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Indirect effects of Daily Self-Control Demands on Subjective Vitality via Ego Depletion –
How Daily Psychological Detachment Pays Off

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The present study uses a within-person approach to provide insights into day-specific dynamics in the relation between self-control demands at work and well-being. Integrating arguments derived from the Limited Strength Model of Self-Control and research on spillover processes, we develop and test a theoretical model of how the adverse effects of day-specific self-control demands at work may spill over to the home domain. Specifically, we propose ego depletion at home (an indicator of regulatory resource depletion) as a mediator linking self-control demands on a given working day to reduced subjective vitality at home (an indicator of well-being). Furthermore, we suggest that daily psychological detachment moderates this indirect relationship to the effect that high detachment prevents the spillover of the adverse effects of self-control demands to the home domain. Results from our daily diary study across ten days (N = 86 employees) provide strong support for the proposed moderated mediation model, demonstrating that daily psychological detachment buffers the effect of self-control demands on ego depletion, thereby disrupting the indirect effect of self-control demands on subjective vitality at home. The study underlines the importance of within-person approaches for

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examining the adverse effects of self-control demands, and provides further evidence for the immediate resource-replenishing benefits of daily detachment levels.

Keywords: diary study, ego depletion, multilevel structural equation modelling, psychological detachment, self-control demands, spillover

Indirect Effects of Daily Self-Control Demands on Subjective Vitality via Ego Depletion - How Daily Psychological Detachment Pays Off

Self-control demands (SCDs) have become an integral part of the job in many occupations (Cascio, 2003; Rivkin, Diestel, & Schmidt, 2015b; Schmidt & Neubach, 2007). Self-control involves inhibiting, modifying, or overriding spontaneous and automatic reactions, urges, emotions, and desires that would otherwise interfere with goal-directed behavior (Baumeister, Heatherton, & Tice, 1994). Thus, SCDs at work cause people to alter the way they would spontaneously think, feel, or behave. For example, employees are required to engage in self-control when they have to follow certain display rules, create specific impressions, resist distractions, or overcome motivational deficits resulting from unattractive tasks (Schmidt & Neubach, 2007). To date, there is broad empirical evidence that SCDs at work relate to impairments of psychological well-being, such as burnout and depression (for an overview see Schmidt & Diestel, 2015). The Limited Strength Model of Self-Control (Muraven & Baumeister, 2000) provides a theoretical framework for these findings. The model suggests that different acts of self-control draw on a common regulatory resource (or self-control strength), which is limited and gets depleted through use. The state of depletion after exerting self-control is referred to as *ego depletion* and is characterized by feelings of exhaustion, low willpower, and reduced capacity for further self-control. If circumstances prevent replenishment of the depleted self-control resource, prolonged ego depletion can manifest in impairments of well-being.

Initial studies conceptualized SCDs as stable work characteristics and adopted a between-person approach to examine interindividual differences in the experience of SCDs among employees with certain professions (e.g., services sector employees, nurses; Diestel & Schmidt, 2011; Schmidt & Diestel, 2012). However, more recent studies have found that SCDs can also vary *within persons* (e.g., between different working days). For example, Rivkin, Diestel, and Schmidt (2015a) outlined that on working days characterized by higher SCDs than usual (e.g., due to frequent interruptions, intensive customer interactions, or unattractive work tasks), employees report increased levels of ego depletion compared to days with lower levels of SCDs.

Therefore, given the adverse consequences of SCDs and their relevance for individuals and organizations, consequent research has focused on factors that may protect employees' well-being when dealing with SCDs at work. Such factors are commonly referred to as "psychological resources" (Hobfoll, 2002). In their review, Halbesleben, Neveu, Paustian-Underdahl, and Westman (2014) propose recovery experiences as a promising psychological resource in the organizational context. Accordingly, Rivkin et al. (2015b) found that psychological detachment, a core component of recovery, can mitigate the adverse effects of SCDs on employees' well-being. Psychological detachment refers to the sense of mentally being away from the work situation during non-work time (Etzion, Eden, & Lapidot, 1998). Drawing on the proposition that during psychological detachment "(...) no further demands are made on functional systems called upon during work" (Sonnentag &

Fritz, 2007, p. 205), Rivkin et al. (2015b) argue that high levels of detachment reduce resource depletion resulting from work-related SCDs and facilitate resource recovery.

The current study contributes to this area of research by examining the relationships between SCDs, psychological detachment, and employees' well-being from a within-person perspective. By using a daily diary-design with assessments of work and home experiences, the study develops previous cross-sectional research designs by providing more detailed insights into the daily relation of SCDs to employees' well-being across life domains. Specifically, we disentangle how day-specific SCDs at work affect employees' well-being at home (commonly referred to as *spillover effects*, Edwards & Rothbard, 2000), and test whether day-specific levels of psychological detachment may prevent this spillover effect. Therefore, in a moderated mediation model, we test the following propositions derived from the Limited Strength Model of Self-Control (Muraven & Baumeister, 2000) and research on spillover (Edwards & Rothbard, 2000). First, we propose that SCDs at work cause increased levels of ego depletion at home, which in turn impair subjective vitality (as an indicator of well-being) at home. Put differently, we suggest ego depletion at home as a mediator of the adverse effects of SCDs at work on subjective vitality at home (Hypothesis 1). Moreover, day-specific psychological detachment is predicted to buffer the relation between SCDs at work and ego depletion at home, thereby disrupting the indirect effect of SCDs at work on subjective vitality at home (moderation of the a-path, Hypothesis 2). Figure 1 depicts the hypothesized study model.

Our research aims to make three contributions to the literature. First, it may shed light on within-person dynamics in the relation between SCDs and well-being by developing and testing a theoretical model of how the adverse effects of day-specific SCDs at work may spill over to the home domain. This distinguishes the current study from previous between-person research, which did not allow a detailed analysis of processes occurring at the within-person-level. Our study could provide initial evidence that SCDs experienced at work on a given day increase levels of ego depletion later at home, and that ego depletion, in turn, impacts on employees' subjective vitality at home, hence contributing to an exhaustive evaluation of the adverse effects of SCDs and extending knowledge on the interconnectedness between home and work domains.

