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Accepted for publication in Maik Bieleke, Wanja Wolff, Corinna Martarelli (eds). 2024. The Routledge International Handbook of Boredom. Routledge.

http://doi.org/10.4324/9781003271536-7

Boredom: A Control-Value Theory Approach

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Citation for this publication:

Pekrun, R., & Goetz, T. (2024). Boredom: A control-value theory approach. In M. Bieleke, W. Wolff, & C. Martarelli (Eds.), *The Routledge international handbook of boredom* (pp. 74-89). Routledge.

Abstract

Control-value theory (CVT) posits that perceptions of control and value are main drivers of human emotions, including boredom. This chapter explains how CVT conceptualizes boredom and its relations with important antecedents and outcomes. We first outline how the theory defines emotion, and why it considers boredom an emotion. Next, we discuss CVT propositions on the origins of boredom. Overly high control (underchallenge), lack of control (overchallenge), and lack of value are seen as prime individual causes of boredom. By implication, more distal individual factors, such as personal goals, as well as social environments that influence perceived control and value are expected to also influence boredom. Boredom, in turn, is thought to impact behavior and performance, with negative effects on immediate performance but more variable effects on long-term outcomes. The outcomes of boredom reciprocally influence appraisals and the environment, implying that boredom, consequences, and antecedents are linked by feedback loops over time. These feedback loops open up multiple ways to regulate boredom. In conclusion, we discuss the relative universality of boredom across contexts and cultures, implications for practice, and directions for future research.

In this chapter, we use control-value theory (CVT) to explain antecedents, outcomes, and regulation of boredom. CVT is built on the premise that appraisals of control and value are prime drivers of human emotions, including boredom. In its original version, the theory focused on achievement emotions (Pekrun, 2000, 2006, 2018; Pekrun & Perry, 2014; see also Pekrun, Marsh, Elliot, et al., 2023). More recently, the theory has been revised to explain human emotions more generally (Pekrun, 2021), thus making it possible to derive general hypotheses on the origins and functions of boredom. By considering a broad range of emotions, CVT also allows analyzing similarities and differences between boredom and other emotions.

Based on CVT, we first outline how we conceptualize boredom and why we consider boredom as an emotion. Next, we discuss control and value as antecedents of boredom, as well as resulting implications for the impact of other individual factors and social environments. We then consider outcomes, regulation, and the relative universality of boredom. In conclusion, we discuss implications for practice and directions for future research.

Boredom – An Exceptional Emotion

What is boredom? Is it an emotion? Emotions are typically conceived as psychological responses to important events (e.g., Scherer & Moors, 2019). For example, joy about positive news is a response to the news, anxiety before an upcoming exam a response to possible failure, and anger about being hit by an enemy a response to being hit. Events that lack relevance do not trigger these emotions, or only a faint version of the full-blown response. Boredom differs from this description in two ways. First, boredom typically does not occur in response to single events but to ongoing situations. Second, boredom typically occurs in response to situations that lack relevance and meaning.

Accordingly, it would be possible to classify boredom as a non-emotional state. In the psychological literature on emotions, this is a prevailing view. Despite being fundamentally important from an evolutionary perspective, boredom is lacking in Ekman's lists of basic emotions (e.g., Ekman, 1992; Ekman et al., 2002). Major theories of emotion, including classic appraisal theories such as Lazarus's, Scherer's, and Roseman's models as well as related approaches like attribution theory, do not address boredom (e.g., Lazarus, 2006; Roseman & Evdokas, 2004; Scherer, 2009; Weiner, 1985). In Scherer and Moors's (2019) seminal account of appraisal theory, boredom is not mentioned. Similarly, textbooks of emotion psychology usually do not address boredom, and major handbooks of emotion research do not include chapters on boredom (e.g., Barrett et al., 2016).

Alternatively, if we believe boredom is sufficiently similar to classic emotions such as joy, anxiety, or anger, then we would need to modify our conception of emotions. We believe that the second strategy is sensible, because boredom manifests a profile of components that is equivalent to the profile of classic emotions. As it is usually understood, this profile comprises a range of component processes, with affective, cognitive, physiological, motivational, and behavioral-expressive processes deemed especially important – such as nervous feelings, worries about

possible failure, physiological arousal, avoidance motivation, and anxious facial expression in fear of failure before an exam. Boredom comprises the same set of processes (albeit with different contents; see below).

