Emotions?

One problem of many studies of emotions in achievement settings is that they use *interindividual* covariation of variables to study *intraindividual* psychological functions. For example, in test anxiety research, negative correlations between test anxiety and academic achievement are typically interpreted as indicating that test anxiety exerts negative effects on achievement within individuals (Zeidner, 1998). Similarly, in research on motivation, correlations between goals and students' learning are interpreted as indicating that goals influence learning, and correlations of academic self-concepts and achievement seen as suggesting that self-concepts affect achievement (or vice versa).

However, conclusions of this type are not always warranted, since interindividual and intraindividual covariation of variables are statistically independent (Robinson, 1950; Schmitz & Skinner, 1993). A well-known example cited by Schmitz and Skinner (1993) is the relation between duration of sleep and frequency of migraine headaches. These two variables show positive interindividual correlations, which seemingly implies that sleeping late can lead to headaches (or headaches to longer sleeping). Such a conclusion, however, would be misleading, since the two variables correlate *negatively* within individuals, implying that headaches occur in combination with *shorter* duration of sleep.

Interindividual approaches can be used to predict and explain individual differences. To analyze the psychological functions of emotions as addressed by the control-value theory and similar approaches, process-oriented, intraindividual approaches are needed. Such approaches seem to be underrepresented in research on achievement emotions, and in educational and psychological research more generally. In our own research, we used cross-sectional and longitudinal sample-based studies to analyze individual differences of achievement emotions, and diary studies implying a combined *idiographic–nomothetic strategy* to analyze processes. In one such study, we analyzed emotions experienced by students over six weeks prior to and during their final university exams (Pekrun & Hofmann, 1996). We first analyzed the development of exam-related emotions and their covariation with appraisals and learning within individuals, and then analyzed the distribution of individual developmental trajectories and covariations of variables over individuals. Two main results of this study emerged. First, the development of emotions like hope and anxiety before and during exams was quite specific to individual students, to the extent that the corresponding sample statistics (development of mean daily emotional intensity in the sample) did *not represent any single individual* under study. Second, concerning covariation between emotions, antecedents, and effects, we found functional homogeneity across individuals for most of the variables, but we also found functional heterogeneity in some instances. Enjoyment and motivation to learn, for example, correlated positively over time in all subjects of the sample, thus indicating functional homogeneity and generalizability across individuals. Furthermore, the (positive) intra-individual correlations of enjoyment and motivation were congruent to the (positive) interindividual correlation of these two variables when aggregated within individuals over time. However, anxiety correlated differently with motivation across individuals, most students showing negative correlations, but some of them positive correlations. These differences of functional relations can be explained by ambivalent mechanisms of anxiety balanced differently in different individuals, as predicted by the control-value theory (Pekrun *et al*., 2002a).

Findings like these imply that sample statistics and interindividual correlations should not be misinterpreted as representing the intraindividual functions of students' emotions. Rather, educational research on emotions needs strategies to analyze emotional processes within individuals, and to test the generalizability of these processes across individuals in order to validate nomothetic models.

Implications: III. How Can Emotion Research Inform Education?

Emotions are of primary educational importance, for two reasons. First, as implied by the control-value theory, emotions can affect students' interest, engagement, achievement, and personality development, as well as the social climate in classrooms and educational

institutions (Ainley, Corrigan, & Richardson, 2005; Meyer & Turner, 2002; Pekrun *et al*., 2002a, 2002b; Turner & Schallert, 2001). Second, as noted above, emotions are central to psychological health and well-being, implying that they should be regarded as important educational outcomes in themselves, independent of their functional relevance.

In the following, I discuss some of the implications of the control-value theory for educational practice, and then address the need to conduct more empirical intervention research on how to foster students' achievement emotions.

Implications for Educational Practices Fostering Students' Achievement Emotions

The control-value theory implies that students' emotions can be positively influenced by fostering their perceptions of competence and control over academic activities and outcomes, and by shaping their appraisals of the values of these activities and outcomes. It follows from the assumptions of the theory that important factors influencing student's control, values, and emotions likely are the following (see Fig. 2).

(1) *Task demands and the cognitive quality of instruction* Raising the cognitive quality of instruction and assignments should increase students' sense of control, as well as their positive academic values. Improving facets of instruction like clarity, structure, and the presentation of cognitively activating tasks can be assumed to contribute to perceived control. The task demands implied by instruction and assignments are important as well, and likely influence achievement emotions in two ways. First, demands determine the difficulty of learning material, thus influencing students' chances for mastering the material, and resulting control perceptions and emotions. Second, the relative match between demands and individual capabilities can influence the student's valuing of the material. As posited by the control-value theory, if demands are too high or too low, task values can be reduced to the extent that boredom is experienced. By implication, matching task demands to capabilities is likely important not only in order to support cognitive learning, but for the sake of students' task-related achievement emotions as well.

