# Perfect Self-Control? The Role of Perfectionistic Cognitions in Daily Self-Control Episodes

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**Abstract**

Self-control is an important resource that helps us keep track of goal achievement even in the face of alternative behavioral impulses. This might be especially relevant for the pursuit of daily life goals in a personally relevant achievement context. We investigated the role of daily perfectionistic cognitions in daily self-control episodes. Leaning on the Integrative Self-Control Theory, we investigated components of daily self-control episodes, including goal setting, conflicting desires (temptations), recruitment of self-control (resistance), and self-control failure and success (temptation enactment, procrastination, goal achievement). We used a measurement burst ambulatory assessment design to follow 183 preservice teachers for 9 months, during phases in which they repeatedly prepared for personally relevant achievement situations (demonstration lessons). The results of our three-level analyses (Level 1: day; Level 2: phase; Level 3: person) were consistent with theoretical considerations and previous empirical evidence. They revealed more negative outcomes for unique daily perfectionistic concerns cognitions (PCC) and more positive outcomes for unique daily perfectionistic strivings cognitions (PSC) in associations with conflicting desires and self-control failure and success on the day level and partially on the levels of between-phase and between-person differences. Unexpectedly, both PSC and PCC were associated with more recruitment of self-control. The theoretical implications for the understanding of the role of perfectionistic cognitions in daily self-control episodes are discussed.

*Keywords*: perfectionistic concerns cognitions, perfectionistic strivings cognitions, self-control, ambulatory assessment, preservice teachers

# Perfect Self-Control? The Role of Perfectionistic Cognitions in Daily Self-Control Episodes

Working on a manuscript instead of perfecting the background of one's teaching slides, exercising instead of watching one's favorite Netflix show, or preparing for an exam instead of calling one's best friend are only three examples where daily self-control is needed. Self-control has been defined as the "ability to override or change one's inner responses, as well as to interrupt undesired behavioral tendencies (such as impulses) and refrain from acting on them" (Tangney et al., 2004, p. 274), or as the "overriding of one action tendency in order to attain another goal" (Carver & Scheier, 2016, p. 3). Thus, self-control can be considered a narrower aspect of self-regulation, which has been more broadly defined as "self-corrective adjustments [that] are taking place as needed to stay on track, whatever one's current purpose is (whether overriding another impulse or simply reacting to perturbations from other sources) […]" (Carver & Scheier, 2016, p. 3). As such, self-control is defined as a stable personal characteristic (ability/trait) but also as a more concrete situation-specific act of overriding unwanted impulses in order to attain a higher-order goal (state). In the present research, we focused on this situation-specific view and investigated the role of perfectionistic cognitions in daily self-control episodes in a personally relevant achievement context. In such a context the successful outcome of daily self-control episodes is especially important.

## The Integrative Self-Control Theory

In their Integrative Self-Control Theory, Kotabe and Hofmann (2015) identified the central components that are eminent in theory and research on self-control and described their interplay in everyday self-control episodes. According to the Integrative Self-Control Theory, a self-control episode is initiated by a desire (i.e., a state of wanting that has the potential to direct a person toward more immediate rewards) that is perceived to be in conflict with a

higher-order goal and thus becomes a temptation (components summarized in the so-called *activation cluster*). The temptation occupies cognitive capacity needed for higher-order goal pursuit and activates the motivation to engage in effortful self-control (i.e., resistance as the central component in the so-called *exertion cluster*). If the effort invested in self-control surpasses the strength of temptation, there is a high probability that self-control will be successful (no enactment of temptation).[1] If mobilized self-control is not enough, then there is a high probability that self-control will not be successful (enactment of temptation). The central components in daily self-control episodes i.e., a higher-order goal, the perception of a temptation and its strength (activation), the amount of effort invested to resist the temptation (exertion), and the probability of self-control failure (temptation enactment) are affected by characteristics of the person and characteristics of the situation (e.g., Hofmann et al., 2012).

**Relevance of Perfectionistic Cognitions for Daily Self-Control Episodes**

One personal characteristic that is highly relevant for distinct components of self-control episodes is perfectionism. The diverse facets of the construct have been summarized by two dimensions (e.g., Stoeber & Gaudreau, 2017) . The first is a critical evaluation of one's own behavior and concerns about the consequences of not living up to one's standards (*perfectionistic concerns*). This dimension has consistently been linked with psychological maladjustment. The second is the setting of and striving for extremely high standards (*perfectionistic strivings*). This second dimension has shown more positive associations with psychological adjustment, especially when the overlap with dispositional perfectionistic concerns was controlled for (Hill et al., 2010; Stoeber & Gaudreau, 2017). From the

[1] The Integrative Self-Control Theory also includes external enactment constraints that might prevent success or failure irrespective of self-control effort or temptation strength.

definition of the dimensions of perfectionism, it is conceivable that they should be differentially associated with diverse self-control components, such as goal setting (both dimensions: high level and ascribed importance, but different motivational background) and vigilance toward possible temptations (due to focusing on potential shortcomings in perfectionistic concerns), and are thereby related to self-control effort and enactment probability. Prior studies and meta-analyses have supported the differential and sometimes opposite associations of perfectionistic strivings and concerns not only with overall goal progress (e.g., Powers et al., 2011, 2012), but more specifically with trait self-control (i.e., the capacity to resist temptation; Achtziger & Bayer, 2013; Tangney et al., 2004) and trait as well as daily procrastination (which indicates a breakdown of self-control; Sirois et al., 2017; Smith et al., 2017; Xie et al., 2018) when regarding trait perfectionism. A first investigation using the same daily self-control data as the present study[2] (Altstötter-Gleich et al., in press) found evidence that trait perfectionistic concerns were positively associated with between-person differences in the daily perception of temptations but also with a higher resistance to

[2] This study investigated associations between trait perfectionism and between-person differences in (average) state self-control components. The current study is kind of zooming in to processes that unfold on the daily basis when preparing for an upcoming achievement situation. Most importantly, as outlined throughout the introduction, the hypotheses for the current research were not informed by the specific trait perfectionism results of this prior investigation but they were derived from broader theoretical considerations and empirical evidence and they were formulated prior to any analysis of the perfectionistic cognitions variables. The bivariate correlations between perfectionistic cognitions and facets of trait perfectionism are reported in Table A10 in the supplemental material at https://osf.io/96wnc/.

temptations. Trait perfectionistic strivings were associated with less frequent temptations, higher resistance, and less frequent enactment.

However, with regard to self-control episodes that unfold on a daily (or even more fine-grained) basis, trait perfectionism might constitute only a quite distal predictor. The activation of the perfectionistic disposition on a specific day would constitute a more proximal predictor that has the potential to be more closely associated with a specific daily self-control episode. If we could identify perfectionistic cognitions as relevant proximal predictor for daily self-control episodes and their success, they might constitute a good candidate for tailored interventions as the change of repeated short-term processes has the potential to result in trait changes (e.g., Wrzus & Roberts, 2017). Perfectionistic cognitions have been defined as state-like manifestations of perfectionism in the form of specific automatic thoughts that emerge when the perfectionistic self-schema is activated by demanding situations that indicate an opportunity for perfection or imperfection (e.g., Flett et al., 1998; Stoeber et al., 2010). Thus, the frequency of perfectionistic cognitions should vary within persons as a function of demands, which trigger the translation of cognitive schemas into perfectionistic cognitions (Flett et al., 1998, 2007; Flett, Hewitt, et al., 2012). Additionally, the frequency with which perfectionistic cognitions occur should vary between individuals due to between-person differences in the underlying cognitive schemas represented by the dimensions of dispositional perfectionism and their facets.

