8-2023

# Overcoming procrastination: Time pressure and positive affect as compensatory routes to action

Jana KUHNEL
*University of Vienna*

Ronald BLEDOW
*Singapore Management University*, RBLEDOW@smu.edu.sg

Angela KUONATH
*Ludwig Maximilians Universitat, Munchen*

Journal of Business and Psychology
https://doi.org/10.1007/s10869-022-09817-z

ORIGINAL PAPER

# Overcoming Procrastination: Time Pressure and Positive Affect as Compensatory Routes to Action

**Jana Kühnel**[1] · **Ronald Bledow**[2] · **Angela Kuonath**[3]

Accepted: 6 May 2022


## Abstract

The current work seeks to identify factors that support action initiation from the theoretical lens of self-regulation. Specifically, we focus on factors that reduce procrastination, the delay of the initiation or completion of activities. We draw from action control theory and propose that positive affect operates as a personal and time pressure as a situational factor that unblock routes to action. High positive affect makes people less prone to procrastination because positive affect reduces behavioral inhibition and facilitates the enactment of intentions. By contrast, when positive affect is low, people depend on time pressure as an action facilitating stimulus. We present results of a daily diary study with 108 participants that support our hypotheses. We replicate the findings in the context of work in a second daily diary study with 154 employees. We discuss benefits and drawbacks of the enactment of intentions under time pressure and implications of the results for how to reduce procrastination.

**Keywords** Procrastination · Action control theory · Positive affect · Challenge hindrance stressors · Person-environment interaction · Motivation

Most people experience days on which they fail to do the things they have planned, that is, days on which they procrastinate. Procrastination is defined as the delay of the initiation or the completion of activities (Howell et al., 2006; Lay, 1986), and it is a "prevalent and pernicious form of self-regulatory failure" (p. 65, Steel, 2007) that can result in adverse consequences. According to van Eerde (2016) and Kühnel et al. (2016), people experience procrastination when they fail to put their intentions into actions, that is, when they experience intention-action gaps. As such, procrastination is often experienced as negative because it implies a discrepancy between intentions and actions and impedes the positive experiences of making progress on tasks and attaining one's goals (Amabile & Kramer, 2011). Moreover, when people procrastinate, their performance may suffer (Beswick et al., 1988; Tice & Baumeister, 1997), they may fail to meet deadlines (van Eerde, 2003), and they may risk the success of projects (Gersick, 1989).

The initiation of action is an everyday process that usually happens without deliberate effort. The fact that action initiation is at all a distinct process becomes apparent only when it fails and people experience procrastination. Procrastination in terms of intention-action gaps should be distinguished from *intended*, *purposeful* delays of action that might be adaptive (e.g., Kim & Seo, 2015; van Eerde et al., 2016; van Hooft et al., 2005). If a delay of action is intended, it may be referred to as strategic delay instead of procrastination (van Eerde, 2016). But why does action initiation sometimes fail despite people's intention to act and result in procrastination? The current studies address this question and examine factors that enable action initiation. Specifically, we investigate the availability of positive affect as a personal and time pressure as a situational

✉ Jana Kühnel
jana.kuehnel@univie.ac.at

Ronald Bledow
rbledow@smu.edu.sg

Angela Kuonath
angela.kuonath@psy.lmu.de

[1] Department of Occupational, Economic, and Social Psychology, Faculty of Psychology, University of Vienna, Universitätsstraße 7, 1010 Vienna, Austria

[2] Lee Kong Chian School of Business, Singapore Management University, 81 Victoria Street, Singapore 188065, Singapore

[3] LMU Center for Leadership and People Management, Ludwig-Maximilians-Universität München, Geschwister-Scholl-Platz 1, 80539 Munich, Germany

Published online: 09 June 2022

factor that may unblock routes to action and focus on the compensatory interplay of these factors.

By specifying two distinct and compensatory routes to action, the current work offers a novel theoretical perspective on procrastination. Specifically, we build our line of argument on central tenets of action control theory and the framework of self-regulation it is embedded in (Kuhl, 1985, 2000). Action control theory offers an explanatory approach to how personal and situational factors regulate action. Adopting this theoretical lens allows us to conceptualize procrastination as a result of the unavailability of personal or situational factors that bridge the gap between intention and action and to shed light on the interplay between both factors. To do so, we focus on individual differences in positive affect as a crucial personal driver for action initiation and time pressure as a crucial situational driver. Our theoretical perspective on procrastination offers a novel explanation for why positive affect helps to overcome procrastination—a relationship that is empirically well-established (Steel, 2007) but insufficiently explained. Moreover, our theoretical perspective allows for the *integration* of positive affect as personal driver and time pressure as situational driver that help to realize intentions and to overcome procrastination. Specifically, we propose that procrastination more likely occurs for people who experience low levels of positive affect and on days characterized by lower time pressure. Higher time pressure, however, should support action initiation and thus prevent procrastination—an effect we propose to be especially relevant for those people who experience low levels of positive affect as they more strongly need to rely on situational factors that stimulate action initiation.

The current work contributes to research on procrastination that conceptualizes procrastination not only as a stable individual difference characteristic but also as a phenomenon that fluctuates over time (e.g., Kühnel et al., 2016, 2018; Prem et al., 2018). That is, we broaden the understanding of procrastination by taking into account that some people procrastinate more than others, and that not all days are equal regarding the level of procrastination people display. This day-specific analytical approach is advantageous for the assessment of procrastination as it allows us to capture "life as it is lived" (p. 579, Bolger et al., 2003) and to minimize participants' retrospective bias. Moreover, it helps not only to identify individual differences as rather stable predictors of procrastination but also to shed light on situational factors that fluctuate over time and that may determine peaks and troughs in procrastination. In addition, our work contributes to research on person-situation interactions (Mischel & Shoda, 1995) by showing that situational and personal factors need to be jointly considered to explain why and when people procrastinate. Our day-specific approach offers a unique angle on person-situation interactions by modeling the lower-level coupling of the situational factor of time pressure and procrastination as a function of the higher-order personal factor of positive affect (cross-level interaction effect, see Aguinis et al., 2013; Mathieu et al., 2012). Thus, our analytical approach "lies at the heart of modern-day contingency theories, person–environment fit models, and any theory that considers outcomes to be a result of combined influences emanating from different levels of analysis" (p. 952, Mathieu et al., 2012).

Our work also contributes to the understanding of the consequences of time pressure as a situational factor for engagement and performance (e.g., Kühnel et al., 2012; LePine et al., 2005; Schmitt et al., 2015). The current studies investigate potential *short-term* benefits of time pressure for action initiation on the level of days. Our within-person design provides the opportunity to disentangle relationships between time pressure and procrastination that hold within persons from relationships that hold between persons (Curran & Bauer, 2011). That is, our within-person design allows us to look at the coupling of time pressure and procrastination across days (for a recent daily diary study, see Prem et al., 2018), and thus enables us to take a complementary approach to research that focuses on detrimental long-term consequences of enduring time pressure for employees (e.g., Sonnentag et al., 2010).

Our line of argument and empirical findings are also of practical relevance. They inform practitioners and researchers on why some people are particularly prone to procrastination and on how time pressure can help them to succeed at initiating action.

In the following, we derive hypotheses on the relationships between positive affect, time pressure, and procrastination. We conducted a daily diary study with 108 participants (Study 1) to test our hypotheses. In a second daily diary dataset with 154 employees (Study 2), we test whether the findings can be replicated. In Study 2, we specifically focus on positive affect, time pressure, and procrastination in the context of work.

## Action Initiation from the Lens of Action Control Theory

We build our line of argument on theoretical frameworks on the self-regulation of action (Carver & Scheier, 1982; Kuhl, 1985, 2000) and argue that there are two distinct routes to initiate action. From this theoretical lens, people experience procrastination when the initiation of actions, that is, the realization of intentions, via both of these routes is blocked. One route relies on the instigation of action by the availability of positive affect. According to action control theory, positive affect is "especially important whenever a[n] […] action has to be initiated on one's own devices, that is, without external help or external cues indicating the opportunity

of its enactment" (p. 697, Kazén et al., 2008). Action may also be instigated by an alternative, situational route that relies on the heightened perception of discrepancies between people's current state and desired states (Carver & Scheier, 1982). We argue that the situational factor of time pressure implies a discrepancy between people's current state and goal states that stimulates action (Ariely & Wertenbroch, 2002). In the next sections, we first turn to the instigation of action through the availability of positive affect. Then, we turn to the role of time pressure, and finally, we explicate the proposed compensatory interplay between the two routes. Specifically, for people who seldom experience positive affect, the alternative route via heightened perception of discrepancies between their current state and desired states should be important to prevent procrastination.

## Positive Affect and Procrastination

Our proposition that the instigation of action depends on the availability of positive affect is in line with the widely-acknowledged conceptual idea that positive affect reflects the activation of human's approach motivational system (Carver & White, 1994; Murray et al., 2009; Watson et al., 1999) and that the experience of positive affect reduces behavioral inhibition and broadens people's thought-action repertoires (Fredrickson, 2001; Kühnel et al., 2022). Positive affect "is a source of human strength – […] it encourages and supports flexible, open-minded cognitive processing that enables people to do what needs to be done" (p. 180, Isen, 2003).

