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Bored of Sports? Investigating the Interactive Role of Engagement and Value as Predictors of Boredom in Athletic Training

Corinna S. Martarelli[1], Pauline Berthouzoz[1], Maik Bieleke[2], and Wanja Wolff[2, 3]

[1] Faculty of Psychology, UniDistance Suisse

[2] Department of Sport Science, University of Konstanz

[3] Department of Educational Psychology, University of Bern

Recent research has identified boredom as a guiding signal in goal-directed behavior. As boredom activates a search for more valuable activities, it can consequently challenge goal-directed behavior; this is also expected to be the case in the sporting context. Here, we examined the experience of boredom in athletic training for a competition among 153 athletes with a cross-sectional questionnaire. We developed the questionnaire based on theoretical approaches to boredom. Specifically, we considered two core triggers of boredom (i.e., the ability to remain engaged with the training and the value that athletes ascribe to the training). We found that the positive relationship between the difficulty of engagement in athletic training and the experience of boredom was moderated by the value ascribed to the training. In other words, it seems that the value ascribed to the training can play a protective role, in that high levels of value nullify the positive relationship between difficulty of engagement and boredom experienced in sports. Future research is needed to better understand the antecedents and consequences of boredom experiences in specific sporting contexts, which could be achieved, for example, by differentiating between individual and collective activities or competitions and training situations.

Keywords: boredom, sports, engagement, value, moderation analysis

Being properly prepared for a sporting competition requires countless hours of training. Athletes must exert intense mental and physical effort to stick with their training regimens and remain engaged in their goal pursuit. Thus, training for a competition requires the continued and effective regulation of goal-directed behavior. Of the many challenges, athletes (and nonathletes, for that matter) can face while they train for a major goal (McCormick et al., 2019), one challenge has only very recently started to attract research interest (despite being a topic of immense interest in sports-related media). This challenge is boredom (Wolff, Bieleke, Martarelli, & Danckert, 2021). Simply put, exercising for many hours—by repeatedly reiterating similar movements—in preparation for a competition might sometimes be boring.

Crucially, boredom should not be taken lightly or seen as an irrelevant nuisance. It has recently been highlighted that being bored during an activity can make continuing with it more demanding of one's self-control. Specifically, boredom is

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Corinna S. Martarelli https://orcid.org/0000-0001-9160-793X

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The data and questionnaire are available at https://osf.io/ktuvf/ (Martarelli, Berthouzoz, et al., 2022).

Correspondence concerning this article should be addressed to Corinna S. Martarelli, Faculty of Psychology, UniDistance Suisse, Schinerstrasse 18, 3900 Brig, Switzerland. Email: corinna.martarelli@fernuni.ch

understood to place an additional demand on self-control by signaling that one should do something else, thereby making it more demanding to continue with one's current activity (Wolff & Martarelli, 2020). Research shows that boring activities can lead to sensations of exertion (Bieleke et al., 2021), fatigue (Milyavskaya et al., 2019), and frustration (Westgate & Wilson, 2018). This is critical in the sports setting, as athletic training already relies on athletes' effectiveness in regulating physical effort (i.e., on athletes' self-control; Englert & Taylor, 2021), and the regulatory demands might be even higher if athletes must also deal with exercise-induced boredom (Wolff, Bieleke, Stähler, et al., 2021). Given boredom's likely relevance to the sporting context and the relative scarcity of research on the topic, we investigated the correlates of boredom in sports—particularly the ability to remain engaged with the training and the value that athletes ascribe to the training—in the present study.

Theoretical Foundations of Boredom

Outside the sporting context, there has been increasing empirical and theoretical work about boredom ascribing functional relevance to this rather neglected emotion (e.g., Elpidorou, 2022). Indeed, boredom has emerged as a powerful motivator for human (and even nonhuman) behavior. For example, boredom has been linked to engaging in sadistic behavior (Pfattheicher et al., 2021), infringing on guidelines during a pandemic (Wolff et al., 2020), self-administering electric shocks (Wilson et al., 2014), and participating in maladaptive academic behavior (Audrin & Hascoët, 2021). Current models explain when and why boredom might occur and integrate the important distinction between boredom as a transient cognitive–affective experience and boredom proneness as a relatively stable individual disposition. To illustrate this contrast, the latter idea refers to high boredom-prone individuals who get bored more frequently and intensely (Farmer & Sundberg, 1986) and tend to perceive their life as generally boring (Tam, van Tilburg, & Chan, 2021). With respect to boredom as a transient state, the ability to remain *engaged* with an activity (Eastwood et al., 2012) and the *value* that one ascribes to this activity (Van Tilburg & Igou, 2012) are two core triggers of boredom. For instance, an athlete should be more likely to experience boredom during a strength training drill if a lot of distractions make it harder for her to stay engaged and if she is not fully convinced of this session's utility for achieving her sporting goal. Furthermore, there are interpersonal differences in how individuals cope with boredom not only the environment (e.g., monotony) but also the person (e.g., boredom proneness) drive the experience of boredom (Goetz & Hall, 2014). What this means is that if the athlete in the preceding example is boredom prone, the experience of boredom will be even more likely for her when compared to another athlete low in boredom proneness.