Following this reasoning, CVT uses an expanded definition of emotions to accommodate affective states such as boredom. First, according to this definition, emotions are responses that can occur not only in response to events, but also in response to ongoing situations, actions, persons, and various other phenomena, together called "objects" (Pekrun, 2006, 2021; Pekrun, Marsh, Elliot, et al., 2023; for similar conceptions of emotion in philosophy, see Montague, 2009; Scarantino & de Sousa, 2018). Second, sets of coordinated affective, cognitive, motivational, physiological, and behavioral-expressive responses to objects are called emotions, regardless of the perceived relevance or meaning of the object.

From this perspective, it is imperative to consider boredom as an emotion. Boredom represents a coordinated set of responses to specific situations or actions (i.e., situations and actions that lack relevance and meaning), and these responses comprise the same component processes as other emotions, at least in the prototypical case of boredom. Prototypical boredom comprises (1) unpleasant affective *feelings*; (2) specific *cognitive* processes, including mind wandering and daydreaming as well as altered perceptions of time; (3) *motivation* to escape from the current situation; (4) *physiological* responses (typically physiological deactivation); and (5) bored facial, postural, and vocal *expression* (e.g., Bench & Lench, 2019; Danckert et al., 2018; Fahlman et al., 2013; Harris, 2000; Pekrun et al., 2010; Van Tilburg & Igou, 2012, 2017).

Defined this way, boredom clearly differs from other emotions. Some of the single component processes can occur in other emotions as well, such as daydreaming in pleasant relaxation, or motivation to escape in anxiety. However, the composition of the full set of component processes is unique. Furthermore, as argued by Pekrun et al. (2010), our definition of boredom also implies that boredom is more than the absence of positive emotion. A lack of enjoyment simply implies an absence of positive feelings and related approach motivation. In contrast, prototypical boredom comprises negative feelings that can be extremely intense, and avoidance motivation that can be equally strong. Surely, situations that are not enjoyable can generate boredom, suggesting that lack of enjoyment can contribute to boredom. Alternatively, however, situations that are not enjoyable can cause frustration, anger, or anxiety. Boredom is unique and cannot be explained by the absence of positive emotions alone.

Antecedents of Boredom

Appraisals as Proximal Antecedents

Human thought, emotion, and action in response to situations are typically shaped by perceptions of the situation, with only few exceptions. CVT shares this premise with social-cognitive theories more generally, and appraisal theories of emotion specifically. Two groups of appraisals are deemed to be especially important for the generation of emotions, including perceptions of

control and of *value* (Figure 1). The CVT concepts of these two appraisals integrate various dimensions of appraisals considered in other appraisal theories, such as controllability, coping potential, and power (control), as well as valence, relevance, goal congruency, and moral significance (value; see Moors et al., 2013). Thus, CVT provides an integrated account of appraisals that synthesizes and simplifies existing models of appraisals. In addition, the CVT approach to classify appraisals also makes it possible to link the appraisal view of emotions with cognitive theories of motivation, such as expectancy-value theories (e.g., Eccles & Wigfield, 2021; Pekrun, 1993).

Succinctly stated, CVT posits that emotions typically are triggered when one feels in control over, or out of control of situations that are subjectively important. For example, working on a project is enjoyable when one feels competent to perform the work well (control), and when the work is meaningful (value). Anxiety before an important exam (high value) is instigated when one feels out of control over one's performance, implying that failure is possible (lack of control). However, boredom diverges from this general pattern. In contrast to other emotions, boredom is thought to be instigated when value is *lacking*, which contributes to the uniqueness of this emotion.

CVT proposes that there are four types of cognitions contributing to emotionally relevant perceptions of control (Pekrun, 2006, 2021): *action-control expectancies* to be able to initiate and successfully perform an action; *action-outcome expectancies* that actions generate specific outcomes; *situation-outcome* expectancies that the situation will generate these outcomes even without one's own action; *causal attributions* of outcomes to specific causes; and *self-concepts* of one's attributes (such as ability) which influence expectations and attributions. CVT distinguishes between two broad groups of values: The *intrinsic values* of actions which comprise perceptions of features that make the action itself attractive (or undesirable), regardless of any outcomes, and *extrinsic values* that make the action attractive (or undesirable) because it is instrumental for attaining outcomes. Both intrinsic and extrinsic value can be either positive or negative, making performance of the action either desirable or undesirable.

Boredom is an emotion that is experienced in relation to current ongoing activities rather than single outcome events. Using CVT language, this object focus makes boredom an *activity emotion* rather than an outcome emotion (Pekrun, Marsh, Elliot, et al., 2023). For activity emotions, CVT proposes that action-control expectations, along with underlying self-concepts of ability, are the most relevant control cognitions, and perceptions of intrinsic value the most important value cognitions. More specifically, boredom can be instigated when self-concept and action-control expectations are either very high, indicating insufficient challenge (underchallenge), or very low, meaning that the challenges to successfully perform cannot be met (overchallenge). This conception extends prior approaches that focused on underchallenge as a cause of boredom (e.g., Csikszentmihalyi, 2000). From considering both under- and overchallenge as precursors of boredom, it follows that control and boredom are linked in a curvilinear rather than linear fashion. In terms of value, the theory proposes that boredom is triggered when the activity lacks intrinsic value.