Action control theory (Kuhl, 2000) specifies *why* positive affect does not only provoke broad behavioral activation but also enables the realization of specific, intended actions. According to the theory, positive affect facilitates behavior and enables the enactment of intentions (Kuhl & Kazén, 1999). The theory assumes that once formed the representation of an intention is stored in memory until there is an opportunity for its enactment (Goschke & Kuhl, 1993; Kuhl, 2000). Until then, the behavioral programs that can execute an intention are inhibited to prevent premature action. According to the theory's volitional facilitation assumption, positive affect reduces the inhibition of behavioral programs associated with an intention. Therefore, when people experience high positive affect, they are more likely to enact their intentions and less likely to postpone intention enactment. When people lack positive affect, they face difficulties in overcoming behavioral inhibition, which results in the experience of procrastination. At its extreme, the diminished capacity to experience positive affect may result in listlessness and is related to depressive disorders (American Psychiatric Association, 2013).

Based on the above reasoning, we expect that people who experience higher levels of positive affect are less likely to procrastinate. Previous research on job search behavior has shown that people with high levels of positive affect are more likely to enact their job search intentions compared to people with low levels of positive affect (e.g., Turban, Lee, Veiga, Haggard, & Wu, 2013). A meta-analysis on procrastination's possible causes and effects (Steel, 2007) revealed a negative correlation between the experience of positive affect and procrastination ($r = -.17$, rho $= -.21$). Similarly, in a study with more than 9.000 participants, Gröpel and Steel (2008) showed that lack of energy was a strong predictor of procrastination. Thus, according to our theoretical argument and in line with supporting results from previous studies, we hypothesize as follows:

Hypothesis 1: People with high levels of positive affect procrastinate less compared to people with low levels of positive affect.

## Time Pressure and Procrastination

While the availability of positive affect is one route to action, action may also be instigated by a heightened perception of discrepancies between people's current state and their goal states (Carver & Scheier, 1982; Kuhl, 1987). Discrepancies are experienced as unpleasant and thus stimulate people to find ways to reduce them. We argue that time pressure is a situational cue that signals discrepancies between people's current state and their goal states (Ariely & Wertenbroch, 2002; Carver & Scheier, 1982; Fay & Sonnentag, 2002). In the context of work, time pressure signals a discrepancy between the variety of work-related goals and one's current performance on work tasks that may instigate people to initiate action or invest additional effort (Binnewies et al., 2009; Brodsky & Amabile, 2018).

Our proposition that time pressure supports the initiation of action is in line with other influential theoretical frameworks, namely, the episodic process model of performance (Beal et al., 2005) and the challenge-hindrance stressor framework (Crawford et al., 2010; LePine et al., 2005). According to the episodic process model of performance (Beal et al., 2005), time pressure should prevent procrastination because time pressure increases task attentional pull. Task attentional pull supports people to establish an on-task focus, and thus, to realize their intentions (Beal et al., 2005). Tasks have a higher attentional pull when deadlines exist for the completion of the tasks, when the task is important, and when the task goals are present. High attentional pull makes it easier for people to attend to tasks and to complete them, because task attentional pull supports people to focus on the task at hand and to resist the pull of off-task distractions (Beal et al., 2005). We argue that time pressure should increase task attentional pull and thus fosters the initiation and completion of intended actions (Vahle-Hinz

et al., 2019). As a consequence, people should be less likely to procrastinate on days characterized by time pressure compared to days on which time pressure is absent.

Another influential framework that suggests benefits of time pressure for action initiation is the challenge-hindrance stressor framework (Crawford et al., 2010; Freedman & Edwards, 1988). According to the challenge-hindrance stressor framework, when people experience time pressure, they are more likely to appraise their tasks as challenging (Prem et al., 2017, 2018). Appraising tasks as having the potential to promote personal gain or growth facilitate action initiation (Kuhl, 2000; Podsakoff, LePine, & LePine, 2007). Indeed, Rodell and Judge (2009) found a positive relationship between daily challenge stressors (among them, time pressure) and daily performance, and studies have shown that challenging tasks promote goal achievement and thriving (e.g., Ohly & Fritz, 2010; Prem et al., 2017).

It is important to note that we propose a short-term beneficial effect of time pressure for action initiation rather than a long-term effect of enduring time pressure. Our focus is thus complementary to research on long-term consequences of chronic time pressure (e.g., Sonnentag et al., 2010) as well as research on the coupling of time pressure and well-being over longer time frames such as weeks or months (Baethge et al., 2018) that revealed that a beneficial effect of time pressure is found on the within-person level of analysis and for shorter time frames only.

Taken together, we hypothesize as follows:

Hypothesis 2: Day-specific time pressure is negatively related to procrastination, that is, people procrastinate less on days with higher time pressure compared to days with lower time pressure.

## Compensatory Interplay Between Positive Affect and Time Pressure

According to action control theory, when action initiation is supported by external cues, there is a lower need for positive affect as a personal resource to facilitate the enactment of intentions (Kazén et al., 2008). In other words, time pressure acts as an action stimulating situational cue that substitutes for the unavailability of positive affect. Thus, people who experience low levels of positive affect should more strongly depend on the experience of time pressure to enact their intentions. When time pressure is present, they move from intention to action; when time pressure is absent, they tend to procrastinate. By contrast, people who experience high positive affect should be less dependent on the experience of time pressure to get things done. The availability of positive affect should help them to prevent procrastination even when time pressure as a situational cue that indicates the necessity of action is absent because positive affect allows a person to autonomously initiate action (Isen, 2003; Kuhl & Kazén, 1999). For people with high positive affect, the experience of time pressure should therefore be less strongly coupled to the enactment of intentions.

The following example of two hypothetical persons, who differ in their level of positive affect, illustrates our theoretical idea: In general, Addison (A for action) procrastinates less often compared to Phoenix (P for procrastination) because Addison has a higher level of positive affect available than Phoenix. Positive affect is a personal resource that facilitates the enactment of intentions and prevents procrastination. While Addison and Phoenix differ in their overall level of procrastination, they will both show some fluctuation in procrastination from day to day: they procrastinate more on some days than on other days. These fluctuations in procrastination can be explained by fluctuating levels of time pressure: On days characterized by lower time pressure they procrastinate more compared to days with higher time pressure. This beneficial, day-specific effect of time pressure in preventing procrastination is more pronounced for Phoenix than for Addison because Phoenix is more dependent on external factors that support action initiation due to his/her lack of positive affect. On days on which Addison and Phoenix do not procrastinate, they show on the surface the same behavior, however, different reasons underly their behavior. Addison does not procrastinate because of her/his high level of positive affect, whereas Phoenix does not procrastinate because time pressure supports action initiation on the current day.

In sum, we hypothesize as follows:

Hypothesis 3 (cross-level interaction): The negative relationship between day-specific time pressure and procrastination is more pronounced for people with low levels of positive affect and less pronounced for people with high levels of positive affect.

In the following, we present results from two field studies. In Study 1, we test our conceptual ideas in a daily diary study with 108 employees. In Study 2, a daily diary study with 154 employees, we aim to replicate the first study's results. While Study 1 examines positive affectivity as a domain-independent operationalization of positive affect, Study 2 uses vigor, as a domain-specific operationalization of a person's positive affect in the context of work.

## Study 1

### Method

#### Sample and Procedure

Participants of this daily diary study were self-employed-participants and employees from companies in diverse

industries. The convenience sample was collected by a student as part of her master thesis. Specifically, participants were recruited through the master student's personal network and via flyers that were distributed in the region (Southern Germany). Inclusion criteria for participation were at least 70% weekly working time and non-shift work. A lottery (vouchers for an online retailer) was offered to motivate people to participate in the study. Participants who gave their informed consent to participate in the study first completed a general online questionnaire that assessed trait positive affect and sociodemographic characteristics. In the following work week, participants were asked to answer an online questionnaire at the end of each day before going to bed. Participants received individually scheduled reminder e-mails containing a link to the daily online questionnaires. Of the 133 participants who agreed to participate, 21 had to be excluded due to exclusion criteria of the study or due to incomplete survey data on the variables of interest. Thus, the final sample was comprised of 108 participants (completion rate 81%) who in total provided complete survey data on 399 days. Forty-six percent of the sample were women, and average age was 41 years ($SD = 10$). On average, participants' work hours were 43 h/week ($SD = 6$). Forty percent of the sample had a leadership position. Participants had, on average, 8 years of professional experience in their current organization ($SD = 10$).

### Measures

**Positive Affect** Positive affect was operationalized as a domain-independent trait. "High levels of the trait are marked by frequent feelings of cheerfulness, enthusiasm, and energy" (p. 207, Watson & Naragon, 2009). Trait positive affect was assessed with the items alert, excited, active, strong, inspired, and interested from the Positive and Negative Affect Schedule scales (PANAS; Watson et al., 1988). The scale referred to how the person felt in general. Items had to be answered on a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree. Cronbach's alpha was .71.

**Procrastination** Day-specific procrastination was assessed with six items from Tuckman's (1991) procrastination scale that were slightly adapted to capture day-specific procrastination (Kühnel et al., 2016). Example items are "Today, I promised myself I'll do something and then dragged my feet" and "Today, I needlessly delayed finishing jobs, even when they were important". Items had to be answered on a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree. Cronbach's alpha ranged between .87 and .88 over the days.

**Time Pressure** Day-specific time pressure was assessed with three items developed by Semmer, Zapf, and Dunckel (1999) that were adapted to capture time pressure of the current day. An example item is "How often were you pressed for time today?" Items had to be answered on a 5-point scale ranging from 1 = never/very rarely to 5 = frequently. Cronbach's alpha ranged between .86 and .89 over the days.