Attesting to the importance of low engagement and low value as antecedents of experiencing boredom, all of the more influential theoretical models on boredom incorporate these—or theoretically similar—concepts. For example, the control-value theory (CVT; Pekrun et al., 2010) posits that the level of perceived control (i.e., having influence over achievement activities or outcomes) as well as the perceived value (i.e., how interesting or useful the achievement activity or outcome is) jointly contribute to the experience of boredom. In other words, boredom can be elicited by activities that are perceived as too challenging or too easy and/or by activities that are low in meaning, thus affecting engagement. These drivers of boredom are also theorized by the Meaning and Attentional Components (MAC) model (Westgate & Wilson, 2018). According to the MAC model, boredom occurs when attentional demands do not match a person's resources and when an activity is perceived as meaningless. Last, the Boredom Feedback Model (BFM; Tam, van Tilburg, Chan, Igou, et al., 2021) takes a slightly different approach by proposing that engagement mediates the effect that value has on boredom. Despite this model, theorizing a different order in the causal chain of components, it also emphasizes the importance of value and attention in explaining the causes of boredom. In the BFM, value (in terms of an "intention to attend") is conceptualized as an antecedent of attentional engagement, and boredom results when this intention to attend is at odds with one's actual levels of engagement.

Importantly, while all of these models differ in various aspects, they all suggest that boredom is more likely to occur when people are unable to successfully engage with the task at hand and/or when the task's value is perceived as being

low. Interestingly, while a lot of research has investigated engagement and value separately as antecedents of boredom (e.g., Hunter & Eastwood, 2018; Van Tilburg & Igou, 2012), studies that have evaluated the impact of engagement and value jointly on boredom are relatively scarce. An important exception is the research of Westgate and Wilson (2018) who found independent effects of engagement and value on the experience of boredom. Despite the nonsignificant interactions in their studies, the effect sizes (partial η^2) ranged from 0 to 0.368, thus raising the question of whether the two dimensions are truly independent or able to interact in some contexts. Furthermore, despite the CVT of Pekrun et al. (2010) not directly theorizing about the interaction between the two dimensions, there are empirical findings related to the CVT revealing an interaction between the two dimensions in the prediction of boredom in educational settings (e.g., Goetz et al., 2010; Putwain et al., 2018; Shao et al., 2020).

In the present study, we focus on concepts that have been identified as relevant by different boredom theories, thereby attesting to these concepts' likely relevance to the experience of boredom. In turn, we think these concepts constitute a promising starting point for empirical research on boredom in sports. Importantly, we do not set out to test the validity of competing boredom theories but rather to assess whether the core concepts of these theories matter in the expected way in the sporting context.

Boredom in Sports

Until very recently, boredom in sports had not been addressed as an important research topic (Wolff, Bieleke, Martarelli, et al., 2021). However, the scant empirical evidence available on boredom in sports highlights that even competitive athletes struggle with boredom. For instance, Velasco and Jorda (2020) used a multimethod approach combining qualitative and quantitative methods and revealed that athletes frequently experience boredom. In this particular study, repetitive activities were mentioned as boredom triggers by 34.8% of the athletes, followed by anticipated negative mood (16.9%) and lack of involvement or absence of teammates (15.7%). Waiting times (13.5%) and lack of competitiveness (10.1%) were also mentioned as possible triggers of boredom. The authors additionally observed that athletes with a higher proneness to experience boredom performed more poorly according to their coaches (Study 2). Thus, specific social (e.g., lack of teammates) and psychological aspects (e.g., high boredom proneness) were found to cause more boredom, and boredom had a negative impact on athletes' performance.

While boredom is prototypically understood as something that occurs in situations that are underchallenging and of low arousal (van Tilburg & Igou, 2017; Vogel-Walcutt et al., 2012; see also Bieleke et al., 2021; Westgate & Wilson, 2018), a recent study showed that boredom can even occur during very hard efforts that are performed until exhaustion (Hirsch et al., 2021). In another vein, a study that was conducted with ultraendurance runners competing in a 24-hr running competition showed that trait measures of boredom predicted how much the athletes struggled with boredom during their competition and that the experience of boredom during the competition was a predictor of whether an athlete had experienced a crisis during their run (Weich et al., 2022). Taken together, these types of studies show that boredom seems to accompany training in various sporting contexts (i.e., training and competitions), and the presence of boredom might impair sporting performance.