CVT posits that control and value interact in generating emotions. Taking the examples cited earlier, work is enjoyable when one feels competent and the work is meaningful; when feeling out of control or perceiving the task as meaningless, work is not enjoyable. Both conditions need to be fulfilled to make the work enjoyable. Similarly, you may experience fear of failure before an exam when feeling out of control and perceiving the exam as important; when you are confident to succeed or just don't care, why should you be nervous.

For boredom as well, control and value are thought to interact: It is assumed that the effects of control on boredom depend on value. Boredom is thought to be instigated when overly high control (underchallenge) is coupled with lack of value, or when low control (overchallenge) is coupled with lack of value. In contrast, when high control is combined with high value, pleasant relaxation and confident feelings ("assurance"; Pekrun, Marsh, Elliot, et al., 2023) should result. When low control is combined with high value, anxiety or frustration are aroused. As such, over- or underchallenge alone are not sufficient to prompt boredom. Rather, it is their combination with lack of value that generates boredom.

Although perceived control and perceived value represent distinct appraisals, they are not independent but can influence each other. For understanding the generation of boredom, it is especially important to consider that control can influence value. Underchallenge (high control) can reduce the intrinsic value of the activity, thus contributing to boredom through undermining value. If tasks are too easy, they become boring over time. Overchallenge (lack of control) implies that the task is not well understood, which reduces meaningfulness and thus also undermines intrinsic value. For example, if you attend a lecture that you don't understand, the lecture is meaningless for you (even if it is an intellectual joy for others), thus leaving you bored. In addition to these immediate effects of control on value, value can reciprocally influence control: Valued activities are those in which we invest, thus increasing competencies and control; activities lacking value are those we try to abandon, which may lead to lack of competence and control over time.

An intriguing open question is the interplay of intrinsic and extrinsic values in causing boredom. Clearly boredom is instigated when both types of value are lacking. However, what happens if an activity lacks intrinsic value but leads to important outcomes, thus acquiring meaningfulness through extrinsic value (Van Tilburg & Igou, 2013)? We predict that this combination can lead to a blend of different emotions. Specifically, we assume that lack of intrinsic value makes the activity boring, while the anticipation of outcomes simultaneously generates other emotions. For example, monotonous assembly line work can cause boredom (Shackleton, 1981), but the expectation of being paid for each hour of the work can, at the same time, trigger anticipatory joy of receiving and spending the money. To the extent that neither of the two emotions is too strong, they can co-exist (Moore & Martin, 2022). Similarly, if preparing for an exam is repetitive and boring, but anticipating possible failure triggers anxiety, then preparation can instigate both boredom and fear – an especially toxic mix of negative emotions. Again, such a

blend likely requires that neither of the two emotions is too strong; intense panic before an exam likely extinguishes any feelings of boredom.

Blends of emotions resulting from complex patterns of appraisals may also help to explain the inconsistent evidence on boredom and arousal (see Goetz et al., 2014; Raffaeli et al., 2018). If boredom is coupled with emotions that involve physiological arousal, then the resulting state may be characterized by low arousal, high arousal, or fluctuations of arousal, depending on which of the emotions dominates. For example, if boredom is experienced during a monotonous class that lacks personal value, but not being allowed to leave the class simultaneously triggers anger, then the resulting blend of deactivating boredom and activating anger may involve various levels of arousal.

The extant empirical evidence supports the importance of control and value appraisals for boredom. Most of the existing studies were conducted in educational settings and focused on students' boredom during achievement activities (for overviews, see Goetz et al., 2019; Pekrun & Perry, 2014). The results show that perceived control typically correlates negatively with boredom, in contrast to earlier accounts that focused on boredom in students who are not sufficiently challenged (e.g., Sisk, 1988). It seems likely that today's demands in K-12 and postsecondary education are too high to let the average student be bored due to underchallenge. Nevertheless, boredom has also been reported for gifted students who may lack challenge, especially when being a member of regular classrooms. For example, Fredricks et al. (2010) found that regular classrooms (as compared with gifted and advanced classrooms) undermined gifted students' passion for schoolwork and instead induced boredom. Studies that included separate measures of over- and underchallenge have confirmed that both can generate boredom (see Krannich et al., in press).