## Results

**Descriptive Statistics** Table 1 shows means, standard deviations, intraclass correlations (ICCs), and intercorrelations between variables. Procrastination and time pressure showed substantial day-to-day variation (within-person variance): 51% of the variance in procrastination and 41% of the variance in time pressure resided at the within-person level. Age was negatively related to procrastination ($r = -.32$). This finding is in line with previous meta-analytical findings that revealed a significant–but smaller–relationship between procrastination and age (rho = −.16 in Steel, 2007, and average weighted $r = -.06$ in van Eerde, 2003), supporting the idea that the meta-analytical relationship was underestimated due to range restriction in the variable age as the majority of studies included in the meta-analysis used

**Table 1** Study 1: Means, standard deviations, and correlations of variables

| Variable | *M* | *SD* | ICC[a] | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|
| 1. Day-specific procrastination | 1.83 | 0.75 | .49 | | −.15** | | | |
| 2. Day-specific time pressure | 2.58 | 0.99 | .59 | .08 | | | | |
| 3. Positive affect | 3.42 | 0.51 | - | −.28** | −.03 | | | |
| 4. Age | 40.54 | 9.61 | - | −.32** | −.06 | .18 | | |
| 5. Gender[b] | 0.46 | 0.50 | - | .16 | −.03 | .00 | −.27** | |
| 6. Conscientiousness | 4.19 | 0.48 | - | −.49*** | −.12 | .38*** | .08 | .13 |

The day-level correlation ($N = 399$) is depicted above the diagonal; person-level correlations ($N = 108$) are depicted below the diagonal. To calculate the day-level correlation, variables 1 and 2 were centered around the respective person-mean. For person-level correlations, day-level data were averaged across days

[a]Intraclass correlation (ICC) = ratio of the between-person variance to the total variance, 1-ICC = ratio of the within-person variance to the total variance. [b]Gender: 0 = male, 1 = female

**$p < .01$. *** $p < .001$

student samples (the corrected correlation was rho = −.51 in Steel, 2007, when a correction was applied by using the standard deviation of age from the US Census Bureau).

**Analytic Strategy** We used the Hierarchical Linear Modeling (HLM) 7.01 software package (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011) to conduct multilevel analyses. To ensure unbiased estimations (Enders & Tofighi, 2007), we centered the day-level predictor variable time pressure around the respective person mean (group-mean centering) and the person-level predictor variable trait positive affect around the grand mean (grand-mean centering). To test the hypotheses, we specified and compared nested hierarchical linear models. All models were run with full maximum likelihood estimation.

**Test of Hypotheses** Hypotheses 1 and 2 proposed negative relationships between positive affect and procrastination and between day-specific time pressure and procrastination. Model 1 in Table 2 shows that trait positive affect was significantly and negatively related to procrastination (estimate = −0.331, $SE = 0.108$, $t = -3.03$, $p < .01$), and that day-specific time pressure was significantly and negatively related to procrastination (estimate = −0.125, $SE = 0.048$, $t = -2.61$, $p < .01$). Model 1 fit the data better than the null model (Δ −2 × Log likelihood = 15.610, $df = 2$, $p < .001$). Thus, in support of Hypothesis 1, participants with higher levels of positive affect procrastinated less compared to participants with lower levels of positive affect. In support of Hypothesis 2, on days with higher time pressure, compared to days with lower time pressure, participants procrastinated less.

Hypothesis 3 proposed that the negative relationship between day-specific time pressure and procrastination is moderated by positive affect, such that the negative relationship between time pressure and procrastination is less strong for individuals with higher levels of positive affect. To test this hypothesis, we followed best practice recommendations for estimating cross-level interaction effects using multilevel modeling (Aguinis et al., 2013). That is, we built a random intercept and random slope model to test if the model with a random slope fits the data better than the model without a random slope. In Model 2, we added a random slope of time pressure predicting procrastination. This random intercept and random slope model fit the data better than Model 1 without a random slope component (Δ −2 × Log likelihood = 11.103, $df = 2$, $p < .01$). In Model 3, we added positive affect as a predictor of the random slope of time pressure. This interaction term was a significant predictor of procrastination (estimate = 0.305, $SE = 0.122$, $t = 2.49$, $p < .05$), and Model 3 fit the data better than Model 2 (Δ −2 × Log likelihood = 5.942, $df = 1$, $p < .05$). The interaction effect is depicted in Fig. 1.

We performed simple slope tests with the computational tool by Preacher et al. (2006). For participants high in positive affect (+1 *SD*), the slope between time pressure and procrastination was not significant (simple slope = −0.014, $SE = 0.083$, $t = -0.17$, $p = .861$). For participants with average positive affect (*M*) or low level of positive affect (−1 *SD*), the slopes between time pressure and procrastination were negative and significant (simple slope = −0.170, $SE = 0.059$, $t = -2.84$, $p < .01$, and simple slope = −0.325, $SE = 0.089$, $t = -3.63$, $p < .001$, respectively). Taken together, the negative relationship between day-specific time pressure and procrastination was more pronounced for people with low levels of positive affect. For people with high levels of positive affect, time pressure was not significantly related to procrastination. Thus, Hypothesis 3 was supported.[1]

## Study 2

In Study 2, we test whether the findings of Study 1 can be replicated in a different sample with measures that focus specifically on the context of work. In contrast to Study 1 that used domain-unspecific operationalizations of the constructs of interest, Study 2 used work-specific operationalizations of positive affect, procrastination, and time pressure. The data of Study 2 was used in a previous publication that had a different goal and focus (see Appendix).

### Method

#### Sample and Procedure

Participants of this study were self-employed participants and employees from companies in diverse industries. The convenience sample of Study 2 was collected by students under the first author's supervision as part of a research seminar. Participants were recruited through the students' personal networks. Inclusion criteria for participation was non-shift work, and at least three working days a week. Participants who gave their informed consent to participate received e-mails containing links to online questionnaires. First, participants completed a

[1] Previous research has shown that conscientiousness is a strong predictor of procrastination ($r = -.62$, rho = −.75; Steel, 2007). We therefore included a measure of conscientiousness as a potential control variable (six items, Cronbach's alpha = .73; Körner et al., 2008). If we simultaneously include conscientiousness and positive affect as predictors of procrastination in the regression model, conscientiousness was a significant and negative predictor of procrastination (estimate = −0.55, $SE = 0.11$, $t = -4.89$, $p < .001$). The main effect of positive affect on procrastination was no longer significant (estimate = −0.14, $SE = 0.11$, $t = -1.28$, $p = .202$), but positive affect was still a significant cross-level moderator of the day-specific relationship between time pressure and procrastination (estimate = 0.30, $SE = 0.12$, $t = 2.46$, $p < .05$).

**Table 2** Study 1: Results of multilevel analyses predicting procrastination

| | Dependent variable: Procrastination | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Null model | | | Model 1 | | | Model 2 | | | Model 3 | | |
| | Est | *SE* | *t* | Est | *SE* | *t* | Est | *SE* | *t* | Est | *SE* | *t* |
| Intercept | 1.839 | 0.057 | 32.06*** | 1.835 | 0.055 | 33.29*** | 1.835 | 0.055 | 33.31*** | 1.841 | 0.055 | 33.43*** |
| *Level-1 predictor* | | | | | | | | | | | | |
| Time pressure | | | | −0.125 | 0.048 | −2.61** | −0.163 | 0.062 | −2.61* | −0.170 | 0.059 | −2.84** |
| *Level-2 predictor* | | | | | | | | | | | | |
| Positive affect | | | | −0.331 | 0.108 | −3.03** | −0.306 | 0.108 | −2.82** | −0.330 | 0.108 | −3.03** |
| *Cross-level interaction* | | | | | | | | | | | | |
| Time pressure × positive affect | | | | | | | | | | 0.305 | 0.122 | 2.49* |
| −2 × Log likelihood (*df*) | | 791.000 | (3) | | 775.389 | (5) | | 764.286 | (7) | | 758.344 | (8) |
| Δ −2 × Log likelihood (*df*) | | | | | 15.610 | (2)*** | | 11.103 | (2)** | | 5.942 | (1)* |
| Level 1 intercept variance (*SE*) | | 0.283 | (0.023) | | 0.276 | (0.022) | | 0.230 | (0.021) | | 0.231 | (0.021) |
| Level 2 intercept variance (*SE*) | | 0.276 | (0.048) | | 0.251 | (0.045) | | 0.263 | (0.044) | | 0.263 | (0.044) |
| Level 2 slope variance (*SE*) | | | | | | | | 0.121 | (0.048) | | 0.097 | (0.044) |
| Level 2 intercept-slope covariance (*SE*) | | | | | | | | −0.035 | (0.035) | | −0.035 | (0.034) |

