# Academic Boredom

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**Abstract**

In this chapter, we discuss academic boredom, that is, boredom that manifests itself in academic settings. We start by defining academic boredom and discussing how it can be assessed. We show that academic boredom is an area that has been growing rapidly over the past 10 years. Empirical evidence of the high prevalence of academic boredom among students and teachers is presented. We also provide an overview of theoretical considerations and empirical findings on the antecedents (e.g., over- or under-challenge, lack of value) and consequences of academic boredom (e.g., negative achievement outcomes), as well as relevant conceptual frameworks and findings on how to most effectively cope with academic boredom (e.g., cognitive approaches, such as changing the perception of the situation). Implications for educators in terms of preventing and reducing academic boredom are then presented, such as increasing students' perceived value of academic tasks and content by emphasizing the relevance of classroom activities to students' daily lives. Finally, future directions in research on academic boredom are outlined, such as research on test boredom or the development of intervention programs to reduce boredom in students and teachers.

Keywords: boredom, education, achievement, student, teacher

## Academic Boredom

Research on academic boredom is a flourishing field in psychology and education. To illustrate this growing research interest, we provide an overview on the frequency of the respective publications throughout the $20^{th}$ and $21^{st}$ century in psychological and educational research. To identify the number of publications on academic boredom, we conducted a literature search using PsycInfo and ERIC. Boredom-related publications were narrowed down to the academic setting using the search term "boredom AND (academic OR school* OR universit*"; in the title or abstract). Publication counts displayed in Figure 1 are plotted in 10-year periods, whereas publication rates are presented as the number of academic boredom-related papers per 10.000 publications to correct for the general increase of publications over time. For example, there are 2.1 million entries listed in PsycInfo and ERIC (without duplicates) from 2013 to 2022. Out of these entries, 529 entries refer to academic boredom. As such, 2,4 papers out of 10 000 papers published between 2013 and 2022 refer to academic boredom (i.e., 529 / 2.170.452 * 10.000 = 2,4).

A strong and continuous overall increase in the relative number of publications over time can be observed for publications on academic boredom. This observation can partly be explained by some of the major accomplishments in research on academic boredom, namely, the theoretical anchoring and operationalization of academic boredom. The control-value theory of achievement emotions (CVT; 2006, 2018, 2021) was first presented in 2000. The most commonly employed measures of academic boredom, namely the class- and learning-related boredom scales of the Achievement Emotions Questionnaire (AEQ; Pekrun et al., 2011), were published in 2011. These developments may have served as accelerators of research on academic boredom. Additionally, since the end of the $20^{th}$ century, more attention has been given to emotion-related concepts such as affective engagement and well-being in school, as well as students' experience of discrete emotions (see, e.g., Camacho-Morles et al., 2021; Pekrun et al., 2002; Reschly & Christenson, 2022).

In addition, the growing research interest in academic boredom can be due to the following reasons (see below for details): (1) evidence of the high prevalence of academic boredom, (2) its negative effects on achievement outcomes and health, and (3) the awareness of the need to find ways to reduce academic boredom. In summary, the combination of boredom's high prevalence and its negative consequences calls for an in-depth examination of the topic by all educational stakeholders.

## Definition of Academic Boredom

Boredom experienced in academic settings can be referred to as academic boredom. This characterization is in line with the general definition of academic emotions; a term used to describe emotions experienced in relation to learning, attending classes, and taking tests and exams across academic settings and instructional situations (Pekrun et al., 2002). For example, academic boredom can be experienced during learning activities, such as homework completion or classroom exercises. It can also be experienced by both students and teachers. Whereas research on students' boredom has proliferated, teachers have been the focus of boredom research to a very limited extent. Boredom in the context of learning and academic achievement touches upon many aspects of our daily lives, considering how often we find ourselves in academic contexts, such as schools, universities, continuing education, driving schools, or adult education. Especially with the increasing emphasis on lifelong learning, academic boredom has become an emotion that can occur across the entire lifespan.

In research on academic emotions, groups of emotions have been identified that differ in their object focus (i.e., the activities, situations, and content areas to which they refer; Pekrun et al., 2017). *Achievement boredom* occurs in relation to achievement-related activities (i.e., solving a math task, or memorizing vocabulary; Camacho-Morles et al., 2021) and their success and failure outcomes (e.g., getting the task right, or failing to remember the correct translation). *Epistemic boredom* has recently attracted researchers' attention (Muis et al., 2018; Pekrun & Stephens, 2012). The term "epistemic" refers to cognitive activities aimed at acquiring and generating knowledge. Thinking, however, is not just based on pure cognitive reasoning alone ('cold cognition'). Rather, it is closely tied to emotions that relate to the knowledge-processing qualities of cognitive activities. A prototypical situation for the occurrence of epistemic boredom is processing information that is already known and that may not be perceived as inspiring or interesting. In other words, non-discrepant information and cognitive congruence are likely to elicit epistemic boredom. Epistemic boredom may also arise if cognitive incongruency during knowledge acquisition cannot be resolved (Pekrun et al., 2017). *Social boredom* refers to academic boredom which occurs in social contexts. For example, social boredom can arise during interactions with classmates (e.g., group work) and teachers. Finally, there is *topic boredom*, that is, boredom which is triggered by the specific contents of a learning task (Pekrun & Linnenbrink-Garcia, 2014). In contrast to achievement and epistemic boredom, topic boredom does not directly pertain to learning and problem solving, and is much narrower and purely content-specific. One example is learning about a topic that seems completely irrelevant to one's own life.

Regardless of the specific object focus of boredom, it can be assumed that the experience of boredom is quite similar across these contexts. There are numerous approaches to characterizing this experience (Kleinginna & Kleinginna, 1981). The component process model of emotions (Scherer, 2000; Scherer & Moors, 2019) integrates different definitional approaches and is often used in research on academic boredom. The model suggests that emotions are best understood through considering them as episodes that consist of interrelated psychological processes including affective, cognitive, motivational, physiological, and expressive components. From this perspective, we propose that boredom is a unique emotional experience consisting of five dynamically interacting components (see Figure 2): *affective* (e.g., unpleasant, aversive feelings), *cognitive* (e.g., altered perceptions of time, mind-wandering), *motivational* (e.g., desire to withdraw from the situation or change the activity), *physiological* (e.g., low arousal), and *expressive* (e.g., vocal, facial, postural expressions; Pekrun et al., 2010). Empirical findings on academic boredom (and other academic emotions) generally support this view. They show that the components of boredom (and other academic emotions) can be separated empirically and that they can also be combined into one overarching boredom factor (e.g., Goetz et al., 2022; Pekrun et al., 2011).

Research has also examined the conceptual dimensions underlying the experience of boredom. In the circumplex model of affect (Russell, 1980; see also Petrolini & Viola, 2020; Watson & Tellegen, 1985), emotional states are defined in terms of two orthogonal dimensions: Valence (positive/ pleasant to negative/ unpleasant) and arousal (low to high physiological activation). Boredom is consistently classified as an unpleasant emotional state of negative *valence* (e.g., Fisher, 1993; Pekrun et al., 2010; Perkins & Hill, 1985; Van Tilburg & Igou, 2017a). Although this assumption is supported in the literature (e.g., Goetz, Frenzel, & Pekrun, 2007), research regarding the *arousal* dimension of boredom is inconsistent. For example, whereas several studies classify boredom as a low arousal emotion (e.g., Van Tilburg & Igou, 2017a), others suggest the opposite (e.g., Berlyne, 1960; Ohsuga et al., 2001), or that boredom involves mixed arousal (Danckert et al., 2018; Merrifield & Danckert, 2014). Thus, there is an ongoing debate about how to best understand this emotion in relation to arousal (Pekrun et al., 2010).

