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TESTING THE DIRECT AND MODERATOR EFFECTS OF THE STRESSOR-DETACHMENT MODEL OVER ONE YEAR: A LATENT CHANGE PERSPECTIVE

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Testing the Direct and Moderator Effects of the Stressor-Detachment Model over One Year: A Latent Change Perspective

Abstract

To test the direct and moderator effects of the stressor-detachment model from a long-term perspective, we investigated whether workload and detachment are related to changes in exhaustion and sleep difficulties over one year. We also examined whether detachment attenuates the relationship between high workload and these outcomes both cross-sectionally and over time. Questionnaire data with 1,722 respondents at Time 1 and 1,182 respondents at Time 2 were collected. We used a latent change score approach to analyze the data in order to identify intra-individual change among the studied constructs. Our results showed that high workload and low detachment at baseline were related to an increase in exhaustion over one year. Additionally, an increase in workload and a decrease in detachment were related to a simultaneous increase in exhaustion over time. Low detachment, but not high workload, was related to an increase in sleep difficulties over time, and a decrease in detachment across one year was related to a simultaneous increase in sleep difficulties. A high level of detachment only attenuated the relationship between workload and exhaustion at baseline. Our results underline the significance of poor psychological detachment as a risk factor for the development of strain outcomes over time.

Keywords: detachment, exhaustion, longitudinal, recovery, sleep difficulties, workload

Testing the Direct and Moderator Effects of the Stressor-Detachment Model over One Year: A Latent Change Perspective

Contemporary working life is characterized by high job demands, which are reflected in employees' experiences of high workload, unrealistic job expectations, and having to work at high speed almost all the time (American Psychological Association, 2015; Eurofound, 2015). Over time, excessive job demands pose a significant threat to employees' health and well-being (e.g., Kivimäki et al., 2012). Recovery from work (i.e., "psychophysiological unwinding after effort expenditure," Geurts & Sonnentag, 2006, p. 485) has been identified as a mechanism that protects against the negative effects of heavy job demands on employees, such as health complaints, exhaustion, and impaired job performance (Sonnentag, Venz, & Casper, 2017). One particularly powerful experience promoting recovery is psychological detachment from work, defined as mental disengagement from work-related thoughts during off-job time (Sonnentag & Fritz, 2007).

Inspired by the research findings that highlight the importance of psychological detachment for employee well-being, Sonnentag and Fritz (2015) introduced a theoretical framework called the stressor-detachment model, which argues that, in addition to stressors, detachment from work is a key factor predicting employees' experience of strain. Moreover, detachment can attenuate the relationship between stressors and strain. This is because sustained activation, rather than the acute stress reaction, is detrimental to employee well-being and health over time (McEwen, 1998). Lack of detachment from work during free time maintains sustained activation, even when the stressor is no longer present (Ottaviani et al., 2016).

Whereas multiple cross-sectional and daily diary studies have reported concurrent associations or short-term effects of detachment on strain (for reviews, see Bennett, Bakker, & Field, 2017; Sonnentag et al., 2017; Wendsche & Lohmann-Haislah, 2017), studies examining the long-term effects of detachment are scarce, and the findings remain inconclusive (Kinnunen & Feldt, 2013; Sonnentag, Arbeus, Mahn, & Fritz, 2014; Sonnentag, Binnewies, & Mojza, 2010). At the same time, it is important to understand whether the general tendency to detach from work will predict long-term change in chronic strain outcomes. This knowledge of the long-term associations between detachment and strain has valuable practical implications for employees and organizations when assessing the long-term costs (e.g., burnout, insomnia) against supposed benefits of letting work interrupt free time. Additionally, only few earlier studies have examined whether detachment actually moderates the relationship between job demands and strain across time, although this is one of the key arguments made in the stressor-detachment model (Sonnentag & Fritz, 2015).

Our aim is to address these gaps and test the direct and moderator effects of the stressor-detachment model across one year. More specifically, we examine how workload and detachment relate to change in strain (i.e., exhaustion and sleep difficulties) over a one-year period. In addition, we investigate whether detachment moderates the relationship between workload and the strain outcomes.

Our study makes a novel contribution to the recovery literature by examining these relationships with a latent change score approach. The benefit of using a latent change score (LCS) modeling as opposed to the more commonly used cross-lagged panel model (CLPM) is that with LCS we can predict intra-individual change in the outcomes. Instead, when using CLPM in longitudinal research, the outcome modeled is a combination of change and between-person level differences at the previous time point. In this regard, the LCS approach is similar to latent growth curve modeling, which also makes it possible to distinguish within-person change (“slope”) from the between-person differences at the baseline level (“intercept”). However, latent growth curve modeling typically requires a minimum of three measurement waves, whereas LCS can be used with only two (Curran, Obeidat, & Losardo, 2010; Ferrer & McArdle, 2010). As our primary interest is to examine *within-person change* in employee strain as an outcome of detachment from work and workload, using LCS over CLPM as an analytic method is a preferred choice for us (see Usami, Hayes, & McArdle, 2016).

Disentangling within-person change from between-person differences also allows us to test two distinct ways in which stressor-strain or detachment-strain effects may vary over time: synchronous effects and lagged effects (see Ford et al., 2014). By synchronous effects we refer to predicting change in the outcomes with concurrent change in the predictors, and by lagged effects we refer to using the baseline level of the predictors to predict upcoming change in the outcomes. Specifying how the detachment-strain relationship unfolds in time by investigating whether detachment has both synchronous and lagged effects on strain will contribute to the theoretical development of the stressor-detachment model. It also offers important knowledge to employees and organizations who wish to better understand how detachment may relate to strain over time. Finally, predicting intra-individual change controls for many stable differences across people and thus helps to rule out certain confounding variables (e.g., negative affectivity).

Theoretical Perspectives on Psychological Detachment

Recovery can be defined as a process during which psycho-physiological functioning returns to its pre-stressor level and employees' resources are restored (Geurts & Sonnentag, 2006). According to the effort-recovery (E-R) model (Meijman & Mulder, 1998), incomplete recovery between work shifts can lead to a sub-optimal working condition, requiring increased effort to perform adequately, resulting in stress reactions such as strain and fatigue. Continued exposure to workload and incomplete recovery can lead to chronic health problems or decreased well-being in the long term (McEwen, 1998). The E-R model states that the absence of job demands is a necessary condition for recovery. However, refraining from job-related activities is not enough to ensure sufficient recovery, as merely thinking about work during free time can result in prolonged physiological activation (Ottaviani et al., 2016).