*Note.* Est = estimate. $N_{\text{Level 1}} = 399$. $N_{\text{Level 2}} = 108$

*$p < .05$. **$p < .01$. ***$p < .001$

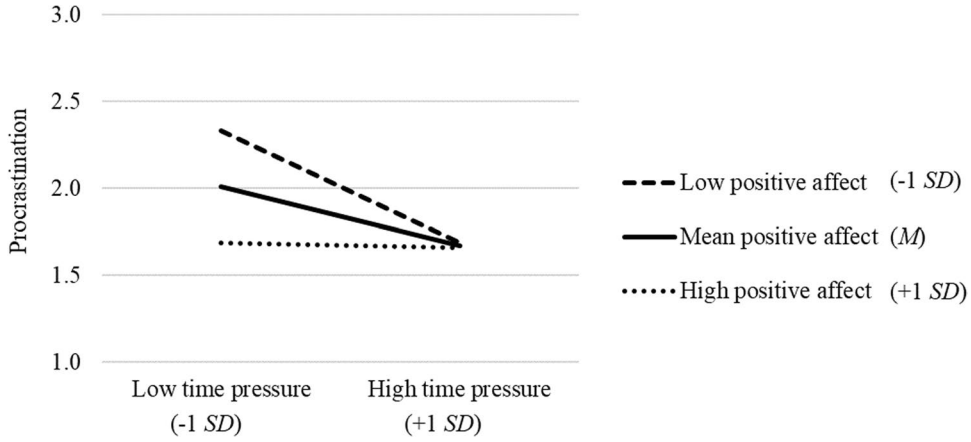


**Fig. 1** Study 1: Cross-level interaction of positive affect on the slope of time pressure predicting procrastination

general online questionnaire that assessed sociodemographic characteristics. Next, participants received links to online questionnaires over the course of 2 weeks (up to ten workdays). Each day, participants were asked to answer a daily questionnaire when they finished work. The final sample was comprised of 154 participants (in total complete survey data for 740 days). Half of the sample were women, and average age was 38 years ($SD = 13$). On average, participants' work hours were 42 h/week ($SD = 7$). Twenty-eight percent of participants held a leadership position. Participants had, on average, 8 years of professional experience in their current organization ($SD = 9$).

### Measures

**Work-Related Positive Affect** In the context of work, the availability of positive affect is reflected in the experience of vigor, which encompasses arousal as well as positive feelings at work (Little et al., 2011; Ryan & Frederick, 1997; Shirom, 2007). Thus, individual differences in availability of positive affect in the work domain were operationalized with the experience of work-related vigor (Newman & Harrison, 2008) and assessed with the three vigor items of the UWES-9 (Schaufeli et al., 2006). Trait positive affect and work-related vigor are strongly related (rho = .59, Young et al., 2018). At the end of each workday, the vigor items had to be answered with respect to how a person felt during the workday ("Today, I felt bursting with energy at my work", "Today, I felt strong and vigorous at work", and "Today when I got up in the morning, I felt like going to work"). Items were answered on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. We aggregated daily ratings (person mean) across the 2 weeks ($ICC = .38$) to obtain an indicator of participants' general level of work-related positive affect (see Bolger & Schilling, 1991; Epstein, 1983; Iida, Shrout, Laurenceau, & Bolger, 2012). Such a context-specific, repeated measurement and aggregation approach to estimate positive affect can increase reliability and validity (Cronbach et al., 1972). Cronbach's alpha was .88.

**Procrastination** Day-specific procrastination was assessed with the same six items that were used in Study 1 (Kühnel et al., 2016; Tuckman, 1991). Participants were asked to answer the items regarding their workday. Cronbach's alpha ranged between .85 and .88 over the days.

**Time Pressure** Day-specific time pressure was assessed with two items developed by Semmer et al. (1999) that were adapted to capture time pressure of the current day (e.g., "How often were you pressed for time today?"). Items had to be answered on a 5-point scale ranging from 1 = never/very rarely to 5 = frequently. Correlations of the two items assessing time pressure at work ranged between .70 and .74 across days.

## Results

### Descriptive Statistics

Table 3 shows means, standard deviations, intraclass correlations (ICCs), and intercorrelations between variables. Procrastination and time pressure showed substantial day-to-day variation (within-person variance). More specifically, 55% of the variance in procrastination and 50% of the variance in time pressure resided at the within-person level.

### Analytic Strategy

We applied the same analytic strategy as in Study 1. We centered the day-level predictor variable time pressure around the respective person mean (group-mean centering) and the person-level predictor variable work-related positive affect around the grand mean (grand-mean centering).

**Table 3** Study 2: Means, standard deviations, and correlations of variables

| Variable | *M* | *SD* | ICC[a] | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|
| 1. Day-specific procrastination at work | 1.64 | 0.66 | .45 | | −.10** | | |
| 2. Day-specific time pressure | 2.31 | 0.98 | .50 | −.10 | | | |
| 3. Work-related positive affect (vigor) | 4.25 | 0.86 | - | −.40*** | .18* | | |
| 4. Age | 38.36 | 13.48 | - | −.32*** | .17* | .16* | |
| 5. Gender[b] | 0.50 | 0.50 | - | .07 | .00 | .00 | −.03 |

The day-level correlation ($N = 740$) is depicted above the diagonal; person-level correlations ($N = 154$) are depicted below the diagonal. To calculate the day-level correlation, variables 1 and 2 were centered around the respective person-mean. For person-level correlations, day-level data were averaged across days

[a]Intraclass correlation (ICC) = ratio of the between-person variance to the total variance, 1-ICC = ratio of the within-person variance to the total variance. [b]Gender: 0 = male, 1 = female

*$p < .05$. **$p < .01$. ***$p < .001$

### Test of Hypotheses

Model 1 in Table 4 shows that work-related positive affect was significantly and negatively related to procrastination (estimate = −0.236, $SE = 0.043$, $t = -5.48$, $p < .001$), and that time pressure was significantly and negatively related to procrastination (estimate = −0.070, $SE = 0.029$, $t = -2.39$, $p < .05$). Model 1 fit the data better than the null model ($\Delta - 2 \times$ Log likelihood = 33.216, $df = 2$, $p < .001$). Thus, in support of Hypothesis 1, participants who experienced higher levels of positive affect at work procrastinated less compared to participants with lower levels of positive affect at work. In support of Hypothesis 2, on days with higher time pressure, compared to days with lower time pressure, participants procrastinated less. After building a random intercept and random-slope model (Model 2), in Model 3, we added work-related positive affect as a predictor of the random slope of time pressure. This interaction term was a significant predictor of procrastination (estimate = 0.100, $SE = 0.036$, $t = 2.78$, $p < .01$), and Model 3 fit the data better than Model 2 ($\Delta - 2 \times$ Log likelihood = 7.640, $df = 1$, $p < .01$). The interaction effect is depicted in Fig. 2.

For participants high in work-related positive affect (+1 *SD*), the slope between time pressure and procrastination was not significant (simple slope = 0.007, $SE = 0.040$, $t = 0.17$, $p = .860$). For participants with average (*M*) or low work-related positive affect (− 1 *SD*), the slopes between time pressure and procrastination were negative and significant (simple slope = −0.079, $SE = 0.030$, $t = -2.62$, $p < .01$, and simple slope = −0.165, $SE = 0.045$, $t = -3.63$, $p < .001$, respectively). Taken together, the negative relationship between day-specific time pressure and procrastination was especially pronounced for people who experienced lower levels of positive affect at work. Thus, Hypothesis 3 was supported.

## Additional Analyses

Our theoretical model proposes that time pressure prevents procrastination and investigated whether time pressure is a predictor of procrastination. However, it is also plausible that time pressure and procrastination may be reciprocally related such that procrastination results in higher time pressure at a later point in time (reversed causation). To investigate this idea, we conducted next-day analyses and predicted time pressure on the next day ($t + 1$) from procrastination on the current day ($t$). That is, we investigated whether more procrastination on one day, compared to less procrastination on other days, results in higher time pressure on the next day. Procrastination on the current day was not significantly related to time pressure on the next day neither in Study 1 nor in Study 2 (estimate = −0.016, $SE = 0.085$, $t = -0.19$, $p = .849$, and estimate = 0.116, $SE = 0.070$, $t = 1.65$, $p = .100$, for Study 1 and Study 2, respectively). Thus, reversed causation was not supported by our data.

## Discussion

The aim of the current research was to highlight factors that enable individuals to initiate action on the basis of action control theory. In contrast to most studies, we took into account that some people procrastinate more than others, and that not all days are equal regarding the level of procrastination people display. This approach enabled us to examine the joint influence of time pressure as a situational factor and positive affect as a personal factor, whereby the latter was not only of direct relevance for action initiation, but also determined the importance of time pressure in supporting action initiation. Specifically, results from two studies showed that positive affect as indicated by a person's trait positive affect (Study 1) or vigor at work (Study 2) prevented

**Table 4** Study 2: Results of multilevel analyses predicting procrastination at work

| | Dependent variable: Procrastination at work | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Null model | | | Model 1 | | | Model 2 | | | Model 3 | | |
| | Est | *SE* | *t* | Est | *SE* | *t* | Est | *SE* | *t* | Est | *SE* | *t* |
| Intercept | 1.659 | 0.040 | 41.37*** | 1.660 | 0.036 | 45.28*** | 1.660 | 0.036 | 45.20*** | 1.660 | 0.036 | 45.21*** |
| *Level-1 predictor* | | | | | | | | | | | | |
| Time pressure | | | | −0.070 | 0.029 | −2.39* | −0.069 | 0.030 | −2.25* | −0.079 | 0.030 | −2.62** |
| *Level-2 predictor* | | | | | | | | | | | | |
| Work-related positive affect (vigor) | | | | −0.236 | 0.043 | −5.48*** | −0.219 | 0.042 | −5.14*** | −0.236 | 0.043 | −5.48*** |
| *Cross-level interaction* | | | | | | | | | | | | |
| Time pressure × work-related positive affect (vigor) | | | | | | | | | | 0.100 | 0.036 | 2.78** |
| −2 × Log likelihood (*df*) | | 1290.882 | (3) | | 1257.666 | (5) | | 1253.134 | (7) | | 1245.494 | (8) |
| Δ −2 × Log likelihood (*df*) | | | | | 33.216 | (2)*** | | 4.532 | (2) | | 7.640 | (1)** |
| Level 1 intercept variance (*SE*) | | 0.242 | (0.014) | | 0.239 | (0.014) | | 0.235 | (0.014) | | 0.234 | (0.014) |
| Level 2 intercept variance (*SE*) | | 0.194 | (0.028) | | 0.154 | (0.023) | | 0.156 | (0.023) | | 0.156 | (0.023 |
| Level 2 slope variance (*SE*) | | | | | | | | 0.007 | (0.012) | | 0.004 | (0.011) |
| Level 2 intercept-slope covariance (*SE*) | | | | | | | | −0.025 | (0.014) | | −0.026 | (0.013) |