The existing evidence also supports the notion that value relates negatively to students' boredom. Negative correlations have been reported for different types of value, including intrinsic value as well as achievement value and utility value (i.e., instrumental usefulness of academic work for students' current and future life). However, supporting CVT propositions, the negative relations with boredom are stronger for intrinsic value than for other types of value. For example, in the analysis by Pekrun, Marsh, Elliot, et al. (2023, Study 3), the intrinsic value of learning materials was a strong negative predictor of students' boredom in a university course, whereas the perceived value of their achievement in the course did not contribute to predicting boredom.

There also are a few studies that examined links between control-value appraisals and boredom in non-academic settings. For example, studies in sports psychology have shown that control and value beliefs are negatively related to boredom during physical activity (see, e.g., Simonton et al., 2020, 2021). Similarly, research on work emotions supports the role of control and value for work-related boredom. For example, research on job boredom has found that overqualification, presumably leading to underchallenge (i.e., overly high control), as well as lack of meaningfulness in one's work contribute to boredom (e.g., Sánchez-Cardona et al., 2020).

Distal Individual Antecedents: Achievement Goals as an Example

To the extent that appraisals are proximal causes of emotions, other individual factors can affect emotions by shaping appraisals (Figure 1). Relevant factors include all individual dispositions and momentary processes that influence perceptions of control and value, such as gender, personality traits, individual memories, stereotypes, cognitive biases, etc. An example in the achievement domain is personal achievement goals (Elliot & Hulleman, 2017). These goals can be grouped according to the achievement standards individuals can use to define them, including mastery standards judging achievement relative to mastery of the task domain, and social comparison ("normative") standards judging achievement relative to others. In addition, achievement goals differ by either referring to attaining success (approach goals) or to avoiding failure (avoidance goals). As proposed by Elliot and McGregor (2001), the two dimensions yield a 2 × 2 taxonomy that includes performance-approach goals (aiming to outperform others), performance-avoidance goals (aiming not to perform worse than others), mastery-approach goals (aiming to acquire competence), and mastery-avoidance goals (aiming not to lose competence; for an extended 3 × 2 taxonomy differentiating between performance, self-improvement, and task mastery goals, see Elliot et al., 2011).

From a CVT perspective, these different goals help to focus attention on different aspects of performance attainment, thus influencing control-value appraisals and related emotions (Pekrun et al., 2006, 2009). Performance-approach goals focus attention on the controllability of success relative to others, and on the importance of success, thus strengthening outcome emotions such as hope for success, and pride once success has been attained. Performance-avoidance goals focus attention on possible lack of control and the importance of avoiding failure, thus triggering anxiety, shame, and hopelessness.

In contrast, mastery goals focus attention on the achievement activities themselves, and on the competence attainment that they can produce. As such, it is mastery goals that are most relevant for boredom. Specifically, mastery-approach goals are expected to focus attention on one's competence and the meaningfulness of achievement activities, thus promoting enjoyment of these activities and reducing boredom. Certainly, performance goals as well as mastery avoidance goals may also influence boredom, although in more indirect ways through instigating other emotions that are not compatible with boredom. For example, intense anxiety before an exam as triggered performance-avoidance goals may prevent any boredom during preparing for the exam.

The extant evidence supports this view. For example, Pekrun et al. (2006) analyzed the predictive relations between students' initial achievement goals for a psychology course and their subsequent emotions in the course later in the semester. Mastery-approach goals positively predicted enjoyment of learning, and negatively predicted boredom and anger. Similarly, in the prospective study by Pekrun et al. (2009), exam-related mastery goals positively predicted undergraduates' enjoyment in preparing for the exam, and negatively predicted their boredom and anger. Subsequent research confirmed the negative link between mastery- and task-related

approach goals and boredom (e.g., Daniels et al., 2009; Lüftenegger et al., 2016; Ranellucci et al., 2015). Importantly, mastery-approach goals and boredom were negatively related both in between-person analysis of trait-like measures of goals and boredom, and in within-person analysis of the intraindividual links between daily goals and state boredom over time (Goetz et al., 2016).

The Role of Social Environments

For the influence of situational factors, CVT proposes that the same logic holds as for individual factors: If perceptions of control and value are proximal antecedents of boredom, then any external factors that influence boredom should do so by affecting these appraisals in the first place (Figure 1). Any factors that influence control and value can also impact boredom. Different factors influence the two appraisals, but some factors influence both, and sometimes in opposite ways – the influence of environments on emotions can be manifold and complex.