One explanation for these contradictory findings is that arousal is not clearly defined and may be multidimensional in nature, with different assessments capturing only specific elements (see Schimmack & Reisenzein, 2002; Watson et al., 1999). Another possibility is that boredom is not ideally represented as a unitary construct, but is better understood as an umbrella term that encompasses different "types" of boredom. In line with this proposition, an empirical study by Goetz, Frenzel et al. (2014) found support for different types of academic boredom that can be differentiated based on the underlying dimensions of valence and arousal: (1) "*indifferent boredom*" (relaxed, withdrawn, indifferent) with a slightly positive valence and very low arousal; (2) "*calibrating boredom*" (uncertain, receptive to change/distraction) with a slightly negative valence and low arousal; (3) "*searching boredom*" (somewhat restless, active pursuit of change/distraction) with a slightly negative valence and medium arousal; (4) "*reactant boredom*" (highly restless and motivated to leave the situation) having a high negative valence and high arousal; and (5) "*apathetic boredom*" (highly aversive) characterized by a high negative valence and very low arousal.

It is important to note that the *average* levels of valence and arousal when experiencing academic boredom reflect the traditional classification of boredom in the circumplex model (i.e., unpleasant emotional state, negative valence, and low arousal). Although this classification may be useful in identifying a prototypic boredom experience, Goetz, Frenzel et al. (2014) argue that this prototype is more accurately understood as a composite construct averaging across disparate types of boredom that vary in valence and arousal. However, it is important to note that the prototypical experience of boredom (e.g., negative valence, low arousal) appears to be the most commonly experienced type of boredom. Follow-up studies in the academic context are in line with the proposal that different types of boredom might exist (e.g., Tempelaar & Niculescu, 2022).

## Assessment of Academic Boredom

Academic boredom has primarily been assessed through interviews (e.g., Farrell et al., 1988; Goetz, Frenzel, & Pekrun, 2007; Kanevsky & Keighley, 2003) and standardized self-report scales (e.g., Daschmann et al., 2011). In addition to single-item measures (e.g., Geiwitz, 1966; Gjesme, 1977; Perkins & Hill, 1985; Shaw et al., 1996), self-report research has increasingly utilized multi-item scales to assess various facets of academic boredom (see Table 1; for detailed descriptions of existing measures see the review by Vodanovich & Watt, 2016). The most commonly employed measures of academic boredom are the boredom scales included in the *Achievement Emotions Questionnaire* (AEQ), which are based on the component approach to academic boredom outlined above (Pekrun et al., 2011; sample item: "*I get so bored I have problems staying alert*" – physiological component). A short version of the AEQ, the AEQ-S, that includes two four-item scales measuring class-related and learning-related boredom has been recently developed (Bieleke et al., 2021). Domain-specific versions of the AEQ have also been developed to examine boredom in different subject areas (sample item: "*I can't concentrate in* [DOMAIN] *class because I am so bored*"; for the AEQ-M, a math-specific version, see Bieleke at al., 2022; for a version for civic education see Graf et al., 2022). Further, the AEQ, including the boredom scales, was adapted to be used in different cultural contexts and translated into more than 20 languages (e.g., the Filipino AEQ, King, 2010; the Italian AEQ, Raccanello, 2015) as well as modified for different age groups, for example, for elementary school students (AEQ-ES, Lichtenfeld et al., 2012) and pre-adolescents (AEQ-PA, Peixoto et al., 2015). Descriptive statistics for the AEQ, the AEQ-S and the AEQ-M boredom scales and empirically observed relations with other academic variables (e.g., emotions, self-concept, achievement) are reported for elementary school students (Lichtenfeld et al., 2012), high-school students (Bieleke et al., 2022; Goetz et al., 2010), and university students (Bieleke et al., 2021; Pekrun et al., 2011).

It is important to note that existing instruments such as the AEQ do not measure boredom during tests and exams. There is generally a lack of research on test-related boredom, probably because it is counter-intuitive to think of tests as being boring. However, Goetz et al. (2022) recently developed scales assessing test-related trait and state boredom (Test Boredom Scale - Trait, TBS-Trait; Test Boredom Scale - State, TBS-State). In two studies that used these instruments, they showed that boredom can occur during tests and is related to proposed antecedent and outcome variables. Three additional studies in which test boredom was assessed also documented significant levels of test boredom in students (Bieleke et al., in press; Goetz, Frenzel, & Pekrun, 2007; Raccanello et al., 2019).

Although the current chapter primarily focuses on academic boredom from the vantage point of students, it is important to recognize that boredom can also be experienced by teachers. There is a lack of scales and studies on teachers' boredom ─ probably as it is also counter-intuitive that teachers would experience boredom during teaching (which they often do; see below). The Teacher Emotions Scales (TES; Frenzel et al., 2016), probably the most widely used scale for the assessment of teachers' emotions, measures teachers' enjoyment, anger, and anxiety, but not their boredom. To our knowledge, there are only three studies that assessed teacher boredom with multi-item scales (Donker et al., 2020; Erturk et al., 2022; Goetz et al., 2015). These studies used items that were adapted from the AEQ and the TES.

## Frequency of Students' and Teachers' Boredom

International research has consistently found boredom to be one of the most frequently experienced academic emotions worldwide (e.g., U.S.: Csikszentmihalyi & Larson, 1984; Asia: Won, 1989; Europe: Goetz, Frenzel et al., 2014; Africa: Vandewiele, 1980). Findings have also shown that children and adolescents experience boredom more often in academic than in non-academic contexts (e.g., for adults see Chin et al., 2017). An example of a study that shows how often boredom occurs in school is Larson and Richards' (1991) experience-sampling study of 5th and 9th grade students. They found that boredom was experienced 32% of the time in class. Similarly, Goetz, Frenzel and Pekrun (2007) reported that 9th grade students were bored almost half of the time during class. Research on older students yielded similar findings. Using real-time data collection methods, Nett et al. (2011) showed that 11th grade students were bored 58% of the time during math classes. Hence, academic boredom appears exceptionally pervasive.