Second, while Rivkin et al. (2015b) demonstrated that individuals with high overall levels of detachment (i.e., a higher general ability or trait to switch off from work in leisure time, cf., Fritz, Yankelevich, Zarubin, & Barger, 2010) are less susceptible to the adverse consequences of chronic SCDs, their study did not provide insight into potential benefits of transitory within-person variations in psychological detachment. Considering evidence that immediate (same-day) gains from detachment are stronger than delayed gains (Sonnentag & Fritz, 2015), our study examines whether day-specific psychological detachment can prevent the spillover of the adverse effects of SCDs from work to the home domain. We thereby may shed further light on the immediate resource-replenishing value of day-specific detachment levels. Since psychological detachment is a highly malleable state that can be learned (Hahn, Binnewies, Sonnentag, & Mojza, 2011), the present research could enrich our understanding on how to protect employees' subjective vitality at home on days with high SCDs at work.

Finally, the study offers important methodological advantages that extend previous research. Cross-sectional and longitudinal studies can suffer from a retrospective bias (Reis & Gable, 2000), as they rely on post-hoc evaluations of the experiences (i.e., employees are asked to report SCDs, detachment, and well-being either on an overall level or over longer time periods; cf., Ohly, Sonnentag, Niessen, &

Zapf, 2010). Adopting a within-person design with real-time assessments (i.e., SCDs at work, detachment at home) may reduce measurement biases and enhance the validity of our results (cf., Xanthopoulou, Bakker, & Ilies, 2012).

The Spillover of SCDs at Work to Subjective Vitality at Home via Ego Depletion at Home

Research from the field of occupational health psychology has identified SCDs (i.e., controlling impulses, resisting distractions and overcoming inner resistances) as an influential stressor at work (Schmidt & Diestel, 2015). Controlling impulses involves inhibiting spontaneous, impulsive response tendencies and associated affective states (e.g., injudicious expressions towards other individuals). Resisting distractions refers to the demand to ignore interruptions evoked by task-irrelevant stimuli, which would interfere with successful task accomplishment (e.g., social media). Overcoming inner resistances relates to the requirement to overcome motivational blockades, for example in cases of unattractive tasks (Schmidt & Neubach, 2007).

While there is broad empirical evidence from cross-sectional and longitudinal studies that chronic SCDs at work predict long-term indicators of impaired well-being (for an overview, see Schmidt & Diestel, 2015), to date, little attention has been drawn to day-specific SCDs and their relation to short-term indicators of employees' well-being (Rivkin et al., 2015a). In order to fully understand day-specific work demands and their consequences for employees, a growing body of research suggests to consider spillover processes that link work and home (e.g., Ilies et al., 2007; Rodríguez-Muñoz, Sanz-Vergel, Demerouti, & Bakker, 2014; Thompson, Kirk, & Brown, 2005). These spillover processes imply that experiences at work can transcend work boundaries and influence behaviors, thoughts, and feelings later at home (Edwards & Rothbard, 2000). Addressing this issue, the current study examines the potential spillover of the adverse effects of day-specific SCDs experienced at work to the home domain.

Drawing on the Limited Strength Model of Self-Control (Muraven & Baumeister, 2000), we argue that SCDs and the associated exertion of self-control draw on and deplete employees' limited regulatory resource at work. The resulting state of ego depletion endures until self-control efforts are interrupted and replenishment of the resource becomes possible (Muraven & Baumeister, 2000). It can be assumed, however, that while at work, it is difficult for employees to refrain from exerting self-control efforts in order to get appropriate rest for resource restoration. Scholars suggest that several activities during work breaks require prolonged regulatory efforts (e.g., preparing for subsequent work episodes, running errands, social lunch break activities; Sonnentag, 2001; Trougakos & Hideg, 2009; Trougakos, Hideg, Cheng, & Beal, 2014), and hence fail to cease ego depletion. Low effort activities during work breaks (e.g., relaxation), in contrast, offer momentary relief (Trougakos & Hideg, 2009), but may not have as much impact as off-job activities (e.g., sufficient sleep; Diestel, Rivkin, & Schmidt, 2015; psychological detachment, Rivkin et al., 2015b) in fully rewinding and returning depleted resources to pre-stressor levels. We therefore propose that after having dealt with SCDs at work, employees bring taxed resources to the home domain, manifesting in increased levels of ego depletion at home. In addition, demands to exert self-control for work-related purposes at home (e.g., in form of overcoming inner resistances in order to finish work-related tasks, or resisting distractions induced by work-related stimuli, such as phone calls, when engaging in leisure time activities) may further contribute to ego depletion. Therefore, one can assume that day-specific SCDs at work positively relate to ego depletion at home.

The Limited Strength Model of Self-Control (Muraven & Baumeister, 2000) further corroborates that prolonged self-control efforts and associated ego depletion can manifest in impairments of well-being over time, leading us to assert that ego depletion may also affect employees' well-being within the same day. More precisely, we propose that on days with high SCDs at work, resulting levels of ego depletion in the evening at home will decrease employees' well-being in the form of subjective vitality. Ryan and Frederick (1997) conceptualized subjective vitality as a short-term indicator of enhanced well-being and motivation, associated with feelings of vigor, activity, and productivity (Ryan & Deci, 2008) on the one hand, and positive affect (Watson & Tellegen, 1985), happiness, and low depressiveness on the other (Penninx et al., 2000). Accordingly, states of vitality comprise behavioral as well as affective aspects of day-specific individual well-being.

As previously delineated, we argue that on days with high SCDs at work, employees' regulatory resources remain depleted in the evening, manifesting in ego depletion at home. Taking into account that a) ego depletion is associated with negative affect (Hagger, Wood, Stiff, & Chatzisarantis, 2010), and b) the regulation of affect and behavior requires the availability of regulatory resources (Hagger et al., 2010; Lanaj, Johnson, & Wang, 2016), we further propose that when in states of ego depletion, employees have difficulties to shift from negative to positive affect, and to engage in behaviors that would enhance vitality (i.e., meeting friends, exercising). As a result, daily levels of subjective vitality are diminished.

In sum, integrating the arguments that SCDs at work evoke ego depletion at home, and ego depletion in turn manifests in impairments of subjective vitality at home, we propose ego depletion at home as a mediator of the adverse spillover effects of SCDs at work on subjective vitality at home.

Hypothesis 1: Day-specific ego depletion at home mediates the day-specific adverse relation between SCDs at work and subjective vitality at home.