The Present Study

In the present study, we define athletes as individuals who have taken part in and trained for a competition at least once in their lives. This means that we had a large range of athletes in our sample, spanning from high-involved (i.e., competing in sports on the regional, national, and/or international level) and low-involved athletes (i.e., competing at an amateur level). The categories of high- versus low-involved athletes are not used consistently across sports studies (Diehl et al., 2012), as low-involved athletes are sometimes defined as athletes carrying out recreational sports without having ever taken part in an actual competition. Related to this is the idea that boredom in sports matters differently in training and competition contexts. Indeed, in a historical article, Davies (1926) already emphasized that boredom during training is likely to be much more relevant than during eventual competition. Interestingly, while recent work has shown that boredom matters during competitions (Weich et al., 2022), relatively little is known about the effects of boredom during training.

Based on the common ground of current boredom theories (Pekrun et al., 2010; Westgate & Wilson, 2018), we expect boredom in sports to be high if athletes find it difficult to engage with their training (e.g., when training goals are unreasonably high or low) and if they perceive their training to be lacking in value. Current theories diverge about the hypothetical chain of variables (e.g., value, engagement, and boredom). Rather than testing a causal link between the variables, we aim to determine when and under what conditions this well-established relationship between difficulty of engagement and the experience of boredom occurs. While some evidence indicates that engagement and value do not interact in driving boredom (Westgate & Wilson, 2018), empirical evidence from the educational setting has revealed that value can reduce the negative association between difficulty of engagement and boredom (Putwain et al., 2018). These inconsistent findings highlight the need for further research on this matter. Addressing this issue, we investigate value as a possible moderator of the relationship between the difficulty of engagement and the experience of boredom. Moderators can boost, weaken, or reverse a relationship. In agreement with Putwain et al. (2018), we hypothesize that a higher value might weaken the well-known positive relationship between difficulty of engagement and the experience of boredom. To test these hypothesized main effects and interactions, we assessed the self-reported boredom experienced in training for a competition, the difficulty of engaging in the training, and the value ascribed to the training in a sample of competitive athletes. Further, we included effort (physical and mental) as a control variable, given that previous research has highlighted effort as a possible confounder of engagement (Milyavskaya et al., 2019). We additionally controlled for individual differences in trait boredom proneness and dispositional self-control, both of which have been shown to correlate with specific boredom experiences (Fahlman et al., 2013; Kılıç et al., 2020).

Method

Transparency and Openness

We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study. All data and research materials are available at https://osf.io/ktuvf/. The study was not preregistered.

Participants

An a priori G*Power analysis revealed that we needed a sample of 89 participants to detect at least a medium effect (linear multiple regression, fixed model, R^2 increase, input parameters: $f^2 = .15$, $\alpha = 0.05$, $1 - \beta = .95$; Faul et al., 2007). We aimed to reach as many participants as possible during the period from February to August 2021 via social media and sports shops in the French- and German-speaking parts of Switzerland. To be eligible to take part in the study, the athletes had to have participated in at least one competition in their lifetime and had to compete in an individual sport. A total of 182 athletes took part in the study, with no incentives given. Of these athletes, 29 (16%) failed an instructional manipulation check[1] and were, thus, removed from the sample. The final sample consisted of 153 athletes (51% men, age 16–60 years, $M = 32.7$ years, $SD = 11.7$), 42% of whom were competing in a long-distance endurance sport (e.g., ski touring or long-distance running), 27% in alpine skiing, 10% in cycling, and the rest in other sports, such as swimming, athletics, golf, or horse riding. Of all the athletes, 42% reported having a personal coach, and 61% reported training in a team. The athletes were living in Switzerland, with the majority being French speaking (87% French-speaking athletes). They competed in amateur (39.1%), regional (21.2%), national (20.5%), or international (19.2%) competitions. The study was approved by the local Ethics Committee of UniDistance Suisse.

Measures

Boredom proneness was measured using the French and German versions of the Short Boredom Proneness Scale (SBPS; Martarelli, Baillifard, et al., 2022; Martarelli et al., 2021; Struk et al., 2017). This scale measures an individual's general propensity to experience boredom (e.g., "I don't feel motivated by most things that I do"). Responses were given on 7-point Likert scales ranging from 1 (*do not agree at all*) to 7 (*fully agree*).

[1] To identify participants who failed to follow instructions, we included an instructional manipulation item (i.e., "Answer this question with 6").

McDonald's ω was 0.865, and, thus, internal consistency was good.

To assess *dispositional self-control*, a recently validated single-item measure was used (Wolff, Bieleke, Englert, et al., 2022). Athletes were asked to rate "how much self-control do you have?" on an 11-point Likert scale from 1 (*not at all*) to 11 (*a lot*).

The *experience of boredom* in training was measured using the Bored of Sports Scale (BOSS), which was recently developed by Wolff, Bieleke, Stähler, et al., 2021. This sport-specific questionnaire contains 11 items (e.g., "the training sessions bore me to death") that assess the level of boredom experienced in a sporting context. McDonald's ω was 0.907.