In a study by Goetz and Nett (2012), university students were asked how strongly they experienced specific academic emotions (i.e., learning and achievement settings, retrospective questionnaire, Likert scale: (1) *not at all* to (5) *very strongly*). They found mean levels of 3.02 for boredom, 2.90 for anxiety, and 3.30 for enjoyment, showing boredom to be experienced just as intensively as anxiety. With respect to boredom across disciplines, a study with German 8th and 11th grade students examined boredom, anxiety, and enjoyment in the domains of German (native language), mathematics, physics, history, and music (for dataset information, see Haag & Goetz, 2012). In each subject domain, mean boredom levels were above the scale midpoint and higher than enjoyment and anxiety levels. A recent study by Goetz et al. (2022) with high school students (8th graders in Study 1; 5th to 10th graders in Study 2) showed that boredom occurs even in testing situations (i.e., low stakes mathematics tests). The mean level of test boredom assessed via single items was 1.91 for 8th graders (Study 1) and 1.81 for 5th to 10th graders on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*very strongly*), and from 1 (*strongly disagree*) to 5 (*strongly agree*), respectively. In sum, studies across different domains, school levels, and ability levels (e.g., high achievers) consistently show high levels of academic boredom across academic settings and school situations (e.g., Bieleke et al., 2021; Goetz et al., 2020; Schwartze et al., 2020, 2021). It is important to note that empirical findings clearly indicate that academic boredom (like all other academic emotions) is largely organized in a domain-specific manner (e.g., Goetz, Frenzel, Pekrun et al., 2007), which means that the intensity of experiencing boredom can differ greatly across academic domains.

Research on the prevalence and intensity of teachers' boredom is largely lacking (Frenzel et al., 2016). However, recent studies suggest that boredom is also frequently and intensely experienced by teachers. Findings from Donker et al.'s (2020) and Goetz et al.'s (2015) studies indicate that teachers report relatively high levels of boredom during teaching, which seem to be higher than their levels of anxiety (Goetz et al., 2015) and anger (Donker et al., 2020; however, different items were used within these studies to assess different emotions, so the means cannot be directly compared). Repetitive marking is another source of boredom, and assignments marked later in a sequence can incur lower marks as a result of the mounting boredom that the markers face (Erturk et al., 2022). Further, in qualitative interviews with teachers, boredom has also been reported. For example, in a study by Khajavy et al. (2018), teachers named demotivated and uncollaborative students as a key reason for their boredom in the classroom.

## Antecedents of Academic Boredom

In considering the potential antecedents of academic boredom, six theoretical models are of particular importance (see Figure 3). Two of these models relate directly to learning and performance situations, namely (1) Pekrun's (2006, 2018, 2021) control-value theory (CVT) and (2) Robinson's (1975) model. The other four models relate to the individual experience of boredom in general, namely the model of (3) Hill and Perkins (1985), (4) the attentional model of boredom by Eastwood et al. (2012), (5) the pragmatic meaning-regulation model by Van Tilburg and Igou (2011, 2019) and (6) the meaning and attentional components model of boredom (Westgate & Wilson, 2018). In addition, antecedent variables (e.g., isolation) that have been identified as predictive of boredom in scattered empirical studies are also informative (e.g., Fisher, 1993).

*(1) The Control-value theory.* CVT (Pekrun, 2006, 2018, 2021) posits that individuals' perceptions of personal control and value concerning achievement activities and outcomes represent the most important cognitive antecedents of boredom in achievement settings. More specifically, an interactive effect of both variables on boredom is hypothesized, implying that specific levels of both control and value (as detailed below) trigger boredom. However, it is important to note that until now most studies of the control-value antecedents of boredom did not consider this proposed interaction (for exceptions, see Goetz et al, 2010; Putwain et al., 2018; Shao et al., 2020).

*Perceived control* refers to an agent's perceived causal influence over actions and outcomes (Skinner, 1996). CVT further posits that the relation between perceived control and boredom is curvilinear. Higher levels of boredom are expected when perceived control is very low or very high, and less boredom is expected when perceived control is at an intermediate level. In other words, it is proposed that boredom is most likely to occur when a learning or achievement task is not sufficiently challenging (high control), or conversely, when task demands exceed capabilities (low control; for empirical evidence, see, e.g., Acee et al., 2010; Krannich et al., 2016). However, rather than the predicted curvilinear relation, variables indicating perceived control (e.g., self-concept, self-efficacy) were typically found to show a negative linear (or at least monotonic) relation with boredom (Forsblom et al., 2021; Pekrun et al., 2010, in press; see also Goetz & Hall, 2020). This might reflect the fact that tasks at school and university are designed to represent challenges that promote learning (i.e., tasks that are not too monotonous or easy to solve); thus, rarely generating very high levels of control. However, a recent experimental study showed that boredom can in fact occur both in situations of very high and very low control (Struk et al., 2021). Similarly, recent research on being over- and underchallenged as indicators of low and high levels of control indicates that both over- and underchallenge are positive predictors of boredom, even though they are typically negatively correlated (e.g., Goetz et al., 2022).

*Perceived value* concerns the perceived positive versus negative valence of a learning activity or outcome and their personal relevance (importance). CVT posits that academic boredom is most reliably elicited when achievement activities are perceived as lacking importance or value. The model thus hypothesizes a negative relation between boredom during academic activities and the subjective value of these activities. In this respect, boredom differs from other positive and negative emotions that are assumed to be *more* intensely experienced with increasing importance. To conceptualize value, CVT uses the traditional distinction between intrinsic and extrinsic value. Intrinsic value of an activity implies that the activity is valuable in itself, regardless of any outcomes (e.g., enjoyment of working on the task; Gaspard et al., 2015). Intrinsic value is based on rewarding aspects of the activity, such as interest in the task or flow during task performance, and leads to intrinsic motivation (Ryan & Deci, 2009). In contrast, extrinsic value of an activity is defined as the perceived instrumental value of the activity to attain outcomes (e.g., attaining good grades or a professional position), and underpins extrinsic (instrumental) motivation. Empirically, negative correlations between perceived value (both intrinsic and extrinsic) and boredom have been found (e.g., Goetz et al., 2006; Pekrun et al., 2010, 2011, in press). Value as conceived in CVT is closely related to the concept of meaning that is highlighted in a number of recent studies on boredom (e.g., Fahlman et al., 2009; Moynihan et al., 2021). Both intrinsic and extrinsic value can render an activity meaningful, thereby reducing boredom (see also Van Tilburg & Igou, 2013). Meaning of life has been discussed in the clinical literature on boredom, most notably by Victor Frankl in his writings about logotherapy (e.g., Frankl, 1984).

Concerning more *distal antecedents*, CVT asserts that aspects of the social environment, such as teaching quality or parental support, impact students' perceptions of control and value, thereby influencing their boredom. For example, explaining the value of learning materials to students can be expected to increase their perceptions of value and reduce their boredom. Supporting CVT, recent studies suggest that appraisals of control and value do indeed mediate the effects of teaching quality on students' boredom (e.g., Goetz et al. 2020).

*(2) Robinson's (1975) model of academic boredom.* Robinson's model proposes three critical types of variables that serve as antecedents of academic boredom. The first is the *monotony* of classroom activities, the second is the students' perceived *uselessness* of these activities (cf. perceived value in CVT), and the third is the *social environment* (i.e., home, parents, peers, school, and teachers; cf. social environment in CVT). Thus, there is a substantial overlap with CVT. However, while the monotony of classroom activities is an aspect of the social environment in CVT, it is presented as a separate dimension in Robinson's model and thus given more importance in that model.

*(3) Hill and Perkin's (1985) general boredom model.* The main assumption underlying this model is that boredom is primarily the result of *monotonous situations*. However, the model assumes that this effect is moderated by a) *situational characteristics* (i.e., does the situation allow additional/alternative stimulation), b) *personal characteristics* (e.g., extroverts tend to seek more stimulating activities), and c) *task characteristics* (i.e., some tasks offer more flexibility than others in terms of alternative activities). Thus, this model shares the monotonicity aspect with CVT and Robinson's model, but adds moderators for the relationships between monotonicity and boredom.