The Buffering Function of Day-Specific Psychological Detachment

Psychological detachment from work has been defined by Etzion et al. (1998) as "the individual's sense of being away from the work situation" (p. 579). It refers to an off-job experience that can be described as "switching off" mentally (Sonnentag & Bayer, 2005). In order to successfully detach from work, an employee should not only refrain from work-related behaviors (e.g., answering work-related phone calls), but also avoid thinking about work-related issues. In their preliminary work on recovery experiences, Sonnentag and Fritz (2007) have identified psychological detachment as one out of four key components of recovery, apart from relaxation, mastery, and control. While there is convincing empirical evidence that all four recovery components have beneficial effects on employees' psychological well-being (Sonntag & Fritz, 2007), scholars propose differential mechanisms to underlie these effects. On the one hand, the positive effects of mastery and control are assumed to result from building up new internal resources (e.g., self-efficacy or skills); on the other hand, the effects of psychological detachment and relaxation are accounted for by the interruption of work-related demands and associated recovery of depleted resources.

Furthermore, previous research indicates that psychological detachment in addition to increasing employees' well-being (e.g., Sonnentag & Fritz, 2007) but can also buffer the adverse consequences of work demands on well-being (e.g., Sonnentag, Binnewies, & Mojza, 2010). The authors of these studies argue that during psychological detachment, the cognitive availability of experiences at work is reduced. Thus, recovery processes (e.g., recovery of depleted energetic resources) are facilitated,

which in turn attenuate or even prevent resulting impairments of employees' psychological well-being. In contrast, the lack of detachment during off-job time hinders recovery, as individuals do not experience full relief from their job demands. Building on this proposition, Rivkin et al. (2015b) proposed and found that psychological detachment supports replenishment of the limited self-control resource and thus, attenuates the adverse effects of SCDs on well-being. More specifically, their findings indicate that people who are generally better able to detach from work than others (for example, due to lower job involvement or segmentation preference between work and home; Sonnentag, 2012) are less likely to suffer from impairments of well-being as a consequence of dealing with SCDs at work.

However, the literature suggests that employees' levels of psychological detachment can also vary substantially from day to day (e.g., Derks, van Mierlo, & Schmitz, 2014; Sonnentag & Binnewies, 2013). That is, irrespective of an employees' general level of detachment, day-specific circumstances can influence psychological detachment on a particular evening. For example, on days when employees engage in social interactions in the evening or keep an appointment they are looking forward to, it will be easier for them to detach from work, as work-related issues lose their importance and are no longer on employees' minds.

In their review, Sonnentag and Fritz (2015) outline that the immediate (i.e., same-day) benefits of daily psychological detachment are stronger compared to benefits that occur later in time, as unfolding events, for example at work, can override the positive effects of detachment. Recent diary studies consistently found that daily levels of psychological detachment can interrupt spillover processes and thereby uncouple the relations between daily experiences at work and well-being at home (e.g., Derks & Bakker, 2014; Sonnentag & Binnewies, 2013). Drawing on this basis, the present study examines whether day-specific psychological detachment can inhibit the spillover of the adverse effects of SCDs at work to the home domain.

As previously outlined, we propose that day-specific SCDs at work tax employees' limited regulatory resources, resulting in states of ego depletion at home. However, we assume that on days when employees succeed in mentally disengaging from their work, they do not have to exert further self-control for work-related purposes at home, so that the depletion of regulatory resources is interrupted. In addition, high daily levels of detachment may allow employees to recover their regulatory resource. We thus propose that psychological detachment prevents reductions of subjective vitality at home, which would result from prolonged ego depletion. Taken together, we suggest that daily levels of psychological detachment mitigate the daily spillover of SCDs at work to ego depletion at home, thereby interrupting the indirect effect of SCDs at work on subjective vitality at home.

Hypothesis 2: Day-specific psychological detachment moderates the day-specific (indirect) relationship between SCDs at work and subjective vitality at home, such that this relationship is weaker when day-specific psychological detachment is high (moderation of the a-path, cf. Figure 1).

Method

Participants and Procedure

We conducted a daily diary study to test our hypotheses. Participants were recruited through personal contacts. Therefore, over the course of the last year, we collected contact information from individuals who expressed their willingness to contribute to a scientific study and asked them to participate. A

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basic requirement for participation in our study was that employees worked in services sector occupations or held occupations with regular contact to clients or other individuals, because SCDs constitute a predominant stressor in these occupations (Diestel & Schmidt, 2011). This requirement was taken into account in the recruitment process and additionally communicated at the beginning of our study. All in all, our participants held different occupations, ranging from salespersons, consultants, and teachers to care workers, car retailers, and clerks. The final sample comprises 86 participants (107 were originally contacted). Among the participants, 64% were female and 26% worked part-time (part-time employees in this study worked less days per week, but had full working days). Age ranged from 18 to 63 years ($M = 40.12$; $SD = 14.24$). Our participants worked an average of 33.81 ($SD = 12.90$) hours per week with other people.

The data were collected via online surveys. In advance of the day-specific measurements, respondents received an e-mail explaining the survey process and assuring confidentiality of the responses. Additionally, they were invited to fill out a background questionnaire that assessed demographic variables. Afterwards, two times per day over 10 consecutive working days, participants received e-mails including instructions and links to the day-specific questionnaires. In the afternoon at work (12 PM every day), participants were asked to rate SCDs during the “last few hours of work”. The evening-survey (6 PM) invited participants to rate ego depletion, subjective vitality, and psychological detachment at home. After receiving the e-mails, the surveys were accessible for six hours. Thus, participants were able to complete the afternoon survey between 12 PM and 6 PM, and the evening survey between 6 PM and midnight. However, they were instructed to complete the afternoon survey at work and the evening survey at home. If participants did not react to the survey within the first two hours, a reminder was sent. On average, the surveys were completed two hours after reception. On weekends or (public) holidays, the diary study was interrupted and continued on the next regular working day. Overall, the response rate to our daily questionnaires was 68%, resulting in 588 (out of 860 possible) daily measurement points.

Measures and Control Variables

SCDs (at work). We assessed day-specific SCDs with 15 items from an instrument developed by Schmidt and Neubach (2010). On a five-point Likert scale (1 = *not at all*; 5 = *a great deal*), participants rated their work in terms of the requirements to inhibit impulses, resist distractions, and overcome inner blockades during “the last hours” of work. Items such as “In the last hours, my job required me not to lose my temper” (impulse control), “In the last hours, my work required me to resist distractions” (resisting distractions), and “In the last hours, some of my tasks were such that I really needed to force myself to get them done” (overcoming inner resistances) illustrate the scale. The scale score was computed as the average of the single-item scores (see Schmidt & Diestel, 2012). Cronbach’s alpha was $\alpha = .88$, calculated using the person-mean centered items (see Geldhof, Preacher, & Zyphur, 2014).