To assess engagement, value, and effort, six statements were developed. For engagement, athletes had to evaluate three items ("It was difficult for me to stay engaged with the training," "I stuck to my weekly training program," and "I was confident in my ability to stay engaged in the training"). The second and third items were recoded (reversed) and then the three items were averaged to create the variable *difficulty of engagement*. Internal consistency was sufficient, and McDonald's ω was 0.674. To determine the *value* ascribed to the training, the athletes had to evaluate the item "the training was valuable to me." For *effort*, athletes had to evaluate two items ("the training required mental effort" and "the training required physical effort"). McDonald's ω was 0.565, which is rather low but acceptable if we consider that only two items were averaged. Furthermore, adding the average effort item or the single effort items in the analyses presented below did not change the results in terms of significance. All items were rated on 5-point Likert scales ranging from 1 (*not at all*) to 5 (*a lot*).

One *instructional manipulation item* (Oppenheimer et al., 2009) was included to identify participants who failed to follow instructions. The instructional manipulation item (i.e., "please answer this question with 6") was included in the SBPS (7-point Likert scale).

Procedure

The study was created using the open-source software LimeSurvey (https://www.limesurvey.org) and is available on the open science framework (OSF; https://osf.io/ktuvf/). The online survey took an average of 15 min to complete. After giving informed consent, the athletes responded to general questions regarding their age, gender, main sport, the highest level in which they had competed, number of competitions completed, and number of years practicing the sport. Subsequently, athletes worked on the two-trait questionnaires measuring *boredom proneness* (SBPS) and *dispositional self-control* (a single self-control item). To identify participants who failed to follow instructions, we included one instructional manipulation item in the SBPS. The athletes were then asked to recall and visualize their training for one competition. The *experience of boredom* in training was then measured with the BOSS, as well as the *difficulty of engagement*, *value*, and *effort*. Finally, the athletes were asked whether they had a personal coach and whether they trained in a team or alone. The questionnaire also included questions about additional sports the athletes practiced, as well as risk-taking activities that are not further considered in this article.

Analytical Approach

We report the descriptive analyses, correlations, and a general linear model to investigate the predictors of boredom in training. For the general linear model, the variables were mean centered. The analyses were computed with jamovi Version 1.6.23 (The Jamovi Project, 2021) with the functionalities of the GAMLj toolbox (Gallucci, 2019). The data set is available on OSF (https://osf.io/ktuvf/).

Results

The means, standard deviations, skewness, and kurtosis of the variables are reported in Table 1, and the correlations between the variables are reported in Table 2.

The experience of boredom and boredom proneness were relatively low (mean of 1.50 for the experience of boredom measured on a 5-point Likert scale, and mean of 2.19 for boredom proneness measured on a 7-point Likert scale; see Table 1). The effort invested in and the value ascribed to the training were relatively high (means of 3.86 and 4.22, respectively, measured on 5-point Likert scales; see Table 1). Further, dispositional self-control also turned out to be relatively high (mean of 8.11 measured on an 11-point Likert scale; see Table 1). For the variables that we included in the general linear

Table 1
Descriptive Statistics of the Variables

Variable	*M* (*SD*)	Skewness	Kurtosis
Number of competitions	66.10 (11.91)[a]	2.97	9.60
Self-control (11-point scale)	8.11 (1.78)	0.97	2.16
Boredom proneness (7-point scale)	2.19 (0.97)	1.25	1.61
Sport-specific questions			
Difficulty of engagement (5-point scale)	2.21 (0.78)	0.52	0.17
Value (5-point scale)	4.22 (0.90)	−1.15	1.16
Effort (5-point scale)	3.86 (0.90)	−0.84	0.72
Experience of boredom (5-point scale)	1.50 (0.54)	2.16	7.59

Note. To facilitate interpretation of means and further comparison, Likert-scale points are reported in parentheses after the name of the variable ($N = 153$).
[a] The mean, *SD*, and kurtosis of the number of competitions were high. Thus, we additionally report the median in this note, which was 30.

model analyses, the values of skewness and kurtosis were near zero (between −3 and 3), thus suggesting negligible deviations from normality.

The correlation analyses revealed a positive association between the experience of boredom in sports and having difficulty in engaging with training ($r = 0.38, p < .001$). In addition, a negative correlation between boredom in sports and the value attributed to training was observed ($r = -0.24, p = .003$). Further, sports-specific boredom was associated with boredom proneness ($r = 0.32$, $p < .001$) but with neither dispositional self-control ($r = 0.13, p = .100$) nor effort ($r = 0.08, p = .308$). Value was positively associated with effort invested in the training ($r = 0.28$, $p < .001$) and negatively with difficulty in remaining engaged in the training ($r = -0.31$, $p < .001$). Having a coach was associated with lower experienced boredom during training ($r = -0.23$, $p = .005$), lower difficulty of engagement ($r = -0.26$, $p < .001$), higher value attributed to the training ($r = 0.24, p = .003$), lower age ($r = -0.31, p < .001$), gender ($r = 0.28, p < .001$, with women training significantly more often with a coach), and training in a team ($r = 0.37$, $p < .001$, with individuals training in a team also more often having a coach). In addition, training in a team was associated with lower experienced boredom during training ($r = -0.21$, $p = .009$), lower difficulty of engagement ($r = -0.16, p = .045$), higher value attributed to the training ($r = 0.16$, $p = .048$), and lower age ($r = -0.17, p = .032$). Despite the correlations between the different predictors under investigation here, multicollinearity did not appear to be an issue (variance inflation factor for all main effects <1.423).

