

## **Multidimensional perfectionism and daily self-control episodes**

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We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

### **Abstract**

The study examined the interrelations of perfectionistic concerns and perfectionistic strivings on self-control. Going beyond previous research, we examined dispositional and daily components of self-control. In addition, we tested opposing predictions of the tripartite model (postulating that high perfectionist strivings combined with high perfectionist concerns are associated with negative outcomes) and the 2x2 model (postulating that this is true for low perfectionistic strivings combined with high perfectionistic concerns). Over the course of 9 months, 183 teacher trainees participated in approximately 5 ambulatory assessment periods (each lasting 10 days), that preceded a challenging performance situation. Negative associations between perfectionistic concerns and dispositional self-control were confirmed. In addition, the results showed that high perfectionistic concerns also interfered with three of the five daily self-control components. Contrasting statistical effects of perfectionistic strivings supported the assumptions of the 2x2 model and suggest that perfectionistic strivings buffer the detrimental effects of perfectionistic concerns.

Keywords: perfectionistic concerns, perfectionistic strivings, self-control, ambulatory assessment

### **Multidimensional perfectionism and daily self-control episodes**

Perfectionism is a personality trait that is characterized by two components. According to Stoeber and Otto (2006), we will refer to them as perfectionistic strivings (PS) and perfectionistic concerns (PC). PS capture the tendency to set demanding standards for one's performance and to strive for their attainment. PC refer to the evaluation of goal-attainment and captures an overcritical stance on one's performance, and the tendency to overestimate the consequences of failing to meet one's standards. If one leaves the terms 'demanding' and 'overcritical' aside, it becomes apparent that PS and PC play an important role in self-regulation, broadly defined as a process towards goal-directed behavior (e.g., Baumeister & Vohs, 2007). Among others (e.g., eating behavior, physical activity), behaviors related to academic and job-related achievements represent prototypical examples of behaviors that are self-regulated. The process of self-regulation comprises the setting of standards (achievement goals), the monitoring of goal progress, and regulatory effort (i.e., invested self-control) (Carver & Scheier, 2011). In this framework, PS und PC can be understood as individually varying dispositions to set high standards and to critically monitor and evaluate goal progress and invested effort. Our study aimed to examine the impact of PC, PS, and their interaction on processes of self-regulation, relying not only on global self-report measures but also on daily diary data.

#### ***Perfectionism in the light of self-control***

Different theoretical accounts assume that PC involve a fear of failure and an avoidance orientation (e.g., Slade & Owens, 1998). Both variables are constitutive factors of procrastination, a common form of self-regulation failure (Sirois, et al., 2017). Various authors proposed PC as a possible precursor of procrastination (e.g., Rice et al., 2012; Shafran et al., 2002). Sirois et al.(2017) confirmed this assumption in a meta-analysis, revealing a small to medium positive average relationship ( $r = .23$ ). The findings on procrastination suggest that further self-regulation processes are also associated with PC. One of these

processes - self-control - has received considerable attention in social, personality, and health psychology (e.g., Hofmann, et al., 2009; Tangney, et al., 2004). Self-control refers to the regulatory process of overriding unwanted impulses, that is, resisting desires that collide with higher order goals (Hofmann, et al., 2012; Hofmann & Van Dillen, 2012). In their integrative self-control theory (SCT), Kotabe and Hofmann (2015) address several components of self-control and describe their interplay in everyday self-control episodes. Central components postulated by the SCT, such as desire-goal conflicts (temptations), their perceived strength and the amount of control effort invested to resist temptations can be assumed to be related to PC, which not only involve fear of failure, but also hypervigilant monitoring of aspects that might interfere with the achievement of self-set goals (e.g., Shafran et al., 2002). By allocating more attention to potential obstacles (e.g., reward-related stimuli that are at least partially incompatible with goal pursuit), individuals with high (vs. low) PC should experience more frequent and more intense temptations. Moreover, because hypervigilant monitoring of internal and external aspects that might interfere with goal pursuit is expected to deplete cognitive resources, individuals high in PC should have less control capacity to resist temptation.

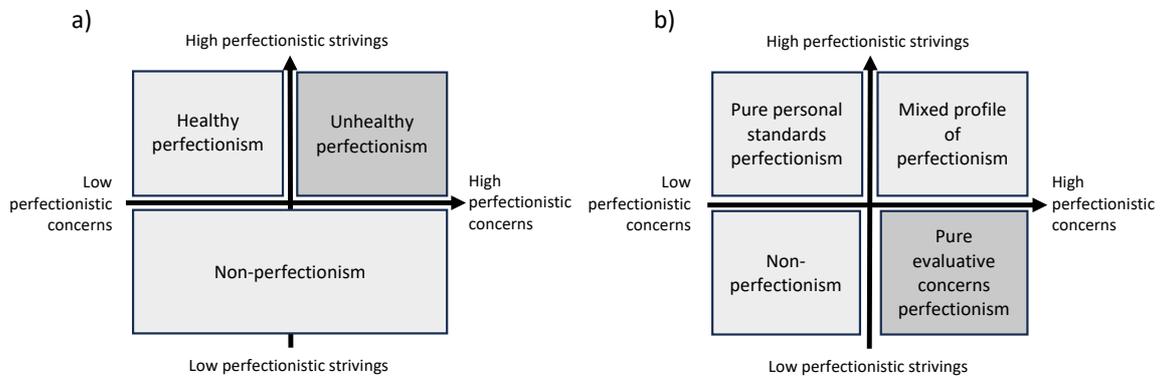
In a large-scale ambulatory assessment (AA) study, Hofmann et al. (2012) analyzed self-control components proposed by SCT in daily life from a perspective beyond procrastination, integrating desire strength and desire-goal conflict as facets of temptation, as well as resistance and behavior enactment as facets of self-control. They found that high perfectionism was associated with greater desire strength in daily life and higher levels of desire-goal conflict, but also with a higher likelihood of resistance to temptations. However, it is somewhat difficult to interpret these findings because Hofmann et al. (2012) used a unidimensional measure of perfectionism, which is a mixture of PS and PC and cannot detect the widely documented countervailing effects of the two dimensions.