Building on these ideas, the stressor-detachment model (Sonnentag & Fritz, 2015) identifies psychological detachment from work as a core experience enhancing recovery. Detachment may vary between and within individuals, meaning that people differ from each other in the extent to which they typically detach from work, and how well an employee is able to detach from work may change over time. Based on this idea, we suggest that both between-person level at baseline (e.g., typically having more difficulty than others in detaching from work), and within-person change in detachment over time (e.g., experiencing a decrease in detachment as a result of starting to read work emails more often in the evenings) may contribute to increasing strain over time. Thus, detachment may have both lagged and synchronous effects on strain (see Ford et al., 2014).

Workload and Psychological Strain

Workload is a quantitative job demand characterized by a high quantity of work and pressure to work at high speed (van Veldhoven, 2014). Job demands refer to the "physical, social, or organizational aspects of the job that require sustained physical or mental effort" and are associated with corresponding costs (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001, p. 501). Thus, a continuously high workload requires sustained effort, which in turn might lead to chronic strain reactions, especially in combination with insufficient recovery (Meijman & Mulder, 1998).

As outcomes exemplifying chronic strain reactions, we focused on emotional exhaustion and sleep difficulties, as these constructs reflect psychological strain that may develop gradually after long-term exposure to job demands and insufficient recovery. Exhaustion is the core burnout dimension, and it refers to "feelings of being overextended and depleted of one's emotional and physical resources" (Maslach, Schaufeli, & Leiter, 2001, p. 399). Earlier research has linked exhaustion to long sickness absences, and mental and physical illness, such as depression and cardiovascular diseases (Ahola, 2007). High job demands may lead to constant overtaxing of employees' resources and thus increase exhaustion over time (Demerouti et al., 2001). Cross-sectional studies have supported this view, systematically linking workload to exhaustion (see Alarcon, 2011, for a review). Longitudinal between-person studies have found that people who experience high job demands also experience more exhaustion one year later (Sonnentag et al., 2010; Taris, Kompier, Geurts, Houtman, & Van Den Heuvel, 2010). One earlier study examining intra-individual change in job demands found that an increase in job demands (including workload, emotional demands, and work-home interference) predicted an increased level of burnout one year later (Schaufeli, Bakker, & Van Rhenen, 2009).

Sleep difficulties are characterized by trouble initiating or maintaining sleep, waking up too early, or nonrestorative sleep (Edinger et al., 2004). Sleep difficulties have been associated with burnout symptoms, depression, increased alcohol consumption, sickness absence, and decreased productivity at work (Lindblom, Linton, Fedeli, & Bryngelsson, 2006; Stoller, 1994). It is generally assumed that workload relates to increased physiological and psychological activation, which in turn may interfere with sleep (Åkerstedt, Nordin, Alfredsson, Westerholm, & Kecklund, 2012). Recent reviews have concluded that high job demands are systematically associated with sleep disturbances in cross-sectional studies (Litwiller, Snyder, Taylor, & Steele, 2017) and in prospective studies with time intervals ranging from three months to five years (Linton et al., 2015). Although these studies have mainly focused on between-person differences, some studies have used dichotomized scores of sleep difficulties to identify participants with new cases of sleep disturbances at follow-up. For example, Åkerstedt et al. (2012) found that high job demands at baseline, and shifting from low demands at baseline to high demands at follow-up, predicted belonging to the group with new cases of sleep difficulties five years later.

Focusing on intra-individual change in strain over one year, we examine whether the level of workload at baseline is related to change in exhaustion or sleep difficulties over time, and whether a change in workload between the two time points relates to a simultaneous change in exhaustion or sleep difficulties. Examining these two different ways of how workload may relate to strain over time corresponds to testing a) lagged effects and b) synchronous effects, between stressors and strain (Ford et al., 2014). Following the review by Ford et al. (2014), we assume that stressors may have lagged effects on strain because certain chronic strain reactions develop slowly after extended exposure to occupational stressors. More specifically, in line with the stressor-detachment model (Sonnentag & Fritz, 2015), we expect a high level of workload to have lagged effects on strain, as a constantly high workload will likely result in increases in exhaustion and sleep difficulties over time beyond any immediate short-term effects. This likely occurs via the accumulation of strain due to the constant overtaxing of employees' resources (Demerouti et al., 2001). That is to say, we expect that employees who experience a higher level of workload than others at baseline will likely experience an increase in exhaustion and sleep difficulties during the following year.

Synchronous effects, in turn, refer to associations where "increases/decreases in stressor levels are accompanied by concurrent increases/decreases in strains" (Ford et al., 2014, pp. 11). Ford et al. (2014) note that synchronous effects are observed as cross-sectional correlations. Following their definition of synchronous effects ("the strain changes concurrently with the stressor and both are measured at all time points", pp. 18), we suggest that synchronous effects can also be operationalized as predicting change (or slope, or trajectory) in strain with a concurrent change (or slope, or trajectory) in the stressor. Accordingly, we expect that employees who experience an increase in workload over one year also experience a concurrent increase in exhaustion and sleep difficulties. Additionally included in our study is the relationship between the baseline level of workload and baseline level of strain, which corresponds to between-person cross-sectional effects.

Regarding the long-term effects in our study, we chose one year as the time lag. Sonnentag and Fritz (2015) suggest that as short-term dynamics typically operate within longer-term dynamics, psychological detachment from work can be described within different time frames such as days, weeks, or years. Choosing one year helps to eliminate seasonal effects that may potentially cause temporary changes in employees' workload or well-being (e.g., effects of returning from a longer summer vacation). Additionally, one year has been found to be an appropriate time period for revealing long-term effects in earlier between-person studies in our field (De Lange, Taris, Kompier, Houtman, & Bongers, 2004; Kinnunen & Feldt, 2013; Siltaloppi, Kinnunen, Feldt, & Tolvanen, 2011; Sonnentag et al., 2010).