*(4) Eastwood et al.'s (2012) attentional model of boredom*. In this model, attention problems are considered as the main antecedents of boredom, which is defined as "the aversive state of wanting, but being unable, to engage in satisfying activity" (Eastwood et al., 2012, p. 483). Three main reasons for such attention problems are outlined: a) chronic weakness of attention systems (e.g., ADHD), b) chronic inability to articulate a satisfying target for engagement (e.g., Alexithymia), and c) chronic hyposensitivity or hypersensitivity to stimulation. Thus, unlike the above models, the focus of the attentional model of boredom is primarily on the learner. It is important to note that, to our knowledge, this model has not yet been tested in studies of academic boredom, although it could be quite useful in this context (e.g., relatively high rates of ADHD in high school and university students). However, quite a few of studies on academic boredom refer to the definition of boredom as presented in Eastwood et al.'s (2012) work (e.g., Tam et al., 2020).

*(5) Van Tilburg and Igou's (2011, 2019) pragmatic meaning-regulation model.* This model emphasizes the role of meaning perceptions in both the unfolding and consequences of

boredom. Based on treatises in philosophy (e.g., Schopenhauer, Kierkegaard, Sartre; see Svendsen, 2005) and early studies of boredom and meaning (e.g., Fahlman et al. 2009), Van Tilburg and Igou propose that boredom arises in response to meaningless (in)activity. Boredom, in turn, is considered a self-regulatory signal that prompts a search for meaningful behaviors. Consistently, studies show that experimentally induced boredom causes people to, for example, bolster meaning-laden ideologies and ingroups (vs. outgroups; Van Tilburg & Igou, 2011, 2016), retrieve meaningful nostalgic memories (Van Tilburg et al., 2013), and pledge charity contributions (Van Tilburg & Igou, 2017b). The pragmatic nature of this process lies in the proposal that in the absence of readily available meaningful action, people are quick to turn to momentary distractions that help to avoid aversive self-awareness (Moynihan et al., 2021).

While the pragmatic meaning-regulation model focuses on meaning appraisal and motivation in particular, it does not maintain that this meaning-regulation is the only or necessarily primary aspect of boredom. Rather, Van Tilburg & Igou (2019) suggest that boredom's link to meaning perceptions and meaningful behavior may represent the expression of a more basic self-regulatory process directed at aiding the pursuit of rewarding goals. Where meaning comes into play is when boredom occurs in the context of the symbolic world that humans created, where basic rewards may be replaced by valuable worldviews. Accordingly, the pragmatic meaning-regulation model attempts to explain boredom's role when acting in reference to the broader cultural landscape.

The pragmatic meaning-regulation model shares an essential assumption with CVT: meaning is particularly attributed to those activities high in perceived value. Thus, boredom-inducing activities are those that lack perceived value and hence, meaning. Furthermore, research suggests that this relationship is likely qualified by the instrumentality of specific behavior in the pursuit of such goals (Van Tilburg & Igou, 2013; see also Van Tilburg & Igou, 2017b, Study 2), which may hint at the possibility for further integration with the perceived control component of CVT.

*(6) Westgate and Wilson's (2018) meaning and attentional components (MAC) model of boredom*. In this model, two components are outlined as constitutional basis of specific profiles of high and low boredom. Building on the foundational work by Danckert, Eastwood and others who linked boredom to attention failures (e.g., Danckert & Merrifield, 2018; Hunter & Eastwood, 2018; Malkovsky et al., 2012), the first is the "attention" component (i.e., the degree of unsuccessful attentional engagement). This component differentiates a) under-stimulation (demands < resources), b) low-level engagement (low demand + low

resources), c) high-level engagement (high demand + high resources), and d) over-stimulation (demand > resources). Building on prior work linking boredom to meaning and its regulation (e.g., Fahlman et al., 2009; Van Tilburg & Igou, 2011, 2019), the second component is "meaning". This component differentiates a) low meaning (i.e., task is incongruent with valued goals) and b) high meaning (task is congruent with valued goals). Combining both components yields a taxonomy with eight cells (i.e., 4 × 2) depicting the eight different profiles of high and low boredom, like attentional boredom as a combination of overstimulation and high meaning (see Table 2 in Westgate & Wilson, 2018). According to the profiles, specific interventions are suggested (e.g., increasing resources if attentional boredom [i.e., demands > resources, in combination with high meaning] is experienced). To date, this model has received little attention in educational research.

The model shares some similarities with the CVT, as the attention component is related to perceived control and the meaning component to value. Both models posit that low value ─ or meaning ─ elicit boredom. However, there also are differences. The MAC model posits that high meaning (i.e., value) triggers boredom when combined with over- or under-challenge. In contrast, consistently with the existing evidence, CVT proposes that high value does not trigger boredom but other emotions, with different levels of challenge triggering different emotions (e.g., anxiety rather than boredom in situations of over-challenge). The MAC model focuses on boredom only, which may explain why it is oblivious to differential antecedents of different negative emotions.

*Additional antecedents of boredom.* In addition to the antecedent variables outlined above (e.g., perceived control and value), other possible predictors of academic boredom have been proposed as well (see Smith, 1981). These include: *environmental characteristics* (e.g., isolation, lack of alternatives; Fisher, 1993) and *dispositional characteristics* (e.g., boredom susceptibility, age, extraversion; e.g., Farmer & Sundberg, 1986). The *fit* between the two (e.g., suboptimal stimulation, task difficulty that is too high, contents that do not match individuals' interests) has increasingly been a focus in boredom research since the 1980s (e.g., Krannich et al., 2022; O'Hanlon, 1981). Some of these proposed antecedents overlap with those outlined in the preceding theoretical models, other aspects of the social environment (e.g., repeated task interruption), individual differences (e.g., boredom susceptibility), and "fit" (e.g., between interest and task content) represent unique contributions to the boredom literature. To better reflect the combined contributions of existing research on boredom antecedents, a conceptual heuristic is presented in Figure 3.

## Consequences of Academic Boredom

To explain the effects of boredom on performance and the mechanisms underlying these effects, the cognitive-motivational model of emotion effects that is part of CVT (Pekrun, 2006; Pekrun & Linnenbrink-Garcia, in press) can be used as a theoretical framework. The model posits that the effects of boredom on performance are mediated by (1) availability of cognitive resources, (2) motivation, and (3) use of learning strategies, including higher-order self-regulation of learning strategies. It should be noted, however, that motivation and strategies can also be considered educational outcomes in their own right. Regarding motivation, the CVT assumes that boredom is associated with the desire to leave or avoid the situation that triggers boredom. As such, boredom is assumed to impair task-related engagement and persistence. In terms of cognitive resources, boredom is thought to divert attention to other, more rewarding and higher valued pursuits. Thus, boredom is thought to reduce the cognitive resources available for the "boring" task, leading to attention deficits. Finally, boredom is assumed to affect learning strategies and self-regulation by undermining the use of cognitive and metacognitive learning strategies, resulting in superficial information processing. Specifically, boredom is hypothesized to reduce students' use of deep learning strategies (e.g., cognitive elaboration). Boredom is also expected to affect students' ability to regulate their learning in terms of goal setting, selecting cognitive and metacognitive strategies, and monitoring their progress. Given the negative effects of boredom on cognitive resources, motivation, learning strategies, and self-regulation, it is not surprising that boredom is expected to have negative effects on overall academic achievement (Pekrun et al., 2010).