Psychological Detachment (at home). Day-specific psychological detachment (four items) was assessed with the detachment subscale from the recovery experience questionnaire developed by Sonnentag and Fritz (2007). Participants were asked to report the extent to which they have been occupied with job-related thoughts after work so far (1 = *not at all*; 5 = *a great deal*). A typical item from the scale is “Tonight, I haven’t thought about work at all”. Cronbach’s alpha was $\alpha = .92$.

Ego Depletion (at home). Day-specific ego depletion was assessed using five items related to the participants' momentary experiences with resource depletion and low willpower (e.g., "At the moment, it feels increasingly difficult to concentrate."). The scale was developed and validated by Bertrams, Unger, and Dickhäuser (2011), who intended to assess the psychological state of ego depletion as proposed by Muraven and Baumeister (2000). All items are scored using a four-point Likert scale (1 = *not at all*; 4 = *a great deal*). Cronbach's alpha was $\alpha = .89$.

Subjective Vitality (at home). Day-specific subjective vitality was measured with four items from Ryan and Frederick (1997), which indicate feelings of aliveness and energy. An exemplary item from the scale is "I am looking forward to tomorrow". The items are scored on a seven-point Likert scale (1 = *not at all*; 7 = *a great deal*). Cronbach's alpha was $\alpha = .82$. As indicated by the sample items, ego depletion refers to momentary experiences of depletion and low willpower, whereas subjective vitality reflects rather prospective well-being.

Control Variables. We assessed age, gender, work-time (part-time vs. full-time), and negative affect as control variables. Age, gender, and work-time were included in the analyses to control for their potential confounding influence. For example, part-time employees may have more time to detach from work due to less overall work-time, resulting in higher scores of detachment. Furthermore, we controlled for trait negative affect using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), because trait negative affect has been found to influence the appraisal of stressors and strain (Debus, König, Kleinmann, & Werner, 2015). Negative affect reflects a dispositional dimension, with high negative affect characterized by subjective distress and unpleasant engagement, and low negative affect by the absence of these feelings. Participants were asked to rate the frequency with which they experience 10 different emotions (e.g., distress, guilt) on a five-point Likert scale (1 = *not at all*; 5 = *very often*). Cronbach's alpha was $\alpha = .74$.

Construct Validity

We conducted multilevel confirmatory factor analyses (MCFAs) to test the psychometrical distinctiveness of our variables. Therefore, we created parcels of our constructs by aggregating item indicators of the latent variables. This practice offers a number of advantages, such as a reduced number of parameters, more normally-distributed and reliable measures, and more efficient parameter estimates (Bandalos & Finney, 2001; West, Finch, & Curran, 1995).

First, we tested a four-factor model including all study variables (SCDs [five parcels], psychological detachment [two parcels], ego depletion [two parcels], and subjective vitality [two parcels]). Fit indices indicated a good fit for this model: $\chi^2 (76) = 118.300, p < .01$, root mean square error of approximation (RMSEA) = .031, comparative fit index (CFI) = .989, standardized root mean square residual within-person/between-person (SRMRw/SRMRb) = .023/.045. In contrast, a model including all variables into one factor performed worse: $\chi^2 (88) = 2070.715, p < .01$, RMSEA = .196, CFI = .499, SRMRw/SRMRb = .196/.290.

Furthermore, in view of the conceptual relatedness of the ego depletion and subjective vitality measures, we also tested a three-factor model. In this model, we specified both SCDs and psychological detachment as single factors, and aggregated ego depletion and subjective vitality as another factor. The four-factor model, however, performed better than this three-factor solution: $\chi^2 (82) = 384.699, p < .01$, RMSEA = .079, CFI = .924, SRMRw/b = .055/.079). In sum, MCFAs suggest that all study variables represent distinct constructs.

Analytical Procedure

To test our predictions, we used multilevel structural equation modelling (MSEM) in Mplus 7.2 (Muthén & Muthén, 2012), because the day-level data (level 1) were nested within the person-level data (level 2), and this procedure allows for conducting analyses on multiple levels. In a first step (in order to test Hypothesis 1), we specified a 1-1-1 mediation model (Preacher, Zyphur, & Zhang, 2010) in which ego depletion at home mediates the adverse effects of SCDs at work on subjective vitality at home (Model 1). In a second step, we specified a moderated mediation model (Model 2) to examine the moderating role of psychological detachment in the day-level relation between SCDs and ego depletion (Hypothesis 2). Since the focus of this analysis was to examine day-specific effects, we centered SCDs and psychological detachment around the person-mean before computing the interaction term. This procedure allows exclusively testing the interaction effect at the within-person-/day-level, as it eliminates all between-person variance (cf., van de Pol & Wright, 2009), and additionally reduces biasing effects of multicollinearity when testing interaction effects (Aiken, West, & Reno, 1991). All paths between the study variables were modelled using the robust maximum likelihood method of estimation. To obtain standardized path coefficients for the proposed models, all study variables were grand-mean centered prior to analyses (Hox, 2002).¹

Results

Table 1 displays the descriptive statistics, internal consistencies (Cronbach's alpha), and correlations among all study variables. The proportions of within-person variation were 45 % in SCDs, 66 % in ego depletion, 56 % in subjective vitality, and 52 % in psychological detachment. Due to these high levels of day-specific variation, the application of multilevel modelling is necessary.

As all of our study variables were measured via self-report, we conducted Harman's single factor test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) to examine the degree to which common-method variance (CMV) could have biased our results. The results, however, revealed that in our data, no single factor did account for a major part of the variance (the first factor explained 28.17% of the variance), indicating that CMV is not relevant regarding our findings.

The Mediating Effect of Ego Depletion at Home

In the following, we present the study results at both the within-person and between-person level. Hypothesis 1 proposes that daily ego depletion at home mediates the adverse relation between SCDs at work and subjective vitality at home. The results of Model 1 indicate that SCDs positively relate to ego depletion (within-level: $\beta = 0.16, p < .01$; between-level: $\beta = 0.22, p < .01$; cf., Table 2), and that ego depletion negatively relates to subjective vitality (within-level: $\beta = -0.88, p < .01$; between-level: $\beta = -1.31, p < .01$; cf., Table 2). Moreover, Model 1 provided a good model fit ($\chi^2(12) = 22.921, p < .05, RMSEA = .039, CFI = .961, SRMR_{w/b} = .061/.067$).