Hypothesis 1a: High levels of workload are related to high levels of exhaustion and sleep difficulties at baseline.

Hypothesis 1b: Employees who experience a high level of workload at baseline will experience an increase in exhaustion and sleep difficulties over time.

Hypothesis 1c: Employees who experience an increase in workload over time will experience a simultaneous increase in exhaustion and sleep difficulties.

Detachment and Psychological Strain

Successful psychological detachment from work during free time can stop acute load reactions from accumulating, and thus prevent an increase in chronic strain reactions over time (Sonnentag & Fritz, 2015). Detachment is a particularly powerful recovery experience because it signifies the full absence of job demands, and thus enhances recovery from work (Meijman & Mulder, 1998). As detachment signifies a break from job demands, it has the potential to cease the energy loss cycle that may otherwise continue during off-job time. Thus, not detaching from work during free time may relate to increases in emotional exhaustion in the long term. Two recent reviews show that detachment is systematically associated with less exhaustion; however, most of the evidence comes from cross-sectional or diary studies focusing on short-term effects (Sonnentag & Fritz, 2015; Wendsche & Lohmann-Haislah, 2017). One earlier longitudinal study focusing on between-person differences found that employees experiencing high detachment at baseline experienced less exhaustion one year later (Sonnentag et al., 2010). However, contradictory results also exist, as in two prospective studies detachment was not related to exhaustion four weeks later (Sonnentag et al., 2014), or to fatigue including exhaustion one year later (Kinnunen & Feldt, 2013). To the best of our knowledge, earlier longitudinal studies have not examined detachment in relation to intra-individual change in exhaustion.

Poor detachment increases difficulties in falling asleep and hampers sleep quality on the daily level, as thinking about work evokes prolonged physiological activation (Ottaviani et al., 2016). In the long term, poor detachment may result in more persistent sleep difficulties. Successful detachment has been associated with better sleep quality and fewer sleeping problems in cross-sectional (e.g., Sonnentag & Fritz, 2007) and within-person daily diary studies (e.g., Hülsheger et al., 2014). Regarding longitudinal studies, worry and work preoccupation, which are related but not identical to lack of detachment (Sonnentag & Fritz, 2015), have been associated with increased levels of sleep complaints one and five years from baseline (Van Laethem et al., 2015; Åkerstedt et al., 2012). To our knowledge, earlier longitudinal studies have not addressed the relationship between sleep difficulties and psychological detachment as conceptualized by Sonnentag and Fritz (2007). Nevertheless, in a study by Siltaloppi et al. (2011), those employees who experienced reasonably high levels of recovery experiences, including detachment, experienced the fewest sleep difficulties over one year.

To address the gaps identified above, we investigated lagged and synchronous effects of detachment on strain over one year. That is, we examined whether low levels of detachment at baseline predicted an intra-individual increase in exhaustion or sleep difficulties over one year, or whether an intra-individual decrease in detachment was associated with a simultaneous increase in exhaustion or sleep difficulties. Again, we also included the relationship between the baseline level of detachment and baseline level of strain in our study, which corresponds to cross-sectional between-person effects.

Hypothesis 2a: Low levels of detachment are related to high levels of exhaustion and sleep difficulties at baseline.

Hypothesis 2b: Employees who experience low levels of detachment at baseline will experience an increase in exhaustion and sleep difficulties over time.

Hypothesis 2c: Employees who experience a decrease in detachment over time will experience a simultaneous increase in exhaustion and sleep difficulties.

Detachment as a Moderator between Workload and Psychological Strain

With the help of detachment employees facing a high workload can replenish their resources (e.g., energy) during off-job time and maintain their well-being (Sonnentag & Fritz, 2015). As successful recovery ceases the accumulation of load effects (Meijman & Mulder, 1998), detachment during free time can help employees to restore energy resources and improve sleep quality after a demanding day at work. Thus, detachment can protect against the accumulation of chronic strain reactions over time when the workload is high.

Few earlier studies have examined detachment as a moderator between workload and exhaustion or sleep difficulties. In an earlier cross-sectional study, detachment did not moderate the relationship between workload and exhaustion (Siltaloppi, Kinnunen, & Feldt, 2009). One diary study found that detachment during the previous break period moderated the effect of workload on fatigue during a night shift after four hours, but not after eight or 12 hours, and not during a day shift (Korunka, Kubicek, Prem, & Cvitan, 2012). In a longitudinal study by Sonnentag et al. (2010), detachment at baseline did not moderate the relationship between workload and exhaustion one year later. Other studies examining detachment as a moderator between stressors and strain have either examined dissimilar stressors (e.g., job insecurity or self-control demands; Kinnunen, Mauno, & Siltaloppi, 2010, Rivkin, Diestel, & Schmidt, 2015) or outcomes (e.g. perceived stress, cognitive failures, or life satisfaction; Safstrom & Hartig, 2013). One of these studies reported a significant stressor-detachment interaction when predicting exhaustion: Detachment was found to attenuate the effect of self-control demands on exhaustion in a cross-sectional design (Rivkin, Diestel, & Schmidt, 2015).

In summary, both cross-sectional and longitudinal empirical evidence on detachment as a moderator between workload and exhaustion or sleep difficulties is scarce. Nevertheless, based on the stressor-detachment model we propose the following hypotheses:

Hypothesis 3a: Detachment moderates the relationship between high workload and exhaustion and sleep difficulties at baseline. The relationship between a high workload and high levels of exhaustion and sleep difficulties is attenuated for employees experiencing high levels of detachment at baseline.

Hypothesis 3b: Detachment moderates the relationship between high baseline workload and an increase in exhaustion and sleep difficulties over time. Employees experiencing high levels of detachment at baseline will experience a smaller increase in exhaustion and sleep difficulties as the result of a high workload than those with low levels of detachment.

Hypothesis 3c: The change in detachment moderates the relationship between an increase in workload and an increase in exhaustion and sleep difficulties over time. The relationship between an increase in workload and an increase in exhaustion and sleep difficulties is attenuated with a simultaneous increase in detachment.