There is an extensive body of empirical evidence documenting negative relations between academic boredom and achievement outcomes across age groups (e.g., elementary, secondary, and university students), research designs (e.g., cross-sectional, longitudinal, and experience-sampling studies), types of analysis (e.g., between- vs. within-person analysis), and academic settings (e.g., classroom, home-based learning, learning in technology-enhanced learning environments). Academic boredom has been found to correlate negatively with academic achievement in primary school (cross-sectionally, see Raccanello et al., 2019; longitudinally, see Putwain et al., 2022). With effects pointing in the same, namely negative direction, secondary school students' academic boredom has been related to academic achievement cross-sectionally (Schwartze et al., 2020) and longitudinally (Pekrun et al., 2017, 2022), and across task domains (Goetz & Hall, 2020). The same pattern has been found for boredom and academic achievement in higher education (cross-sectionally, Daniels et al., 2009; Goetz et al., 2010; longitudinally, Pekrun et al., 2014, in press; Respondek et al., 2017). The existing studies have used between-person analysis (i.e. those who are more bored than others perform worse), but recent evidence documents that within-person relations between boredom and achievement are negative as well (i.e., people perform worse at times that are boring for them; Pekrun et al., 2022).

Meta-analyses corroborated negative relations between boredom and academic performance outcomes. For example, Tze et al. (2016) reported an average effect-size of $r = -.16$ in their meta-analysis for the relations between boredom and achievement. Loderer et al. (2020) reported a small, though significant negative correlation in a meta-analysis of boredom in technology-based learning environments and learning outcomes ($r = -.08$). Although the overall relation seems rather small, the between-study heterogeneity was large (*r*s ranging from -.41 to .24), showing 29 negative as well as 5 positive relations for boredom in TBLEs. Camacho-Morles et al.'s (2021) meta-analysis uncovered interesting moderator effects. The overall true mean-score relation (i.e., correlations corrected for measurement error) between boredom and academic performance was $\rho = -.25$, but the relation varied considerably across studies using different boredom scales (see Table 1; e.g., Achievement Emotions Questionnaire – Mathematics [AEQ-M]: $\rho = -.38$; Epistemic Emotion Scale [EES]: $\rho = -.10$), and between trait ($\rho = -.25$) and state boredom ($\rho = -.19$). However, it is important to note that the observed overall relations between boredom and achievement may be attenuated because easy tasks can trigger boredom due to under-challenge (Krannich et al., 2022), which would imply a positive relation between achievement and boredom. As such, differential effects of boredom resulting from over- vs. underchallenge might be one reason for the variability of relations with achievement (Ahmed et al., 2013; Camacho-Morles et al., 2021; Hamilton et al., 1984; Kass et al., 2001). Indeed, recent studies have confirmed that the effects of boredom due to being over- versus underchallenged can differ significantly. For example, in line with the abundance hypothesis (see below), Goetz et al. (2022) were able to show that boredom due to being overchallenged during an achievement test was negatively related to test scores, whereas boredom due to being underchallenged was not.

Consistent with the aforementioned mediating mechanisms, learning-related boredom has been found to correlate positively with learning-related attention problems (Pekrun et al., 2010, in press) and cognitive errors (Wallace et al., 2003), and negatively with memory performance (i.e., recall; Trevors et al. 2017). Boredom also relates negatively to students' intrinsic motivation (e.g., Pekrun et al., 2014) and motivation to learn (for an experience sampling study see Tam et al., 2020). Students' boredom has also been shown to correlate negatively with their use of deep learning strategies (e.g., Pekrun et al., 2011, in press; Tze et al., 2016) and with self-regulated learning skills, such as goal-setting, perseverance, and decision making (de la Fuente et al., 2020; Pekrun et al., 2010; Pekrun et al., 2011; Tze et al., 2016).

In addition to the hypothesized negative effects of boredom on achievement, CVT proposes that students' achievement reciprocally influences their boredom, with success reducing boredom and failure exacerbating it. As such, boredom and achievement are thought to be linked by reciprocal effects over time. Longitudinal findings showing reciprocal effects that link boredom with achievement outcomes are of special concern, as negative reciprocal effects suggest a "vicious cycle" of boredom and achievement over time (Pekrun et al., 2014). Reciprocal effects have been found using classic cross-lagged panel modeling (Pekrun et al., 2014, 2017), and have been replicated using within-person analysis based on the random-intercept cross-lagged panel model (Pekrun et al., 2022), controlling for critical covariates. As such, from both between- and within-person perspectives, the evidence suggests that boredom negatively influences students' achievement, and that achievement negatively influences boredom, over and above autoregressive effects and the influence of possible confounders.

Vodanovich (2003a) hypothesized that, under certain circumstances, boredom may promote creativity (holistic thinking), self-reflection (e.g., refocusing attention on alternative activities where greater success is possible), innovation (e.g., seeking variety and change), and relaxation (e.g., renewal of cognitive resources, well-being). Some of these aspects could in turn lead to better performance outcomes. Vodanovich's (2003a) hypothesis is consistent with evolutionary research, which suggests that we need to be able to disengage from prolonged exposition to non-rewarding situations (Bornstein et al., 1990). Indeed, an initial study suggested that state boredom may increase subsequent performance on a divergent thinking task, which is often used to assess creativity (Mann & Cadman, 2014). Although this finding could not be replicated on a trait-level (Hunter et al., 2016), boredom proneness (after controlling for various personality traits) was still related to epistemic curiosity and exploration, as potential antecedents of creative performance. However, although beneficial effects of boredom may occur for engagement with subsequent tasks, boredom during a current task is likely to undermine cognitive performance on the task, especially if the task is cognitively demanding and requires full use of available cognitive resources as argued below (see also Haager et al., 2018). Furthermore, possible beneficial effects may be bound to non-constrained situations where individuals can freely choose or change tasks, which is typically not the case in traditional academic settings.

Furthermore, recent research hypothesized that boredom due to being over- vs. underchallenged (see above, antecedents of boredom) might have different effects on achievement outcomes (Goetz et al., 2022; Krannich et al., 2022). In principle, boredom should have a negative influence on mediators of boredom-achievement relations (see above) regardless of being due to under- or overchallenge. However, when being underchallenged, the negative effects of boredom on resulting task performance are likely to be relatively small because even reduced cognitive resources, reduced motivation, and reduced use of effortful learning strategies may still be sufficient to solve the task. In contrast, a reduction in resources elicited by boredom due to being overchallenged should have stronger adverse effects on achievement outcomes. Based on these considerations, Goetz et al. (2022) proposed the "abundance hypothesis" stating that boredom is less detrimental when students feel underchallenged (i.e., when tasks are easy) than when they feel overchallenged (i.e., when tasks are difficult or complex). Further, Krannich et al. (2019) showed that boredom due to being over- vs. underchallenged may have different effects on academic self-concept, with boredom due to overchallenge signalling low ability, and boredom due to underchallenge signalling high ability. Self-concept, in turn, is known to impact important outcome variables, such as achievement and career aspirations (e.g., Guo et al., 2015), further supporting the finding that boredom due to underchallenge may not always undermine achievement.