Opposite statistical effects of PC and PS are often found when the effects of PS are controlled for shared variance with PC (Stoeber & Otto, 2006). These partial correlation analyses show that PC suppresses adaptive aspects in PS. Therefore, in addition to bivariate correlations of both dimensions of perfectionism with outcome variables, it is informative to examine unique associations. Such a suppressor effect may also be evident in associations with self-regulation, as unique PS have been assumed to involve an approach orientation that should result in more focused, effortful, and affectively positive laden striving for personally relevant goals (Slade & Owens, 1998). Meta-analytic results (Sirois et al., 2017) support this assumption, showing a medium-sized negative association between PS and procrastination, which was almost as large as the positive association between PC and procrastination, but in the opposite direction ( $r = -.22$ ). Similar results were reported by Xie et al. (2018). Therefore, the present study aimed to investigate the statistical effects of PC and PS independently of each other. Unique PS and PC were expected to show different, or even opposite relationships with daily self-control components.

Another important consideration is that the relations between perfectionism and other constructs are not limited to the main effects of PS and PC. To consider individual differences in the combination of low vs. high PS and low vs. high PC, researchers often adopt a group-based approach distinguishing three subtypes of perfectionism (*tripartite-model*; e.g. Stoeber & Otto, 2006; see Figure 1a) or four subtypes of perfectionism (*2x2-model*; Gaudreau & Thompson, 2010; see Figure 1b).

**Figure 1**

Group-based approaches to perfectionism (perfectionism types). a) Tripartite model (e.g., Stoeber & Otto, 2006). b) 2x2 model (Gaudreau & Thompson, 2010)



With respect to negative outcomes such as goal conflicts, reduced self-control and increased procrastination, the two models make different predictions: The tripartite-model assumes the most negative outcome for the so-called unhealthy perfectionism, a combination of high PC and high PS. In contrast, the 2x2-model introduced by Gaudreau and Thompson (2010) suggests the most negative outcome for a perfectionism-type that is characterized by low PS accompanied by high PC. In this type, referred to as *pure evaluative concerns perfectionism*, „individuals pursue perfectionistic standards deriving from perceived external pressure [high PC] without personally valuing or internalizing these standards [low PS]“ (Gaudreau & Thompson, 2010, p. 533)

To our knowledge, only one previous study has analyzed the interactive effects of PS and PC on self-control. Kljajic et al. (2017) studied university students and examined the effects of PS, PC, and their interplay on burnout (i.e., exhaustion, cynicism, and lack of efficacy), work engagement (i.e., vigor, dedication, and absorption), self-regulation (i.e., self-control, attention control, procrastination, and susceptibility to temptation), and semester grade point average (SGPA). Their results showed that the hypotheses of the 2x2 model were supported for all of these criterion variables and that the assumptions of the tripartite-model

had to be rejected. However, it is not yet clear whether these results can be confirmed by another study and whether similar results can be found when going beyond the investigation of individual self-concepts (i.e., trait measures) by assessing self-control components in daily life, as we did in our study.

### *The present study*

The purpose of the present study was to test whether relations between dimensions of perfectionism and dispositional self-control can be confirmed and whether these associations generalize to daily self-control components in highly relevant real-life achievement situations. Similar to Hofmann et al. (2012), we collected AA data on daily self-control components that included conflicting desires (temptations and desire strength), self-control (resistance to temptations), and behavior enactment (i.e., giving in to a specific temptation and more general procrastination). Going beyond Hofmann et al. (2012), we differentiated between the two dimensions of perfectionism (PS and PC). We expected PC to be related to lower dispositional self-control, more frequent and stronger daily temptations, lower daily resistance, more frequent daily enactment, and more daily procrastinating behavior. Additionally, based on previous findings that PS were related to less trait procrastination (Sirois et al., 2017; Xie et al., 2018) we aimed to explore whether PS show opposite statistical effects as compared to PC, that is, whether PS are associated with higher dispositional self-control, less frequent and weaker daily temptations, higher daily resistance, less frequent daily enactment, and less daily procrastinating behavior.

Following established conceptualizations of perfectionism, we aimed to analyze not only the main effects of PS and PC but also their interaction. Two opposing predictions were tested: Based on the tripartite model (Stoeber & Otto, 2006), PS should represent a risk factor that exacerbates the negative effects of PC on self-control with the worst outcomes for a combination of high PS and high PC (hPS/hPC). Because low PS result in comparable predictions of an outcome regardless of the level of PC, a significant interaction confirms the

tripartite model. Based on the 2x2 model (Gaudreau & Thompson, 2010), high PS should counteract the detrimental effects of PC resulting in the worst outcome for a combination of low PS and high PC (lPS/hPC). Thus, the 2x2 model is confirmed, when PS and PC show significant main effects with different signs regardless of whether the interaction is significant or not (Gaudreau, 2012). Our main hypotheses regarding negative associations between PC and daily self-control components as well as on potential interactive effects of PS and PC were preregistered<sup>1</sup> at the OSF before data collection was complete and before we ran the analyses: <https://osf.io/n83em>. The hypotheses on dispositional self-control were not included in the preregistration. Raw data, code, and supplemental materials will be uploaded parallel to manuscript publication under the same link.