Methods

Participants and Procedure

The data were collected as a part of a larger project on recovery from work (see Kinnunen et al., 2017). The participants of this study were Finnish employees mostly working in cognitively or emotionally demanding jobs from 12 different organizations in various fields. The questionnaire data were collected in two phases in spring 2013 and 2014 from 11 of the organizations with a 12-month time lag between the measurements. The remaining organization (603 employees contacted) entered the study one year later, and the participants from this company completed the questionnaires in 2014 and 2015. At Time 1 (henceforth T1), an electronic questionnaire was sent either directly to the employees’ work e-mail addresses (in eight organizations) or the link to the questionnaire was delivered to the employees by our contact persons (in four organizations). Of the employees contacted (*N* = 4,196), 1,722 returned the questionnaire after two reminders, yielding a response rate of 41.0%. At Time 2 (henceforth T2), the electronic questionnaire was sent to those employees' via e-mail who responded at T1 and who were still employed in the same organizations (*N* = 1,533). Of these, a total of 1,182 employees returned the questionnaire, yielding a response rate of 77.1%. In both study phases, the employees were informed about the goals of the study, assured that the responses would be treated confidentially, and reminded that participation was voluntary.

Of the sample (*N* = 1,722) at T1, 63.2% were women. The participants were on average 46.7 years old (range 20–68, *SD* = 10.3). Most participants (69.4%) were living with a partner (either married or cohabiting), and 47.9% had children (average of two) living at home. Of the sample, 40.2% held a university degree (master's level or higher), 24.8% held a polytechnic degree, and the rest (35.0%) had a vocational school qualification or less. The majority had a permanent job (86.0%), worked full-time (95.5%), and worked a regular day shift (93.7%). The average weekly working hours were 35.6 (*SD* = 7.9). The most common fields were education (41.9%), public administration (21.8%), information technology (17.1%), and media (13.6%). In analyzing sample attrition, we compared the respondents of the longitudinal sample (*n* = 1,182) with the non-respondents at T2. The respondents did not differ from the non-respondents in terms of gender, age, having a partner, number of children, or level of education. They also did not differ in terms of the study variables (workload, detachment, exhaustion, or sleep difficulties). However, the respondents more often had a permanent job contract (88.5% vs. 80.2%, $p < .001$), a daytime job (94.5% vs. 91.8%, $p < .05$), and worked more hours per week (35.9 vs. 35.0, $p < .05$).

Measures

All study variables (workload, detachment, exhaustion, and sleep difficulties) were measured at both at T1 and at T2.

Workload was measured with three items (e.g., “How often does your job require you to work very fast?”) from the Quantitative Workload Inventory (Spector & Jex, 1998) on a scale from 1 (= *very seldom or never*) to 5 (= *very often or always*).

Psychological detachment from work was assessed with three items (e.g., “During time after work… I don’t think about work at all”) from the Finnish version of the Recovery Experience Questionnaire (Kinnunen, Feldt, Siltaloppi, & Sonnentag, 2011; Sonnentag & Fritz, 2007) on a scale from 1 (= *strongly disagree*) to 5 (= *strongly agree*). As this study was conducted as a part of a larger research project, in order to limit the burden on participants, the measures had to be kept short. Consequently detachment was measured with only three items, selected based on the strongest factor loadings reported in earlier studies (Kinnunen & Feldt, 2013; Kinnunen et al., 2011; Sonnentag & Fritz, 2007).

Emotional exhaustion was measured with five items (e.g., “I feel emotionally drained from my work”) from the Maslach Burnout Inventory (Kalimo, Hakanen, & Toppinen-Tanner, 2006; Maslach, Jackson, & Leiter, 1996) on a scale from 0 (= *never*), 1 (= a few times a year) … to 6 (= *always/every day*). *Sleep difficulties* were assessed with four items (“How often have you perceived any of the following complaints during the last month?”) on a scale from 1 (= *very seldom or never*) to 5 (= *very often or always*). The four items, derived from the Karolinska Sleep Questionnaire (Åkerstedt, Hume, Minors, & Waterhouse, 1994), included difficulty falling asleep, repeated awakenings, premature (final) awakening, and not feeling refreshed upon waking.

Control variables. To take into account any confounding factors, we controlled for age (*in years*), gender (1 = *female*; 2 = *male*), and shift work (1 = *daytime job*; 2 = *shift work*). Gender is known to relate to exhaustion, as women often report experiencing higher levels of exhaustion than men (Maslach et al., 2001). Furthermore, older workers (compared to younger workers) and shift workers (compared to those with a daytime job) may experience a higher level of sleep difficulties (Åkerstedt et al., 2012).

Statistical Analysis

We analyzed the data using a latent change score (LCS) approach in a structural equation modeling framework to test both direct and moderating effects (Ferrer & McArdle, 2010; McArdle, 2009) using the Mplus 7.3 program (Muthén & Muthén, 1998-2015). The parameters were estimated using maximum-likelihood estimation with robust standard errors to take into account the effect of any non-normality in the variables (MLR estimator; Muthén & Muthén, 1998-2015). The default setting for handling missing values in Mplus was used, which takes into account all observations in the data without imputing the data (Muthén & Muthén, 1998-2015).

Measurement models. We used latent variables constructed with original items for each scale, as the latent variable approach enables measurement errors to be taken into account. To ensure that there is no structural change in the latent constructs over time, we examined the time invariance of factor loadings, and observed variables' intercepts and error variances between T1 and T2. To compare the different models, we used the Satorra-Bentler scaled χ^2 difference test (Satorra & Bentler, 2001). As the χ^2 difference test is known to be oversensitive with large samples, and as such may suggest rejecting a model although the discrepancy is trivial (Bollen, 1983), we also used the Root Mean Square Error of Approximation (RMSEA) to evaluate the time invariance. Values smaller than .06 for the RMESEA point to an acceptable model fit (Hu & Bentler, 1999), and following Li, Fay, Frese, Harms, and Gao (2014), we applied change $\leq .015$ in the RMSEA to indicate time invariance. In addition, the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Residual (SRMR) were used for model fit estimation. Acceptable values are greater than .95 for the CFI and TLI, and smaller than .08 for the SRMR (Hu & Bentler, 1999).