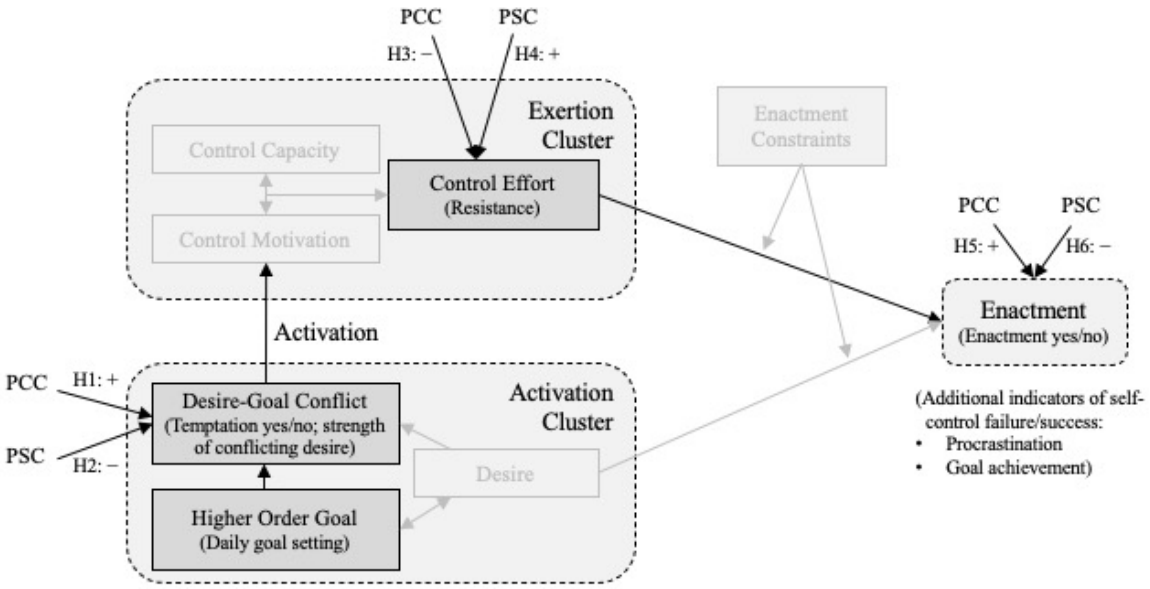
In parallel to the conceptualization of trait perfectionism, it has proven valuable to differentiate between cognitions that mirror thoughts about having high standards for oneself (*Perfectionistic Strivings Cognitions*; PSC) and thoughts about mistakes and their negative consequences (*Perfectionistic Concerns Cognitions*; PCC) because the two have demonstrated differential associations with psychological adjustment (Flett et al., 2011; Prestele & Altstötter-Gleich, 2019; Stoeber et al., 2010, 2014). Whereas PCC have

consistently shown positive associations with different indicators of distress, PSC have been found to be mostly unrelated or even negatively related to distress.

One important limitation in prior research on perfectionistic cognitions is that they have predominantly been investigated in cross-sectional studies with retrospective assessments across a certain period of time (usually 1 or 2 weeks) that did not assess perfectionistic cognitions as they might arise on a daily basis and thus did not differentiate between-person differences (being a person who is more or less prone to PSC/PCC) from within-person variations (having more or fewer PSC/PCC on one day compared with another). This research practice limits the informative value that might be gained through the investigation of state perfectionistic cognitions as a supplement to and as a relevant process variable in (trait) perfectionism research. More specifically, to our knowledge, daily perfectionistic cognitions have not been investigated with respect to their associations with daily self-control. Figure 1 summarizes the central components of the Integrative Self-Control Theory, highlighting the components that we focused on in the current study, their interplay, and hypothesized associations with perfectionistic cognitions. In the following, we outline the ways in which we expect daily PSC and PCC to be related to the central components of daily self-control episodes.

**Figure 1**

*Schematic and Simplified Representation of the Integrative Self-Control Theory*




*Note*. This schematic and simplified representation of the Integrative Self-Control Theory was adapted from Kotabe & Hofmann (2015). The components that were assessed in the current study are highlighted (operationalizations in parentheses). Components that were not assessed in the current study are greyed out. Hypothesized associations with perfectionistic strivings cognitions (PSC) and perfectionistic concerns cognitions (PCC) are indicated with arrows. The directed arrows indicate that PSC and PCC were treated as joint predictors of self-control outcomes in multilevel regression analyses but do not imply the assumption of causal directionality.

## Daily Perfectionistic Cognitions and Higher-Order Goals

According to the Integrative Self-Control Theory, the first component that is relevant to the activation of self-control episodes is the nature and importance of higher-order goals. As described above, perfectionistic cognitions are thought to be triggered in situations that offer the opportunity for perfection or imperfection, that is, for achieving or failing to achieve perfectionistic goals. Thus, the emergence of daily perfectionistic cognitions indicates that they are triggered by a salient, personally relevant goal (i.e., high importance). This should result in a positive association between daily perfectionistic cognitions and daily goal setting (specifically, the goal of investing a certain amount of time in the pursuit of a higher-order

goal as an indicator of the daily salience of the higher-order goal)[3]. Goal salience is a core element in the activation of self-control. Thus, interindividual and intraindividual differences in the salience of higher-order goals should affect the perception of temptations, investments in resistance, and finally, self-control success. As such, experiencing a situation that is personally relevant has the potential to trigger perfectionistic cognitions in prone persons and to activate self-control episodes. Empirical investigations of the association between perfectionistic cognitions and goal salience are scarce (e.g., Prestele et al., 2020). We thus explored the association between perfectionistic cognitions and daily goal setting in our data.

**Daily Perfectionistic Cognitions and Temptations**

The second relevant component in the activation of self-control episodes is the experience of desires that are perceived to conflict with the higher-order goal (i.e., temptations). In general, perfectionism has been assumed to be accompanied by an attentional bias toward negative perfectionism-relevant cues including imminent interruptions in goal progress or interruptions that already occurred (e.g., Howell et al., 2016). The experience of desires that conflict with a higher-order goal has the potential to disrupt focused goal pursuit and can thus be considered a special case of negative perfectionism-relevant cues. Specifically, the definition of perfectionistic concerns includes preoccupation with potential mistakes and overly critical self-evaluations. As a state-like manifestation of trait perfectionistic concerns, PCC should indicate a state of sensitivity toward potential

[3] It is important to note that we assume comparable goal salience for both PSC and PCC, whereas it was beyond the scope of our study to examine the motivational background of the salient goals, which has been shown to differ substantially between perfectionistic strivings and concerns at trait level (e.g., Moore et al., 2017; Slade & Owens, 1998).

interruptions (e.g., temptation), and, the other way around, the perception of a temptation should activate PCC. Both processes should contribute to a positive association between PCC and perceived temptation on a daily basis.

Another reason why we expected differential associations of daily PSC and PCC with the perception of temptations (probability and strength) is based on the differentiation between approach and avoidance that is evident in the content of perfectionism-specific automatic thoughts (Kobori & Tanno, 2005). On the trait level, approach orientation has been found to be associated with higher self-control, and avoidance orientation has been found to be associated with lower self-control (e.g., Briki, 2018). Higher self-control in turn has been found to be associated with avoiding rather than resisting temptation (e.g., Ent et al., 2015). Based on this indirect evidence for associations between perfectionistic cognitions and temptations via their respective associations with motivational orientation and self-control, we would expect PSC (which indicate an approach orientation) to be associated with the tendency to avoid temptations (low probability and strength of reported temptations), whereas the reverse should be true for PCC (which indicate an avoidance orientation).

*Hypothesis 1: Higher levels of daily PCC are associated with a higher probability of experiencing relevant daily temptations and with higher levels of temptation strength.*

*Hypothesis 2: Higher levels of daily PSC are associated with a lower probability of experiencing relevant daily temptations and with lower levels of temptation strength.*

**Daily Perfectionistic Cognitions and Resistance**

A perceived conflict between a higher-order goal and a desire should activate the motivation to engage in effortful self-control (exertion). Generally, it can be assumed that, in a state where it is very important to achieve a demanding goal (a core element of perfectionism), more effort is invested in self-control. Defining daily perfectionistic cognitions as specific automatic thoughts, there might be another process at play. Negative

cognitions occupy working memory capacity that might otherwise be used for goal pursuit (and to resist temptation). For example, worry, negative automatic thoughts, and ruminative thoughts have been found to be associated with reduced attentional control and working memory capacity (e.g., De Raedt & Koster, 2010; Derryberry & Reed, 2002; Eysenck & Calvo, 1992). In a similar vein, it has been argued in self-control research that salient temptations occupy working memory capacity and thereby limit the extent to which this important resource can be applied to self-control (e.g., Hofmann & Van Dillen, 2012; Kavanagh et al., 2005; Kotabe & Hofmann, 2015). This process should especially be true for daily PCC, which focus attention away from goal pursuit toward temptations and might even work in the opposite way for daily PSC, which indicate a focus on goal approach.

In one study, perfectionistic cognitions (with no differentiation between PSC and PCC) were found to be associated with impaired attentional control (Desnoyers, 2013). There is also evidence of a positive association between PSC (but not PCC) and effort invested in practicing (hours spent practicing) in musicians (Kobori et al., 2011). However, this research did not directly investigate state levels of perfectionistic cognitions, and the investment of effort in goal pursuit is not a direct indicator of self-control effort. Hence, it is still an open question whether daily PSC and PCC would be differentially associated with the amount of effort invested in resisting a concrete temptation.