## **Method**

### ***Study Design and Procedure***

This study was part of a larger project (<https://osf.io/t8bn9/>). We identified preservice teachers in Germany as an ideal population to study the relation between perfectionism and self-control since preservice teachers repeatedly undergo performance situations (demonstration lessons) that repeatedly require self-control for goal achievement and that do not differ in format over time or between participants. In addition, it can be assumed that the personally highly relevant performance demands make perfectionist tendencies salient (Flett & Hewitt, 2016). For their second state exam, preservice teachers have to complete one year of practical training following their university education. This training, which combines input and supervision in teacher education centers as well as practical training and supervision in schools, is followed by a phase of theoretical and practical final examinations. Within the practical training phase, preservice teachers have to prepare and implement demonstration

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<sup>1</sup> The data analysis plan and exclusion criteria were not preregistered.

lessons that are evaluated by their supervisors. Each evaluation feeds into the final grade of the second state exam, which in turn is the most important job requirement.

The project comprised an initial online survey, an online tutorial preparing participants for the AA period, a 9-month-phase of repeated AA periods, and a follow-up online questionnaire. Each AA period comprised goal assessments 12 days and 2 days before the demonstration lesson, a 10-day period of morning and evening assessments beginning 10 days before the demonstration lesson, and a post-demonstration lesson assessment. Only the first online assessment of traits and the daily evening assessments registered each evening of the 10 days preceding each demonstration lesson were relevant for the present study.<sup>2</sup> For each assessment, personalized links to the respective online survey were sent via SMS so that participants could complete the surveys online on their smartphones. The rationale for this sampling scheme was to capture the daily variables in near-real time to avoid the predominance of retrospective biases but at the same time avoid interrupting and distorting ongoing preparation and thus self-control components by more frequent assessments. Most study seminars scheduled 6 demonstration lessons per preservice teachers over the course of 9 months. With signing up for the study, participants provided informed consent and completed the initial online survey including a demographic questionnaire and trait self-report measures (including perfectionism and dispositional self-control). In the daily evening surveys, participants were asked to rate their daily self-control and procrastination behavior (as well as other measures that were not relevant for the present study). Note that daily self-control and procrastination items were only included in evening assessments on days on which participants had planned to prepare for the demonstration lesson, as indicated in the morning

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<sup>2</sup> A detailed description of the project-design and an overview of all instruments can be retrieved from the project OSF ([osf.io/t8bn9](https://osf.io/t8bn9)).

survey or of they reported having worked for the demonstration lesson during the day even though they had not indicated these plans in the morning.

### *Procedure*

Participants were recruited in teacher education centers in Rhineland-Palatinate, Germany during information events, where they were informed about the goals of the study, the procedure, remuneration, and how they could sign-up to participate. The study's website was introduced, and flyers were handed out. To be eligible, participants had to (i) be enrolled as a preservice teacher in a teacher education center, (ii) own a smartphone with internet connection, and (iii) be willing to provide personal data (e.g., phone number, email-address). Completion of the online questionnaire and the online tutorial were prerequisites to participate in the AA periods. Individual sampling schemes were programmed for each participant to account for individually scheduled demonstration lessons and AA times of prompts. Participants were remunerated by receiving 15 Euro for each AA period when they completed at least 50% of the daily morning and evening questionnaires additional to the goal assessment and post demonstration lesson questionnaire. By completing more daily questionnaires (60%, 80%, 100%), participants could collect raffle tickets to participate in a lottery to win prices ranging from 10€ up to 300€ in accordance with their compliance rate. Moreover, participants could indicate whether they were interested in receiving a personal report of their scores by the end of the study. Over the course of the study, participants received emails that were designed to maintain their engagement in the study by informing them about the raffle tickets they had collected. Ethical approval was obtained from the Local Ethics Committee [73 2016] and the Rhineland Palatinate Ministry of Education.

One hundred ninety participants signed up to participate. Three participants withdrew from the study before completing the initial online questionnaire, four completed only the initial online questionnaire, and two were excluded because they participated in only one AA period and completed less than 50% of the daily prompts. The final sample consisted of 183

preservice teachers (84% women; Age:  $M = 25.93$ ,  $SD = 3.08$ ,  $Min = 23$ ,  $Max = 44$ ). Teacher education centers scheduled up to eight demonstration lessons per preservice teacher over the course of 9 months. A total of 110, 146, 160, 144, 145, 134, 20, and 8 participants provided data for the AA phases preceding Demonstration Lessons 1 to 8, respectively. On average, participants completed 5.15 AA phases ( $Min = 1$ ,  $n = 6$ ;  $Max = 7$ ,  $n = 6$ ;  $SD = 1.36$ ). Careless responses were identified according to a) response time, b) longstrings, and c) inconsistency of responses (see [OSF](#) for detailed description). To ensure compliance with the daily time schedule we generally excluded any data that were assessed more than 8h after the prompt. Across AA phases, participants on average completed 44 evening assessments ( $Min = 6$ ,  $n = 1$ ;  $Max = 63$ ,  $n = 1$ ;  $SD = 14.27$ ). Overall, we recorded  $N = 8,069$  evening assessments at Level 1.