What Predicts Boredom in Sports?

We regressed the variables of interest, which included difficulty of engagement, value, and the interaction between difficulty of engagement and value, to determine their effects on boredom in sports. We included effort, dispositional self-control, boredom proneness, age, gender, personal coach, and team as covariates of the general linear model. The unstandardized estimates, standardized estimates, standard errors, confidence intervals, and *p* values of the analysis are reported in Table 3. The model explained 27% of the variance in the experience of boredom in sports. Boredom proneness ($b = 0.13$, $SE = 0.04$, 95% CIs [0.04, 0.22], $p = .003$), difficulty of engagement ($b = 0.15$, $SE = 0.06$, 95% CIs [0.04, 0.26], $p = .009$), and the variable of team (coded as 0 for training alone and 1 for training in a team; $b = -0.18$, $SE = 0.09$, 95% CIs [−0.35, −0.01], $p = .042$) turned out to be associated with the experience of boredom in sports. The more the athletes were prone to the experience of boredom in general, the higher the boredom that they experienced during their training. Also, higher levels of difficulty of engagement were associated with the experience of boredom in training, and the experience of boredom seemed to be reduced when training in a team. Further, the moderation analysis revealed a significant interaction between difficulty of engagement and value ($b = -0.12$, $SE = 0.05$, 95% CIs [−0.23, −0.02], $p = .023$).

Unpacking the significant moderation effect further, a simple slope analysis revealed that the conditional effect of difficulty of engagement on the experience of boredom was significantly

Table 2
Correlations Between the Variables

Variable	Boredom proneness	Self-control	Experience of boredom	Effort	Difficulty of engagement	Value	Age	Gender	Coach	Team
Boredom proneness	—									
Self-control	−0.172*	—								
Experience of boredom	0.321***	−0.133	—							
Effort	0.103	−0.146	0.081	—						
Difficulty of engagement	0.266***	−0.168*	0.375***	0.083	—					
Value	−0.238**	0.018	−0.237**	0.279***	−0.312***	—				
Age	−0.231**	0.154	0.082	−0.083	0.008	0.018	—			
Gender	0.005	−0.091	−0.096	0.276***	−0.136	0.085	−0.246**	—		
Coach	−0.092	−0.038	−0.226**	0.154	−0.264***	0.238**	−0.310***	0.282***	—	
Team	−0.004	−0.087	−0.209**	0.145	−0.162*	0.160*	−0.173*	0.105	0.372***	—

Note. Gender is coded as 0 = man and 1 = female, coach is coded as 0 = no coach and 1 = coach, and team is coded as 0 = no team, and 1 = team (N = 153).
* $p < .05$. ** $p < .01$. *** $p < .001$.

different from zero at the mean (b = 0.15, SE = 0.06, 95% CIs [0.04, 0.26], p = .009) and 1 SD below the mean of value ascribed to the training (b = 0.26, SE = 0.07, 95% CIs [0.12, 0.41], p < .001), but not 1 SD above the mean (b = 0.04, SE = 0.07, 95% CIs [−0.11, 0.19], p = .617). These results indicate that the positive association between the difficulty of engagement and boredom experiences during training is especially strong in individuals who feel that their training is of little value. Figure 1 illustrates the interaction by depicting the regression lines of the relation between difficulty of engagement and experiencing boredom during training at high, medium, and low scores of value ascribed to the training.

Discussion

In the present research, we tested whether *engagement* and *value*—two well-known antecedents of boredom—interact in the prediction of boredom in sports. Consistent with existing theoretical work on boredom, the difficulty of engaging in one's training was associated with higher boredom levels in sports (e.g., Westgate & Wilson, 2018). Specifically, we found a moderate relationship between the difficulty of engagement and the experience of boredom. This effect held even when controlling for boredom proneness, self-control, invested effort, value, and sociodemographic variables. Also, consistent with existing theoretical work was the finding that ascribing high value to one's training was related to less boredom in sports. In contrast with our expectations, this relationship was rendered nonsignificant when the abovementioned variables were added to the model. However, value played a role in the interaction, as we found that value moderated the association between difficulty of engaging and boredom in sports. In other words, valuing the training for a competition seems to play a protective role, in that high levels of value seem to nullify the positive relationship between difficulty of engagement and boredom experienced. Overall, the present findings align well with the key predictions of extant boredom theories. Low value and high difficulty in engaging with one's training are both linked with higher boredom. However, the significant interaction is inconsistent with Westgate and Wilson's (2018) MAC model, which predicts value and engagement to be independent. Nevertheless, the CVT (Pekrun et al., 2010) is consistent with an interaction