Important factors that are expected to influence boredom via changing perceived control are task demands, social expectations, goal structures, autonomy support, and feedback. *Task demands* relative to individual competencies determine the level of challenge. If demands are too high, control can be reduced to the extent that the task is completely meaningless, thus generating boredom if it is not possible to leave the situation. If demands are too low, as in work characterized by monotonous assembly line activities, red tape, or automated production processes, boredom can result as well (Cummings et al., 2016; Harju et al., 2022).

Similarly, *social expectations* and *goal structures* that generate overly high challenges can influence control and, therefore, boredom. If expectations from parents, teachers, supervisors, or coaches are too high, anxiety may be triggered in the first place. However, if it is not possible to meet the expectations, then anxiety may be replaced by boredom over time, especially if the stakes are not very high. Conversely, if expectations in the environment are very low, or if there are no expectations at all (such as in laissez-faire parenting), then challenge may be lacking, and boredom may result unless the individual is able to create challenges themselves.

Autonomy support implies to create environments that offer a range of opportunities, thus making it possible to self-select tasks that meet competencies and increase a sense of control. For example, if students are provided with multiple tasks among which they can choose, then boredom may be prevented, especially if task selection is eased by teachers' guidance and scaffolding (see Tvedt et al., 2021, for negative relations between autonomy support and boredom). Finally, *feedback* about one's actions and their outcomes, such as feedback about achievement conveyed by school grades, can change control perceptions and resulting boredom (for supporting evidence, see Forsblom et al., 2022). Repeated failure feedback can reduce perceived control to the extent that no chances to succeed are seen anymore, which can create hopelessness if success is still perceived as desirable, but boredom if the task domain is devalued and becomes meaningless due to lack of control.

Factors that influence value include value messages, need fulfillment, and outcome contingencies. *Value messages* – or value induction – can be direct or indirect. Direct messages consist of information about values, such as parents' instructions about desirable behavior. However, often indirect messages as implied by the behavior of role models are more powerful. An especially important mechanism underlying such effects is emotional contagion (Herrando & Constantinides, 2021). Emotions can be directly transmitted between persons through contagion, such as teachers' enthusiasm immediately sparking excitement in students, thus preventing boredom (Pekrun, Marsh, Elliot, et al., 2023). Similarly, it is sensible to assume that displays of boredom in the environment can immediately cause boredom (see also Tam et al., 2020).

Need fulfillment and *outcome contingencies* influence perceptions of the intrinsic and extrinsic values of actions. If environments ease actions that fulfill needs for competence, autonomy, and relatedness (Ryan & Deci, 2017), then these actions become valuable, thus preventing boredom. From a theory perspective, this is a point where CVT and self-determination theory meet: Self-determination theory explains the generation of value; CVT explains how value generates emotions. Relevant factors include all situational contingencies and behaviors of others that make it possible to fulfill one's needs. Of special importance is the cognitive quality of environments that makes it possible to fulfill needs for competence and cognitive stimulation (Pekrun, Marsh, Elliot, et al., 2023); the variety of opportunities provided which helps fulfill needs for autonomy; and social affordances in the environment that are suited to fulfill needs for relatedness.

From these propositions, it follows that some features of social environments influence perceptions of both control and value. An example are factors that help fulfill needs for competence and autonomy. Helping persons to develop competencies supports them to develop a sense of control. At the same time, increased competencies may open doors to select tasks and environments that are stimulating and meet one's aspirations, thus promoting a sense of value. Similarly, if environments provide a range of options for task selection, then needs for autonomy, a sense of control, and selection of personally valuable options can be promoted at the same time, thus enhancing both control and value.

Consequences of Boredom

How does boredom influence behavior and performance? To explain the impact of emotions, the cognitive-motivational model of emotion effects that is part of CVT can be used (Pekrun, 2006; Pekrun, Marsh, Elliot, et al., 2023). This model proposes that it is not sufficient to only consider valence and distinguish between positive and negative emotions (or affect). Rather, it necessary to also consider level of arousal and object focus of emotions. Considering valence and arousal makes it possible to distinguish between four broad groups of emotions: *positive activating* (e.g., excitement, hope, pride); *positive deactivating* (e.g., relief, contentment, pleasant relaxation); *negative activating* (e.g., anger, anxiety, shame); and *negative deactivating* (e.g., boredom, hopelessness). Additionally considering object focus makes it possible to distinguish between discrete emotions within these four categories. For example, both enjoyment of learning and

pride about resulting success are positive activating emotions – however, enjoyment focuses attention on the activity, whereas pride about success relates to an outcome of the activity. All three dimensions (valence, arousal, and object focus) combined render a three-dimensional taxonomy of emotions (see Pekrun, Marsh, Elliot, et al., 2023, for achievement emotions, and Pekrun 2021, for human emotions more generally). Within this taxonomy, boredom can be classified as a negative, low-arousal emotion focused on the current situation or activity.