### *Measures*

**Trait measures.** *Perfectionistic strivings* (PS) were assessed using the High Standards scale of the Revised Almost Perfect Scale (APS-R, Slaney et al., 2001, 7 items, e.g., “I expect the best from myself.”). *Perfectionistic concerns* (PC) were assessed by the Discrepancies scale of the APS-R (12 items, e.g., “I hardly ever feel satisfied with my performance”). In previous research, the scales proved to be reliable and valid measures reflecting central components of PS and PC. The German version of the APS-R was derived from a standard translation and back-translation procedure and has been shown to be valid in previous research (e.g., Zureck et al., 2015).

*Dispositional self-control* was assessed by the Self-Control scale (Bertrams & Dickhäuser, 2009; 13 items; e.g. “I am good at resisting temptation.”). The scale proved to be a reliable and valid instrument for the assessment of individual differences in perceived self-control capacity.

All trait items were rated on a 6-point agreement scale (1 = “not at all”; 6 = “entirely”). Scale-mean scores of the trait measures were computed such that high scores indicate high levels of PS, PC, and dispositional self-control.

**Daily measures.** Daily self-control was assessed in terms of different self-control components experienced at the respective day. Following the assessment described by Hofmann et al. (2012), participants indicated whether they had experienced a desire that tempted them not to prepare for the upcoming demonstration lesson as planned (*Temptation*: Was there anything today that tempted you not to prepare for the class visit as planned; 0 = no; 1 = yes). In the case of a temptation, participants further rated the strength of the conflicting desire (*Desire Strength*: How strong was the temptation to not prepare for the teaching exercise as planned; 1 = extremely weak; 6 = irresistible) and how strongly they tried to resist the temptation (*Resistance*: How hard did you try to resist temptation; 0 = not at all; 5 = strongly). Finally, participants indicated whether they gave in to the temptation (*Enactment*: Did you give in to temptation; 0 = no; 1 = yes). In addition, participants rated whether they engaged in one of three forms of *procrastination* during the day (postponement, interruption, premature termination; 0 = no; 1 = yes; adapted from Patzelt & Opitz, 2014). A multilevel confirmatory factor analysis for binary indicators (see [OSF](#)) confirmed the unidimensionality of these items. Hence, we computed a sum score across these three items, with higher scores representing higher daily procrastination.

### ***Data Analyses***

Our data consisted of repeated measures (evening assessments) nested within participants. As preliminary analyses, we computed bivariate correlations and descriptive statistics of all study variables, as well as intraclass correlations for the daily variables and two-level Omega (Geldhof et al., 2014) for daily procrastination. McDonald’s Omega for trait measures were computed with the R package MBESS (version 4.9.0, Kelley, 2022; R version 4.0.5).

To examine which (if any) of the opposing predictions deduced from the tripartite model/ clinical model of perfectionism vs. the 2x2 model of perfectionism was supported with respect to the assessed indicators of dispositional and daily self-control, we had to go beyond bivariate associations and analyze unique and interactive effects of PS and PC. We therefore computed moderated hierarchical regression analyses. For dispositional self-control as the dependent variable, we conducted single-level moderated regression analysis with the `lm`-function of the R package `stats` (version 4.0.5, R Core Team, 2021). For the daily self-control components as dependent variables, we conducted two-level moderated regression analyses using `Mplus` (Version 8.5; Muthén & Muthén, 2017)<sup>3</sup>. For the binary outcomes (daily temptation, daily enactment) and the ordinal outcome (daily procrastination), we computed logistic two-level regression analyses using the numerical integration algorithm implemented in `Mplus`. In the first step of each analysis, sample-mean centered PS and PC were entered as two predictor variables. In a second step, we added the product term of PSxPC. The product term was retained if it was significantly different from zero (two-sided  $p < .05$ ; Gaudreau, 2012). In this case, we applied simple slope analyses. If the product term was not significant, we retained only the main effects of PS and PC. In both cases, we additionally calculated Cohen's  $d$  as standardized effect size<sup>4</sup> for the difference between the subtypes of perfectionism as suggested by Gaudreau (2012), and summarized these differences graphically<sup>5</sup> (e.g., Kljajic et al., 2017).

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<sup>3</sup> As a sensitivity analysis, we repeated our analyses by additionally taking into account the intermediate level of demonstration lessons. These analyses yielded the same results as the two-level analyses. (see [OSF](#)).

<sup>4</sup> For the daily dependent variables, we standardized the Level-2 difference between the perfectionism subtypes by the Level-2 standard deviation (Schuurman et al., 2016).

<sup>5</sup> To graphically depict the results of the logistic regression analyses, the estimated log-odds were transformed into probabilities.

### *Sample Size Considerations*

The present research was part of a larger project with multiple research questions. During the study planning phase, we determined the required sample size based on “standard” person-level regression models. A power analysis for an increase in  $R^2$  in a linear multiple regression using G\*Power (Faul et al., 2009) yielded a minimum sample size of 132 to detect an effect size of  $\phi^2 = 0.0604$  with a power of 80% and an alpha level of 5%. To account for a potential drop-out rate of about 50% (across the six demonstration lessons), we originally aimed to assess 270 preservice teachers by recruiting multiple cohorts who began their training at different points in time at different teacher education centers. During data collection, it turned out that recruitment took longer than planned but that actual drop-out rates were much lower than expected (see the Participants, Compliance, and Data Cleaning section). Therefore, we stopped recruitment when 192 participants had signed up and the maximum time period available for data collection was about to be reached.