Table 3
Fixed-Effects Parameter Estimates

Names	Estimate	*SE*	95% Confidence interval		β	*df*	*t*	*p*
			Lower	Upper				
(Intercept)	−0.027	0.040	−0.106	0.052	0.000	142	−0.677	.499
Boredom proneness	**0.130**	**0.044**	**0.044**	**0.217**	**0.234**	**142**	**2.976**	**.003**
Self-control	−0.023	0.023	−0.068	0.021	−0.078	142	−1.042	.299
Effort	0.055	0.048	−0.040	0.150	0.093	142	1.154	.250
Difficulty of engagement	**0.150**	**0.057**	**0.038**	**0.262**	**0.216**	**142**	**2.657**	**.009**
Value	−0.044	0.050	−0.142	0.054	−0.073	142	−0.882	.379
Age	0.004	0.004	−0.003	0.012	0.093	142	1.164	.246
Gender	−0.037	0.084	−0.204	0.130	−0.034	142	−0.437	.663
Coach	−0.041	0.092	−0.223	0.142	−0.037	142	−0.438	.662
Team	**−0.178**	**0.087**	**−0.350**	**−0.007**	**−0.162**	**142**	**−2.056**	**.042**
Difficulty of Engagement × Value	**−0.125**	**0.054**	**−0.232**	**−0.018**	**−0.162**	**142**	**−2.306**	**.023**

Note. *SE* = standard error. The dependent variable was the experience of boredom in sports ($N = 153$). Significant effects ($p < .05$) are written in bold. Note that removing the control variables from the analysis did not change the interaction in terms of significance (in other words, the interaction also remained significant in models with fewer predictors included). Further, carrying out the analysis with a subsample of athletes competing in sports on the regional, national, or international levels (high-involved athletes, $N = 92$) did not change the significance of the interaction term. This analysis is reported in Appendix A.

between these two predictors, and empirical research in the educational setting provides support for this interaction (e.g., Goetz et al., 2010; Putwain et al., 2018; Shao et al., 2020). It also emerged that in the context of sports and exercise, value and engagement are not independent. Here, the relationship between engagement and boredom seems to depend on the value ascribed to the activity.[2] The importance of value in the experience of boredom is in line with leisure boredom research (e.g., Iso-Ahola & Weissinger, 1987), a field that has some common ground with sport boredom research (especially in the context of recreational sports and exercise), as both leisure activities and recreational sport occur outside of one's obligations. It is worth noting that leisure boredom research has shown that, despite leisure activities being chosen freely, boredom can occur (Weybright et al., 2015).

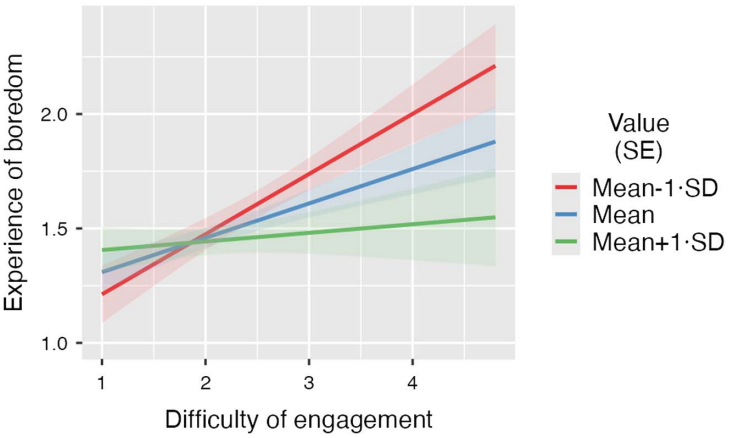
Furthermore, the results highlight a moderate relationship between boredom proneness and the experience of boredom in sports. This finding adds to the domain-general/domain-specific conceptualization of the boredom construct. Previous research has, for example, shown an overlap between boredom proneness and academic boredom (Farmer & Sundberg, 1986) and between boredom proneness and work boredom (Baratta & Spence, 2018). It is, thus, evident that boredom-prone individuals have distinctive characteristics that are relatively invariant across contexts and over time. In particular, our results highlight the overlap between domain-general and domain-specific boredom in the sporting context. Additional studies could determine the invariant features of trait-like boredom versus its variability across contexts.

Our correlational analysis revealing that boredom in sports is tied to value ($r = -0.24$) but not to effort ($r = 0.08$) adds to recent models of the self-control/boredom interplay (Wolff & Martarelli, 2020), which posit that boredom is more closely related to value (boredom route) rather than to costs (effort route) in goal-directed behavior. The experience of boredom signals whether one should

[2] It is more difficult to explain the results in the context of the BFM of Tam, van Tilburg, Chan, Igou et al. (2021). The BFM predicts a mediation effect of value via engagement in the experience of boredom. In the context of the BFM, engagement is a possible explanation for the relationship between value and boredom, and engagement results from value. In the review process of this article, we realized that we could also test this proposed mediation effect. Analyzing the data according to this model revealed the hypothesized indirect effect of value on the experience of boredom via difficulty of engagement (full mediation). For transparency, we report the mediation analysis on OSF (https://osf.io/ktuvf/). Given the nature of our data (correlational), it is not appropriate to speak of causation in the context of the moderation and mediation analyses. When planning this study (based on the MAC model and CVT), we aimed to test the interactive effect of engagement and value on boredom. Given our study question and design, further research is needed to test the mediation hypothesis proposed by the BFM.