The model proposes that these different emotions can impact behavior and performance through various mediating mechanisms. According to the model, prime mechanisms include the following. First, by focusing attention on the object of emotion, emotions impact *working memory resources* available for behavioral performance. Positive emotions related to the task focus the available resources on performing the task, such as enjoyment of climbing a mountain making it possible to fully concentrate on each single step. In contrast, task-irrelevant emotions focus attention away from the task, such as pride about an award distracting from current task performance, or anxiety focusing attention on worries about possible failure.

Second, emotions influence *intrinsic and extrinsic motivation* to initiate and perform actions. Activity-related emotions are thought to impact intrinsic motivation, outcome emotions are expected to trigger extrinsic motivation. Third, emotions change the *mode of information processing.* Based on mood-as-information approaches (Schwarz & Clore, 2003), it is assumed that positive emotions enhance flexible, creative thinking and a broad activation of memory networks. Negative activating emotions like anxiety are expected to promote more rigid, detail-oriented ways of thinking and a focused activation of memories. Negative deactivating emotions are thought to undermine any more systematic and effortful processing of information. Finally, emotions impact *ways to regulate behavior*. Positive task-related emotions like enjoyment are thought to promote self-regulation. Setting goals, monitoring behavior, and evaluating outcomes in a self-directed way requires flexible thinking that is responsive to task demands, which is eased by positive emotions. In contrast, anxiety can prompt motivation to rely on external guidance to avoid negative outcomes, thus promoting external regulation.

How does boredom influence these mechanisms, and what are the resulting outcomes? First, boredom draws attention away from the current activity (Eastwood & Gorelik, 2019). Instead, attention is invested in daydreaming and mind wandering, thus reducing the resources available for task performance. Second, boredom prompts motivation to leave the current situation and instead turn to more rewarding activities (Bench & Lench, 2013). Boredom is especially detrimental to intrinsic motivation. Third, as negative deactivating emotions more generally, boredom is likely to reduce any systematic processing of task information and focused use of behavioral strategies. Fourth, by implication, boredom is also likely to reduce task-related self-regulation.

The impact of boredom on the four mechanisms combined amounts to negative effects on current task performance (for supporting evidence, see, e.g., Haager et al., 2018). Distracted attention, lack of intrinsic motivation, and shallow information processing do not promote performance.

However, as we posit in our "abundance hypothesis" (Goetz et al., 2022), the strength of these negative effects may depend on type of task. Specifically, performance on easy tasks that require few cognitive resources may be less affected by negative resource consumption than performance on difficult or complex tasks. For easy tasks, even reduced resources may still be abundant relative to task demands. For difficult and complex tasks, resource consumption through daydreaming and mind wandering may be devastative for task performance, similar to the resource consumption effects of emotions like anxiety, shame, or hopelessness that are due to worrying about negative outcomes (Derakshan & Eysenck, 2009; Mikels & Reuter-Lorenz, 2019).

From this perspective, the negative activity emotion boredom undermines performance through attentional mechanisms that are functionally similar to the mechanisms prompted by negative outcome emotions. The contents of task-irrelevant thinking are different (typically positive daydreaming in boredom; negative thinking in anxiety, shame, or hopelessness), but the functional pathway impacting performance is the same. Nevertheless, even with easy tasks, the negative motivational effects of boredom should reduce overall performance on these tasks as well.

However, in contrast to immediate negative effects on current task performance, boredom can have positive effects on subsequent tasks and long-term performance (see also Danckert & Eastwood, 2020; Westgate, 2020). Boredom can induce strong motivation to engage in alternative thinking and alternative tasks. As such, although thoughts drifting away from the current task do not enhance current performance, they can enhance overall creative performance in a series of activities (e.g., Mann & Cadman, 2014). The precondition for such positive effects is autonomy to select and modify tasks. In situations providing such autonomy, boredom may unfold positive long-term effects, such as creative artwork or scientific discoveries driven by initial boredom and enabled by the artists' or scientists' freedom to self-define tasks.

In restricted situations not providing such freedom, we expect boredom to be detrimental to overall performance. This view is supported by the extant evidence. The link between students' boredom and their academic achievement is a case in point. In current education systems, students don't have much of a choice over academic tasks; consequently, students' boredom relates negatively to their achievement. In the meta-analysis by Camacho-Morles et al. (2021), the true-score correlation between boredom and academic achievement averaged across 66 independent effect sizes (total sample size: 28,410 students) was $\rho = -.25$.