¹ Adding previous-day measures of all focal variables to our analyses did not change the pattern of results.

To test the indirect (mediation) effect of ego depletion, we utilized the Monte Carlo re-sampling method to estimate the appropriate confidence interval for the indirect effect, because bootstrapping cannot be applied to multilevel analyses (Preacher & Selig, 2012; van der Leeden, Meijer, & Busing, 2008). More specifically, we computed bias-corrected 95% confidence intervals (CIs) for the indirect effect based on 20,000 re-samples using the software provided by Selig and Preacher (2008). In support of Hypothesis 1, the CI for the indirect effect of ego depletion at home in the relation of SCDs at work and subjective vitality at home did not include zero for the within-person part of our model ($\beta = -0.14$ [CI: -0.26:-0.02]). Thus, ego depletion at home indeed mediates the day-specific relation between SCDs at work and subjective vitality at home. Moreover, Table 2 also indicates a significant indirect effect for the between-person part of our model ($\beta = -0.29$ [CI: -0.58:-0.08]). This result implies that the mediating effect of ego depletion is also present in the relation between cumulative SCDs and subjective vitality aggregated across ten days.

Taken together, the results of our analyses strongly support Hypothesis 1 by demonstrating that the day-specific relation between SCDs at work and reduced subjective vitality at home is mediated by ego depletion at home.

The Moderating Effect of Psychological Detachment

Hypothesis 2 predicts that psychological detachment moderates the day-specific spillover of SCDs at work to ego depletion at home (i.e., the a-path of the mediation model, see Figure 1). The results of our analyses demonstrate that Model 2, which includes the interaction term of SCDs and psychological detachment, yields a good data fit ($\chi^2(11) = 16.564, p < .05, RMSEA = .029, CFI = .980, SRMR_{w/b} = .047/.067$). To examine whether including the interaction has improved model fit, we conducted a Log-likelihood ratio test as suggested by Muthén and Muthén (2012). The results of this test indicate that compared to Model 1, Model 2 yields an improved data fit ($\Delta\log\text{-likelihood}(df) = 6.92(1); p < .01$).

Furthermore, in addition to a negative direct effect of psychological detachment on ego depletion (within-level: $\beta = -0.12, p < .01$; between-level: $\beta = -0.20, p < .01$), our analyses reveal a negative effect of the interaction between SCDs and psychological detachment in the prediction of ego depletion (within-level: $\beta = -0.20, p < .05$), thereby providing support for Hypothesis 2. To facilitate the interpretation of the interaction effect, we depicted the interaction and performed simple slope tests, as recommended by Preacher, Curran, and Bauer (2006). As illustrated in Figure 2, the interaction pattern is consistent with our predictions. In particular, on days with low levels of psychological detachment, day-specific SCDs at work increase levels of ego depletion at home. In contrast, on days with high levels of psychological detachment, there is no significant relation between day-specific SCDs at work and ego depletion at home (cf., Figure 2). Thus, day-specific psychological detachment attenuates the day-specific spillover effects of SCDs at work on ego depletion at home.

Finally, we tested whether our results provide evidence for the proposed moderated mediation model by analyzing whether the indirect (mediating) effect of ego depletion at home varies as a function of psychological detachment. Therefore, we examined conditional indirect effects of SCDs at work on subjective vitality at home (via ego depletion at home) at average (mean) levels of detachment, at high levels of detachment (one standard deviation above the mean), and at low levels of detachment (one standard deviation below the mean; Bauer, Preacher, & Gil, 2006). For average (within-level: $\beta = -$

0.13 [CI: -0.25:-0.01]) and low (within-level: $\beta = -0.25$ [CI: -0.39:-0.11]) levels of psychological detachment, the 95% CI does not include zero. These findings suggest that on days with low or average levels of psychological detachment, ego depletion at home mediates the effect of SCDs at work on subjective vitality at home. In contrast, for high detachment, the 95% CI includes zero (within-level: $\beta = -0.02$ [CI: -0.17:0.15]). Thus, there is no statistically significant mediating effect of ego depletion at home in the relation between SCDs at work and subjective vitality at home on days with high levels of detachment.

Supplemental Analyses

In order to address concerns of reversed causality (e.g., the assumption that high levels of ego depletion and subjective vitality encourage employees to perceive SCDs as more threatening), we specified a model including ego depletion and subjective vitality as predictors of next-day SCDs. It should be noted that restructuring the data for these analyses led to data loss at the between-person level (N=81 compared to N=86) and the within-person level (N=492 compared to N=588): Since we did not collect any data after day ten, this day had to be excluded for all participants. Results indicate that neither ego depletion ($\beta = 0.08$, $p=.36$) nor subjective vitality ($\beta = 0.02$, $p=.67$) significantly relate to SCDs at the within-person level, thereby supporting the proposition that SCDs predict ego depletion and subjective vitality, and not vice versa.

Discussion

Recent research suggests SCDs to be an often neglected job-stressor in modern working environments. Yet, for a comprehensive understanding of SCDs and their adverse effects on employees' well-being, it is also important to examine dynamic (day-specific) processes that may underlie these effects, such as within-person spillover effects linking SCDs on a given working day to enduring experiences of depletion and impaired well-being at home.

Accordingly, the present study used a daily diary design to investigate the indirect effects of daily SCDs at work on subjective vitality at home via ego depletion at home. Consistent with arguments proposed by the Limited Strength Model of Self-Control (Muraven & Baumeister, 2000) and previous findings on spillover effects from work to home (cf. Ilies et al., 2007; Judge & Ilies, 2004; Martinez-Corts, Demerouti, Bakker, & Boz, 2015; Sonnentag & Binnewies, 2013), our results illustrate the adverse impact of that day-specific SCDs experienced at work on ego depletion in the evening at home, along with reduced subjective vitality. Put differently, the adverse effects of SCDs at work on subjective vitality at home were fully mediated by ego depletion at home, indicating ego depletion as a mechanism underlying the adverse effects of daily SCDs at work on employees' well-being at home. Furthermore, our results shed light on daily psychological detachment as a protective resource against the spillover of daily SCDs from work to the home domain. More specifically, high levels of day-specific psychological detachment prevent that daily SCDs at work manifest in prolonged states of ego depletion and associated impairments of subjective vitality at home by interrupting further self-control exertion and supporting regulatory resource replenishment. Hence, SCDs at work are less likely to affect employees' subjective vitality at home on days when psychological detachment is high.