*Note.* Est = estimate. $N_{\text{Level 1}} = 740$. $N_{\text{Level 2}} = 154$

* $p < .05$. ** $p < .01$. *** $p < .001$

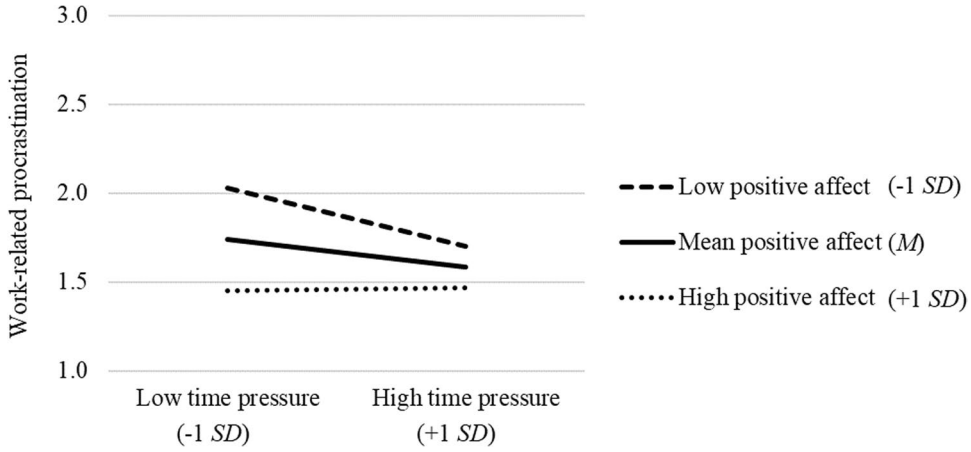


**Fig. 2** Study 2: Cross-level interaction of work-related positive affect on the slope of time pressure predicting procrastination at work

procrastination. Moreover, days that were characterized by higher time pressure, compared to days characterized by lower time pressure, were days on which people procrastinated less than usual. Finally, we revealed that time pressure has a particularly important function for overcoming procrastination for people who experience low positive affect. For people who display high positive affect, time pressure appeared to not be needed to prevent procrastination.

## Theoretical Contributions and Implications for Future Research

The current research supports the volitional facilitation assumption of action control theory (Kuhl, 2000)—positive affect reduces the inhibition of behavioral programs associated with an intention—and shows that time pressure operates as an alternative route to action. Our results emphasize the importance of considering joint effects of situational and personal factors when examining procrastination (Mischel & Shoda, 1995). Importantly, the two alternative routes are compensatory in so far as time pressure *scaffolds* action initiation (Heath & Anderson, 2010) for people who are prone to fail at initiating action because of an insufficient level of positive affect. Thus, our findings emphasize that in order to understand action initiation and procrastination, the interplay of different volitional processes needs to be taken into account.

Our research adds to findings on the consequences of time pressure for engagement and performance (e.g., Crawford et al., 2010; Schmitt et al., 2015). We revealed short-term benefits of time pressure for initiating action on the level of days by investigating the coupling of time pressure and procrastination across days (for a recent daily diary study, see Prem et al., 2018). This approach is complementary to research on long-term consequences of chronic time pressure as well as research on the coupling of time pressure and well-being over longer time frames such as weeks or months (Baethge et al., 2018). Taken together, research revealed that a beneficial effect of time pressure is found on the within-person level of analysis and for shorter time frames only. In line with these findings, we observed non-significant between-person correlations between time pressure and procrastination both in Study 1 and Study 2 ($r = .08$ and $r = -.10$, respectively). That is, in our studies, benefits of time pressure for action initiation did not exist on the between-person level (see also Prem et al., 2018). A higher or lower chronic level of time pressure appears to neither prevent nor promote procrastination. Rather, day-specific fluctuations in time pressure may prevent from procrastination on some days—specifically, on those days characterized by higher time pressure. Taken together, results indicate that relationships on the within-person level can be different from equivalent relationships on the between-person level, showing that within-person research has the potential to add to our theoretical understanding of phenomena and may result in practical implications that differ considerably from practical implications that would be drawn based on results from between-person research (see Curran & Bauer, 2011; Dalal et al., 2014).

Our results on the effects of fluctuations in time pressure are further qualified by our finding that beneficial effects of time pressure were absent for people who experience high positive affect. For people who experience low positive affect, time pressure helped to overcome procrastination. Future research may want to investigate long-term changes in time pressure and positive affect and their relationship. We speculate that dealing with enduring time pressure may exhaust employees' resources and may reduce the experience of positive affect in the long term (Sonnentag et al., 2010). As a consequence, employees may become dependent on time pressure to initiate action at work.

Moreover, our research results' may inspire future research to investigate the source of positive affect. One might speculate that people who pursue goals that are in line with their personal values and motives experience positive affect because they succeed in self-generating positive

affect when there are opportunities to initiate action. People who pursue goals that are not in line with their personal values and motives, however, may have greater difficulties in self-generating positive affect that supports action initiation (Sheldon, 2004; Sheldon & Elliot, 1999). Thus, people who pursue goals that are not in line with their personal values and motives may be more dependent on the presence of time pressure to get things done.

Results of our studies can also be interpreted from the theoretical lens of temporal motivation theory (Steel & König, 2006). Temporal motivation theory (TMT) assumes that people pursue whatever behavior has the highest utility. The temporal component of TMT refers to the timing of rewards and punishments. The framework is helpful for predicting when someone will stop procrastinating a certain action and will pursue the intended course of action as—according to the model—the utility of a certain action is also a function of the timing of rewards and punishments. The utility of a certain action increases with temporal proximity of rewards and punishments. From the perspective of TMT, time pressure can be seen as an indicator that rewards or punishments are close in time. Time pressure may thus contribute to the denominator of the utility equation, increasing the utility of the respective action. A testable assumption that results from the integration of TMT and our theoretical model would suggest that time pressure should increase if an action is postponed and should thus result in a higher utility to initiate the action. This process should be most pronounced for people with low positive affect.

While our results show that time pressure supports the initiation of action, we cannot conclude that the action itself is superiorly performed under time pressure. Previous studies showed that high time pressure may induce a speed-accuracy trade-off and that people under time pressure may employ decision-making strategies that jeopardize performance and imply higher risks (Ferrari, 2001; Moore & Tenney, 2012; Sonnentag & Frese, 2012). Beneficial effects of time pressure may only unfold when a certain level of time pressure is not exceeded and/or when boundary conditions are met such as high job control (Binnewies & Wörnlein, 2011; Kühnel et al., 2012; Schmitt et al., 2015).

We like to reiterate that we follow the conceptualization of procrastination as intention-action gaps (see also van Eerde, 2003). That is, people procrastinate when they fail to do what they intended to do. Chun Chu and Choi (2005) postulated that some people (termed "active procrastinators") may intentionally delay their tasks for an arousal experience that occurs when working against a deadline. From our theoretical perspective, people who believe that they work best under pressure ("I tend to work better under pressure", p. 252, Chun Chu & Choi, 2005) and who make deliberate decisions to postpone some tasks ("I intentionally put off work to maximize my motivation", p. 252, Chun Chu & Choi, 2005) do not experience intention-action gaps but *deliberately* postpone an activity. Thus, this behavior does not fall under our conceptualization of procrastination.

## Limitations

We focused on the effect of time pressure on procrastination and did not take into account potential reciprocal relationships between time pressure and procrastination. Time pressure prevented procrastination, but procrastination may also increase subsequent time pressure (van Eerde, 2000). The cross-sectional nature of our within-person relationships does not allow to conclude whether time pressure precedes or follows procrastination. However, the *negative* within-person relationship between time pressure and procrastination found in our studies does not support the idea that procrastination on one day increases time pressure on the same day. Moreover, our additional analyses revealed that more procrastination on a given day (compared to less procrastination on other days) was not significantly related to higher time pressure on the next day. Nevertheless, future research may want to realize several measurement points during one day to disclose potential reciprocal and lagged within-day relationships between time pressure and procrastination.