Furthermore, longitudinal evidence indicates that this correlation is due, in part, to effects of boredom on achievement over time. For example, in a study of university students' boredom during a two-semester course, Pekrun et al. (2014) showed that boredom negatively predicted students' performance on course tests, controlling for autoregressive effects and possible confounders. Similarly, secondary school students' boredom predicted their achievement in mathematics, both in between-person analysis using classic cross-lagged panel modeling (Pekrun et al., 2017; see also Lichtenfeld et al., 2022), and in within-person analysis using Hamaker et

al.'s (2015) random-intercept cross-lagged panel model (RI-CLPM; Pekrun, Marsh, Suessenbach, et al., 2023).

Reciprocal Causation and Boredom Regulation

CVT proposes that emotions impact motivation and action, but that actions and their outcomes reciprocally influence the appraisals and environmental factors generating emotions (Figure 1). As such, emotions, outcomes, and antecedents are thought to be linked by reciprocal effects. For boredom, reciprocal effects can involve both positive feedback loops (two variables A and B positively influencing each other) and negative feedback loops (effects in the two directions bearing opposite signs, such as A negatively influencing B, but B positively influencing A; see also Tam et al., 2021). For example, boredom can reduce performance, and resulting failures can further increase perceptions of lack of control and value that instigated boredom in the first place. This type of feedback loop implies a vicious circle that can exacerbate boredom and low performance over time, thus undermining positive developmental trajectories (see Pekrun et al., 2014; Hunter & Eastwood, 2021). Alternatively, if boredom stirs motivation to change direction in productive ways, the long-term effects of boredom on outcomes can be positive; these positive outcomes, in turn, can strengthen perceptions of control and value, thus reducing the likelihood of future boredom.

Importantly, the feedback processes linking emotions, outcomes, and antecedents make it possible to regulate and treat emotions by targeting any of the elements involved in these cyclic processes. Considering Gross's (2015) model of emotion regulation as well as perspectives from CVT, four especially important groups of regulatory processes include the following (Figure 1; Pekrun & Stephens, 2009). First, it is possible to upregulate adaptive emotions and downregulate maladaptive emotions by appropriately selecting and modifying situations (*situation-oriented regulation*). Second, emotions can be managed by changing one's thinking and the direction of attention (*attention- and appraisal-oriented regulation*). Third, emotions can be regulated by directly changing one or several of their component processes (*emotion-oriented regulation*). Finally, emotions can be influenced by increasing one's competencies and behavioral repertoire (*competence-oriented regulation*), which facilitates successful action and all the positive appraisals and emotions resulting from success.

Strategies from these four groups can also be used to regulate and treat boredom. As far as the context allows, selecting non-boring situations or modifying situations such that they are less boring (Sansone et al., 1992) are especially promising ways to fight boredom. If it is possible to select or modify the situation such that joy and excitement are stirred, then boredom can be extinguished immediately, and if the selected situation continues to provide sufficient stimulation and meaning, then the fight against boredom can prove sustainable. An example is gifted students who may experience new and continuous challenges when changing from regular to gifted classrooms. Similarly, increasing one's competencies can generate multiple benefits that can help to counter boredom. With increased competencies, it is easier to select and change situations in personally satisfying ways. Changing appraisals is promising as well, especially if

modified perceptions of control or value are backed by the situation. In contrast, it is likely more difficult to directly change components of the boredom experience, such as suppressing task-irrelevant thoughts. As with regulation of other emotions, it is overall more promising to change antecedent processes rather than wanting to reduce the emotions once it was instigated.

Existing models of coping with boredom fit nicely with this view. Specifically, Nett and colleagues have adapted models of coping with stress to explain how boredom can be regulated (e.g., Nett et al., 2010). Four types of coping are distinguished: Cognitive approach – changing one's perception of the situation; cognitive avoidance – focusing on thoughts not related to the situation; behavioral approach – taking actions to change the situation; and behavioral avoidance – taking actions not related to the situation (see also Tam et al., 2021). Cognitive approach and avoidance coping represent appraisal-oriented and attention-related regulation, respectively. Behavioral approach and avoidance coping represent situation modification, either by changing features of the situation itself, or by redefining the situation in terms of pursuing alternative actions.

Relative Universality of Boredom

CVT posits that the basic mechanisms linking emotions to their antecedents and outcomes are universal, with few exceptions (young infants; persons with diseases of the central nervous system). From CVT propositions, it follows that overchallenge, underchallenge, and lack of value should universally instigate boredom – across persons, genders, ethnicities, cultures, etc. If also follows that boredom should universally reduce immediate performance on cognitive tasks (for the universality of boredom-achievement links, see Camacho-Morles et al., 2021), and that it can generally be managed using the regulatory strategies outlined earlier. In contrast, the contents, distributions, and process parameters (such as intensity and decay rates) of boredom and other emotions are thought to vary across persons, domains, and socio-cultural contexts. It is this combination of universality and diversity that is called "relative universality" in CVT (Pekrun, 2009, 2018; Pekrun & Goetz, in press).