*Hypothesis 3: At a given level of daily temptation strength, higher levels of daily PCC are associated with lower levels of resistance.*

*Hypothesis 4: At a given level of daily temptation strength, higher levels of daily PSC are associated with higher levels of resistance.*

**Daily Perfectionistic Cognitions and Self-Control Success**

As a consequence of their differential (dis)advantages in the earlier components of self-control episodes and as a consequence of the specific triggering of PCC versus PSC by

the experience of self-control failures versus success, it can be assumed that daily PSC should be associated with a lower probability of enacting a temptation, less procrastination, and higher goal achievement, whereas the reverse should be true for daily PCC. One prior study reported a positive association between perfectionistic cognitions and procrastination automatic thoughts (Flett, Stainton, et al., 2012), and there is evidence that daily PSC and PCC might be inversely associated with daily goal achievement (Prestele et al., 2020). However, associations between daily perfectionistic cognitions and the success of daily self-control effort are questions that are open for investigation.

*Hypothesis 5: Higher levels of daily PCC are associated with lower daily self-control success (i.e., a higher probability of enacting a temptation, more procrastination, and lower goal achievement).*

*Hypothesis 6: Higher levels of daily PSC are associated with higher daily self-control success (i.e., a lower probability of enacting a temptation, less procrastination, and higher goal achievement).*

Additionally, we aimed to explore whether these associations would hold when we controlled for the earlier steps in the Integrative Self-Control Theory (i.e., daily temptation strength and daily resistance). This unique main effect addresses the question of whether—assuming constant levels of temptation strength and resistance—higher levels of PCC and lower levels of PSC would still be associated with a higher probability of enacting a temptation. Therefore, this main effect constitutes a more stringent test of self-control success.

## The Present Study

We identified preservice teachers as an ideal population in which to test our hypotheses because preservice teachers in Germany repeatedly experience stressful personally relevant achievement situations (demonstration lessons in which their performance

in a prepared lesson is evaluated by a committee). In the days preceding the actual achievement situation (preparation phase), daily self-control is required for effective preparation and, hence, for achieving the higher-order goal of getting a good evaluation. An advantage of studying preservice teachers preparing for their demonstration lessons is that these achievement situations do not differ in format over time or between participants. Hence, using this particular situation allowed us to reduce inter- and intrapersonal variance in objective situation characteristics. Leaning on the Integrative Self-Control Theory as well as theoretical reflections and empirical evidence on the role of perfectionistic cognitions we investigated unique, potentially opposing associations of daily PSC and PCC with daily self-control episode variables. Whereas our research hypotheses are primarily located on the daily level of analysis, perfectionistic cognitions are also assumed to show valid stable differences that result from between-person differences in perfectionistic self-schemata. We therefore also explored corresponding associations on the between-phase and between-person levels of analysis. The hypotheses and analysis plan of this study were preregistered at the OSF after data collection but before data analysis (https://osf.io/jprcf).

## Method

### Study Design

This study was part of a larger project (https://osf.io/t8bn9/). For their second state exam, preservice teachers have to complete 1 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 theoretical and practical final examinations. During the practical training phase, preservice teachers have to prepare and implement demonstration 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 Ambulatory Assessment (AA) periods, a 9-month phase of up to eight repeated AA periods, and a follow-up online survey. 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 daily morning and evening assessments that were recorded each day of the 10 days preceding each demonstration lesson were relevant for the present study.[4] In the morning, participants indicated their daily goal setting. Among other constructs, daily perfectionistic cognitions, daily self-control (temptations, temptation strength, resistance, enactment), daily procrastination, and daily goal achievement were assessed in the evenings. For each assessment, personalized links to the respective online survey (SoSci Survey, Leiner, 2016) were sent via SMS so that participants could complete the surveys online on their smartphones. We employed this sampling scheme so that we could capture the daily variables in near-real time to avoid the predominance of retrospective biases. At the same time, we did not want to sample too frequently as we wanted to avoid interrupting and distorting their ongoing preparation and thus the self-control components. Teacher education centers scheduled up to eight (typically six) demonstration lessons per preservice teacher over the course of 9 months.

**Procedure**

At the informational events, participants were informed about the goals of the study, the procedure, remuneration, and how they could sign up to participate. The study's website

[4] A detailed description of the project design and an overview of all instruments can be retrieved from the project's OSF page (https://osf.io/t8bn9/).

was introduced, and flyers were handed out. To be eligible, participants had to (a) be enrolled as a preservice teacher in a teacher education center, (b) own a smartphone with an Internet connection, and (c) be willing to provide personal data (e.g., phone number, email address). After signing up for the study, participants provided informed consent and completed the initial online survey. Completion of the online survey and the online tutorial were prerequisites for participating in the AA periods. Individual sampling schemes were programmed for each participant to account for individually scheduled demonstration lessons and the timing of AA prompts. Participants were remunerated with 15 Euro for each AA period when they completed at least 50% of the daily morning and evening questionnaires in addition to the goal assessment and post-demonstration lesson questionnaire. By completing more daily questionnaires (60%, 80%, 100%), participants could collect tickets to participate in a raffle to win prizes 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 at 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.

**Sample Size Considerations**

During the study planning phase, sample size was determined on the basis of person-level moderator hypotheses, which were not part of the present research. Assuming a small to moderate effect size for the interaction ($\phi^2 = 0.075$), an alpha level of 5%, and a power of 80%, a power analysis using the software G*Power (Faul et al., 2009) yielded a minimum sample size of $N = 132$. A total of 192 participants were recruited in teacher education centers

in Rhineland-Palatinate, Germany.[5] Prior to our analyses, but after data collection, we aimed to gain insight into whether the sample size achieved would provide an adequate level of power to detect the multilevel regression effects[6] that were hypothesized in the present paper. We therefore conducted Monte Carlo simulations in Mplus (Bolger et al., 2011). Assuming relatively large ICCs for daily perfectionistic cognitions ($ICC_{PSC}$ = .60, $ICC_{PCC}$ = .50; Prestele et al., 2020) and moderate ICCs for daily self-control (ICC = .30; Altstötter-Gleich et al., in press), while also considering an average sample size of 100 participants at each of the 60 measurement occasions (a conservative average of the empirical data > 7,000 daily assessments across mostly 60 [6 AA phases of 10 days each] measurement occasions), this analysis revealed a power of ≥ .89 for small and moderate unique effects on the day level ($\beta$ ≥ .10) and for large unique effects of PSC and PCC on the person level ($\beta$ ≥ .30; Funder & Ozer, 2019) at a Type I error rate of 5%.

**Compliance and Data Cleaning**

One hundred ninety-two 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 had to be excluded because they participated in only one AA period and thereby responded to less than 50% of the daily prompts. The final

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[5] To account for a potential drop-out rate of about 50% (from the first to the sixth assessment phase), we originally aimed to assess 270 preservice teachers by recruiting multiple cohorts of preservice teachers (who began their training at different time points at different teacher training centers). As the actual drop-out rates turned out to be much lower, we achieved the planned sample size by recruiting fewer participants across multiple waves.

[6] The term “effect” is used throughout the manuscript to refer to regression coefficients as statistical parameters and is not supposed to imply causal directionality.

sample consisted of 183 preservice teachers (84% women; Age: $M = 25.93$, $SD = 3.08$). 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 answered the daily assessments for 5.15 AA phases ($Min = 1$, $n = 6$; $Max = 7$, $n = 6$; $SD = 1.36$). Measurement occasions were retained for the analyses if they passed the following checks for compliance and careful responding: Careless responses were identified by (a) extremely short response times, (b) longstrings, and (c) inconsistencies in responses (see https://osf.io/t8bn9/ for a detailed description). To ensure compliance with the daily time schedule, we generally excluded any data that were provided more than 8 hr after the prompt. For the present research question, because both morning and evening assessments were relevant and should not be influenced by the (next) day's ongoing experience, we additionally deleted three daily assessments (morning surveys answered later than noon of the same day, $n = 1$; evening surveys answered later than 9:00 am the next morning, $n = 2$). One morning assessment was deleted because it was recorded twice in the same morning (first recording retained). As morning assessments were mainly used to compute an index for daily goal achievement (see the Measures section), morning assessments were retained only if they could be matched with an evening assessment from the same day. Across AA phases, on average, we retained 44 evening assessments ($Min = 6$, $n = 1$; $Max = 63$, $n = 1$; $SD = 14.27$) and 42 matched morning assessments ($Min = 4$, $n = 1$; $Max = 60$, $n = 6$; $SD = 14.51$) per participant from usually 10 mornings/evenings of six demonstration lesson preparation

phases (i.e., 60 mornings/evenings).[7] Overall, the analyses in the present research were based on a total of $N = 8{,}067$ evening assessments and $N = 7{,}693$ assignable morning assessments at Level 1 nested in 950 preparation phases at Level 2 nested in 183 individuals at Level 3.