We cannot rule out the possibility that assessing procrastination with the help of self-report measures bears some risk of measurement reactivity. Specifically, asking participants whether they procrastinated on a given day may stimulate participants to reduce procrastination on the following days, resulting in a decline in procrastination over the course of the study. We did not observe a significant decline in procrastination over the course of Study 1 (estimate $_{\text{time}} = -0.021$, $SE = 0.023$, $t = -0.89$, $p = .373$), but we did observe a significant decline in work-related procrastination over the course of the work week in Study 2 (estimate $_{\text{time}} = -0.035$, $SE = 0.013$, $t = -2.67$, $p < .01$). The decline in work-related procrastination over the course of the work week may indicate measurement reactivity in Study 2, but it may also mirror recent findings on systematic differences between the days of a work week (e.g., Pindek et al., 2020). For example, sleep quality increases over the course of a work week (Hülsheger et al., 2014), and day-specific sleep quality, in turn, prevents procrastination (Kühnel et al., 2016). Importantly, results of our studies remain the same when "time" (day of study) was included as an additional predictor of procrastination. That is, controlling for systematic changes over the course of the studies, that may also be due to measurement reactivity, does not change our findings and thus, these systematic changes do not serve as alternative explanation of our findings.

In Study 2, we obtained day-specific measures of work-related positive affect over up to ten work days and used

the aggregate (person mean) of these day-specific measures to predict procrastination (Hypothesis 1). The benefit of this approach is that it allowed us to capture a situation-specific measure of work-related positive affect that is less prone to retrospective bias compared to a trait measure of work-related positive affect. The downside of this approach, however, is that the relationship between positive affect and procrastination may be overestimated due to the concurrent measurement of work-related positive affect and procrastination as momentary mood may influence both the assessment of day-specific work-related positive affect and of day-specific procrastination. Whereas the correlation between positive affect and procrastination was of small to moderate size in Study 1 ($r = -.28$) and thus similar to meta-analytic findings (rho $= -.21$ with positive affect in Steel, 2007, and average weighted $r = .30$ with depression in van Eerde, 2003), the size of the correlation between work-related positive affect and work-related procrastination was moderate to large in Study 2 ($r = -.40$). On the one hand, the stronger relationship between work-related positive affect and procrastination in Study 2 may indicate that the relationship is potentially overestimated in Study 2. On the other hand, the relationship found in Study 2 may be stronger due to the fact that positive affect and procrastination were both assessed referring to the context of work (vs. domain-unspecific assessments in Study 1). However, even a potential overestimation of the relationship between positive affect and procrastination due to the concurrent measurement in Study 2 does not serve as an alternative explanation for our finding that work-related positive affect was a cross-level moderator of the day-specific relationship between time pressure and procrastination (Hypothesis 3).

### Practical Implications

We identified two routes to action that may be addressed to prevent procrastination: positive affect and time pressure. The conceptualization of positive affect as a trait, that captures relatively stable individual differences in positive emotional experiences (Watson & Naragon, 2009), does not exclude the possibility that long-term changes can be achieved (Diener et al., 2009). The stimulation of positive emotions may help to overcome procrastination. For example, research shows that transient elevations in positive affect can be achieved by good sleep quality (Kühnel et al., 2020; Sonnentag et al., 2008), and by emotional contagion by leaders (Sy et al., 2005). Moreover, people may capitalize on positive events to sustain the experience of temporary positive affect (Gable et al., 2004). Redesigning jobs so that job resources are available is another lever as research shows that autonomy and other job resources are linked to positive changes in well-being over time (Sonnentag, 2015).

Regarding time pressure, we emphasize that our results do not support the simple idea that time pressure should in general be increased to prevent procrastination. Rather, a temporary increase in time pressure may help to prevent procrastination. In our datasets, people who experience higher time pressure did not significantly differ from people who experience lower time pressure regarding their level of procrastination. Rather, day-specific fluctuations in time pressure mattered. Higher-than-usual time pressure on one day supported the initiation and completion of intended actions, meaning that without other days characterized by lower-than-usual time pressure there may be no benefit of days with higher time pressure because resources may become depleted when time pressure persists (de Lange et al., 2009). We would also like to call for caution to increase time pressure, since previous research suggests that day-specific time pressure should be accompanied by high day-specific job control in order to develop beneficial effects for motivation (Kühnel et al., 2012).

Our theoretical assumption underlying the scaffolding effect of time pressure is the heightened perception of discrepancies between people's current state and desired states. Thus, on days on which something important needs to be done, people may prevent procrastination by increasing their awareness of the discrepancies between their current state and their desired state (e.g., by mentally reconnecting to work in the morning to activate goals, see Sonnentag et al., 2019) and by adopting a focus on the process of how to overcome the discrepancy (Kaftan & Freund, 2018). Our research suggests that especially people with low levels of positive affect should benefit from increasing their awareness of discrepancies between their current state and desired states. Our suggestions complement established approaches such as forming implementation intentions (if–then plans; Gollwitzer, 1999), that aim at specifying when, where, and how one will enact a certain behavior in order to achieve a goal and thus enhance the accessibility of specified opportunities.

## Conclusion

We examined factors that help to overcome procrastination, the delay of the initiation or completion of activities. In support of the volitional facilitation assumption of action control theory (Kuhl, 2000), we provide evidence for two distinct and compensatory routes to action. Positive affect operated as a personal and time pressure as a situational factor to prevent procrastination. These two routes are compensatory in so far as time pressure scaffolds the initiation of action for people

who are prone to fail at initiating action because of a lower trait level of positive affect. Thus, our findings emphasize that in order to understand procrastination, the interplay of different volitional processes needs to be taken into account.

## Appendix

### Data Transparency Statement

We decided to include the data of a second study (Study 2) to show that all findings of Study 1 can be conceptually replicated in a second dataset and in the context of work. The data of Study 2 was used in a previous publication (published paper #1). Procrastination was used as a variable in published paper #1 and is also used as a variable in Study 2 of the current manuscript. However, published paper #1 focused on the relevance of sleep and social sleep lag for procrastination, whereas the current manuscript has a different theoretical focus and examines the role of time pressure and vigor (work-related positive affect). See Table 5.

**Table 5** Data transparency table

| | Procrastination | Vigor (work-related positive affect) | Time pressure |
|---|---|---|---|
| Published paper #1 Kühnel et al. (2016) | Dependent variable | – | Control variable |

**Acknowledgements** We are grateful to Anne Dreher for her help with collecting data for Study 1, to our students for their help with collecting data for Study 2, and to Nicolas Feuerhahn for helpful comments on an earlier version of this manuscript. We acknowledge the presentation of this work at the 19th Congress of the European Association of Work and Organizational Psychology (EAWOP), Turin, in 2019.

**Funding** Open access funding provided by University of Vienna.



## References

Aguinis, H., Gottfredson, R. K., & Culpepper, S. A. (2013). Best-practice recommendations for estimating cross-level interaction effects using multilevel modeling. *Journal of Management, 39*, 1490–1528. https://doi.org/10.1177/0149206313478188

Amabile, T. M., & Kramer, S. J. (2011). The power of small wins. *Harvard Business Review, 89*, 70–80.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Association.

Ariely, D., & Wertenbroch, K. (2002). Procrastination, deadlines, and performance: Self-control by precommitment. *Psychological Science, 13*, 219–224. https://doi.org/10.1111/1467-9280.00441

Baethge, A., Vahle-Hinz, T., Schulte-Braucks, J., & van Dick, R. (2018). A matter of time? Challenging and hindering effects of time pressure on work engagement. *Work & Stress, 32*, 228–247. https://doi.org/10.1080/02678373.2017.1415998

Beal, D. J., Weiss, H. M., Barros, E., & MacDermid, S. M. (2005). An episodic process model of affective influences on performance. *Journal of Applied Psychology, 90*, 1054–1068. https://doi.org/10.1037/0021-9010.90.6.1054

Beswick, G., Rothblum, E. D., & Mann, L. (1988). Psychological antecedents of student procrastination. *Australian Psychologist, 23*, 207–217. https://doi.org/10.1080/00050068808255605

Binnewies, C., Sonnentag, S., & Mojza, E. J. (2009). Daily performance at work: Feeling recovered in the morning as a predictor of day-level job performance. *Journal of Organizational Behavior, 30*, 67–93. https://doi.org/10.1002/job.541

Binnewies, C., & Wörnlein, S. C. (2011). What makes a creative day? A diary study on the interplay between affect, job stressors, and job control. *Journal of Organizational Behavior, 32*, 589–607. https://doi.org/10.1002/job.731

Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology, 54*, 579–616. https://doi.org/10.1146/annurev.psych.54.101601.145030

Bolger, N., & Schilling, E. A. (1991). Personality and the problems of everyday life: The role of neuroticism in exposure and reactivity to daily stressors. *Journal of Personality, 59*, 355–386. https://doi.org/10.1111/j.1467-6494.1991.tb00253.x

Brodsky, A., & Amabile, T. M. (2018). The downside of downtime: The prevalence and work pacing consequences of idle time at work. *Journal of Applied Psychology, 103*, 496–512. https://doi.org/10.1037/apl0000294

Carver, C. S., & Scheier, M. F. (1982). Control theory: A useful conceptual framework for personality–social, clinical, and health psychology. *Psychological Bulletin, 92*, 111–135. https://doi.org/10.1037/0033-2909.92.1.111

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology, 67*, 319–333. https://doi.org/10.1037/0022-3514.67.2.319

Chun Chu, A. H., & Choi, J. N. (2005). Rethinking procrastination: Positive effects of "active" procrastination behavior on attitudes and performance. *The Journal of Social Psychology, 145*, 245–264. https://doi.org/10.3200/SOCP.145.3.245-264

Crawford, E. R., LePine, J. A., & Rich, B. L. (2010). Linking job demands and resources to employee engagement and burnout: A theoretical extension and meta-analytic test. *Journal of Applied Psychology, 95*, 834–848. https://doi.org/10.1037/a0019364

Cronbach, L. J., Gleser, G. C., Nanda, H., & Rajaratnam, N. (1972). *The dependability of behavioral measurements: Theory of generalizability for scores and profiles*. John Wiley & Sons Inc.