Theoretical Implications

This research lends itself to several theoretical implications towards the current literature on SCDs, well-being, and psychological detachment. First, our study extends previous research by providing a dynamic model of SCDs and their relation to employees' well-being. Whereas most studies in this context have used cross-sectional research designs to analyze the adverse consequences of SCDs at the between-person level (see Schmidt & Diestel, 2015 for an overview), this daily diary study considers transitory, fine-grained processes that underlie these effects, and illustrates how they evolve on a daily basis. More precisely, the results of our multilevel analysis indicate that daily SCDs at work evoke *same-day* responses in the form of regulatory resource decrements. We believe that this finding significantly contributes to the literature on SCDs by extending the previous belief that SCDs at work only have long-term resource-draining effects. Furthermore, this study demonstrates that daily adverse effects of SCDs can transcend the boundaries of work and spill over to employees' home domain, manifesting in increased levels of ego depletion at home. This finding supports our proposition that employees may not be able to recover depleted regulatory resources during work, and ties in with previous studies from spillover literature demonstrating that daily experiences at work can influence employees' life outside the workplace (e.g., Rodríguez-Muñoz et al., 2014). Finally, we demonstrated that daily levels of ego depletion caused by SCDs at work can threaten employees' subjective vitality within the same day, arguing that ego depletion impedes getting into states of positive mood and engaging in behaviors that would increase vitality. We thereby go beyond previous studies based on the Limited Strength Model of Self-Control that indicated impaired well-being only as a long-term consequence of chronic SCDs (Schmidt & Diestel, 2015). Given that recent research suggests far more behaviors at work to deplete regulatory resources (e.g., responding to help requests, Lanaj et al., 2016; time pressure, planning and decision making, Prem, Kubicek, Diestel, & Korunka, 2016), this study enables a holistic understanding of how such regulatory job demands may affect employees' psychological well-being on a daily basis.

Second, our study adds to the growing body of evidence on the beneficial effects of psychological detachment. In their study, Rivkin et al. (2015b) already shed light on psychological detachment as a protective moderator against the adverse consequences of SCDs on the inter-individual level (that is, people with higher general levels of detachment suffer less from chronic SCDs at work). However, taking into account that a) although an employee's general level of detachment is rather stable, there is substantial fluctuation from day to day around this general level (e.g., Derks et al., 2014, supported by 52% of level 1 variance in our study), and b) short-term (i.e., same-day) benefits of psychological detachment are particularly high (Sonnentag & Fritz, 2015), we extend this line of research by adopting a daily diary-design and examining the protective role of day-specific psychological detachment in the spillover of SCDs at work to the home domain. In particular, our results demonstrate that high daily levels of psychological detachment (e.g., due a social appointment or a sport event) can prevent that the adverse effects of SCDs at work spill over and cause ego depletion and associated impairments of subjective vitality at home. Specifically, our data suggests that the mediating effect of ego depletion in the day-specific relation between SCDs at work and subjective vitality at home gets weaker with increasing levels of day-specific psychological detachment. Our findings hence support the argument that psychological detachment interrupts the depletion of regulatory resources and facilitates recovery (Rivkin et al., 2015b). At the same time, our findings add value to the current literature by demonstrating that this resource replenishment also occurs on a daily basis.

Third, in light of the recent controversial discussion on the replicability of the ego depletion effect in experimental research (cf., Carter, Kofler, Forster, & McCullough, 2015; Dang, 2017; Hagger et al., 2010), our study contributes to the large body of convincing evidence for its validity from the applied field (Lian, Yam, Ferris, & Brown, 2017; Schmidt & Diestel, 2015). More precisely, our results substantiate two core propositions of the model in an occupational setting, namely that a) the exertion of self-control draws on and depletes a limited regulatory resource, which in turn impairs well-being, and b) once the resource is depleted, rest periods (i.e., refraining from self-control) are necessary to recover the resource (Muraven & Baumeister, 2000). Considering that these propositions refer to within-person processes, (i.e., exertion of self-control, ego depletion and recovery), which to date have been foremost examined on the basis of between-person study designs (Hagger et al., 2010; Schmidt & Diestel, 2015), our study broadens the research scope by using a within-person diary design as an appropriate research method. Moreover, our findings correspond with previous evidence on depletion as a mediator between work demands and well-being (e.g., Lanaj, Johnson, & Barnes, 2014; Liang et al., 2016).

Practical Implications

Apart from theoretical contributions, our research has also some practical implications that may help improve employees' psychological detachment at day-level. From an organizational point of view, it is crucial to address the issues of high day-specific work hours, workload and time pressure.

Sonnentag and Bayer (2005) argue that these factors contribute to a prolonged activation of job-related thoughts, which drag on into employees' leisure time. Thus, a reduction of these factors, for example, through an adequate distribution of work tasks or setting realistic goals within a given day, may help employees experience their working day as less stressful and stop ruminating about job-related problems at home. More precisely, Smit (2016) recommends that supervisors could help employees creating plans at the end of the day that describe where, when, and how unfulfilled work goals will be completed during the next days to avoid that unfulfilled goals capture attentional resources in the evening. Furthermore, supervisors should encourage employees to structure the working day in such a way that short-term tasks are completed close to the end of the day.

From the individual's perspective, leisure time activities may facilitate day-specific levels of psychological detachment. Sonnentag, Kuttler, and Fritz (2010) suggest that non-work-related activities requiring one's full attention help foster a psychological distance to work. Thus, especially on days when employees experience high SCDs at work, engaging in specific hobbies (e.g., sports) may help the individual more effectively switch off mentally from work and prevent adverse spillover effects of SCDs at work on well-being at home. Moreover, meaningful off-job activities, such as volunteer work, may facilitate detachment from (paid) work in a similar way (Mojza, Sonnentag, & Bornemann, 2011).

Additionally, a factor that appears to be important both from an organizational and an individual's point of view is the use of modern communication technologies. For example, the increasing use of e-mail or cell phones for work-related purposes at home may hinder employees from mentally disengaging from work in the evening (Lanaj et al., 2014), and thus recovery processes at home (Derks et al., 2014). Hence, especially on days with high work demands (e.g., SCDs), employees should actively refrain from checking e-mails or using cell phones for work-related purposes.