To test an interaction effect in a standard multiple regression model (alpha = 5%) with dispositional self-control as the dependent variable, our final sample size of 183 participants allows to detect an effect size of  $\phi^2 = 0.0434$  (corresponding, for example, to an increase in  $R^2$  of .035 due to the interaction effect and a proportion of explained variance by the main effects and the interaction effect of .195) with a power of 80%. When analyzing a daily self-control component as the dependent variable in a two-level model, the interaction between PS and PC represents an interaction between two person-level variables, and hence, we assumed that the power to detect a small to moderate interaction effect at the person-level is similar to the power to detect a small to moderate interaction effect in a “standard” moderated regression model.

Table 1

*Bivariate correlations, higher-order means/thresholds and variances, intraclass correlation coefficients, and reliability estimates of study measures at the within-person and between-persons level*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	$\omega$	$\rho$
Trait measures										
(1) Perfectionistic strivings		–	–	–	–	–	–	–	–	–
(2) Perfectionistic concerns	.47*		–	–	–	–	–	–	–	–
(3) Dispositional self-control	.33*	-.12		–	–	–	–	–	–	–
Daily measures										
(4) Temptation <sup>a</sup>	-.06	.13	-.30*		–	–	–	.80*	–	.27
(5) Desire strength	-.02	.17	-.40*	.24*		-.25*	.54*	.16*	–	.18
(6) Resistance	.16	.20*	-.07	.22*	.13		-.58*	-.13*	–	.23
(7) Enactment <sup>a</sup>	-.24*	-.21*	-.07	.08	.10	-.65*		.50*	–	.27
(8) Procrastination <sup>a</sup>	-.10	.10	-.30*	.89*	.22*	.07	.17*		.65	.28
<i>M</i>	4.53	2.97	3.81	–	4.44	2.22	–	–		
<i>Threshold (1)</i>	–	–	–	0.95	–	–	-1.13	0.66		
<i>Threshold (2)</i>	–	–	–	–	–	–	–	1.83		
<i>Threshold (3)</i>	–	–	–	–	–	–	–	2.91		
<i>Var</i>	0.66	1.23	0.68	–	1.25	1.86	–	–		
<i>Var (between)</i>	–	–	–	1.20	–	–	1.22	1.31		
$\omega$	.87	.95	.86	–	–	–	–	.90		

*Note.* Between-person statistics ( $N_{\text{Level 2}} > 182$ ) are presented below the diagonal, and within-person statistics ( $N_{\text{Level 1}} > 2,335$  for daily self-control;  $n > 6,849$  for daily procrastination) are presented above the diagonal. Enactment and temptation were coded 0 = no action/temptation, 1 = action/temptation. In the case no temptation(4) occurred, correlations with (5)-(7) were missing. Perfectionistic strivings = High Standards (APS-R); Perfectionistic concerns = Discrepancies (APS-R);  $\rho$  = intra-class correlation. <sup>a</sup> The correlation coefficients are probit residual correlations (WLSMV estimation) for categorical variables

\*  $p < .05$  (two-sided).

## Results

### *Descriptive Statistics*

Descriptive statistics and bivariate correlations are summarized in Table 1. The estimated Omega coefficients indicated acceptable reliabilities of the trait variables and daily procrastination. The intraclass correlation coefficients (i.e., proportion of variance that is due to the person level) for the daily variables ranged from .18 (desire strength) to .28 (procrastination; Table 1). Thus, all daily variables demonstrated substantial between- and within-person variability. The bivariate between-person correlations (Table 1, below the diagonal) revealed that PS were positively associated with dispositional self-control and PC showed a small negative but not significant association to dispositional self-control. Concerning daily self-control variables, the between-person correlations also revealed differential bivariate associations for PS and PC. Whereas PC showed small to moderate positive bivariate associations with most of the daily self-control components, these associations were mostly negligible for PS (with the exception of resistance and enactment).

### *Main analyses*

#### *Dispositional self-control*

The results of the moderated hierarchical regression analyses are summarized in Table 2. Regarding dispositional self-control, PC showed a moderate negative main effect and PS had a moderate positive main effect. In addition, the analyses revealed a significant interaction between PS and PC ( $\Delta R^2 = .025$ ). In support of the assumptions of the 2x2 model, lPS/hPC, the combination of low PS and high PC, was associated with lower self-control compared to hPS/hPC, the combination of high PS and high PC with a large effect size ( $d = 1.43$ ; see Table 3 and Figure 2 A). Overall,  $R^2$  for PS and PC predicting dispositional self-control was .23.

Table 2.  
*Results of moderated hierarchical regression analyses.*

Dispositional self-control		<i>b</i> ( <i>SE</i> )	<i>p</i>	$\beta$
Step1	Intercept	3.81		
	PS	0.49 (0.08)	< . <b>001</b>	0.49
	PC	-0.25 (0.06)	< . <b>001</b>	-0.34
	<i>R</i> <sup>2</sup>	.20		
Step2	PS x PC	0.16 (0.07)	<b>.017</b>	0.17
	<i>R</i> <sup>2</sup>	.23		
<b>Procrastination (logits)</b>				
Step1	Intercept	-0.65		
	Threshold 2	1.82		1.59
	Threshold 3	2.91		2.55
	PS	-0.25 (0.12)	<b>.034</b>	-0.18
	PC	0.19 (0.09)	<b>.033</b>	0.18
	<i>R</i> <sup>2</sup>	.04		
Step2	PS x PC	-0.15 (0.11)	.199	-0.11
	<i>R</i> <sup>2</sup>	.05		
<b>Temptations (logits)</b>				
Step1	Intercept	-0.95		
	PS	-0.21 (0.12)	<b>.074</b>	-0.15
	PC	0.20 (0.08)	<b>.018</b>	0.20
	<i>R</i> <sup>2</sup>	.03		
Step2	PS x PC	-0.19 (0.11)	<b>.087</b>	-0.15
	<i>R</i> <sup>2</sup>	.06		
<b>Desire Strength</b>				
Step1	Intercept	4.38		
	PS	-0.07 (0.06)	.223	-0.12
	PC	0.09 (0.05)	<b>.041</b>	0.22
	<i>R</i> <sup>2</sup>	.04		
Step2	PS x PC	-0.02 (0.04)	.702	-0.03
	<i>R</i> <sup>2</sup>	.04		
<b>Resistance</b>				
Step1	Intercept	2.18 (0.06)		
	PS	0.07 (0.08)	.372	0.09
	PC	0.09 (0.06)	.126	0.16
	<i>R</i> <sup>2</sup>	.05		
Step2	PS x PC	-0.03 (0.07)	.626	-0.05
	<i>R</i> <sup>2</sup>	.05		
<b>Enactment (logits)</b>				
Step1	Intercept	1.13		
	PS	-0.25 (0.13)	<b>.062</b>	-0.18
	PC	-0.13 (0.10)	.186	-0.13
	<i>R</i> <sup>2</sup>	.07		
Step2	PS x PC	-0.10 (0.11)	.332	-0.08
	<i>R</i> <sup>2</sup>	.08		