(2) *Value induction and the motivational quality of instruction* The control-value theory implies that positive values of academic engagement and achievement should be fostered, and negative values prevented. Teachers, parents, and peers deliver direct, verbal messages about academic values, as well as more indirect messages conveyed by their behavior, and by the learning assignments provided to students. Two important ways to foster students' academic values probably include the following. First, the development of values can be promoted by shaping instructional material, assigned tasks, and classroom interaction such that they meet the needs of students (Krapp, 2005). Examples are authentic learning tasks, and a classroom discourse that engages all students, thus serving their needs for social relatedness. Second, by way of observational learning and emotional contagion (Hatfield, Cacioppo & Rapson, 1994), teachers' and parents' own enthusiasm in dealing with academic material likely facilitates students' absorption of values.

(3) *Learning environments supporting autonomy and cooperation* Giving students autonomy implies letting them self-regulate their learning processes, instead of, or in addition to, delivering instruction. Self-regulation can take place at the individual level, or at the level of student groups (individual vs. cooperative learning). These kinds of learning can be assumed to foster students' sense of competence, thus positively influencing their

emotions. Cooperative learning has the additional advantage of serving students' social needs, thus possibly also contributing to their appreciation of academic engagement. However, if these learning environments represent too much of a challenge for the individual student, or provide unfavorable social comparison as provoked by cooperating with gifted peers, control appraisals can suffer, and negative emotions like anxiety, hopelessness, and shame can be induced. By implication, efforts should be made to fine-tune the affordances and constraints of these learning environments to students' capabilities.

(4) *Achievement goal structures and achievement expectations* The goal structures of the classroom define students' opportunities to attain success and avoid failure. Three important types of goal structures defined by different standards of evaluating achievement are individualistic, competitive, and cooperative structures (Johnson & Johnson, 1975).

In *individualistic* goal structures, achievement is defined by individual competence gain (individual standard of evaluation), or by mastery of the learning material (absolute standard). Under such a structure, individual achievement is independent of other students' attainment, meaning that all students can attain success provided that sufficient progress is made. In contrast, in *competitive* goal structures, achievement is defined by normative social comparison standards making individual achievement dependent on the relative attainment of others. In competitive structures, the achievement of different students is negatively linked, since success of some students implies failure of others. By implication, success can be expected by some students, while others must expect failure. *Cooperative* goal structures imply that achievement is defined by the performance of the group, meaning that attainment is positively linked across individuals. Finally, goal structures can be combined into hybrid, multiple structures (e.g., within-group cooperation paired with between-group competition; Covington, 1992).

From the perspective of achievement goal theory, individualistic structures relate to mastery goals, and competitive structures to performance goals (Ames, 1992; Elliot, 1999). Until now, achievement goal theory has primarily focused on these two types of goals, but has yet to fully incorporate cooperative achievement goals, and hybrid goal structures.

Different goal structures and related assessment procedures provide students with different opportunities to experience success, thus likely affecting their perceived control, and their emotions relating to achievement outcomes. For the average student, opportunities for subjective control can be assumed to be higher under individualistic and cooperative goal structures, as compared to competitive structures, other things being equal. By implication, although competitive structures can be enjoyable for high-achieving students, their average emotional effects likely are less beneficial. As one important consequence, it follows from an emotional analysis of goal structures that classroom practices of assessing student achievement should better refrain from using social comparison standards. Specifically, this applies to high-stakes assessment that can dramatically increase the emotional impact of assessment by making important consequences contingent on achievement.

The individual *expectations* of teachers, parents, and peers can operate in similar ways as the overall goal structures applied to the classroom. Social expectations that a specific level of achievement should be attained also provide definitions of success and failure, thus influencing perceived control and the emotions relating to success and failure in students who endorse these expectations. The assumptions of the control-value theory suggest that expectations should not exceed students' capabilities, such that control perceptions and resulting emotions are not influenced negatively.

(5) *Feedback and consequences of achievement* Feedback on success and failure directly determines students' retrospective appraisals of achievement outcomes, thus influencing their retrospective outcome emotions. In addition, feedback also implies information about probabilities of future success or failure, thus having an impact on prospective control appraisals and prospective outcome emotions. The assumptions of the control-value theory imply that cumulative failure feedback undermines students' sense of control, thus contributing to the development of achievement-related anxiety and hopelessness. To the extent that this assumption is true, repeated feedback that a student's attainment was insufficient should be avoided. Rather, failure should be defined as malleable and offering opportunities to learn.

In addition, contributing to the value of achievement, the consequences of success and failure are important. Negative consequences like punishment after failure, for example, are known to be related to the development of test anxiety (Zeidner, 1998). More long-term outcomes may be relevant as well. Specifically, for students in high school and tertiary education, it can be assumed that the subjective value of success and failure is strongly influenced by the impact of academic achievement on future career chances. When goal structures and contingencies are such that students can attain success, and success regularly leads to employment, long-term contingencies can contribute positively to the development of achievement values and emotions. However, under conditions of high probabilities of failure, or low chances for employment, the negative emotional effects on many students will likely outweigh positive emotional benefits. From the perspective of fostering emotional development, it would be better to avoid long-term contingencies under such conditions.