Moreover, organizations could establish guidelines for the use of work-related technologies at home to support employees' psychological detachment during off-job time (Olson-Buchanan & Boswell,

2006). For example, German companies such as Telekom and VW have implemented corresponding regulations for limiting the use of smartphones in the evening.

Finally, Sonnentag and Krueger (2006) propose recovery-related self-efficacy as an important factor to promote psychological detachment. They argue that similar to task-related self-efficacy (Bandura, 1997), recovery-related self-efficacy can be improved through mastery experience, vicarious learning and verbal persuasion. To address this point, Hahn et al. (2011) developed a training program, which achieved beneficial effects on recovery experiences, recovery-related self-efficacy, and well-being. Organizations should consider such interventions in order to assist employees in recovering their regulatory resources, and in that way to prevent impairments of psychological well-being.

Limitations and Suggestions for Future Research

Our research is subject to several limitations that need to be discussed. First, our study relies on self-reports, which may raise concerns about common method variance (Podsakoff et al., 2003). However, in view of the results of our MCFAs, Harman's single factor test, and because high common method variance reduces the probability of detecting interaction effects (Siemens, Roth, & Oliveira, 2010), there is limited evidence that common method variance may have biased the present findings. Nonetheless, future research could further alleviate common method variance concerns by using, for example, cognitive measures of SCDs at work or peer-ratings (e.g., by the partner) to assess subjective vitality at home.

Second, although our research design separated two measurement occasions per day, strong causal conclusions cannot be derived from such a correlational data structure. This is particularly relevant regarding a) the possibility of reversed causality (i.e., low levels of ego depletion or vitality may facilitate perceiving SCDs as more threatening), and b) the proposed mediating effect of ego depletion at home in the relation of SCDs at work and subjective vitality at home, which is assumed to develop over time. Our supplemental analyses addressing this issue, however, speak against reversed causality. Moreover, our findings are in line with previous longitudinal studies demonstrating that SCDs result in impaired well-being and not vice versa (Diestel & Schmidt, 2011). Nevertheless, future studies could benefit from a more thorough examination of the causal relations among our variables, for example through an experimental manipulation of SCDs or ego depletion.

Third, the specification of adequate points in time for measurements is a fundamental issue in diary studies. In particular, theories such as the Limited Strength Model of Self-Control imply relationships between focal variables, but do not specify time periods in which these relationships occur (that is, for example, how much time it takes until demands manifest in depletion and impaired well-being, or until depleted resources are recovered). In our study, we focused on relationships at the day-level and separated two measurement occasions, one in the afternoon at work and one in the evening at home. Future studies, however, should put a stronger emphasis on the temporal order of the proposed relations by assessing study variables (e.g., mediator and outcome variables) at different points in time. As longer-term fluctuations of our study variables (e.g., weekly) are also plausible, this could be another promising aim for future research.

Moreover, the timing and type of measurement of psychological detachment is particularly difficult. In the present study, participants rated detachment in the course of the evening (the survey was available for six hours) in order to avoid data loss that might occur using a questionnaire sent at bedtime (e.g., when participants miss responding to the survey before going to bed). However,

irrespective of the timing, a survey assessing previous levels of psychological detachment might at the same time interrupt participants' detachment, as they are reminded of their work. Hence, future studies could use peer-ratings in order to not influence participants' levels of detachment.

Fourth, our study focuses on psychological detachment as one of four recovery experiences (psychological detachment, relaxation, mastery, control) proposed by Sonnentag and Fritz (2007). Scholars could address relaxation, mastery, and control as further potential moderators of SCDs. In particular, whereas relaxation can be thought to serve as a buffer through replenishing the limited regulatory resource similar to detachment, mastery experiences and control rather support building up new internal resources and thereby even "require a certain degree of self-regulation" (Sonnentag & Fritz, 2007, p. 206). Thus, they could be assumed to further tax the limited regulatory resource instead of promoting its recovery. In sum, future research should address this issue to allow comparisons between the different recovery experiences, and eventually provide differential effects.

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Tables

Table 1
Means, Standard Deviations, Internal Consistencies (Cronbach's Alpha) and Intercorrelations of Study Variables

Variable	1	2	3	4	5	6	7	8
1. Age	–							
2. Gender ^a	.26	–						
3. Work time ^b	-.21	.42	–					
4. Negative affect	-.10	.03	.07	(.74)				
5. Self-control demands	.05	.16	-.21	.19	(.88)	-.12	.24	-.13
6. Psychological detachment	-.06	-.07	-.03	-.21	-.24	(.92)	-.28	.35
7. Ego depletion	-.08	-.15	-.13	.33	.22	-.25	(.89)	-.60
8. Subjective vitality	.13	.01	-.01	-.37	-.10	.41	-.60	(.82)
<i>M</i>	39.62	1.34	1.74	2.34	2.49	3.59	1.91	4.31
<i>SD</i>	14.40	0.48	0.44	0.47	0.58	0.73	0.50	0.96

Notes: Cronbach's alpha for day-level variables are based on the person-mean centered items of each scale. Correlations below the diagonal are person-level correlations ($N_{between} = 86$). Correlations above the diagonal are day-level correlations ($N_{within} = 588$). Numbers in bold $p < .05$. ^aGender (1 = female, 2 = male). ^bwork-time (1 = part-time, 2 = full-time).

Table 2

Estimates of Direct and Indirect Effects

	Ego depletion at home		Subjective vitality at home					
	Estimate (<i>SE</i>)	<i>p</i>	Estimate (<i>SE</i>)	<i>p</i>				
<i>Between-person direct effects (Model 2)^a</i>								
Age	-.002 (.003)	.386	.006 (.005)	.229				
Gender	-.153 (.088)	.081	-.279 (.188)	.137				
Work-time	.026 (.108)	.807	-.184 (.192)	.338				
Negative affect	.166 (.064)	.010	-.303 (.130)	.020				
SCDs at work	.220 (.075)	.003	.295 (.146)	.043				
Psychological detachment	-.199 (.070)	.005	.277 (.160)	.084				
Ego depletion			-1.313 (.291)	.000				
<i>Between-person indirect effects (Model 2)^a</i>								
SCDs → EG → SV			Estimate (<i>SE</i>)	LLCI	ULCI			
			-.289 (.130)	-.584	-.075			
	Ego depletion at home				Subjective vitality at home			
	Model 1		Model 2		Model 1		Model 2	
	<i>Mediation</i>		<i>Moderated Mediation</i>		<i>Mediation</i>		<i>Moderated Mediation</i>	
<i>Within-person direct effects</i>	Estimate (<i>SE</i>)	<i>p</i>	Estimate (<i>SE</i>)	<i>p</i>	Estimate (<i>SE</i>)	<i>p</i>	Estimate (<i>SE</i>)	<i>p</i>
SCDs at work	.162 (.070)	.020	.148 (.069)	.030	-.086 (.085)	.311	-.086 (.085)	.314
Psychological detachment	-.123 (.041)	.003	-.131 (.040)	.001	.153 (.059)	.009	.153 (.059)	.010
Ego depletion					-.879 (.076)	.000	-.882 (.077)	.000