## Measures

### *Daily Perfectionistic Cognitions*

The two facets of perfectionistic cognitions were assessed each evening with items that were developed for the assessment of daily perfectionistic cognitions (Prestele et al., 2020). Originally, these items were adapted from existing trait measures of dispositional perfectionistic strivings and concerns to assess current thoughts that might occur during a day spent preparing for an examination (e.g., "I want to perform particularly well on the exam).". For the present study, we deleted the direct reference to the "exam" from one item and adapted the instructions to assess daily cognitions while preparing for the upcoming demonstration lesson. To reduce participant burden, we selected three PSC and six PCC items that represent the core aspects of the different facets of perfectionistic strivings and concerns. Out of the three PSC items, an example item is "I want to perform particularly well." Out of the six PCC items, an example item is "Bother! I made a mistake here." Participants were asked to indicate how frequently each of the thoughts came to their minds during that work day ranging from 1 (*not at all*) to 6 (*almost the entire time*). Omega coefficients were $\omega_{L1} = .50$, $\omega_{L2} = .82$, and $\omega_{L3} = .90$ for PSC and $\omega_{L1} = .68$, $\omega_{L2} = .89$, and

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[7] Six participants had one more demonstration lesson than all the others (i.e., a maximum of 70 evening assessments). For two participants, the daily assessment phase was 1 or 2 days longer because their demonstration lesson was postponed.

$\omega_{L3}$ = .94 for PCC.[8] We calculated a mean score across the items of each facet so that higher values indicated more frequent PSC and PCC, respectively.

***Daily Self-Control***

In the evening of the days on which participants had planned to prepare or actually prepared for the demonstration lesson, daily self-control was assessed in terms of different self-control episode indicators. As in Hofmann et al. (2012), participants indicated whether they had experienced something that tempted them not to prepare for the upcoming demonstration lesson as planned (*temptation*: 0 = no; 1 = yes). When a temptation occurred, participants further rated the strength of the temptation (*temptation strength*; 1 = extremely weak; 6 = irresistible) and how strongly they tried to resist the temptation (*resistance*; 0 = not at all; 5 = strongly). Finally, participants indicated whether they gave in to the temptation (*enactment*; 0 = no; 1 = yes).

***Daily Goal Setting and Quantitative Goal Achievement***

Each morning, participants indicated how many hours they planned to prepare for the upcoming demonstration lesson that day. The planned preparation time (0 hr to 20 hr) was used as an indicator of daily goal setting[9]. In the evening, we asked how many hours participants actually prepared that day (actual preparation time; 0 hr to 20 hr). As an indicator of quantitative goal achievement, we computed the difference between actual and planned preparation time.

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[8] We followed Geldhof et al.'s (2014) guidelines for ML reliability estimation with at least three items. The results from the two-dimensional multilevel confirmatory factor analysis are summarized in Table A1 at https://osf.io/96wnc/.

[9] Overall, only 2 out of 7,693 morning assessments reported a goal of 0 hours of prep time.

### *Daily Procrastination*

In the evenings of the days on which participants had prepared for the demonstration lesson, participants rated whether they engaged in one of three forms of *procrastination* that day (postponement, pausing, premature termination; 0 = no; 1 = yes; adapted from Patzelt & Opitz, 2014). Omega coefficients indicated adequate reliability ($\omega_{L1}$ = .65, $\omega_{L2}$ = .84, $\omega_{L3}$ = .90).[10] We computed the sum of the three items per day and treated this variable as an ordinal variable.

## Data Analysis

As described above, our study design resulted in nested data (daily assessments nested in preparation phases nested in persons). We applied three-level analyses (Level 1: day; Level 2: phase; Level 3: person) to all daily outcome variables using Bayesian estimation with noninformative priors in Mplus (Version 8.6; Muthén & Muthén, 2017).[11] For the binary outcomes (daily temptation, daily enactment) and the ordinal outcome (daily procrastination), we applied the latent response formulation within the general modeling framework using Bayesian estimation and the standard normal (probit) link function implemented in Mplus.

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[10] Results from the unidimensional multilevel confirmatory factor analysis can be retrieved from Table A2 at https://osf.io/96wnc/.

[11] We additionally conducted two-level analyses for days nested in persons in which we included phase as a dummy-coded covariate as preregistered. The results of these analyses were generally in line with the day- and person-level results of the three-level analyses and are reported in Tables A5 to A9 in the supplemental material on https://osf.io/96wnc/. We decided to apply the three-level analyses to avoid inaccurate parameter estimates (Chen, 2012; De Haan-Rietdijk et al., 2016; Moerbeek, 2004).

Following preliminary analyses involving bivariate correlations, descriptive statistics, intraclass correlations, and reliabilities of the study variables, we computed multilevel regression analyses to investigate unique associations of daily perfectionistic cognitions (PSC and PCC) with daily self-control variables. Day of measurement (0 to 11) was included as a Level 1 control variable, and demonstration lesson (0 to 7) was included as a Level 2 control variable to rule out the possibility that within-person relationships between daily predictors and daily outcomes were simply due to shared time trends in these variables across the study period. We determined the convergence diagnostic (Brooks & Gelman, 1998), checked whether convergence remained after doubling the number of iterations, visually inspected the trace plots to ensure the stability of the Markov chains, and visually checked the smoothness of the histograms for all parameters.

We planned to switch from random slopes to random intercept models if convergence issues occurred (LeBeau et al., 2018). In all models, we evaluated all parameter estimates for the hypothesized relationships and report their 95% credibility intervals. If the 95% Bayesian credibility interval of an estimated parameter did not encompass zero, we considered the parameter as significant. In addition, we report the standardized estimates and *R*-square values provided in Mplus as indicators of effect size. [12]

Our research hypotheses are primarily located on the daily level of analysis. However, given that perfectionistic cognitions are also thought to have a stable component that results

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[12] Standardized results and $R^2$ values were retrieved from random intercept models because Mplus does not provide such results for three-level random slopes models. The results of the random intercept models were generally in line with the results of the random slopes models and can be retrieved from https://osf.io/96wnc/.

from between-person differences in perfectionistic self-schemata, we also expected associations with between-phase and between-person differences in PSC and PCC. Therefore, we regressed daily self-control variables (goal setting, temptations, temptation strength, resistance, enactment, procrastination, goal achievement) on daily perfectionistic cognitions (Level 1) and included phase-level and person-level aggregates of PSC and PCC as Level 2 and Level 3 predictors in order to explore phase- and person-level associations of preservice teachers' aggregates of PSC and PCC with the daily self-control variables. We centered the Level 1 and Level 2 predictor variables on their cluster mean (i.e., the Level 1 variables were centered on the phase means, and the Level 2 variables were centered on the person means) and the Level 3 predictor variables on the grand mean so that we could achieve clearly interpretable parameter estimates. For the daily self-control variables, we added specific "early-stage" episode variables (see Figure 1) in a second set of analyses in order to investigate whether the associations of PSC and PCC with resistance would hold when potential differences in temptation strength were controlled for (Hypotheses 3 and 4) and whether associations of PSC and PCC with enactment would hold when potential differences in resistance and temptation strength were controlled for (Hypotheses 5 and 6). Raw data, code, and supplemental materials can be retrieved from https://osf.io/96wnc/.

## Results

### Preliminary Analyses

The bivariate correlations, descriptive statistics, and intraclass correlations of the variables are summarized in Table 1. The intraclass correlation coefficients of the daily variables ranged from 6% (goal achievement) to 63% (PCC) for the person level (Table 1, first section, above the diagonal) and from 1% (goal achievement) to 15% (PCC) for the phase level (Table 1, first section, below the diagonal).