Structural models. The benefit of the LCS is that it represents change as a distinct latent construct demonstrating “change in the true scores for each variable from the previous occasion” (Ferrer & McArdle, 2010, p. 151). Thus, it overcomes the limitations of using mere change scores (i.e., the changes may be due to measurement error) (McArdle, 2009). Recent studies in the field of work and organizational psychology have used latent change scores to model change in work characteristics (Li et al., 2014) and occupational well-being (Toker & Biron, 2012).

To test our hypotheses, we first created the latent change score factors for workload ($\Delta W_{[T1-T2]}$), detachment ($\Delta D_{[T1-T2]}$), exhaustion ($\Delta E_{[T1-T2]}$), and sleep difficulties ($\Delta SD_{[T1-T2]}$). We tested hypotheses 1, 2, and 3 for exhaustion (Model 1) and sleep difficulties (Model 2) in separate models. For the hypotheses *a*, *b* and *c*, we regressed a) the baseline level of the outcomes on the baseline level of the predictors (workload, detachment, and their interaction term); b) latent change in the outcomes on the baseline level of predictors; and c) latent change in the outcomes on latent change in the predictors. We controlled for age, gender, and shift work by regressing exhaustion (in Model 1) or sleep difficulties (in Model 2) at T1 on these background factors. Only the control variables that were significantly related to the outcomes were included in the final models.

To test the interactions, we defined two latent interaction terms: detachment at T1 × workload at T1, and $\Delta W_{[T1-T2]} \times \Delta D_{[T1-T2]}$. Including an interaction term between continuous latent variables in Mplus requires defining the type as random and incorporating integration (Montecarlo) in the analysis (see Muthén & Muthén, 1998-2015, pp. 76-77). When type is defined as random in Mplus, standardized coefficients, R-square values, or model fit information with χ^2, CFI, TLI, RMSEA, or SRMR are not available. Thus, we provide the explained variance in the outcomes and the model fit information before the inclusion of the interaction terms, and report the unstandardized estimates for the final Models 1 and 2.

Results

The descriptive results—i.e., the means, standard deviations, Cronbach's alphas, and zero-order correlations between the study variables—are presented in Table 1.

Measurement model results

As a preliminary analysis, we tested the factor structure and time invariance for each variable separately. Within each factor, autocorrelations between the same items at T1 and T2 were allowed when it improved the model fit. Three autocorrelations were estimated in longitudinal models of workload and exhaustion, two in detachment, and four in sleep difficulties. Additionally, two pairs of measurement errors were estimated in the measurement models of exhaustion and sleeping difficulties. The fit indices for the time invariance tests are displayed in Table 2. The results from the Satorra-Bentler scaled χ^2 difference test supported time invariance for workload, exhaustion, and sleep difficulties. For detachment, the changes in the RMSEA supported time invariance. All the factor loadings were appropriate, with standardized estimates ranging from .61 to .92.

Structural model results

Both final models (Models 1 and 2; see Figures 1 and 2), including simultaneously estimated time invariant stability models for all latent variables, showed good fit to the data before the interaction terms were added (Model 1: χ^2 = 555.24, *df* = 233, scaling correction for MLR = 1.08, CFI = .98, TLI = .98, RMSEA = .03, SRMR = .04; Model 2: χ^2 = 640.86, *df* = 230, scaling correction for MLR = 1.05, CFI = .97, TLI = .97, RMSEA = .04, SRMR = .04).

Emotional exhaustion. The findings for exhaustion (Model 1) are presented in Figure 1 and Table 3. Of the control variables, only gender was related to exhaustion, indicating that women experienced higher levels of exhaustion at baseline than men did. High workload at baseline was related to high levels of exhaustion at baseline, and to an increase in exhaustion from T1 to T2. Additionally, an increase in workload between T1 and T2 was related to a simultaneous increase in exhaustion. Thus, hypotheses 1*a*, *b*, and *c* regarding the relationship between workload and exhaustion were fully supported. Detachment was also related to exhaustion, as expected: low levels of detachment at T1 were related to high levels of exhaustion at T1, and to an increase in exhaustion over time. Furthermore, a decrease in detachment between the two time points was related to a simultaneous increase in exhaustion. Therefore, hypotheses 2*a*, *b*, and *c* concerning the relationship between detachment and exhaustion were also fully supported. Model 1 explained 20% of the variance in exhaustion at T1, and 27% of the variance in the change in exhaustion from T1 to T2 (compared to 16% with only exhaustion at T1 as a predictor). Note that we report the beta coefficients from the final models, but the explained variance is from the models before the interaction terms were included, as R-square values are not available in Mplus for type random.

Regarding the interactions, the interaction between the level of workload and detachment was significantly related to the level of exhaustion at T1. The interaction is illustrated in Figure 3. To examine the interaction further, we conducted a simple slope test. The relationship between a high level of workload and high level of exhaustion at T1 was more pronounced when detachment was low (1 *SD* below the mean; $B = .71$, $t = 8.17$, $p < .001$) compared to when detachment was high (1 *SD* above the mean; $B = .37$, $t = 4.94$, $p < .001$). In conclusion, hypothesis 3*a* for exhaustion was supported, demonstrating that high levels of detachment attenuate the relationship between high levels of workload and exhaustion at baseline. On the contrary, the interaction between workload and detachment at T1 was not related to the change in exhaustion over time. Furthermore, the interaction term between the change in workload and detachment from T1 to T2 was not significantly related to the change in exhaustion. Thus, hypotheses 3*b* and *c* for exhaustion were not supported.

Sleep difficulties. Findings for sleep difficulties (Model 2) are presented in Figure 2 and

Table 3. Of the control variables, gender, age, and shift work were related to sleep difficulties at T1. Women compared to men, older workers compared to younger workers, and those working in shifts compared to daytime jobs experienced a higher level of sleep difficulties at baseline. High levels of workload at T1 were related to more sleep difficulties at T1. By contrast, workload at T1 did not predict change in sleep difficulties across time. Additionally, change in workload was not related to change in sleep difficulties from T1 to T2. This means that hypothesis 1*a* was supported for sleep difficulties, but hypotheses 1*b* and *c* were not. Concerning the relationship between detachment and sleep difficulties, hypotheses 2*a*, *b*, and *c* were supported. Specifically, low levels of detachment at baseline were related to high levels of sleep difficulties at baseline, and to an increase in sleep difficulties from T1 to T2. Moreover, a decrease in detachment predicted a simultaneous increase in sleep difficulties from T1 to T2. Model 2 explained 19% of the variance in sleep difficulties at T1, and 18% of the variance in the change in sleep difficulties over time (compared to 11% with only sleep difficulties at T1 as a predictor).