(6) *Treatment of appraisals and emotions* Appraisal theories like the control-value theory imply that educators and therapists can attempt to change students' emotions by interventions directly addressing the appraisals underlying these emotions (cognitive treatment). One way of doing this would be through attributional retraining that has proved to be quite successful for improving college students' motivation and academic achievement (e.g., Perry, Hall, & Ruthig, 2005; Perry & Penner, 1990), and might also prove helpful for changing emotions (e.g., Ruthig, Perry, Hall, & Hladkyj, 2004). In addition, treatment of achievement emotions can focus on directly changing the target emotion (emotion-oriented treatment), and on developing students' problem-solving skills and academic agency influencing their emotions (competence training; see Fig. 2).

(7) *Fostering students' self-regulation of emotions* As noted above, the control-value theory implies that regulating control and value appraisals is one important mechanism for emotional self-regulation. Educators can assist students in developing regulatory skills and in self-regulating their appraisals and achievement emotions, thereby indirectly fostering their emotional development (Goetz, Frenzel, Pekrun, & Hall, 2006).

The Need for Educational Intervention Research on Emotions

To date, practical considerations on how to enhance students' emotions can be deduced from theoretical assumptions as presented above, but related empirical evidence is still largely lacking. As yet, academic and achievement emotions are under-researched, with the single exception of research on students' test anxiety. Apart from test anxiety, we lack

cumulative, generalizable knowledge about the dimensions, antecedents, and functions of different emotions experienced in academic settings (see Pekrun *et al*., 2002a; Schutz & Lanehart, 2002; Schutz & Pekrun, in press; Sutton & Wheatley, 2003). Therefore, current emotion research can provide evidence-based principles on how to alleviate test anxiety (see the summary in Zeidner, 1998). Concerning emotions other than test anxiety, however, educational research on emotions can provide speculation, but cannot yet provide firm, evidence-based conclusions on how to design classroom instruction, learning environments, and educational systems in "emotionally sound" (Astleitner, 2000) ways. Two types of studies may be most critical to ameliorate this situation (Pekrun, 2005).

(1) *Basic research* While it is intuitively and theoretically plausible that emotions are important, we need more controlled, empirical studies analyzing the extent to which emotions (other than test anxiety) influence outcomes like student engagement, life-long learning, achievement, health, personality development, and the social climate in classrooms and educational institutions (e.g., Perry, Hladkyj, Pekrun, & Pelletier, 2001; Perry, *et al*., 2005). Also, we need evidence on how these emotions develop.

(2) *Intervention studies* We need more educational intervention studies demonstrating in which ways educators, parents, and the organization of schooling can influence students' emotions. The available research has shown how students' test anxiety can be reduced. Cognitive and cognitive–behavioral ways of modifying test anxiety are among the most successful methods of psychotherapy available today (with effect sizes of $d > 1$; Zeidner, 1998). However, what can be done to reduce students' boredom, anger, shame, or hopelessness, and to foster their hope, pride, and enjoyment of learning?

To date, the few available intervention studies on emotions other than test anxiety have met with only partial success (e.g., Glaeser-Zikuda, Fuss, Laukenmann, Metz, & Randler, 2005), meaning that creating affectively sound environments will not be an easy task. The success story of test anxiety research, however, suggests that it will be possible to generate cumulative knowledge for emotions like anger, hopelessness, boredom, and enjoyment as well, and that it will prove to be possible to design emotionally effective learning environments and interventions targeting these emotions, such that educational emotion research will be able to inform educational practice in validated ways in the near future.

Conclusion

In this analysis, I have outlined assumptions and corollaries of the control-value theory of achievement emotions, as well as some of its implications for educational research and practice. One primary goal in constructing this theory was to provide a more comprehensive theoretical framework integrating perspectives from diverse approaches to the antecedents and functions of achievement emotions. As posited here, comprehensive approaches bridging the gaps between research traditions are urgently needed if the nascent field of educational research on emotions, and research on achievement emotions more generally, is to evolve over the next years (Pekrun & Schutz, in press). Also, these approaches are critical for integrating findings so that they can be used by educational practitioners.

In closing, it should be noted that the assumptions of the theory can be applied not only to students' emotions as addressed in this article, but also to the emotions experienced by

teachers. Emotions are assumed to influence teachers' instructional practices, professional cooperation, personality development, and psychological health in similar ways as they are posited to impact on students' academic agency and well-being. By implication, the emotions experienced by teachers in classroom settings, as well as by principals and school employees in their professional activities, are thought to be no less important when emotional interactions in our schools and universities are to be understood, and these institutions to be shaped in affectively beneficial ways.

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