Figure 1

A Visual Depiction of the Interaction Between the Difficulty of Engagement and Value (N = 153)



Note. *SE* = standard error. The red line represents 1 *SD* below the mean of value ascribed to the training, the blue line represents the mean of value ascribed to the training, and the green line represents 1 *SD* above the mean of value ascribed to the training. Standard errors of the simple effects are depicted (colored shades around the lines). For ease of understanding, the variables were not mean centered. See the online article for the color version of this figure.

search for a more valuable activity (Bench & Lench, 2013; Kurzban et al., 2013), while the perception of effort signals whether one should avoid devoting additional effort to the current activity (Bieleke & Wolff, 2021; Shenhav et al., 2017). This distinction is important in a sporting context because athletic training is effortful, and boredom might add some burden to the regulatory demands that athletes already face.

The most important finding of our study was the significant moderation effect (which remained significant when restricting the sample to athletes competing on a regional, national, or international level). This finding has implications beyond theory, as it provides hints for interventions in the sporting context. Despite boredom being low in athletes (mean of 1.50 for sports boredom rated on 5-point Likert scales; see also, e.g., Hirsch et al., 2021), the experience of boredom is an aversive one (Martarelli, Wolff, et al., 2021), and it has been shown to undermine performance (Velasco & Jorda, 2020). For instance, boredom proneness has been associated with poor decision-making among athletes and could hamper their skill acquisition (Wolff, Bieleke, & Keller, 2022). One possibility for reducing boredom could be to foreground the value of training for a sporting competition (Green-Demers et al., 1998). This coping strategy has been highlighted in the academic context, with increasing value appraisals of boring situations identified as an effective and adaptive boredom coping strategy (Nett et al., 2010). The question remains as to how value can be increased to reduce boredom in a sporting context.

What is the role of athletes, and what can coaches do? In our study, we found lower levels of boredom in athletes training in a team and with a coach (see the correlations in Table 2). Training in a team or finding a coach could, thus, be possible means of reducing boredom in sports (see also Velasco & Jorda, 2020). In addition, athletes could learn to recognize their boredom, and coaches could emphasize the value of each aspect of training. We propose that it is important to make athletes aware of the possible impact boredom has on goal-pursuit behavior so that they can consciously assess the congruence between their own goals and, for example, the value of a particular training activity (Van Tilburg & Igou, 2012). To the best of our knowledge, interventions that specifically target boredom in sports have not yet been developed and tested. Giving specific recommendations in this direction is beyond the scope of this article, as much more research is needed to understand the properties

of an effective boredom intervention in a sporting context and to establish the degree to which such an intervention is necessary. More generally, there are also relatively few studies targeting boredom interventions in other contexts (for an example of an evaluation of a boredom intervention in the academic context, see Parker et al., 2021; for other examples of boredom-focused interventions, see Caldwell's TimeWise and the culturally adapted version, HealthWise, Caldwell, Baldwin, et al., 2004; Caldwell, Smith, et al., 2004).

Our study has several limitations. First, our study has important measurement limitations. We assessed value with a single item (i.e., "the training was valuable to me"), which focuses on the value of the training with respect to the competition (goal) but is agnostic to other value-related aspects, such as the value of the competition per se. This is a limitation because *Expectancy* × *Value* theories (e.g., Van Tilburg & Igou, 2012) have illustrated that the value of behavior (e.g., training) and goal value (e.g., being properly prepared for a competition) are not the same and should not be confounded (see also Van Tilburg & Igou, 2013). The measures we used were all self-reported and limited to a small number of items including poor reliability. Another limitation is that we combined standardized items (e.g., SBPS) with newly created items that need replication. Furthermore, in our study, we did not assess performance, so we do not know whether boredom impaired performance in our study. Although other studies have shown that boredom is linked to impaired performance (Velasco & Jorda, 2020), further research is needed on this topic.

Second, the sample is limited. We included athletes ranging from high-involved athletes (i.e., high-level athletes competing in sports on the regional, national, and/or international level) to low-involved athletes (competing in sports on an amateur level) that compete in an individual sport. Given the sample size, we were not able to test the moderating function of value in different types of sports. Athletes who volunteered to be part of this study may not represent "bored" athletes well. In general, individuals who answer questions in psychological studies might be a special population, and this might even be more so when it comes to studying boredom during sports training. To better target boredom in training, one could focus on sports that require extreme and monotonous training in the future.