Curran, P. J., & Bauer, D. J. (2011). The disaggregation of within-person and between-person effects in longitudinal models of change. *Annual Review of Psychology, 62*, 583–619. https://doi.org/10.1146/annurev.psych.093008.100356

Dalal, R. S., Bhave, D. P., & Fiset, J. (2014). Within-person variability in job performance: A theoretical review and research agenda. *Journal of Management, 40*, 1396–1436. https://doi.org/10.1177/0149206314532691

de Lange, A. H., Kompier, M. A., Taris, T. W., Geurts, S. A., Beckers, D. G., Houtman, I. L., & Bongers, P. M. (2009). A hard day's night: A longitudinal study on the relationships among job demands and job control, sleep quality and fatigue. *Journal of Sleep Research, 18*, 374–383. https://doi.org/10.1111/j.1365-2869.2009.00735.x

Diener, E., Lucas, R. E., & Scollon, C. N. (2009). Beyond the hedonic treadmill: Revising the adaptation theory of well-being. *American Psychologist, 61*, 305–314. https://doi.org/10.1037/0003-066X.61.4.305

Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods, 12*, 121–138. https://doi.org/10.1037/1082-989X.12.2.121

Epstein, S. (1983). Aggregation and beyond: Some basic issues on the prediction of behavior. *Journal of Personality, 51*, 360–392. https://doi.org/10.1111/j.1467-6494.1983.tb00338.x

Fay, D., & Sonnentag, S. (2002). Rethinking the effects of stressors: A longitudinal study on personal initiative. *Journal of Occupational Health Psychology, 7*, 221–234. https://doi.org/10.1037/1076-8998.7.3.221

Ferrari, J. R. (2001). Procrastination as self-regulation failure of performance: Effects of cognitive load, self-awareness, and time limits on 'working best under pressure.' *European Journal of Personality, 15*, 391–406. https://doi.org/10.1002/per.413

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist, 56*, 218–226. https://doi.org/10.1037/0003-066X.56.3.218

Freedman, J. L., & Edwards, D. R. (1988). Time pressure, task performance, and enjoyment. In J. E. McGrath (Ed.), *The social psychology of time: New perspectives* (pp. 113–133). Sage Publications Inc.

Gable, S. L., Reis, H. T., Impett, E. A., & Asher, E. R. (2004). What do you do when things go right? The intrapersonal and interpersonal benefits of sharing positive events. *Journal of Personality and Social Psychology, 87*, 228–245. https://doi.org/10.1037/0022-3514.87.2.228

Gersick, C. J. G. (1989). Marking time: Predictable transitions in task groups. *Academy of Management Journal, 32*, 274–309. https://doi.org/10.2307/256363

Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist, 54,* 493–503. https://doi.org/10.1037/0003-066X.54.7.493.

Goschke, T., & Kuhl, J. (1993). Representation of intentions: Persisting activation in memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 19*, 1211–1226. https://doi.org/10.1037/0278-7393.19.5.1211

Gröpel, P., & Steel, P. (2008). A mega-trial investigation of goal setting, interest enhancement, and energy on procrastination. *Personality and Individual Differences, 45*, 406–411. https://doi.org/10.1016/j.paid.2008.05.015

Heath, J., & Anderson, J. (2010). Procrastination and the extended will. In C. Andreou & M. D. White (Eds.), *The thief of time: Philosophical essays on procrastination* (pp. 233–252). Oxford University Press.

Howell, A. J., Watson, D. C., Powell, R. A., & Buro, K. (2006). Academic procrastination: The pattern and correlates of behavioural postponement. *Personality and Individual Differences, 40*, 1519–1530. https://doi.org/10.1016/j.paid.2005.11.023

Hülsheger, U. R., Lang, J. W. B., Depenbrock, F., Fehrmann, C., Zijlstra, F. R. H., & Alberts, H. J. E. M. (2014). The power of presence: The role of mindfulness at work for daily levels and change trajectories of psychological detachment and sleep quality. *Journal of Applied Psychology, 99*, 1113–1128. https://doi.org/10.1037/a0037702

Iida, M., Shrout, P. E., Laurenceau, J.-P., & Bolger, N. (2012). Using diary methods in psychological research. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in psychology* (Vol. Foundations, planning, measures, and psychometrics, pp. 277–305). Washington, DC: American Psychological Association.

Isen, A. M. (2003). Positive affect as a source of human strength. In L. G. Aspinwall & U. M. Staudinger (Eds.), *A psychology of human strengths: Fundamental questions and future directions for a positive psychology* (pp. 179–195). American Psychological Association.

Kaftan, O. J., & Freund, A. M. (2018). The way is the goal: The role of goal focus for successful goal pursuit and subjective well-being. In E. Diener, S. Oishi, & L. Tay (Eds.), *Handbook of well-being*. Salt Lake City, UT: DEF Publishers.

Kazén, M., Kaschel, R., & Kuhl, J. (2008). Individual differences in intention initiation under demanding conditions: Interactive effects of state vs. action orientation and enactment difficulty. *Journal of Research in Personality, 42*, 693–715. https://doi.org/10.1016/j.jrp.2007.09.005

Kim, K. R., & Seo, E. H. (2015). The relationship between procrastination and academic performance: A meta-analysis. *Personality and Individual Differences, 82*, 26–33. https://doi.org/10.1016/j.paid.2015.02.038

Körner, A., Geyer, M., Roth, M., Drapeau, M., Schmutzer, G., Albani, C., Schumann, S., & Brähler, E. (2008). Persönlichkeitsdiagnostik mit dem NEO-Fünf-Faktoren-Inventar: Die 30-Item-Kurzversion (NEO_FFI-30) [Personality Assessment with the NEO-Five-Factor Inventory: The 30-Item-Short-Version (NEO-FFI-30)]. *Psychotherapie Psychosomatik Medizinische Psychologie, 58*, 238–245. https://doi.org/10.1055/s-2007-986199

Kuhl, J. (1985). Volitional mediators of cognition-behavior consistency: Self-regulatory processes and action versus state orientation. In J. Kuhl & J. Beckmann (Eds.), *Action Control* (pp. 101–128). Springer.

Kuhl, J. (1987). Action control: The maintenance of motivational states. In F. Halisch & J. Kuhl (Eds.), *Motivation, intention, and volition* (pp. 279–291). Springer.

Kuhl, J. (2000). A functional-design approach to motivation and self-regulation: The dynamics of personality systems interactions. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 111–169). Elsevier Academic Press.

Kuhl, J., & Kazén, M. (1999). Volitional facilitation of difficult intentions: Joint activation of intention memory and positive affect removes Stroop interference. *Journal of Experimental Psychology: General, 128*, 382–399. https://doi.org/10.1037/0096-3445.128.3.382

Kühnel, J., Bledow, R., & Feuerhahn, N. (2016). When do you procrastinate? Sleep quality and social sleep lag jointly predict self-regulatory failure at work. *Journal of Organizational Behavior, 37*, 983–1002. https://doi.org/10.1002/job.2084

Kühnel, J., Bledow, R., & Kiefer, M. (2022). There is a time to be creative: The alignment between chronotype and time of day. *Academy of Management Journal, 65*, 218–247. https://doi.org/10.5465/amj.2019.0020

Kühnel, J., Diestel, S., & Melchers, K. G. (2020). An ambulatory diary study of mobile device use, sleep, and positive mood.

*International Journal of Stress Management*. https://doi.org/10.1037/str0000210

Kühnel, J., Sonnentag, S., & Bledow, R. (2012). Resources and time pressure as day-level antecedents of work engagement. *Journal of Occupational and Organizational Psychology, 85*, 181–198. https://doi.org/10.1111/j.2044-8325.2011.02022.x

Kühnel, J., Sonnentag, S., Bledow, R., & Melchers, K. G. (2018). The relevance of sleep and circadian misalignment for procrastination among shift workers. *Journal of Occupational and Organizational Psychology, 91*, 110–133. https://doi.org/10.1111/joop.12191

Lay, C. H. (1986). At last, my research article on procrastination. *Journal of Research in Personality, 20*, 474–495. https://doi.org/10.1016/0092-6566(86)90127-3

LePine, J. A., Podsakoff, N. P., & Lepine, M. A. (2005). A meta-analytic test of the challenge stressor-hindrance stressor framework: An explanation for inconsistent relationships among stressors and performance. *Academy of Management Journal, 48*, 764–775. https://doi.org/10.5465/AMJ.2005.18803921

Little, L. M., Nelson, D. L., Wallace, J. C., & Johnson, P. D. (2011). Integrating attachment style, vigor at work, and extra-role performance. *Journal of Organizational Behavior, 32*, 464–484. https://doi.org/10.1002/job.709

Mathieu, J. E., Aguinis, H., Culpepper, S. A., & Chen, G. (2012). Understanding and estimating the power to detect cross-level interaction effects in multilevel modeling. *Journal of Applied Psychology, 97*, 951–966. https://doi.org/10.1037/a0028380

Mischel, W., & Shoda, Y. (1995). A cognitive-affective system theory of personality: Reconceptualizing situations, dispositions, dynamics, and invariance in personality structure. *Psychological Review, 102*, 246–268. https://doi.org/10.1037/0033-295X.102.2.246

Moore, D. A., & Tenney, E. R. (2012). Time pressure, performance, and productivity. In M. A. Neale & E. A. Mannix (Eds.), *Looking Back, Moving Forward: A Review of Group and Team-Based Research (Research on Managing Groups and Teams)* (Vol. 15, pp. 305–326). Emerald Group Publishing Limited.