Finally, academic boredom as an aversive emotion can be assumed to have negative effects on health, especially when experienced frequently and intensely (Schwartze et al., 2021). Although a number of studies outside of the academic context have shown consistent associations between boredom and health problems such as depression, somatic complaints, substance abuse, or obesity and eating disorders, there is a distinct lack of research addressing the potential effects of academic boredom on health.

## Coping with Academic Boredom

In contrast to the extensive literature on coping with stress (e.g., Lazarus & Folkman, 1984, 1987; Skinner et al., 2003) and emotion regulation in general (see Gross, 2015; Harley et al., 2019), surprisingly few studies have examined the strategies individuals use to effectively cope with boredom (Daniels et al., 2015; Nett et al., 2010; Sansone et al., 1992; Strain & Graesser, 2012; Vodanovich, 2003b). Although the most intuitive strategy commonly cited in the boredom research literature is to simply stop the boring activity (Berlyne, 1960; see also Miller & Wrosch, 2007), this response is not always possible (e.g., in school) and can lead to negative outcomes (e.g., achievement deficits).

To address this research gap, Nett et al. (2010, 2011) have explored whether existing models of coping behavior can be effectively applied to academic boredom. A 2 × 2 classification system from stress research by Holahan et al. (1996) was adapted to examine whether boredom could also be differentiated based on two dimensions: (1) strategies that aim to either approach or avoid the situation, and (2) strategies that are cognitive versus behavioral in nature (see Table 2 for this classification system). Examples for each coping strategy include the following responses to the statement "When I am bored in mathematics class…:" (a) "…I make myself aware of the importance of the issue" (*cognitive approach*), (b) "…I ask my teacher for more interesting tasks" (*behavioral approach*), (c) "…I think about my homework or something I have to study" (*cognitive avoidance*), and (d) "…I talk to my classmates" (*behavioral avoidance*).

To explore the applicability of their coping model to academic boredom, Nett et al. (2010) developed the *Coping with Boredom Scale* with a sample of German secondary students (5th to 10th grade) and identified three groups of students based on their reported boredom-related coping strategies. The first group preferred cognitive approach strategies (*Reappraisers*; e.g., bolstering the perceived value of class content), the second group focused mainly on behavioral approach strategies (*Criticizers*; e.g., suggesting more engaging activities to the instructor), and the third group relied primarily on behavioral avoidance (*Evaders*; e.g., engaging in unrelated activities). An analysis of group differences in academic outcomes found that Reappraisers experienced less boredom and had a more adaptive academic profile (e.g., higher levels of enjoyment, more interest, higher achievement value) than the other groups. Follow-up studies have largely replicated these findings in different countries and in university and high school student samples (e.g., Daniels et al., 2015; Solhi, 2021; Tze et al., 2013). In summary, although cognitive avoidance may be a common response to academic boredom, students who instead attempt to cognitively frame boring content as more interesting or important are less likely to feel bored and experience fewer academic difficulties.

Apart from the studies based on Nett et al.'s (2010, 2011) classification of boredom coping, a few other scattered findings are also informative. For example, Harris (2000) found that university students (mean age: 28 years) cope with non-academic boredom mainly by reading (39%), daydreaming (26%), socializing (21%), watching television (20%), physical activity (18%), doing something new (16%), sleeping (15%), organizing (14%), cleaning (10%), listening to music (9%), or studying (7%). With respect to coping strategies for academic boredom, Goetz, Frenzel and Pekrun (2007) found German 9th graders to report coping with boredom in class primarily through distraction (86%), acceptance of boredom (23%), increasing attention to the task (15%), and relaxation (8%).

## Preventing and Reducing Academic Boredom

The theoretical approaches and findings summarized above suggest numerous ways to prevent or reduce academic boredom (see also Linnenbrink-Garcia et al., 2016). Perhaps one of the most promising approaches to minimizing boredom is to *increase students' perceived value of academic tasks and content*, for example, emphasizing the relevance of classroom activities to students' daily lives (see Durik & Harackiewicz, 2007; Hidi & Renninger, 2006; Hulleman & Harackiewicz, 2009; Piesch et al., 2020; Renninger & Hidi, 2016; on the effects of value enhancement on academic boredom, see Held & Hascher, 2022). A number of value interventions are based on Eccles and Wigfield's expectancy-value theory (i.e., the value component of the EVT; Eccles et al., 1983; Eccles & Wigfield, 2020). For example, Gaspard, Dicke, Flunger, Brisson et al. (2015) have shown that it is possible to promote positive value beliefs by setting value-inducing tasks. For example, students should read a total of six interview quotes from young adults describing situations in which mathematics is useful to them and evaluate these quotes based on their personal relevance. In another condition, students were asked to create a list of arguments for the personal relevance of mathematics to their current and future lives and write an essay explaining those arguments. Thus, students had to apply the relevance of mathematics to their own lives.

Similarly, existing research highlights the importance of *appropriately matching task demands to student competencies* in order to maintain optimal student perceptions of academic control (i.e., not being over- or underchallenged; e.g., Krannich et al., 2016; Preckel et al., 2010). *Demonstrating enthusiasm when teaching* has been shown to contribute to student enjoyment ─ an emotion that is incompatible with boredom and should contribute to greater achievement striving (Bieg et al., 2022; Frenzel et al., 2018; Keller et al., 2016; Pressick-Kilborn, 2015; Xu et al., 2014). It is also important to build teachers' diagnostic skills so they can *better identify when students are bored* and consider the underlying causes to better adjust instructional content and activities to reduce boredom. Although there have been no published studies on how accurately teachers can assess their students' boredom, recent research suggests that parents can gauge the intensity and frequency of their children's boredom as well as certain antecedent variables (e.g., lack of interest, degree of underchallenge) with uncanny precision (Nett et al., 2016).

Because teachers are familiar with the learning behaviors and expressed emotions of students in the classroom, they can be expected to be accurate in assessing their students' levels of boredom. Accordingly, intervention efforts could focus on helping students to better recognize and anticipate their own feelings of boredom, as well as *informing students about effective strategies for coping with boredom*. Despite the potential discomfort teachers may experience in recognizing suboptimal instructional or learning tasks, addressing individual differences in students' interests, achievement levels, inevitable mismatches with classroom activities, and specific strategies for reducing boredom can be expected to help students take more responsibility for their feelings of boredom in class and gain more control over their classroom experience and academic development.

## Next Steps in Research on Academic Boredom

Given the cumulative empirical evidence showing that academic emotions (including academic boredom) are primarily organized in a domain-specific manner (e.g., Goetz, Frenzel, Pekrun et al., 2007), domain-specific assessment of academic boredom is strongly recommended to reliably assess boredom in students during academic activities (e.g., in math vs. language classes). Future studies using real-time (state) assessments of academic boredom (i.e., experience sampling methodology; Bieg et al., 2022; Goetz, Haag et al., 2014; Krannich et al., 2022; Larson & Richards, 1991; Nett et al., 2011) are also strongly recommended to reduce bias due to subjective beliefs (see Goetz, Haag et al., 2014; Kahneman, 2011; Robinson & Clore, 2002). The use of more objective measures of academic boredom, such as physiological indicators (e.g., neuroimaging), behavioral observations or facial expression recognition (see Craig et al., 2008; D'Mello & Graesser, 2010; Harley, 2016), are also encouraged to validate findings obtained from self-report research (Pekrun, in press; for research on relations between physiology and self-reported test anxiety, see Roos et al., 2022, and the meta-analysis by Roos et al., 2021).