**Table 1**

*Bivariate Correlations, Higher-Order Means/Overall Proportions, Variances, and Intraclass Correlation Coefficients of the Measures at the Three Levels of Analysis*

| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|---|
| Between-person (L3)/ between-phase (L2) | | | | | | | | | | |
| Daily perfectionistic cognitions | | | | | | | | | | |
| (1) | PSC | | .44* | -.06 | .23* | .16 | -.10 | .15 | -.02 | .02 |
| (2) | PCC | .38* | | .30* | .27* | .28* | .02 | .18* | .33* | -.16 |
| Daily self-control episodes | | | | | | | | | | |
| (3) | Temptation | -.04 | -.05 | | .27* | .25* | .08 | .08 | .91* | -.15 |
| (4) | Temptation strength | .29* | -.00 | -.26 | | .13 | .06 | -.13 | .33* | -.03 |
| (5) | Resistance | .10 | .18 | .47* | -.20 | | -.63* | .10 | .04 | -.15 |
| (6) | Enactment | -.04 | -.23* | -.75* | .57* | -.88* | | -.17 | .42* | -.13 |
| Additional daily self-control variables | | | | | | | | | | |
| (7) | Goal setting | .35* | .48* | -.06 | .29 | -.04 | .02 | | .08 | .07 |
| (8) | Procrastination | -.17* | .07 | .77* | -.18 | .36* | -.22 | .03 | | -.14 |
| (9) | Goal achievement | .26 | .07 | .07 | .18 | -.73 | .47 | -.24 | -.19 | |
| Day-level (L1) | | | | | | | | | | |
| (2) | | .25* | | | | | | | | |
| (3) | | -.05* | .10* | | | | | | | |
| (4) | | -.08* | .04 | – | | | | | | |
| (5) | | .14* | .08* | – | -.25* | | | | | |
| (6) | | -.11* | .02 | – | .54* | -.55* | | | | |
| (7) | | .19* | .05* | -.25* | -.28* | .35* | -.45* | | | |
| (8) | | -.04* | .11* | .81* | .22* | -.18* | .64* | -.32* | | |
| (9) | | .11* | -.01 | -.36* | -.25* | .29* | -.48* | .70* | -.41* | |
| | *M* | 4.17 | 2.67 | | 4.44 | 3.22 | | 3.70 | | 0.03 |
| | *Proportion (Cat. 0)* | | | 0.69 | | | 0.28 | | 0.63 | |
| | *Proportion (Cat. 1)* | | | 0.31 | | | 0.72 | | 0.19 | |
| | *Proportion (Cat. 2)* | | | | | | | | 0.10 | |
| | *Proportion (Cat. 3)* | | | | | | | | 0.08 | |
| | $SD_{Level3}$ | 0.90 | 0.90 | 0.67 | 0.46 | 0.64 | 0.69 | 0.93 | 0.67 | 0.34 |
| | $SD_{Level2}$ | 0.44 | 0.43 | 0.43 | 0.25 | 0.31 | 0.43 | 0.35 | 0.30 | 0.10 |
| | $SD_{Level1}$ | 0.61 | 0.54 | – | 0.99 | 1.17 | – | 1.91 | – | 1.36 |
| | $\rho_{Level3}$ | .59 | .63 | .28 | .17 | .22 | .29 | .19 | .29 | .06 |
| | $\rho_{Level2}$ | .14 | .15 | .11 | .05 | .06 | .11 | .03 | .06 | .01 |
| | $N_{Level3}$ | 183 | 183 | 183 | 182 | 182 | 182 | 183 | 183 | 183 |
| | $N_{Level2}$ | 949 | 949 | 947 | 730 | 729 | 728 | 950 | 942 | 945 |
| | $N_{Level1}$ | 8,038 | 8,036 | 7,514 | 2,343 | 2,338 | 2,335 | 8,048 | 6,857 | 7,660 |

*Note.* Between-person statistics (Level 3) are presented above the diagonal, between-phase statistics (Level 2) are presented in the first section below the diagonal, and day-level (Level 1) statistics are presented in the second section below the diagonal. Temptation and enactment were coded 0 = no, 1 = yes. PSC = Perfectionistic Strivings Cognitions; PCC = Perfectionistic Concerns Cognitions; ρ = Intraclass correlation.
* 95% credibility interval excludes zero.

Thus, whereas most variables demonstrated substantial between-person variability and variability from day to day and only a little between-phase variability, the amount of between-person variance was higher for perfectionistic cognitions compared with the daily self-control variables and lower for quantitative goal achievement. The day-level correlations (Table 1, second section) revealed that PSC and PCC often had small bivariate associations with the daily self-control variables; however, these correlations were sometimes significant only for PSC (temptation strength, enactment, goal achievement) or went in opposite directions for PSC and PCC (temptation, procrastination). As such, a day in which a person perceived more frequent PSC was also a day with higher goals, a lower probability of experiencing temptation, weaker temptations, stronger resistance, a lower probability of enactment, less procrastination, and higher goal achievement. A day in which a person perceived more frequent PCC was also a day with higher goals and strong resistance but also a higher probability of experiencing temptation and more procrastination. Concerning the between-person correlations (Table 1, first section, above the diagonal), PCC showed small to moderate, significant, positive bivariate associations with most of the daily self-control variables (except enactment and goal achievement). These associations were mostly nonsignificant for PSC (except temptation strength).

**Main Analyses**

For our main analyses, we conducted three-level regression analyses with random intercepts and random slopes. Due to convergence issues, the covariances between the random intercepts and random slopes were set to zero. Tables 2 to 5 summarize the results of the analyses for each dependent variable.

### *Perfectionistic Cognitions, Goal Setting, and Temptations*

First, we analyzed the relationships between perfectionistic cognitions and components relevant for the activation of self-control—that is, goal setting, experiencing temptation, and temptation strength (Table 2). Our exploratory analysis on goal setting showed that on days in which participants perceived more frequent PSC, they set higher goals for themselves. Comparable moderate to large (Funder & Ozer, 2019) positive associations were found on Level 2 for PSC and PCC but not on Level 3. 95% credibility intervals indicated a higher certainty of estimation for the Level 1 and Level 2 compared to the Level 3 effects which were not found to be reliably different from zero.[13] With respect to daily temptations, our analyses revealed differential and partially opposing associations of PSC and PCC. As expected, on days in which participants perceived more frequent PSC, they were less likely to experience temptation, and they perceived weaker temptations. Also as expected, on days in which participants perceived more frequent PCC, they had a higher probability of experiencing temptation, and they perceived stronger temptations (Level 1). These differential associations were also found on Level 3 (between persons) albeit less pronounced: Individuals who experienced more frequent PSC across all preparation phases reported less frequent temptations. Individuals who experienced more frequent PCC across all preparation phases reported more frequent temptations. These effect sizes were only small on the day level but strong on the between person level. 95% credibility intervals indicate a higher certainty of estimation for the Level 1 and Level 2 compared to the Level 3 effects.

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[13] Posterior distribution plots of all parameters can be retrieved from https://osf.io/96wnc/.

**Table 2**

*Parameter Estimates Resulting From Three-Level Random Slope Models Predicting Goal Setting, Temptation, and Temptation Strength*

| Outcome<br>Predictor | *B* | 95% *CI* | (Residual) Variances | *std. B* | $R^2$ |
|---|---|---|---|---|---|
| **Goal Setting** | | | | | |
| Intercept | 2.62* | [2.46; 2.80] | | | |
| Level 1 (Day) | | | 2.93 | | 0.15 |
| Day | 0.22* | [0.21; 0.24] | | 0.35 | |
| PSC | 0.57* | [0.48; 0.66] | 0.02/0.11 | 0.18 | |
| PCC | 0.10 | [-0.00; 0.20] | 0.08/0.14 | 0.03 | |
| Level 2 (Between phase) | | | 0.15 | | 0.23 |
| Phase | 0.02 | [-0.01; 0.05] | | 0.09 | |
| PSC_PhM | 0.24* | [0.13; 0.36] | | 0.27 | |
| PCC_PhM | 0.27* | [0.16; 0.38] | | 0.28 | |
| Level 3 (Between person) | | | 0.88 | | 0.06 |
| PSC_PeM | 0.13 | [-0.04; 0.31] | | 0.13 | |
| PCC_PeM | 0.15 | [-0.02; 0.33] | | 0.15 | |
| **Temptation**[a] | | | | | |
| Threshold | -0.29* | [-0.42; -0.15] | | | |
| Level 1 (Day) | | | | | 0.12 |
| Day | -0.12* | [-0.13; -0.10] | | -0.32 | |
| PSC | -0.14* | [-0.22; -0.06] | 0.07/0.04 | -0.08 | |
| PCC | 0.19* | [0.12; 0.27] | 0.05/0.02 | 0.09 | |
| Level 2 (Between phase) | | | 0.13 | | 0.46 |
| Phase | -0.19* | [-0.22; -0.17] | | -0.68 | |
| PSC_PhM | 0.03 | [-0.08; 0.13] | | 0.02 | |
| PCC_PhM | -0.01 | [-0.12; 0.09] | | -0.01 | |
| Level 3 (Between person) | | | 0.49 | | 0.13 |
| PSC_PeM | -0.18* | [-0.32; -0.05] | | -0.23 | |
| PCC_PeM | 0.30* | [0.17; 0.43] | | 0.38 | |
| **Temptation Strength** | | | | | |
| Intercept | 4.24* | [4.13; 4.35] | | | |
| Level 1 (Day) | | | 0.91 | | 0.01 |
| Day | -0.01 | [-0.03; 0.00] | | -0.03 | |
| PSC | -0.14* | [-0.22; -0.05] | 0.06/0.03 | -0.08 | |
| PCC | 0.11* | [0.01; 0.20] | 0.06/0.03 | 0.05 | |
| Level 2 (Between phase) | | | 0.04 | | 0.47 |
| Phase | 0.10* | [0.07; 0.13] | | 0.65 | |
| PSC_PhM | 0.08 | [-0.03; 0.18] | | 0.14 | |
| PCC_PhM | -0.03 | [-0.14; 0.07] | | -0.04 | |
| Level 3 (Between person) | | | 0.19 | | 0.09 |
| PSC_PeM | 0.07 | [-0.03; 0.17] | | 0.16 | |
| PCC_PeM | 0.09 | [-0.00; 0.19] | | 0.18 | |