Finally, our study has statistical limitations. It reports on correlational data. Even though it makes sense to consider value as moderating the effect of the difficulty of engagement on boredom, the statistical model is agnostic as to the direction of the effect. Indeed, in our study, we did not undertake any manipulation. Thus, we can only speculate about the antecedents (and consequences) of boredom. To estimate causal effects, future research that experimentally manipulates the key variables of interest is required. Beyond having important theoretical implications, experimental manipulations are relevant in applied contexts, as they provide indications of how boredom could eventually be reduced to achieve training goals.

Conclusion

Influential theoretical models of boredom all incorporate a lack of engagement and value as antecedents of boredom (Pekrun et al., 2010; Westgate & Wilson, 2018). Here, we used an athlete sample to evaluate the impact of these postulated antecedents on the experience of boredom in a sporting context. The findings revealed a significant interaction between how difficult athletes found it to engage with their training and the value they ascribed to their training on the experience of sport-specific boredom. Our findings provide insight into the processes that might lead to the experience of boredom in sports. Boredom remains a surprisingly underresearched emotion in the sporting context, although it appears to matter for performance and engagement in sports. With this study, we address this research gap and hope that it will motivate future research on boredom in athletic training.

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Appendix

Moderation Analysis With a Subsample of High-Involved Athletes

We computed the same general linear model as reported in the article with a subsample of high-involved athletes (competing in sports on a regional, national, or international level; $N = 92$). The unstandardized estimates, standardized estimates, standard errors, confidence intervals, and p values of the analysis are reported in the following table. Excluding low-involved athletes did not change the results in terms of significance (i.e., accepting or rejecting the null hypothesis) for the main effects of boredom proneness and difficulty of engagement, as well as for the interaction term (which turned out to be highly significant in this sample; see Table A1, as well as Figure A1). The effect of the coach on athletes' experience of boredom turned out to be nonsignificant in this model ($p = .063$).

Table A1
Fixed-Effects Parameter Estimates

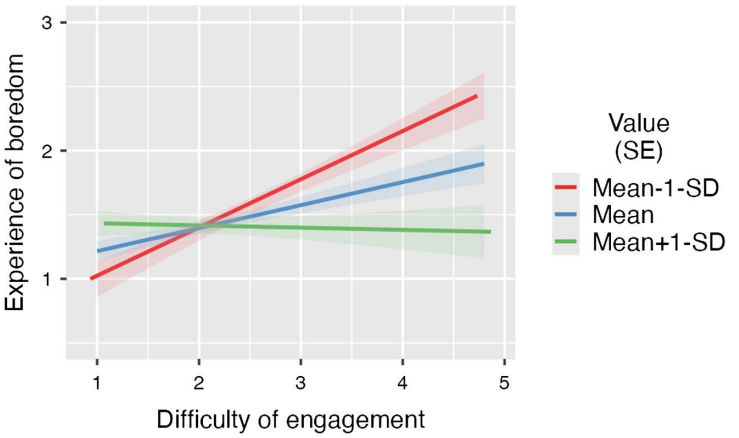
Names	Estimate	*SE*	95% Confidence interval		β	*df*	*t*	*p*
			Lower	Upper				
(Intercept)	1.376	0.040	1.296	1.455	0.000	81	34.396	<.001
Boredom proneness	**0.154**	**0.043**	**0.069**	**0.238**	**0.323**	**81**	**3.615**	**<.001**
Self-control	−0.018	0.022	−0.063	0.026	−0.069	81	−0.817	.417
Effort	0.005	0.058	−0.111	0.120	0.008	81	0.079	.937
Difficulty of engagement	**0.179**	**0.056**	**0.069**	**0.290**	**0.297**	**81**	**3.231**	**.002**
Value	−0.007	0.059	−0.124	0.110	−0.012	81	−0.116	.908
Age	0.002	0.004	−0.005	0.010	0.055	81	0.604	.547
Gender	−0.074	0.094	−0.261	0.112	−0.078	81	−0.793	.430
Coach	0.019	0.093	−0.165	0.204	0.020	81	0.207	.837
Team	−0.180	0.095	−0.370	0.010	−0.162	81	−1.889	.063
Difficulty of Engagement × Value	**−0.232**	**0.058**	**−0.348**	**−0.116**	**−0.326**	**81**	**−3.969**	**<.001**

Note. *SE* = standard error. The dependent variable was the experience of boredom in sports ($N = 92$). Significant effects ($p < .05$) are written in bold.

(*Appendix continues*)

Figure A1

A Visual Depiction of the Interaction Between the Difficulty of Engagement and Value (N = 92)



Note. *SE* = standard error. The red line represents 1 *SD* below the mean of value ascribed to the training, the blue line represents the mean of value ascribed to the training, and the green line represents 1 *SD* above the mean of value ascribed to the training. Standard errors of the simple effects are depicted (colored shades around the lines). For ease of understanding, the variables were not mean centered. See the online article for the color version of this figure.

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