As noted, empirical findings suggest that the experience of boredom can take different forms and that specific subtypes of boredom can be differentiated along the dimensions of valence and arousal (Goetz, Frenzel et al., 2014; Tempelaar & Niculescu, 2022). Further studies on the prevalence, causes, and effects of *specific types of boredom* are recommended to provide insight into how educators can manage boredom. Cultural and developmental differences (e.g., between elementary school children and older students) in the meaning of academic boredom also warrant additional research (e.g., cognitive interviews on self-report measures of boredom; see Frenzel et al., 2012; Karabenick et al., 2007).

Beyond the few existing longitudinal studies cited earlier, future experimental studies or longitudinal studies on the *antecedents and effects of boredom* would help clarify the causal nature of the relations. Within-person experimental and longitudinal designs may be especially useful. Further research on the possibility that different types of boredom (e.g., indifferent vs. reactive boredom; Goetz, Frenzel et al., 2014) may have different antecedents and effects is also needed.

Because research on how learners cope with academic boredom is limited, future studies are needed to evaluate *effective strategies for coping with boredom*. Such studies could draw on existing models in the areas of coping, emotion regulation, and self-regulated learning (see Harley et al., 2019; Nett et al., 2010; Pekrun & Stephens, 2008).

Given that nearly all of the research on academic boredom published to date has focused on students*, research on teacher boredom* is also warranted, especially in light of recent findings showing that boredom is frequently experienced by teachers in the classroom (Becker et al., 2015). Given the substantial amount of existing research illustrating various negative consequences of academic boredom, it is expected that efforts to study teacher boredom could contribute to both teacher well-being and student learning.

A new and important field in academic boredom research could be studies on *test boredom*, which has been largely neglected. Given the large number of testing situations, this could be a topic of high scientific and practical relevance (Goetz et al., 2022).

Finally, it follows from the research directions suggested above that targeted *interventions to reduce and prevent academic boredom for both students and teachers* should be developed. Programs could be developed to enhance perceived control, perceived value, students' self-regulation skills (e.g., Goetz & Bieg, 2016), and their emotion regulation competencies (Harley et al., 2019) targeting students' boredom specifically. Alternatively, existing interventions could be evaluated for possible beneficial effects on boredom, such as attributional retraining (e.g., Hall et al., 2007; Perry et al., 2014) or utility value interventions (e.g., Canning et al., 2018; Durik & Harackiewicz, 2007; Hulleman & Harackiewicz, 2021). Beyond interventions, research could explore how adjusting educational practices in the classroom, parenting strategies, as well as the curriculum and educational policies at the institutional level could help to reduce students' boredom.

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Table 1

*Self-report Measures of Academic Boredom*

| Scale | Reference |
|---|---|
| Academic Boredom Scale (ABS) | Acee et al. (2010) |
| Academic Boredom Survey Instrument (ABSI) | Sharp, Zhu, Matos, & Sharp (2021) |
| Boredom subscales; Achievement Emotions Questionnaire (AEQ; mathematics related version: AEQ-M) * | Pekrun, Goetz, Frenzel, Barchfeld, & Perry (2011) |
| Boredom subscales; Achievement Emotions Questionnaire – Short Version (AEQ-S) | Bieleke, Gogol, Goetz, Daniels, & Pekrun (2021) |
| Boredom subscale; Achievement Emotions Questionnaire –Elementary School (AEQ-ES) | Lichtenfeld, Pekrun, Stupnisky, Reiss, & Murayama (2012). |
| Boredom subscales; Achievement Emotions Questionnaire –Pre-Adolescents (AEQ-PA) | Peixoto, Mata, Monteiro, Sanches, & Pekrun (2015) |
| Boredom subscale Epistemically-Related Emotion Scales (EES) | Pekrun, Vogl, Muis, & Sinatra (2017). |
| Class-related Boredom (short version from the AEQ-M) | Goetz, Cronjaeger, Frenzel, Lüdtke, & Hall (2010) |
| Coping with Boredom Scale | Nett, Goetz, & Daniels (2010); Nett, Goetz, & Hall (2011) |
| Homework Boredom Scale (based on the AEQ-M) | Goetz, Nett, Martiny, Hall, Pekrun, Dettmers, & Trautwein (2012) |
| Precursors to Boredom Scales | Daschmann, Goetz, & Stupnisky (2011); Tze, Daniels, & Klassen (2014) |
| Teacher Emotions Scales (TES) | Frenzel, A. C., Pekrun, R., Goetz, T., Daniels, L. M., Durksen, T. L., Becker-Kurz, B., & Klassen, R. (2016). |
| Test Boredom Scale (TBS; TBS-T for trait assessment, TBS-S for state assessment) | Goetz, Bieleke, Yanagida, Krannich, Roos, Frenzel, Lipnevich, & Pekrun (2022) |

* A number of domain-specific scales based on the AEQ have been developed (e.g., in the context of language education and civic education, Graf et al., 2022; Shao et al., in press) but are not outlined in this table.

Table 2

*Classification of students' strategies for coping with boredom*

| Type of Coping | **Approach Coping** | **Avoidance Coping** |
|---|---|---|
| **Cognitive** | Changing one's perception of the situation. | Focusing on thoughts not related to the situation. |
| **Behavioral** | Taking actions to change the situation. | Taking actions not related to the situation. |