The interaction term between workload and detachment was not related to the level of sleep difficulties at baseline. Similarly, the interaction terms between the level of workload and detachment, or between the changes in workload and detachment, were not related to the change in sleep difficulties. Therefore, hypotheses 3*a*, *b*, and *c* were not supported for sleep difficulties.

Alternative model testing. Although the models tested above were based on the theoretical assumptions of the stressor-detachment model (Sonnentag & Fritz, 2015), reversed relationships between the studied constructs are possible. That is, experiencing poor well-being may lead to higher levels of perceived workload and more trouble with detaching from work. To account for this possibility, instead of reversed causality models, we directly estimated reciprocal models according to common practice in studies with bidirectional hypotheses using the LCS approach (Ferrer & McArdle, 2010; Toker & Biron, 2012). The reciprocal models included relationships from the baseline level of exhaustion/sleep difficulties, detachment, and workload at T1 to changes in all these constructs between T1 and T2, including the same control variables as in our original models, but without the interaction terms. For both models, Bayesian Information Criterion (BIC) suggested selecting the original normal causality model over the reciprocal model ($BIC_{exhaustion}$ = 75157.74 vs. 75177.92; $BIC_{sleep\ diff.}$ = 63634.68 vs. 63652.69).

Discussion

This study contributes to our current knowledge of the long-term effects of psychological detachment from work on employee well-being. We tested both the direct and moderator effects of the stressor-detachment model (Sonnentag & Fritz, 2015) at baseline and over one year in the framework of latent change scores. Specifically, by distinguishing intra-individual change from between person differences in detachment, workload, exhaustion, and sleep difficulties over time, we examined whether workload and detachment have lagged and/or synchronous effects on exhaustion and sleep difficulties over one year. Overall, our results supported the long-term direct effects drawn from the stressor-detachment model, but the moderator effects received only partial support.

We first examined the relationship between *workload and strain*, as outlined in the stressor-detachment model (Sonnentag & Fritz, 2015). According to our expectations, our results showed that high levels of workload were related to high levels of exhaustion at baseline, which is in line with earlier cross-sectional studies (Alarcon, 2011). Moreover, our results indicated that workload had both lagged and synchronous effects on exhaustion over time: both a high level of workload at baseline and an increase in workload over time were related to an intra-individual increase in exhaustion over one year. Similar effects have been found in previous longitudinal studies, where high job demands have been associated with high levels of exhaustion in between-person designs (Taris et al., 2010) and in one earlier intra-individual study (Schaufeli et al., 2009). These findings support the direct relationship between work-related stressors and increased strain, as hypothesized in the stressor-detachment model (Sonnentag & Fritz, 2015), and the idea that stressors may have both lagged and synchronous effects on strain over time (Ford et al., 2014).

In line with earlier cross-sectional studies, we also found that a high level of workload at baseline was related to high levels of sleep difficulties at baseline (see Litwiller et al., 2017 for a review). However, in contrast to our expectations, high levels of workload at baseline or increases in workload over one year were not related to changes in sleep difficulties over time. This is somewhat surprising, as high job demands have been consistently linked to sleep disturbances in earlier longitudinal studies (Linton et al., 2015). It is difficult to offer a definite reason for our contradictory findings, but differences in study designs or samples could offer some explanations. Most of the previous longitudinal studies that found significant relationships between job demands and sleep difficulties used longer time lags, thus allowing more time for change to occur in sleep difficulties (e.g., five years; Åkerstedt et al., 2012).

Regarding the relationship between *detachment and strain*, we found that low detachment was related to more exhaustion and sleep difficulties at baseline, as expected in light of earlier cross-sectional studies (Sonnentag & Fritz, 2007, 2015; Wendsche & Lohmann-Haislah, 2017). However, the major finding in our study was that detachment had both lagged and synchronous effects on strain over time: low level of detachment at baseline predicted intra-individual increase in exhaustion and sleep difficulties over one year, and employees who experienced a decrease in detachment over one year simultaneously experienced an increase in exhaustion and sleep difficulties. Thus it seems that both the between-person level at baseline, and the within-person change in detachment over time, relate to increases in strain over time. These results were expected in light of one earlier longitudinal study, where low detachment was associated with high levels of exhaustion one year after baseline (Sonnentag et al., 2010), and studies where related concepts, such as worry or preoccupation, have been associated with increased sleep difficulties over time (Van Laethem et al., 2015; Åkerstedt et al., 2012). The fact that low detachment and decreasing detachment were related to increasing exhaustion over time emphasizes the importance of the absence of job demands for successful recovery, as underlined in the E-R model (Meijman & Mulder, 1998). Our findings also suggest that thinking about work during free time, as demonstrated by low detachment, can lead to prolonged physiological activation (Ottaviani et al., 2016) and consequently impair sleep quality, leading to an increase in sleep difficulties in the long term. Accordingly, our study supported the direct effects of detachment on strain over one year drawn from the stressor-detachment model (Sonnentag & Fritz, 2015), and served to further demonstrate how the detachment-strain effects may unfold over time.

To the best of our knowledge, our study is the first to provide empirical support for the hypothesis that detachment moderates the relationship between workload and exhaustion, as earlier studies have failed to show significant interaction effects between these constructs (Siltaloppi et al., 2009; Sonnentag et al., 2010). We found that high detachment attenuates the relationship between high workload and high exhaustion at baseline. Employees who experience high workload and low detachment also experience higher levels of exhaustion than those employees who experience high workload but still successfully detach from work. This finding further supports the importance of psychological detachment from work, as those employees who successfully detach from work during free time are less vulnerable to the harmful effects of high job demands. This is likely because detachment offers a full break from job demands, thus ensuring replenishing resources and therefore ceasing the depletion of energy between work shifts (Meijman & Mulder, 1998).