Murray, G., Nicholas, C. L., Kleiman, J., Dwyer, R., Carrington, M. J., Allen, N. B., & Trinder, J. (2009). Nature's clocks and human mood: The circadian system modulates reward motivation. *Emotion, 9*, 705–716. https://doi.org/10.1037/a0017080

Newman, D. A., & Harrison, D. A. (2008). Been there, bottled that: Are state and behavioral work engagement new and useful construct "wines"? *Industrial and Organizational Psychology, 1*, 31–35. https://doi.org/10.1111/j.1754-9434.2007.00003.x

Ohly, S., & Fritz, C. (2010). Work characteristics, challenge appraisal, creativity, and proactive behavior: A multi-level study. *Journal of Organizational Behavior, 31*, 543–565. https://doi.org/10.1002/job.633

Pindek, S., Zhou, Z. E., Kessler, S. R., Krajcevska, A., & Spector, P. E. (2020). Workdays are not created equal: Job satisfaction and job stressors across the workweek. *Human Relations*. https://doi.org/10.1177/0018726720924444

Podsakoff, N. P., LePine, J. A., & LePine, M. A. (2007). Differential challenge stressor-hindrance stressor relationships with job attitudes, turnover intentions, turnover, and withdrawal behavior: A meta-analysis. *Journal of Applied Psychology, 92*, 438–454. https://doi.org/10.1037/0021-9010.92.2.438

Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interactions in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31*, 437–448. https://doi.org/10.3102/10769986031004437

Prem, R., Ohly, S., Kubicek, B., & Korunka, C. (2017). Thriving on challenge stressors? Exploring time pressure and learning demands as antecedents of thriving at work. *Journal of Organizational Behavior, 38*, 108–123. https://doi.org/10.1002/job.2115

Prem, R., Scheel, T. E., Weigelt, O., Hoffmann, K., & Korunka, C. (2018). Procrastination in daily working life: A diary study on within-person processes that link work characteristics to workplace procrastination. *Frontiers in Psychology, 9*, 1087. https://doi.org/10.3389/fpsyg.2018.01087

Raudenbush, S. W., Bryk, A. S., Cheong, Y. F., Congdon, R. T., & du Toit, M. (2011). *HLM 7*. Lincolnwood, IL: Scientific Software International.

Rodell, J. B., & Judge, T. A. (2009). Can "good" stressors spark "bad" behaviors? The mediating role of emotions in links of challenge and hindrance stressors with citizenship and counterproductive behaviors. *Journal of Applied Psychology, 94*, 1438–1451. https://doi.org/10.1037/a0016752

Ryan, R. M., & Frederick, C. (1997). On energy, personality, and health: Subjective vitality as a dynamic reflection of well-being. *Journal of Personality, 65*, 529–565. https://doi.org/10.1111/j.1467-6494.1997.tb00326.x

Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2006). The measurement of work engagement with a short questionnaire: A cross-national study. *Educational and Psychological Measurement, 66*, 701–716. https://doi.org/10.1177/0013164405282471

Schmitt, A., Ohly, S., & Kleespies, N. (2015). Time pressure promotes work engagement. *Journal of Personnel Psychology, 14*, 28–37. https://doi.org/10.1027/1866-5888/a000119

Semmer, N. K., Zapf, D., & Dunckel, H. (1999). Instrument zur Stressbezogenen Tätigkeitsanalyse ISTA [Instrument for stress-related job analysis]. In H. Dunckel (Ed.), *Handbuch psychologischer Arbeitsanalyseverfahren* (pp. 179–204). Zürich: vdf Hochschulverlag.

Sheldon, K. M. (2004). The self-concordance model of healthy goal striving: When personal goals correctly represent. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 65–86). University of Rochester Press.

Sheldon, K. M., & Elliot, A. J. (1999). Goal striving, need satisfaction, and longitudinal well-being: The self-concordance model. *Journal of Personality and Social Psychology, 76*, 482–497. https://doi.org/10.1037/0022-3514.76.3.482

Shirom, A. (2007). Explaining vigor: On the antecedents and consequences of vigor as a positive affect at work. In D. L. Nelson & C. L. Cooper (Eds.), *Positive organizational behavior* (pp. 86–100). Sage.

Sonnentag, S. (2015). Dynamics of well-being. *Annual Review of Organizational Psychology and Organizational Behavior, 2*, 261–293. https://doi.org/10.1146/annurev-orgpsych-032414-111347

Sonnentag, S., Binnewies, C., & Mojza, E. J. (2008). "Did you have a nice evening?" A day-level study on recovery experiences, sleep, and affect. *Journal of Applied Psychology, 93*, 674–684. https://doi.org/10.1037/0021-9010.93.3.674

Sonnentag, S., Binnewies, C., & Mojza, E. J. (2010). Staying well and engaged when demands are high: The role of psychological detachment. *Journal of Applied Psychology, 95*, 965–976. https://doi.org/10.1037/a0020032

Sonnentag, S., Eck, K., Fritz, C., & Kühnel, J. (2019). Morning reattachment to work and work engagement during the day: A look at day-level mediators. *Journal of Management, 46*, 408–1435. https://doi.org/10.1177/0149206319829823.

Sonnentag, S., & Frese, M. (2012). Stress in organizations. In I. B. Weiner, N. W. Schmitt, & S. Highhouse (Eds.), *Handbook of Psychology: Industrial and Organizational Psychology* (2nd ed., Vol. 12, pp. 560–592). John Wiley & Sons Inc.

Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin, 133*, 65–94. https://doi.org/10.1037/0033-2909.133.1.65

Steel, P., & König, C. J. (2006). Integrating theories of motivation. *Academy of Management Review, 31*, 889–913. https://doi.org/10.5465/amr.2006.22527462

Sy, T., Côté, S., & Saavedra, R. (2005). The contagious leader: Impact of the leader's mood on the mood of group members, group affective tone, and group processes. *Journal of Applied Psychology, 90*, 295–305. https://doi.org/10.1037/0021-9010.90.2.295

Tice, D. M., & Baumeister, R. F. (1997). Longitudinal study of procrastination, performance, stress, and health: The costs and benefits of dawdling. *Psychological Science, 8*, 454–458. https://doi.org/10.1111/j.1467-9280.1997.tb00460.x

Tuckman, B. W. (1991). The development and concurrent validity of the procrastination scale. *Educational and Psychological Measurement, 51*, 473–480. https://doi.org/10.1177/0013164491512022

Turban, D. B., Lee, F. K., Veiga, S. P., & d. M., Haggard, D. L., & Wu, S. Y. (2013). Be happy, don't wait: The role of trait affect in job search. *Personnel Psychology, 66*, 483–514. https://doi.org/10.1111/peps.12027

Vahle-Hinz, T., de Bloom, J., Syrek, C., & Kühnel, J. (2019). Putting the episodic process model to the test: Explaining intraindividual fluctuations in job performance across the working day. *Journal of Business and Psychology, 36,* 71–84. https://doi.org/10.1007/s10869-019-09672-5.

van Eerde, W. (2000). Procrastination: Self-regulation in initiating aversive goals. *Applied Psychology, 49*, 372–389. https://doi.org/10.1111/1464-0597.00021

van Eerde, W. (2003). A meta-analytically derived nomological network of procrastination. *Personality and Individual Differences, 35*, 1401–1418. https://doi.org/10.1016/S0191-8869(02)00358-6

van Eerde, W. (2016). Procrastination and well-being at work. In F. Sirois & T. A. Pychyl (Eds.), *Procrastination, Health, and Well-Being* (pp. 233–253). Academic Press.

van Eerde, W., Beeftink, F., & Rutte, C. G. (2016). Working on something else for a while: Pacing in creative design projects. *Time & Society, 25*, 676–699. https://doi.org/10.1177/0961463X15577274

van Hooft, E. A., Born, M. P., Taris, T. W., van der Flier, H., & Blonk, R. W. (2005). Bridging the gap between intentions and behavior: Implementation intentions, action control, and procrastination. *Journal of Vocational Behavior, 66*, 238–256. https://doi.org/10.1016/j.jvb.2004.10.003

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063

Watson, D., & Naragon, K. (2009). Positive affectivity: The disposition to experience positive emotional states. In S. J. Lopez & C. R. Snyder (Eds.), *The Oxford Handbook of Positive Psychology* (pp. 207–216). Oxford University Press.

Watson, D., Wiese, D., Vaidya, J., & Tellegen, A. (1999). The two general activation systems of affect: Structural findings, evolutionary considerations, and psychobiological evidence. *Journal of Personality and Social Psychology, 76*, 820–838. https://doi.org/10.1037/0022-3514.76.5.820

Young, H. R., Glerum, D. R., Wang, W., & Joseph, D. L. (2018). Who are the most engaged at work? A meta-analysis of personality and employee engagement. *Journal of Organizational Behavior, 39*, 1330–1346. https://doi.org/10.1002/job.2303