*Note.* PS = High Standards (APS-R); PC = Discrepancies (APS-R).

*p* < .05 (one-sided) are printed in bold type.

Table 3

*Simple Slope Results and Estimates of Cohen's d.*

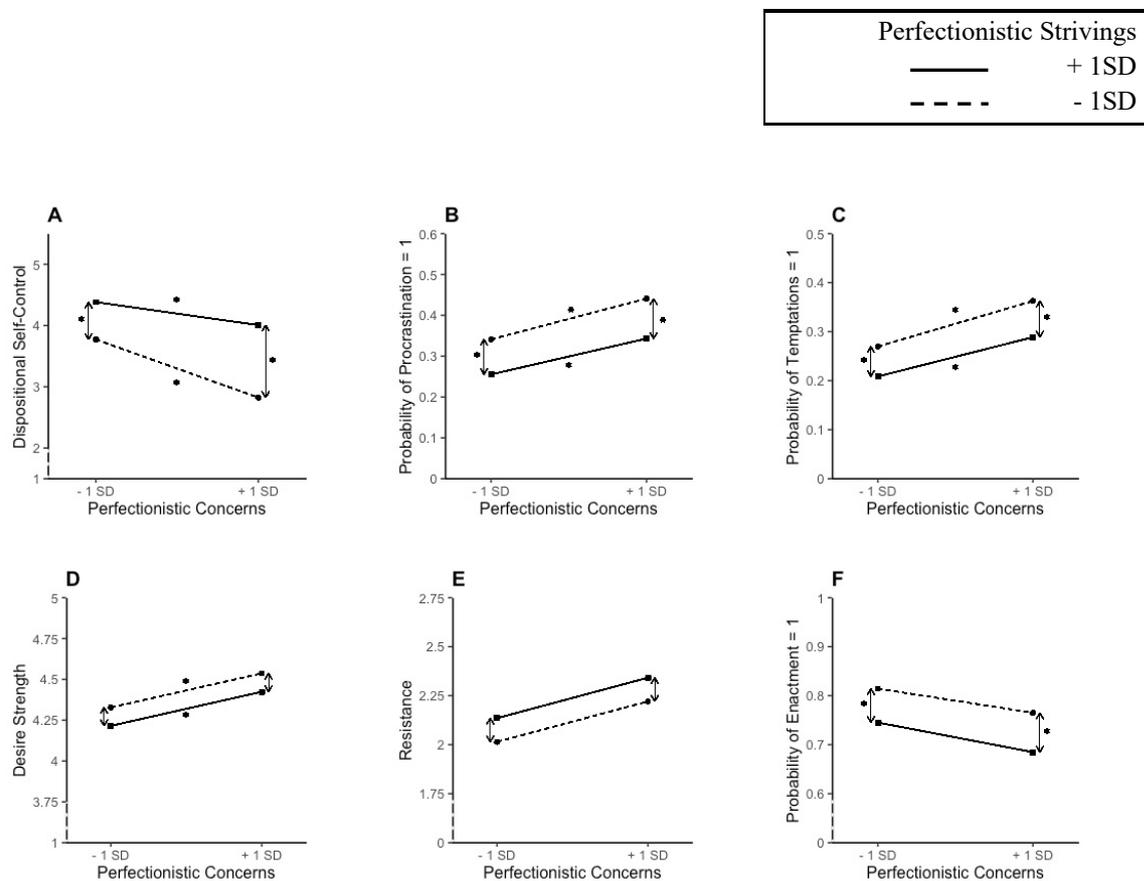
	high PS/low PC vs. low PS/low PC		low PS/high PC vs. low PS/low PC		low PS/high PC vs. high PS/high PC		high PS/low PC vs. high PS/high PC	
	<i>b</i> ( <i>SE</i> ; <i>p</i> )	<i>d</i>	<i>b</i> ( <i>SE</i> )	<i>d</i>	<i>b</i> ( <i>SE</i> )	<i>d</i>	<i>b</i> ( <i>SE</i> )	<i>d</i>
Dispositional self-control <sup>a</sup>	0.37 (0.09; <.001)	0.74	-0.43 (0.09; <.001)	-1.15	0.73 (0.12; <.001)	1.43	-0.17 (0.07; .011)	-0.45
Procrastination		-0.36		0.37		-0.36		0.37
Temptation		-0.31		0.39		-0.31		0.39
Desire strength		-0.24		0.45		-0.24		0.45
Resistance		0.18		0.31		0.18		0.31
Enactment		-0.37		-0.27		-0.37		-0.27

*Note.* PS =high standards (APS-R); PC = discrepancies (APS-R).<sup>a</sup> results of simple slope analyses conducted for significant interactions (two-sided  $p < .05$ ).