*Note*. (Residual) Variances summarize level-specific intercept residual variances and Level 2/Level 3 variances of random Level 1 slopes. Standardized parameter estimates (*std. B*) and $R^2$ were retrieved from random intercept models. PSC = Perfectionistic Strivings Cognitions; PCC = Perfectionistic Concerns Cognitions; PhM = Phase mean; PeM = Person mean. Point estimates

correspond to the median of the posterior distribution. [a]Results for temptation as the outcome variable are based on generalized linear models with a probit link function (i.e., estimates in column *B* represent the expected change in the latent variable underlying the observed categorical variable of experiencing a temptation for a one-unit increase in the predictor variable; estimates in column *std. B* represent the expected standard deviation change in the latent dependent variable for a one standard deviation increase in the predictor variable).
*95% credibility interval excludes zero.

In sum, our analyses supported our hypotheses on negative associations for PSC and positive associations for PCC with temptations and temptation strength (Hypotheses 1 and 2) on the day level and to some extent on the level of between-person differences but not on the level of between-phase differences.

### *Perfectionistic Cognitions and Resistance*

With respect to the central variable in the exertion of self-control, resistance (Table 3), our analyses revealed that on days in which participants perceived more frequent PSC, they invested more effort in resisting temptations (Level 1), and the effect size of this association was small to moderate. Unexpectedly, more frequent daily PCC were positively (and not negatively) related to resistance on Level 1 with a very small effect size. On Level 2 (between phases), the relationships between perfectionistic cognitions and resistance were nonsignificant. However, when we controlled for phase-level temptation strength, the 95% credibility interval of the Level 2 effect of PSC excluded zero. On Level 3, unexpectedly, participants who experienced more frequent PCC across all preparation phases reported stronger resistance, and this association corresponded to a moderate to large effect size, whereas the relationship between person-level PSC and resistance was not significantly different from zero. In sum, we found no support for the expected negative association between PCC and resistance (Hypothesis 3), but our analyses supported our hypotheses on positive associations between daily PSC and daily resistance at a given level of daily temptation strength (Hypothesis 4) on the day level and the phase level (but not on the person level).

**Table 3**

*Parameter Estimates Resulting From Three-Level Random Slope Models Predicting Resistance*

| Set 1: PSC, PCC, and time trends | | | | | | Set 2: Control temptation strength | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | *B* | 95% *CI* | (Residual) Variances | *std. B* | $R^2$ | *B* | 95% *CI* | (Residual) Variances | *std. B* | $R^2$ |
| Intercept | 3.15* | [3.00; 3.29] | | | | 3.26* | [3.12; 3.41] | | | |
| Level 1 (Day) | | | 1.25 | | 0.03 | | | 1.18 | | 0.07 |
| Day | 0.04* | [0.02; 0.05] | | 0.09 | | 0.03* | [0.01; 0.05] | | 0.08 | |
| PSC | 0.24* | [0.14; 0.34] | 0.06/0.02 | 0.12 | | 0.20* | [0.10; 0.30] | 0.09/0.02 | 0.10 | |
| PCC | 0.12* | [0.01; 0.24] | 0.10/0.06 | 0.05 | | 0.15* | [0.04; 0.26] | 0.07/0.06 | 0.06 | |
| Strength | | | | | | -0.30* | [-0.36; -0.24] | | -0.21 | |
| Level 2 (Between phase) | | | 0.08 | | 0.23 | | | 0.08 | | 0.40 |
| Phase | -0.08* | [-0.11; -0.04] | | -0.41 | | -0.07* | [-0.10; -0.03] | | -0.30 | |
| PSC_PhM | 0.12 | [-0.01; 0.24] | | 0.17 | | 0.14* | [0.01; 0.26] | | 0.17 | |
| PCC_PhM | 0.11 | [-0.02; 0.24] | | 0.15 | | 0.10 | [-0.03; 0.22] | | 0.12 | |
| Strength_PhM | | | | | | -0.17* | [-0.25; -0.09] | | -0.50 | |
| Level 3 (Between person) | | | 0.39 | | 0.10 | | | 0.40 | | 0.09 |
| PSC_PeM | 0.03 | [-0.11; 0.16] | | 0.04 | | 0.04 | [-0.10; 0.17] | | 0.06 | |
| PCC_PeM | 0.19* | [0.06; 0.33] | | 0.28 | | 0.16* | [0.02; 0.30] | | 0.23 | |
| Strength_PeM | | | | | | -0.00 | [-0.19; 0.19] | | 0.00 | |

*Note*. (Residual) Variances summarize level-specific intercept residual variances and Level 2/Level 3 variances of random Level 1 slopes. Standardized parameter estimates (*std. B*) and $R^2$ were retrieved from random intercept models. PSC = Perfectionistic Strivings Cognitions; PCC = Perfectionistic Concerns Cognitions; PhM = Phase mean; PeM = Person mean. Point estimates correspond to the median of the posterior distribution.
*95% credibility interval excludes zero.

### *Perfectionistic Cognitions and Self-Control Success*

With respect to the variables related to self-control success—that is, enactment, procrastination, and goal achievement (Tables 4 and 5), our analyses revealed differential and partially opposing associations for PSC and PCC. As expected, Level 1 parameter estimates that were reliably lower than zero indicate that on days in which participants perceived more frequent PSC, they were less likely to give in to temptation (enactment), engaged less in procrastination, and had higher success in achieving their goals (Level 1) with a small effect size. Also as expected, on days in which participants perceived more frequent PCC, they engaged in more procrastination with a small effect size and a comparably high certainty of estimation. However, we found no evidence of the expected positive association between daily PCC and enactment or the expected negative association between daily PCC and goal achievement with quite negligible effect sizes and 95% CIs including zero. Differential associations for the two perfectionistic cognitions dimensions were also found on Level 2 (between phases) and on Level 3 (between persons), albeit the associations were less consistent. In phases in which participants perceived more frequent PSC, they engaged in less procrastination and had higher success in achieving their goals and individuals who experienced more frequent PSC across all preparation phases reported less procrastination. In phases in which participants perceived more frequent PCC, they engaged in more procrastination, and individuals who experienced more frequent PCC across all preparation phases reported more procrastination and less success in goal achievement. Overall, effect sizes were small to large on the between phase and between person levels.

When additionally controlling for temptation strength and resistance in predicting enactment (Table 4, Set 2), the negative Level 1 effect of PSC became nonsignificant. This change indicates that the negative association between daily PSC and enactment might be due to the covariance with temptation strength and resistance.