One explanation for finding a significant moderator effect between detachment and workload on exhaustion while Siltaloppi et al. (2009) did not may relate to the fact that they included different set of variables in their models (they tested the effects of all recovery experiences – detachment, relaxation, mastery, and control – and not only detachment). Regarding the longitudinal moderator effects, and in line with Sonnentag et al. (2010), we found that detachment did not attenuate the relationship between workload and exhaustion over time. Thus high level of detachment seems to attenuate the effect of high workload on immediate experience of exhaustion, but does not buffer against increasing exhaustion over time. Furthermore, in our study detachment did not moderate the relationship between workload and sleep difficulties at baseline or over time. This suggests that low levels of detachment relate to increased sleep difficulties regardless of workload. It seems reasonable that detachment during off-job time alone is important for sleep, as employees most typically have some time away from work before going to bed. Consequently our study only partially supports the expected moderator effects based on the stressor-detachment model.

Limitations and Suggestions for Future Research

The results of our study should be interpreted with caution. First, although a latent change score approach provides information about the changes in employees' experiences and how changes in different experiences relate to each other, our study does not establish causality between the studied constructs. Consequently randomized experimental designs manipulating psychological detachment are needed to strictly establish the causal relationships between detachment and strain. One strength of our design is that when modeling intra-individual change over time, stable third variables (e.g., negative affectivity) should not influence our findings (Zapf, Dormann, & Frese, 1996). Nevertheless, our study cannot rule out all possible third variables, especially if they vary over time.

Second, as our study relied solely on self-reports, we acknowledge that our results reflect employees' internal experiences, for example, perceived workload and subjective experience of sleep difficulties. Future studies could incorporate measures that are more objective, for example the use of outsider reports for measuring workload or sleep actigraphs for measuring sleep difficulties. As psychological detachment from work and exhaustion are internal experiences, self-reports may be the most appropriate measures of these constructs. Future studies may benefit from measuring all three aspects of burnout (exhaustion, cynicism, and personal accomplishment) to gain a more complete picture of the relationship between detachment and burnout. As we modeled latent changes in each variable between two occasions, our results are unlikely to be affected by biases associated with common method variance (Li et al., 2014).

Third, it is difficult to determine the most appropriate time lag to study long-term effects of detachment. Our results demonstrated that one year is a reasonable timeframe to find significant long-term associations between detachment, exhaustion, and sleep difficulties. Future research could benefit from testing different time lags to reveal potential long-term moderation effects between detachment, workload, and the tested outcomes. We acknowledge that this might be difficult as the reality of data collection in several organizations makes it challenging to schedule multiple and frequent measurements. This was the case in our study, as we had to balance between carrying out an optimal research design and respecting the organizations' wishes.

Fourth, when examining the role of detachment as a moderator in the stressor-strain relationship, future research may benefit from examining a wide variety of stressors, or focusing on stressors that have been identified as most crucial for the long-term development of strain in a given occupation. For example, Diestel and Schmidt (2012) found that among financial consultants and insurance company service employees, self-control demands mediated the effect of workload on strain. Thus, among professionals who face high levels of self-control demands, it may be particularly interesting to note that detachment has been shown to moderate the effects of self-control demands on strain (Rivkin, Diestel, & Schmidt, 2015).

Fifth, future studies should take the valence of work-related thoughts into account. Based on our study, we cannot conclude what the benefit of detaching from positive work-related thoughts is compared to negative, or ruminative, work-related thoughts, as detachment covers both. For example, in earlier studies positive work-related thoughts during leisure time have been even associated with high levels of well-being (Meier, Cho, & Dumani, 2016).

Finally, as the response rates (41.0% at T1 and 28.2% at T2 relative to the baseline respondents) were relatively low, the generalizability of our results may be affected by a response bias. However, the response rate was similar as in earlier studies conducted in organizational settings (see Baruch & Holtom, 2008, for a review). Some self-selection occurred between the T1 and T2 questionnaires. The respondents more often had a permanent job contract, more often had a daytime job, and worked more hours per week. Nevertheless, we had a rather large and diverse sample, making the results more generalizable to wider populations.

Theoretical and practical implications

As longitudinal research on the effects of detachment on employee well-being has been scarce and previous findings inconclusive, our study makes theoretical contributions by reporting evidence of the long-term effects between detachment and strain. Our findings support the idea that the hypothesized direct relationships in the stressor-detachment model operate not only within days or weeks, but are also relevant over longer periods of time, such as years (Sonnentag & Fritz, 2015). As a novel theoretical contribution, we were able to specify two distinct ways in which the detachment-strain relationship unfolds over time. First, detachment seems to have lagged effects on strain, suggesting that experiencing less detachment than others predicts increase in strain over time. Second, detachment has a strong synchronous effect on strain, meaning that when an individual experiences a decrease in detachment, a simultaneous increase in strain will likely follow. Our findings confirm that both between- and within-person variation in detachment are important in predicting long-term intra-individual changes in strain. Finally, our study was also among the first to show that detachment attenuates the effects of high workload on exhaustion cross-sectionally. Our study therefore supports the key idea of the stressor-detachment model of detachment as a moderator between stressors and strain cross-sectionally, but not over time. It may be that the moderator effects of detachment depend on the demands and outcomes studied in line with the match principle, i.e., detachment from work that matches particular demands and outcomes will be most effective (de Jonge, Spoor, Sonnentag, Dormann, & van den Tooren, 2012).

Our findings underscore the long-term costs of not detaching from work: both employees experiencing less detachment than others and those experiencing increasing difficulty in detaching from work over time are at risk of experiencing increased exhaustion and sleep difficulties over time. Consequently, to promote employee health and well-being in the long-term, organizations should make sure that employees have an opportunity for sufficient uninterrupted recovery time between work shifts. In practice, this could mean encouraging employees not to work during their free time, and to form workplace policies that restrict phone calls or emails during off-job time. Employees can advance their own detachment by separating work and leisure when possible (e.g., creating clear boundaries between work and non-work), and by engaging in leisure activities that help them to detach from work-related thoughts.

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Table 1.

Means, Standard Deviations, Cronbach's Alphas, and Correlations of the Study Variables (1,064 ≤ N ≤ 1,671).