Specifically, to the extent that boredom-generating appraisals of control and value across persons and contexts, frequency and intensity of resulting boredom should vary as well according to CVT. Related evidence is sparse, but the few existing studies support this contention (Pekrun & Goetz, in press). For example, Goetz et al. (2007) have shown that students' boredom shows zero or weak correlations across academic domains, such as boredom in mathematics versus language classes. This finding implies that levels of boredom can vary substantially across domains – we cannot infer from students' boredom in math if they are bored in English classes, and vice versa. Boredom can also differ between genders (e.g., de Oliveira et al., 2021; Pekrun et al., 2010; Spaeth et al., 2015). Similarly, given that perceptions of control and value can differ substantially across cultures, it is to be expected that levels of boredom differ as well. For example, Ng et al. (2015) have shown that higher levels of boredom were reported by European Canadians than by Chinese participants.

Implications for Practice and Future Directions

From the CVT propositions on antecedents and ways to regulate boredom, recommendations how to prevent or reduce boredom can be derived. Beyond individual coping, treatment interventions and practices in education, work, sports, and arts could use the same set of regulatory strategies as outlined earlier. Changing environments and tasks in boredom-preventive ways and supporting individuals in increasing their competencies may be especially promising. As discussed in the section on situational antecedents, suitable measures may include adapting task demands and expectations, sharing enthusiasm rather than boredom, and fulfilling needs for cognitive stimulation, competence, autonomy, and relatedness. However, directly targeting control and value appraisals may also be promising, especially for boredom-prone individuals who suffer from this emotion despite favorable situational circumstances.

Multimodal approaches combining several methods may be particularly helpful, especially if there are problems with several of the presumed cognitive and situational antecedents of boredom. For example, if a student attends demanding classes and suffers from a perceived lack of control triggering boredom, then selecting less demanding classes, increasing competencies through skills training, and modifying perceptions of control may help reduce boredom. Suitable treatment interventions are available, such as behavioral training to increase skills, attributional retraining changing perceptions of control (Perry et al., 2014), or utility value interventions changing perceptions of value (Lazowski & Hulleman, 2016).

Although these recommendations are theoretically well grounded, it is important to note that cumulative, consistent evidence on antecedents, outcomes, and treatment of boredom is still largely lacking. This stands in contrast to the wealth of evidence on other major negative emotions, such as anger or anxiety. Whereas some of the propositions outlined in this chapter found strong support, such as the proposed negative relations between boredom and achievement, others still await empirical scrutiny. Furthermore, even for relations of boredom with other variables that are well established, evidence on the causal effects generating these links is sparse. For example, from the few existing longitudinal studies on the effects of boredom on achievement, we cannot firmly conclude that boredom affects achievement in the same way in different persons, settings, and socio-cultural contexts.

Three lines of research may be especially important to further test CVT propositions and make headway in this field. First, we need more experimental evidence on boredom that is ecologically valid, beyond findings from artificially constrained situations that are typically used in the laboratory. Lab research can be extremely helpful in generating hypotheses and evidence on possible causal links, but cannot replace an analysis of boredom in the real world. To an extent, however, it may be possible to bring the real world into the lab by creating experimental settings that resemble natural environments. An example is experimental variation of technology-based learning environments to investigate boredom during learning (see, e.g., Azevedo et al., 2022).

Second, we need more field-based research that captures the dynamics of boredom, as well as links with antecedents and outcomes, over time and across populations and contexts. Such research can include short-term studies with high granularity to assess boredom within single situations, days, or weeks, as well as long-term studies tracing the development of boredom across the life course. To increase the validity of dynamic assessments, it would be important to consider various channels of emotion assessment, including self-report but also indicators derived from expression analysis, physiological parameters, or behavioral trace data.

Finally, research is needed on how to design treatment interventions and change practices across settings to prevent or reduce boredom. The motivation interventions cited earlier, such as attributional retraining and utility value intervention, could be evaluated for their effects on emotions, including boredom. Similarly, existing treatments for anxiety and depression could be evaluated for effects on boredom. In the same vein, field-based research should investigate the benefits of changing practices in education, work, and sports to reduce boredom and instead spark enthusiasm, enjoyment, and the ensuing benefits for human development and the society at large.

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Figure 1

Control-Value Theory and Boredom: Overview of Propositions