**Table 4**

*Parameter Estimates Resulting From Three-Level Random Slope Models Predicting Enactment*

| Set 1: PSC, PCC, and time trends | | | | | | Set 2: Control temptation strength and resistance | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | *B* | 95% *CI* | (Residual) Variances | *std. B* | $R^2$ | *B* | 95% *CI* | (Residual) Variances | *std. B* | $R^2$ |
| Threshold | -0.65* | [-0.84; -0.46] | | | | -1.14* | [-1.41; -0.89] | | | |
| Level 1 (Day) | | | | | 0.03 | | | | | 0.48 |
| Day | -0.04* | [-0.06; -0.01] | | -0.11 | | -0.02 | [-0.05; 0.01] | | -0.05 | |
| PSC | -0.23* | [-0.38; -0.08] | 0.18/0.08 | -0.11 | | -0.01 | [-0.18; 0.16] | 0.17/0.06 | 0.00 | |
| PCC | 0.11 | [-0.04; 0.27] | 0.16/0.04 | 0.04 | | 0.11 | [-0.07; 0.30] | 0.13/0.04 | 0.03 | |
| Strength | | | | | | 0.76* | [0.64; 0.89] | | 0.42 | |
| Resist. | | | | | | -0.66* | [-0.77; -0.56] | | -0.44 | |
| Level 2 (Between phase) | | | 0.16 | | 0.42 | | | 0.19 | | 0.80 |
| Phase | 0.18* | [0.13; 0.24] | | 0.62 | | 0.11* | [0.04; 0.17] | | 0.20 | |
| PSC_PhM | -0.10 | [-0.28; 0.09] | | -0.08 | | -0.03 | [-0.26; 0.20] | | -0.01 | |
| PCC_PhM | -0.18 | [-0.36; 0.00] | | -0.16 | | -0.14 | [-0.36; 0.08] | | -0.07 | |
| Strength_PhM | | | | | | 0.52* | [0.37; 0.68] | | 0.60 | |
| Resist._PhM | | | | | | -0.82* | [-0.98; -0.66] | | -0.86 | |
| Level 3 (Between person) | | | 0.57 | | 0.02 | | | 0.47 | | 0.48 |
| PSC_PeM | -0.09 | [-0.26; 0.09] | | -0.10 | | -0.09 | [-0.29; 0.11] | | -0.08 | |
| PCC_PeM | 0.01 | [-0.16; 0.18] | | 0.02 | | 0.11 | [-0.10; 0.31] | | 0.09 | |
| Temp._PeM | | | | | | 0.53* | [0.25; 0.82] | | 0.33 | |
| Resist._PeM | | | | | | -0.85* | [-1.09; -0.5] | | -0.62 | |

*Note*. Results are based on generalized linear models with a probit link function (i.e., estimates in column *B* represent the expected change in the latent variable underlying the observed categorical variable of enacting a temptation for a one-unit increase in the predictor variable; estimates in column *std. B* represent the expected standard deviation change in the latent dependent variable for a one standard deviation increase in the predictor variable). (Residual) Variances summarize level-specific intercept residual variances and Level 2/Level 3 variances of random Level 1 slopes. Standardized parameter estimates (*std. B*) and $R^2$ were retrieved from random intercept models. PSC = Perfectionistic Strivings Cognitions; PCC = Perfectionistic Concerns Cognitions; PhM = Phase mean; PeM = Person mean. Point estimates correspond to the median of the posterior distribution.

*95% credibility interval excludes zero.

**Table 5**

*Parameter Estimates Resulting From Three-Level Random Slope Models Predicting Procrastination and Goal Achievement*

| Outcome<br>Predictor | *B* | 95% *CI* | (Residual) Variances | β | $R^2$ |
|---|---|---|---|---|---|
| **Procrastination**[a] | | | | | |
| Threshold 1 | -0.33* | [-0.47; -0.20] | | | |
| Threshold 2 | 0.44* | [0.30; 0.56] | | | |
| Threshold 3 | 1.10* | [0.96; 1.23] | | | |
| Level 1 (Day) | | | | | 0.10 |
| Day | -0.11* | [-0.12; -0.10] | | -0.30 | |
| PSC | -0.14* | [-0.22; -0.07] | 0.04/0.05 | -0.08 | |
| PCC | 0.22* | [0.14; 0.29] | 0.06/0.03 | 0.10 | |
| Level 2 (Between phase) | | | 0.08 | | 0.36 |
| Phase | -0.11* | [-0.14; -0.09] | | -0.56 | |
| PSC_PhM | -0.10* | [-0.19; -0.01] | | -0.14 | |
| PCC_PhM | 0.12* | [0.03; 0.21] | | 0.15 | |
| Level 3 (Between person) | | | 0.47 | | 0.14 |
| PSC_PeM | -0.16* | [-0.29; -0.03] | | -0.21 | |
| PCC_PeM | 0.31* | [0.18; 0.44] | | 0.40 | |
| **Goal Achievement** | | | | | |
| Intercept | -0.54* | [-0.62; -0.45] | | | |
| Level 1 (Day) | | | 1.63 | | 0.08 |
| Day | 0.12* | [0.11; 0.13] | | 0.26 | |
| PSC | 0.26* | [0.20; 0.33] | 0.04/0.02 | 0.12 | |
| PCC | -0.04 | [-0.12; 0.04] | 0.09/0.08 | -0.02 | |
| Level 2 (Between phase) | | | 0.03 | | 0.10 |
| Phase | 0.01 | [-0.01; 0.03] | | 0.08 | |
| PSC_PhM | 0.10* | [0.02; 0.17] | | 0.27 | |
| PCC_PhM | -0.02 | [-0.09; 0.06] | | -0.04 | |
| Level 3 (Between person) | | | 0.12 | | 0.05 |
| PSC_PeM | 0.05 | [-0.02; 0.12] | | 0.14 | |
| PCC_PeM | -0.08* | [-0.15; -0.01] | | -0.21 | |

*Note*. (Residual) Variances summarize level-specific intercept residual variances and Level 2/Level 3 variances of random Level 1 slopes. Standardized parameter estimates (β) and $R^2$ were retrieved from random intercept models. PSC = Perfectionistic Strivings Cognitions; PCC = Perfectionistic Concerns Cognitions; PhM = Phase mean; PeM = Person mean. Point estimates correspond to the median of the posterior distribution. [a]Results for procrastination as the outcome variable are based on generalized linear models with a probit link function (i.e., estimates in column *B* represent the expected change in the latent variable underlying the observed ordinal variable of procrastination for a one-unit increase in the predictor variable; estimates in column *std. B* represent the expected standard deviation change in the latent dependent variable for a one standard deviation increase in the predictor variable).
*95% credibility interval excluding zero.

In sum, our analyses supported our hypotheses on positive associations of PSC and negative associations of PCC with self-control success (Hypotheses 1 and 2) on the day level and partially on the levels of between-phase and between-person differences.

## Discussion

In the present study, we investigated the role of daily perfectionistic cognitions in daily self-control episodes during phases that are highly relevant to achievement in preservice teachers (i.e., to get a good evaluation for a demonstration lesson and thus to increase the chance for a position at a desired school). Leaning on the Integrative Self-Control Theory, we investigated associations between perfectionistic cognitions and diverse components of daily self-control episodes. By doing so, we extended prior findings by exploring differential associations of perfectionistic strivings versus perfectionistic concerns and by investigating not only between-person differences but also effects of within-person variations in daily perfectionistic cognitions. Leaning on theoretical considerations and prior empirical evidence, we expected more negative outcomes for PCC and more positive outcomes for PSC with respect to their associations with conflicting desires (temptations and temptation strength; Hypotheses 1 and 2), recruitment of self-control (resistance; Hypotheses 3 and 4), and self-control failure and success (temptation enactment, procrastination, goal achievement; Hypotheses 5 and 6). Our hypotheses were primarily located on the day level (Level 1), but we also expected to find comparable associations on the levels of between-phase (Level 2) and between-person differences (Level 3).

### Daily Perfectionistic Cognitions and Goal Setting

Our exploratory analyses revealed positive associations of daily PSC with daily goal setting on the daily level and on the level of between-phase differences that are in line with prior research that reported positive associations between perfectionistic strivings and goal level in diverse contexts on the level of between-person differences in trait perfectionism

(e.g., Eddington, 2014; Flett et al., 1995; Shafran et al., 2002; Stoeber et al., 2008, 2009). Whereas previous research did not support positive associations between PSC and daily goal setting in students while they prepared for an upcoming examination, it did support the positive (unique) association of PCC with daily goal setting that we found on the level of between-phase differences (Prestele et al., 2020). In sum, the association between perfectionistic cognitions and goal setting requires further exploration in future studies.

**Daily Perfectionistic Cognitions and Temptations**

With respect to the experience and strength of conflicting desires (temptation and temptation strength), our analyses supported our hypotheses on opposing unique effects of PSC and PCC on the daily level and to some extent on the between-person level (only temptation) but not on the between-phase level. These findings are generally in line with theoretical considerations proposing that perfectionistic concerns are positively associated with hypervigilance to mistakes and threats to goal pursuit. This idea was empirically supported on the level of trait perfectionism (e.g., Howell et al., 2016; Kljajic et al., 2017; Lundh & Öst, 2001; Schrijvers et al., 2010). On the other hand, the approach orientation associated with PSC (Kobori & Tanno, 2005) should help a person avoid rather than resist temptation (Briki, 2018; Ent et al., 2015). This pattern of results also fits with evidence on work-engagement. Work-engagement (specifically the facet of absorption defined as a state of full concentration and happy engrossment; Schaufeli et al., 2002) counteracts the tendency to experience distracting temptations and trait perfectionistic strivings have been associated with higher absorption (Kljajic et al., 2017). In a recent study, Schmitt et al. (2021) found inverse associations of daily PSC and PCC with daily work-engagement; however, this study did not specifically consider the facet of absorption.