Variable	*M / %*	*SD*	1	2	3	4	5	6	7	8	9	10	11
1. Gender[1]	36.8%	-	-										
2. Age	46.72	10.32	.06*	-									
3. Shift work[2]	6.3%	-	-.03	-.05*	-								
4. Workload T1	3.85	0.81	-.12***	-.03	.07**	(.88)							
5. Detachment T1	2.99	0.99	-.05*	-.03	.06*	-.21***	(.87)						
6. Exhaustion T1	1.92	1.47	-.08**	.02	.03	.33***	-.32***	(.93)					
7. Sleep difficulties T1	2.59	0.90	-.10***	.09**	.05*	.17***	-.31***	.46***	(.79)				
8. Workload T2	3.80	0.81	-.12***	-.07*	.09**	.69***	-.17***	.27***	.13***	(.87)			
9. Detachment T2	3.05	0.97	-.05	-.03	.05	-.19***	.62***	-.22***	-.27***	-.20***	(.86)		
10. Exhaustion T2	1.96	1.44	-.14***	-.04	.02	.29***	-.25***	.68***	.40***	.35***	-.28***	(.93)	
11. Sleep difficulties T2	2.65	0.91	-.06*	.02	.02	.14***	-.25***	.39***	.71***	.12***	-.31***	.50***	(.80)

Note. Cronbach's alphas are shown on the diagonal. [1]Gender: 1 = female, 2 = male; [2]Shift work: 1 = Daytime job, 2 = Shift work. T1 = Time 1; T2 = Time 2. The second column shows percentages for categorical variables: [1]% of male participants, [2]% of shift workers.
* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 2.

Fit Indices for the Analysis of Time Invariance.

Factor and model	χ^2 (*df*)	Scaling correction	Satorra-Bentler scaled χ^2 difference test	RMSEA	CFI	TLI	SRMR
Workload							
Equal form	3.21 (5)	1.20		.00	1.00	1.00	.01
Equal factor loadings	3.94 (7)	1.21	$\Delta\chi^2(2) = 0.74$, $p = .69$	.00	1.00	1.00	.01
Equal intercepts	5.75 (9)	1.16	$\Delta\chi^2(2) = 1.92$, $p = .38$	.00	1.00	1.00	.01
Equal error variances	9.39 (12)	1.22	$\Delta\chi^2(3) = 3.42$, $p = .33$	.00	1.00	1.00	.01
Detachment							
Equal form	3.84 (6)	1.07		.000	1.00	1.00	.01
Equal factor loadings	9.00 (8)	1.01	$\Delta\chi^2(2) = 5.91$, $p = .052$	.009	1.00	1.00	.02
Equal intercepts	19.00 (10)	1.01	$\Delta\chi^2(2) = 10.02$, $p < .01$	.023	1.00	1.00	.03
Equal error variances	21.78 (13)	1.04	$\Delta\chi^2(3) = 3.04$, $p = .39$	.020	1.00	1.00	.02
Exhaustion							
Equal form	75.19 (25)	1.27		.03	.99	.99	.02
Equal factor loadings	79.52 (29)	1.22	$\Delta\chi^2(4) = 1.96$, $p = .74$	.03	.99	.99	.02
Equal intercepts	83.73 (33)	1.19	$\Delta\chi^2(4) = 2.68$, $p = .61$	.03	.99	.99	.02
Equal error variances	87.40 (38)	1.22	$\Delta\chi^2(5) = 4.88$, $p = .43$	.03	.99	.99	.02
Sleep difficulties							
Equal form	80.05 (13)	1.15		.06	.98	.96	.03
Equal factor loadings	82.72 (16)	1.12	$\Delta\chi^2(3) = 0.67$, $p = .88$	.05	.98	.97	.03
Equal intercepts	87.27 (19)	1.10	$\Delta\chi^2(3) = 3.43$, $p = .33$	.05	.98	.97	.03
Equal error variances	93.07 (23)	1.08	$\Delta\chi^2(4) = 4.86$, $p = .30$	.04	.98	.98	.03

Note. Scaling correction = Scaling correction used for the Chi-square difference test in models estimated with maximum-likelihood with robust standard errors (MLR). RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual.

Table 3.

Unstandardized Path Coefficients for Predicting Exhaustion (Model 1) and Sleep Difficulties (Model 2) in the Final Models.

Model 1			Model 2		
	Exhaustion T1	$\Delta E_{[T1-T2]}$		Sleep difficulties T1	$\Delta SD_{[T1-T2]}$
Variable	*B* (*SE*)	*B* (*SE*)	Variable	*B* (*SE*)	*B* (*SE*)
Exhaustion T1	−	-.32 (.03)***	Sleep difficulties T1	−	-.23 (.03)***
Workload T1	.54 (.06)***	.25 (.06)***	Workload T1	.08 (.04)*	-.01 (.03)
Detachment T1	-.40 (.04)***	-.11 (.04)**	Detachment T1	-.28 (.03)***	-.06 (.03)*
Workload T1 × Detachment T1	-.18 (.06)**	-.02 (.05)	Workload T1 × Detachment T1	-.03 (.04)	.01 (.04)
$\Delta W_{[T1-T2]}$	−	.57 (.08)***	$\Delta W_{[T1-T2]}$	−	.10 (.06)
$\Delta D_{[T1-T2]}$	−	-.27 (.06)***	$\Delta D_{[T1-T2]}$	−	-.21 (.04)***
$\Delta W_{[T1-T2]} \times \Delta D_{[T1-T2]}$	−	-.12 (.15)	$\Delta W_{[T1-T2]} \times \Delta D_{[T1-T2]}$	−	.12 (.14)
Gender[1]	-.18 (.07)**	−	Gender	-.20 (.04)***	−
Age	−	−	Age	.01 (.002)***	−
Shift work[2]	−	−	Shift work	.20 (.08)*	−

Note. [1]Gender: 1 = female, 2 = male; [2]Shift work: 1 = Daytime job, 2 = Shift work.
T1 = Time 1; T2 = Time 2. ΔE = change in exhaustion; ΔSD = change in sleep difficulties; ΔW = change in workload; ΔD = change in detachment.
* $p < .05$; ** $p < .01$; *** $p < .001$.