SCDs x PD

-.201 (.081) .013

Within-person indirect effects

	Estimate (<i>SE</i>)	LLCI	ULCI	Estimate (<i>SE</i>)	LLCI	ULCI
SCDs → EG → SV	-.142 (.060)	-.261	-.024			
SCDs → EG → SV (low detachment)				-.245 (.073)	-.391	-.105
SCDs → EG → SV (mean detachment)				-.131 (.059)	-.248	-.012
SCDs → EG → SV (high detachment)				-.017 (.081)	-.166	.152

Notes: ^aThere were no differences in the estimates and standard errors of the between-person effects between Model 1 and Model 2; *SE*=standard error; *LLCI*=lower level confidence interval (95%); *ULCI*= Upper level confidence interval (95%); Confidence intervals are calculated using Monte Carlo method for assessing mediation (MacKinnon et al, 2004); EG=Ego depletion; SV=Subjective vitality; PD=Psychological detachment; $N_{between} = 86$; $N_{within} = 588$.

Figures

Between-Level

Within-Level

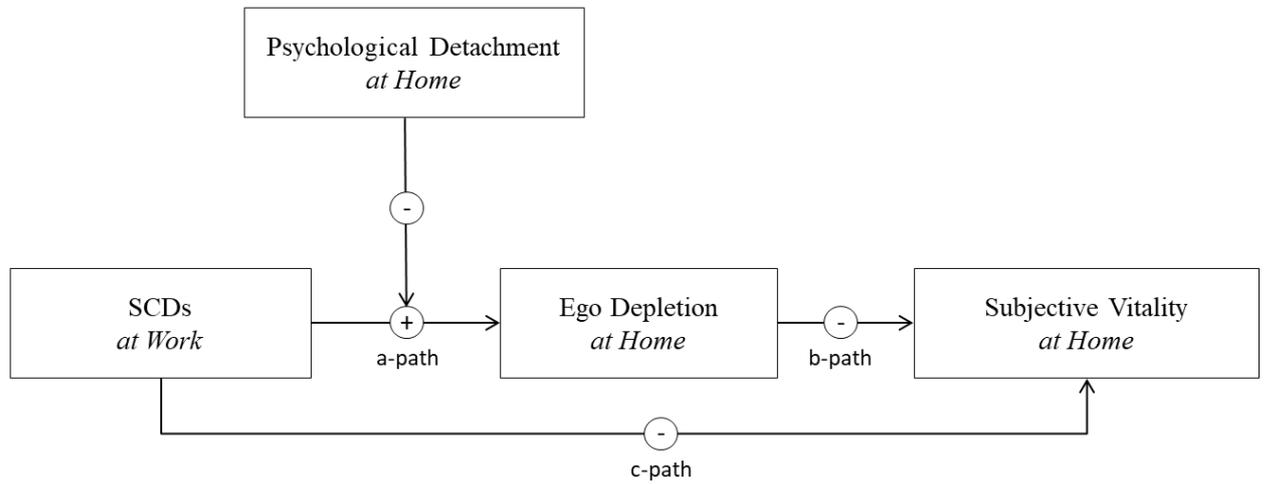


Figure 1. Theoretical Model

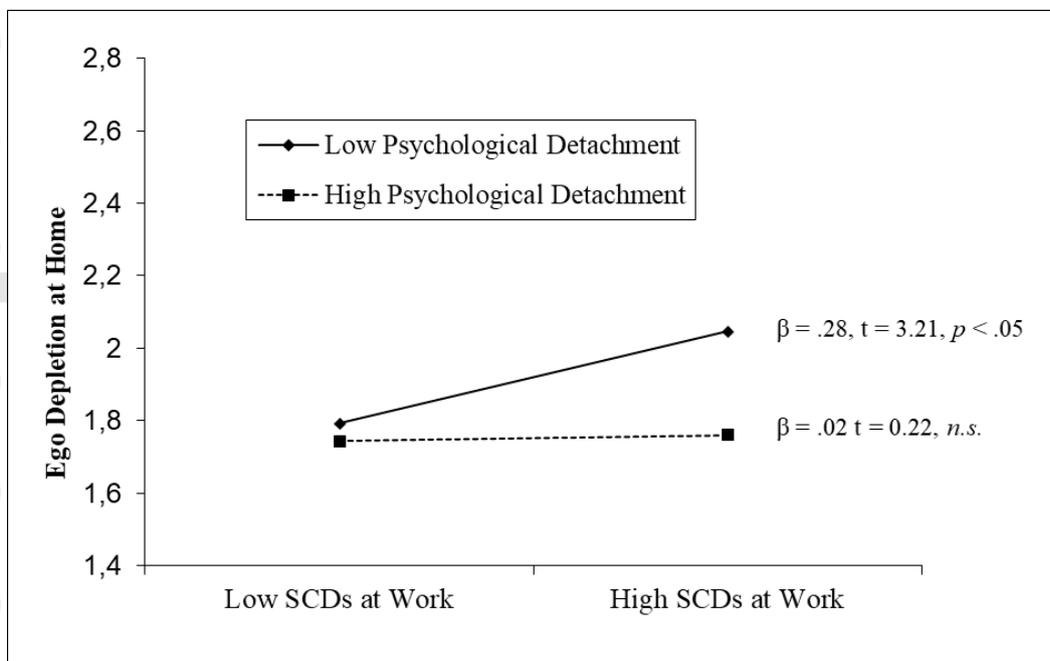


Figure 2. Within-Person Interaction Effect of SCDs at Work and Psychological Detachment at Home on Ego Depletion at Home