**Daily Perfectionistic Cognitions and Resistance**

Concerning the effort invested in self-control (resistance), the positive association with PSC is in line with the general assumption that in a state where it is very important to achieve demanding goals (a core element of perfectionism), more effort is invested in self-control (Kotabe & Hofmann, 2015). However, on the basis of prior evidence that negative automatic and ruminative thoughts and perfectionistic cognitions are linked to reduced attentional control and working memory capacity (e.g., De Raedt & Koster, 2010; Derryberry & Reed, 2002; Desnoyers, 2013; Eysenck & Calvo, 1992), which in turn constitutes an important resource for self-control effort (e.g., Hofmann & Van Dillen, 2012; Kavanagh et al., 2005; Kotabe & Hofmann, 2015), we expected that PCC would be associated with lower resistance. Our results did not support this assumption but suggest that both PSC and PCC showed positive bivariate and unique associations with effort invested in self-control. Even more, on the between-person level, we found that only individuals high in PCC (but not the ones high in PSC) were the ones who resisted more across achievement phases (even when we controlled for the strength of conflicting desires). This unexpected finding for PCC has to be replicated in future studies. Still, preservice teachers high in PSC might be the ones who avoid rather than resist temptation (e.g., Ent et al., 2015).

**Daily Perfectionistic Cognitions and Self-Control Success**

With respect to daily self-control success, we expected to find opposing associations of the two dimensions of daily perfectionistic cognitions in association with enactment, procrastination, and goal achievement. We found the strongest support for our Hypotheses 5 and 6 for the outcome of daily procrastination. Here, our analyses revealed positive unique effects of PCC and negative unique effects of PSC on all three levels of analysis. Beyond this, our hypotheses were partially supported by negative associations between PSC and daily enactment (Level 1) and positive associations between PSC and daily goal achievement

(Levels 1 and 2) on the one hand and by negative associations between PCC and daily goal achievement on the other (Level 3).

**Limitations and Future Directions**

In the present study, we identified preservice teachers as an ideal population in which to test our hypotheses because preservice teachers in Germany repeatedly find themselves in stressful personally relevant achievement situations (demonstration lessons) that (a) require the application of daily self-control for achieving a higher-order goal and (b) do not differ in format over time or between participants. However, the advantage of knowing about the objective stressor that was highly relevant for our sample came along with restrictions in the generalizability of our results beyond the specific samples of participants and situations. Future studies should expand the current findings to other specific or broader samples and other perfectionism-relevant situations in order to explore whether the conclusions that we can draw from the current study will also hold in other situations and for other samples, such as students preparing for an examination, musicians or athletes preparing for a competition, or employees facing day-to-day achievement stressors.

Another limitation of our study is that our design does not allow us to draw conclusions about causal directionality because all variables were assessed only once per day. From the present data, we cannot conclude whether perfectionistic cognitions determined daily self-control or whether daily self-control determined daily perfectionistic cognitions. As we outlined in the Introduction, both causal directions are theoretically plausible. Future studies should consider assessing daily self-control variables and daily perfectionistic cognitions multiple times per day in order to investigate lagged reciprocal effects among these variables over time.

Another limitation of the current design resides in the reliance on self-reports for the assessment of all relevant constructs. Besides general concerns regarding the validity of self-

reports, perfectionism has been shown to be associated with a general tendency to engage in positive self-presentations (Hewitt et al., 2003), which might result in biased self-reports. Specifically, this effect might also impact participants' self-reports of self-control variables. For example, perfectionists have been shown to hide their effort to protect their image of perfection (Flett et al., 2016), which might result in an upward bias in self-reported resistance.

A second limitation concerning the self-report measures we used comes from the reliability of daily variables. Whereas the Omega indices indicated acceptable reliabilities for daily PCC and daily procrastination, the day-level reliability of PSC was comparatively low. While it has been suggested to apply more "relaxed standards" for evaluating within-person reliability compared to the reliability of trait measures (Nezlek, 2017, p. 6), future studies should consider applying some more items to reliably assess PSC and to still capture the entire breadth of the construct.

The tendency to assess only of a narrow aspect of a construct is even more pronounced in one-item measures. As can be seen from our temptations item, another problem with one-item measures is that the difficulty of a single item might be high and not counterbalanced by additional less difficult items that measure the same construct. The high threshold for agreeing with this item was also mirrored in the descriptive statistics of the dependent variables temptation strength and enactment, indicating that usually strong temptations were reported and were frequently enacted, whereas weaker temptations were seldom reported. This high level of temptation strength may also explain the (average) negative association between temptation strength and resistance, as a positive association between temptation strength and resistance has been shown to be reversed at high levels of conflicting desires (e.g., Kotabe & Hofmann, 2016). In ambulatory assessment studies, however, the benefits of having more indicators per construct have to be weighed against

participant burden, which increases with a larger number of items (Eisele et al., 2020). As a final note on temptation, it is important to note that we assessed conflicting desires (i.e., temptations) directly. Thus, we did not differentiate between the strength of the desire and the degree of conflict between the higher-order goal and the desire, as specified in the Integrative Self-Control Theory and shown in previous research to be uniquely associated with resistance and enactment (e.g., Kotabe & Hofmann, 2015, 2016). Thus, we were unable to examine whether PCC's positive association with temptation is due to active selection and shaping of situations (situation generation) leading to a higher likelihood and strength of desires, increased vigilance to desires, or increased reactivity to desires, particularly the perception that a given desire conflicts with the higher-order goal. All of these processes may be possible (see Hewitt & Flett, 2002, for a more general consideration of stress processes) and may be disentangled by a more fine-grained assessment of self-control components.

We included linear time trends as well as cross-sectional associations among self-control episode variables as control variables in our analyses. However, in future research, temporal trends in daily self-control episode components and their complex dynamic associations are worth investigating in their own right. For example, the investigation of time trends in self-control variables could allow researchers to contrast the assumption of decreases in self-control effort and success due to depletion (e.g., Muraven & Baumeister, 2000) against the assumption of increases due to training or the salience of an upcoming achievement situation (Kotabe & Hofmann, 2015). Comparably, linear associations among self-control episode variables might be too short-sighted. For example, according to the conservation of resources hypothesis, positive associations between temptation strength and resistance might reverse at high levels of temptation strength (e.g., Fiske & Taylor, 1991). Additionally, prior ambulatory assessment studies that investigated complex cross-temporal interactions among self-control variables indicated that prior resistance efficacy affected later

resistance efficacy (Wenzel et al., 2020). Albeit beyond the scope of the current research question, such complex dynamic associations might also be explored in additional analyses of the current data and in future data with a higher temporal resolution. Additionally, future studies might explore interactions of PSC and PCC to exploratively investigate potential interactive effects that have frequently been suggested to be relevant on the level of dispositional perfectionism (e.g., Gaudreau & Thompson, 2010; Stoeber & Otto, 2006).

**Conclusion**

To the best of our knowledge, our study constitutes the first investigation of associations between perfectionistic cognitions and daily self-control components. Our analyses revealed differential and partially opposing associations of two dimensions of perfectionistic cognitions with various components of daily self-control episodes, including goal setting, conflicting desires (temptations), recruitment of self-control effort (resistance), and self-control failure and success (temptation enactment, procrastination, goal achievement). The pattern of results can be broadly summarized by stating that daily PSC were associated with more beneficial levels of self-control components, whereas daily PCC were associated with less beneficial levels. However, this pattern of results was not totally consistent across the self-control components we assessed or the levels of analyses we computed. Future studies might use more temporally fine-grained assessments of perfectionistic cognitions and self-control components to explore the complexity and temporal dynamics of self-control mechanisms and the roles that trait perfectionism and perfectionistic cognitions might play here. According to the diathesis-stress model of perfectionism, the diverse facets of perfectionism constitute a vulnerability factor for the development and maintenance of psychological problems; this vulnerability is activated when a person experiences a stressor that involves the general theme of perfection/imperfection or a more facet-specific theme. Self-control constitutes a relevant process variable that can

support or prevent goal achievement. Knowing which specific components of self-control are associated with (state) perfectionism can help to define tailored interventions in the area of trigger mechanisms.

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**Contributions:**

Contributed to conception and design: CAG, TL, EP

Contributed to acquisition of data: GG

Contributed to analysis and interpretation of data: EP

Drafted and/or revised the article: EP, CAG, TL

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**Data Accessibility Statement:** The study materials can be accessed at the project's OSF page (https://osf.io/t8bn9/), data and analysis scripts used for this article can be accessed at https://osf.io/96wnc/.