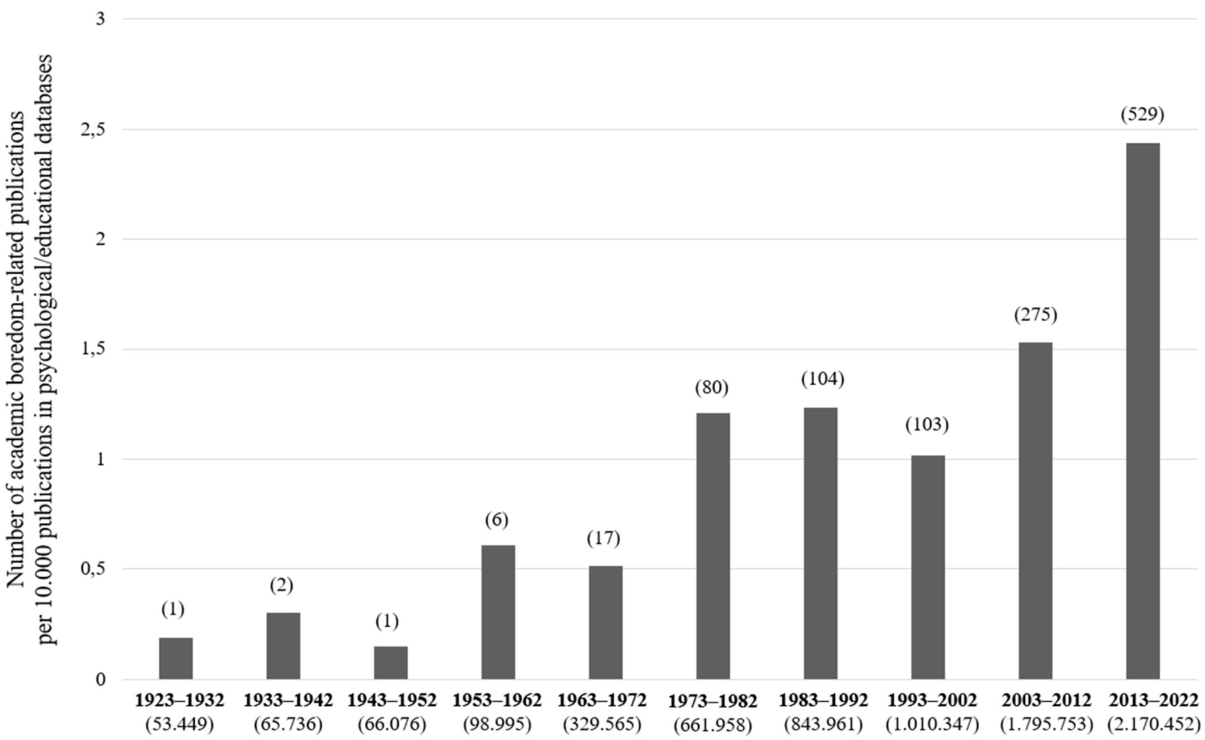


Figure 1. *Relative numbers of publications on academic boredom per 10.000 publications listed in PsycInfo and ERIC databases. Absolute numbers of respective publications are depicted in brackets.*

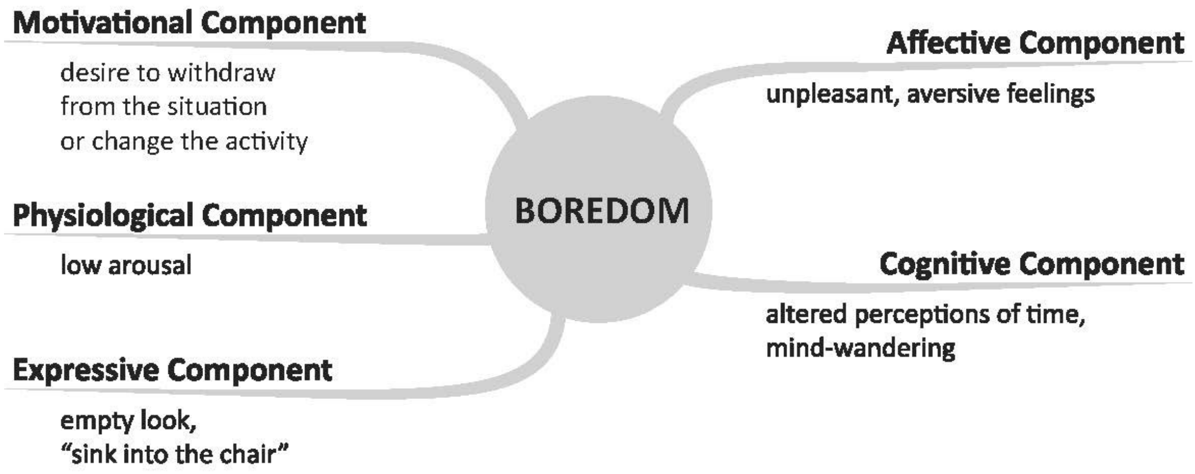


Figure 2. *Components of Boredom*

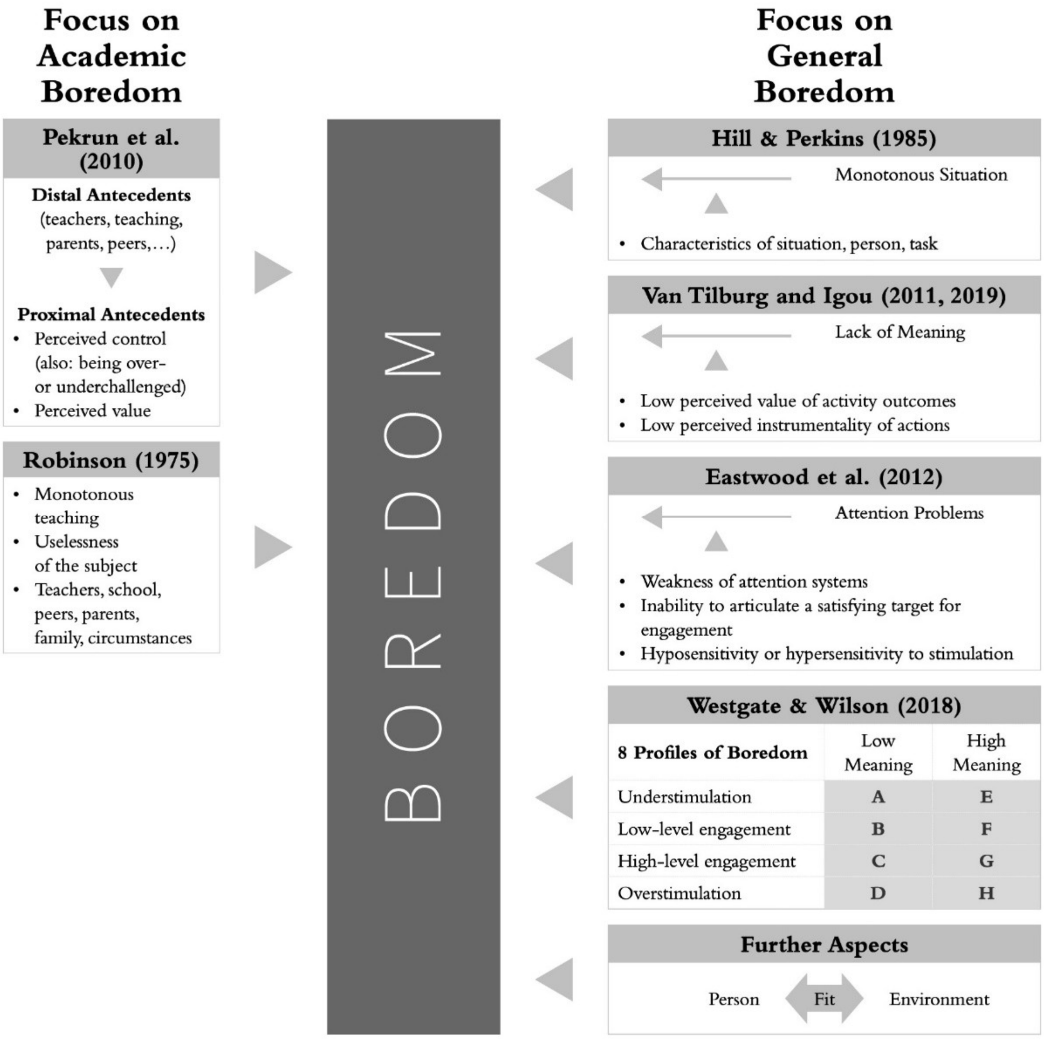


Figure 3. *Theoretical assumptions on the antecedents of achievement boredom*