**Figure 2**

Predicted values for dispositional self-control (A), procrastination (B), temptation (C, coded: 0 = no temptation, 1 = temptation), desire strength (D), resistance (E), and enactment (F, coded: 0 = no enactment, 1 = enactment) across the four subtypes of perfectionism (combinations of PS and PC). In the case of logistic regression results (procrastination, temptation, enactment), the estimated log-odds were transformed into probabilities in the graphical illustration. Perfectionistic Strivings = high standards (APS-R); Perfectionistic Concerns = discrepancies (APS-R).

\* $p < .05$  (one-sided).



*Daily procrastination*

Regarding procrastination, PC demonstrated a small to moderate positive main effect. In contrast, PS demonstrated a small to moderate negative main effect. The interaction between PS and PC was not significant ( $\Delta R^2 = .01$ ). As can be seen from Figure 2 (Panel B), which is based on the main effects of PS, predicted daily procrastination was higher for IPS/hPC than for hPS/hPC, and this difference was moderate in size ( $d = -.36$ , see Table 3). This result supported the 2x2 model. Overall,  $R^2$  for PS and PC predicting daily procrastination was .04.

*Daily temptations*

Regarding daily temptations, we found similar results: PC showed a small to moderate positive main effect, and PS showed a small negative main effect. The PSxPC interaction term was not significant ( $\Delta R^2 = .03$ ). As can be seen from Figure 2 (Panel C), IPS/hPC was associated with a higher probability of temptations than hPS/hPC ( $d = -.31$ ). That is, the pattern of results was in line with the 2x2 model. Overall, PS and PC accounted for about 3% of between-person variance in daily temptations.

*Daily desire strength*

Regarding desire strength, our analyses revealed a small positive main effect for PC and a non-significant negative main effect for PS. No significant PSxPC interaction emerged ( $\Delta R^2 = .00$ ). As can be seen from Figure 2 (Panel D), non-significant differences between IPS/hPC and hPS/hPC were found ( $d = -.24$ ). That is, when predicting daily desire strength, the pattern of results was neither in line with the 2x2 model nor with the tripartite model. Overall, PS and PC accounted for about 4% of between-person variance in daily desire strength.

*Daily resistance*

Regarding daily resistance, we found neither significant main effects for PS and PC nor a significant interaction of PS and PC ( $\Delta R^2 = .00$ ). The pattern of results (Figure 2, Panel

E) contradicts the predictions of the 2x2 model as well as those of the tripartite model since the strongest resistance was predicted for hPS/hPC. Both models assume that the hPS/hPC combination is dysfunctional and therefore, high resistance values for this combination are not in line with the predictions of the models. Overall,  $R^2$  for PS and PC predicting daily resistance was about .05.

#### *Daily enactment*

Regarding daily enactment, we found only a small but non-significant main effect of PC but a significant small to moderate negative main effect of PS. This means that PS were associated with a reduced probability to give in to a temptation when PC were controlled for. The PSxPC interaction term was not significant. Cohen's  $d$  values for the differences between IPS/hPC and hPS/hPC can be interpreted as small to medium ( $d = -.37$ ), but due to the missing positive effect of PC the pattern of predicted values corresponds neither to the 2x2 model nor to the tripartite model (Figure 2, Panel F). Overall, PS and PC predicted about 7% of the between-person variance in daily enactment.

#### **Discussion**

In this study, we examined the relations of the two basic dimensions of perfectionism (PS and PC) with dispositional self-control as well as with components of daily self-control (temptations, desire, resistance, enactment) and daily procrastination. In addition to the already widely documented negative effects of PC (e.g. Sirois et al., 2017), we examined whether initial findings on positive statistical effects of PS (Kljajic et al., 2017) could be confirmed. Going beyond the analysis of unique main effects of the two dimensions, we also investigated their interplay. Our aim was not only to test whether the interaction of PS and PC explains variance in self-control beyond their main effects, but also to compare competing models of perfectionism (the tripartite model, Stoeber & Otto, 2006, and the 2x2 model, Gaudreau & Thompson, 2010) with respect to their explanatory power. To test these assumptions, we analyzed data from an AA study in which both trait and state measures of

self-control were administered to a group of 183 preservice teachers over the course of nine months.

***Hypothesis Test: Negative association between Perfectionistic concerns and self-control***

Concerning our main hypothesis, our analyses confirmed prior evidence on negative associations of PC with dispositional self-control (e.g., Kljajic et al., 2017), and going beyond previous research, we additionally found evidence that high PC interfered with self-control in daily life. PC were associated with more frequent temptations in daily life and more intense daily temptations (higher desire strength). However, when predicting reactions to temptations (i.e., resistance, enactment, and procrastination), our results were inconsistent. Positive unique associations of PC with daily procrastination were in line with our assumptions and prior evidence on associations between PC and dispositional procrastination (Sirois et al., 2017). Contrary to our assumptions, PC were unrelated to daily resistance and daily enactment when PS were controlled for. In summary, the present findings revealed detrimental associations of high PC with those self-control components (experience and intensity of temptations) that are involved in the perception and evaluation of situational cues. However, our results showed that the associations between high PC and the experience of temptations do not necessarily translate into reduced self-control in terms of behavioral responses to these experienced temptations. This may be due to the fact that the goals set by participants in our study were personally very relevant, as performance in the upcoming achievement situations determined their future career prospects. Future studies should therefore more closely examine the role that the personal relevance of the goals pursued plays in daily self-control (see also Kotabe & Hofmann, 2015).

***Exploration: Positive association between Perfectionistic strivings and self-control?***

Beyond the statistical effects of PC, we explored whether unique PS would be positively related to dispositional self-control and individual differences in daily self-control

components. Concerning dispositional self-control, our analyses revealed the expected positive statistical effect of PS. This is in line with prior evidence (e.g., Kljajic et al., 2017) and fits theoretical assumptions of an approach orientation associated with PS (e.g., Slade & Owens, 1998). However, we found mixed results that did not generalize across different criterion variables when predicting daily self-control. When controlling for PC, we found the expected negative association of PS with the probability to perceive temptations, enactment, and procrastination, but no statistical effects on desire strength or resistance. The mixed evidence in the present study calls for further exploration of for whom, under what circumstances and for which specific components PS might be beneficial for self-control in daily life (see also Gaudreau et al., 2018).

#### ***Interplay between PS and PC in association with self-control***

Overall, none of our analyses supported the assumption of the tripartite model of perfectionism that high PS might amplify adverse effects of high PC. Resulting from additive main effects with different signs (in the case of non-significant interaction effects) or from main effects plus interactive effects, a combination of high PS and high PC was associated with higher dispositional self-control, fewer temptations, lower desire strength, more resistance, less enactment, and less daily procrastination, compared to a combination of low PS and high PC - at least on a descriptive level. This pattern of results is more consistent with the 2x2 model's assumption that high PS/high PC should yield the worst outcome, and it contradicts the assumption of the tripartite model that low PS can be characterized as non-perfectionism, regardless of the level of PC. Our findings indicate that PS buffer negative associations of PC instead of amplifying them, and hence, support prior evidence for beneficial effects of PS (e.g. Altstötter-Gleich et al., 2012; Zureck et al., 2015; Rice & Liu, 2020). Beneficial effects of PS might not only refer to self-control in achievement situations, as investigated in the present study, but can also refer to reduced threat appraisal (Zureck et

al., 2015), better task-oriented and emotion-oriented coping (Ashby & Gnilka, 2017; Dunkley et al., 2014), or higher social support (Gnilka & Broda, 2019; Stoeber et al., 2017).

### ***Limitations and Conclusion***

On the one hand, a strength of our study was that the situational conditions under which the daily self-control data were collected can be regarded as relatively standardized (due to the uniform requirements in the demonstration lessons across participants and the high personal relevance of showing a good performance in these demonstration lessons). On the other hand, this may also be a weakness: Since future career perspectives depended on individuals' performance, the preparation phase, during which daily self-control was assessed, can be described as a "strong" situation. Strong (vs. weak) situations have been defined as situations in which individual differences have less impact on experience and behaviors due to their normative character (Meyer & Dalal, 2009). In addition, the relatively high PS scores in our sample ( $M = 4.53$  on a scale ranging from 1 to 6) and the comparatively moderate PC scores ( $M = 2.97$  for the intrapersonal facet and  $M = 2.61$  for the interpersonal facet) may limit the interpretability of the associations of these variables with daily self-control components. Another limitation is the composition of our sample (highly educated young adults, predominantly female). Therefore, our results might not be generalizable beyond young female adults in an academic setting.

Although our sample size was large enough to detect a small to moderate interaction effect with a power of .80, larger sample sizes are needed to detect small differences between "subtypes" of perfectionism (i.e., differences between specific combinations of high vs. low PS and high vs. low PC with a high power). Future studies should attempt to replicate our results with higher Level 2 sample sizes (Bolger et al., 2011) to support or falsify small PS associations with desire strength and resistance, which were not significant in the present study.

Regarding the design of our study, it should be noted that we used end-of-day assessments to measure daily self-control, which required participants to retrieve information from episodic memory (Conner & Barrett, 2012). In future research, multiple assessments of self-control per day may allow the investigation of dynamic processes that unfold within a day, for example, if resistance to temptation changes depending on whether a participant has (un)successfully resisted a previous temptation (Wenzel et al., 2020). A challenge will be to balance the goal of collecting more fine-grained information with the goal of not overburdening participants (as increased participant burden may reduce compliance and data quality).

Irrespective of these limitations, our results support well-known detrimental associations of PC and provide further evidence for beneficial associations of PS. It is important to note that a global measure of trait perfectionism, which was assessed in temporal distance to the predicted daily self-control experiences, was not only associated with dispositional self-control (i.e., a measure tapping individuals' semantic self-concept) but also with individual differences in (some of the components of) daily self-control. Further studies are necessary to better understand the processes underlying the positive association between PS and components of daily self-control.

From a theoretical perspective, the results of our study are relevant in that they provide further evidence for the validity of the 2x2 model compared to the tripartite model in a performance context. Comparable statements can be made so far mainly by studies in the context of sports (e.g., Hill et al., 2018). Particularly in light of the debate about the distinction between perfectionist striving and conscientious striving (Osenk et al., 2020), future research should focus on PS to better understand at what level striving for high standards loses its potential to buffer the negative effects of PC and instead leads to dysfunctional consequences.

From a practical perspective, our findings highlight the relevance of cognitive-behavioral therapy (CBT) interventions in the context of perfectionism-related disorders. They point to a dysfunctional perceptual and evaluative bias associated with PC, which is the subject of several CBT intervention strategies (Galloway et al. 2021).

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