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The lingering curvilinear effect of workload on employee rumination and negative emotions: A diary study

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ABSTRACT

A high workload has long been considered a harmful stressor that adversely affects employees. In the current study, we propose that work underload also has negative implications for employees, and that there is a curvilinear relationship between daily workload and rumination. These negative consequences can carry over to the next day. We collected data from a sample of 137 employees over the course of 9 days to examine how deviations from employees' average workload impacts their negative rumination at the conclusion of the workday and their negative emotions the following morning. Results of the multilevel analyses indicated that daily workload had a significant curvilinear, *J-shaped* association with subsequent evening negative rumination that carries over into the following day in the form of higher negative emotions. These effects were stronger for employees with high levels of trait negative affectivity. Our findings suggest that while the effect of upward deviation from the typical workload is worse for employee rumination and subsequent negative emotions than the effect of downward deviation, deviations in either direction have negative effects on employees, especially for individuals with high levels of trait negative affectivity. In conclusion, this study highlights the importance of examining daily fluctuation in workload.

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Curvilinear; workload; daily diary; negative rumination; activation theory; negative emotions

It has been estimated that work stress contributes to approximately 120,000 deaths and \$190 billion healthcare costs annually in the U.S. alone (AIS, 2019). It is therefore not surprising that researchers and policy makers alike have become increasingly interested in understanding and alleviating the potential sources of stress that employees experience. One of the most dominant factors driving employees' stress experiences is quantitative workload, referred to as the amount of work employees need to complete as part of their roles (e.g. Kath et al., 2013). In fact, almost 40% of employees report that a heavy workload is their main source of work stress (AIS, 2019). Moreover, meta-analytic

evidence indicates that a higher level of workload is associated with adverse outcomes such as exhaustion and fatigue, as well as mental and physical strains (Bowling et al., 2015).

Meanwhile, researchers have found that having too few work demands can also be stressful for employees, noting that underload can lead to boredom, fatigue, and other negative outcomes (e.g. Shultz et al., 2010). Therefore, researchers have begun to explore whether an optimal workload level might exist for each individual employee such that they are not overly taxed but at the same time, not under-stimulated. Consistent with this idea, some researchers have found a curvilinear relationship between workload and well-being (e.g. Noblet et al., 2009). Such findings suggest that people whose overall level of workload is too high or too low, compared to others who have a more balanced workload, suffer poorer well-being.

However, these studies fail to consider that the experience of workload can fluctuate for each person, with some days being very busy and other days being slow. This is an important component of the experience of workload that has been largely overlooked when examining its effects on employee strain outcomes. We aim to address this gap by examining whether daily fluctuations in workload (i.e. experiencing busy or slow days) might result in short-term negative effects on employee negative rumination and consequent negative emotions.

Specifically, we propose that each employee has his or her own typical or characteristic workload level and departures in either direction from this level adversely impact the employee's daily strain outcomes. This argument is a more accurate description of the underlying theoretical mechanism of activation theory (Gardner, 1986). This theory posits that there is a moderate and typical activation level for each individual and that deviation from this level, in either direction, will adversely impact that individual.

However, the majority of the research to date has used a stable view of employees' experiences, comparing each employee to other employees instead of comparing different workload levels that the same person experiences across days, thus explaining how differences among individuals' average levels of workload are related to their strain outcomes in general. In the current study, we aim to rectify this mismatch between theory and research design by focusing on how the daily experiences of deviations from each person's typical workload are related to variations in their negative rumination after work on the same day and their negative emotions in the following morning. By creating a temporal separation between assessments of daily workload and its outcomes, we also expand on previous cross-sectional designs to show how these effects can potentially cumulate over time.

Further, we aim to explore whether negative rumination (defined as repetitive thoughts about a negative event or mood; Weigelt et al., 2019) is a likely mediator for emotions in the following day because it extends the effects of the stressor to beyond the time of actual exposure (Sonnentag & Fritz, 2015). There is support for this notion of evening negative rumination as a mechanism linking employees daily negative work experience (i.e. customer mistreatment) to negative mood in the following morning (Wang et al., 2013).

Furthermore, individuals who are generally more sensitive to negative experiences (i.e. those with higher levels of negative affectivity) are particularly vulnerable to stressors, and are less likely to let go of work-related thoughts after work (Sonnentag & Fritz,

2015). Therefore, we test negative affectivity as an exacerbating factor in the curvilinear relationship between daily workload and negative rumination in the evening, as it can further elucidate the mechanism by which workload affects employee strain outcomes.

Taken together, the current study makes the following contributions to the literature. First, we examine the curvilinear effects of daily workload on rumination and the subsequent effect on next morning negative emotions. This will provide a broader understanding of the potential curvilinear effects of daily workload on employee strain outcomes than prior research (Germeys & De Gieter, 2017). Second, our study highlights the importance of examining daily fluctuations in workload. Third, we examine an important boundary condition, that of negative affectivity, of the curvilinear effects of daily workload. This contributes to our understanding of why some individuals might have more severe reactions than others to deviations from their typical level of workload.

Theoretical background and hypotheses

Workload and activation theory

Workload, defined as employees' perceived pace, volume, and difficulty of work (Bowling & Kirkendall, 2012; Spector & Jex, 1998), is an important contextual factor that is associated with employee mental and physical well-being (Bowling et al., 2015). Traditionally, researchers conceptualized workload as a workplace stressor (Spector & Jex, 1998), with higher levels of workload being associated with strains. However, some researchers (e.g. Shultz et al., 2010) have recognized that having too few work demands is associated with strains as well.

The negative effects of both high workload and low workload are in line with the activation theory framework (Gardner, 1986; Pierce & Aguinis, 2013; Scott, 1966). This theory is not limited to the work domain but is applicable broadly, to individuals' experiences across domains. Activation theory posits that there is a typical or moderate activation or arousal level for each individual. This level is based on physiological patterns of activation and arousal, and the typical level allows the individual to function most efficiently. Large deviations from the typical level in either direction result in decreased behavioral efficiency and decrements to mental well-being (Gardner & Cummings, 1988). That is, individuals need a moderate level of arousal to stimulate engagement in tasks and maintain their functioning and mental well-being. If the arousal level is too low, employees likely feel apathetic and frustrated with their inactivity and boredom (Germeys & De Gieter, 2017). They may experience lower levels of value attainment (e.g. a sense of accomplishment, self-respect) and have a hard time concentrating (Zivnuska et al., 2002). Such effects may be particularly relevant for employees working from the office and who keep regular hours, and therefore are more limited in what they can do to pass their time.

However, as the arousal level increases, the individual finds it easier to engage in tasks, enthusiasm levels increase, and frustration levels decrease. This occurs only until a certain point as too much arousal can leave individuals overwhelmed, hurting their engagement and enthusiasm.

Activation theory generally posits that when individuals experience deviations from their typical level of arousal, they experience adverse reactions. When applied to the work domain, and specifically to workload, activation theory would suggest that each employee has a typical workload level, with adverse reactions occurring when their experienced workload deviates from it in either direction (i.e. experienced underload or overload). This is in also line with the argument that workload has both challenging and hindering aspects (e.g. LePine et al., 2005), such that when workload levels are very low, there is a lack of challenge, but when the workload is too high it becomes a hindrance (Crawford et al., 2010). There is mixed evidence for this notion at the between-person level, as several researchers have found this type of curvilinear effect of workload on strains and well-being outcomes (e.g. Karanika-Murray et al., 2009; Lopes et al., 2014; Montani et al., 2020; Rodwell & Munro, 2013; Sawang, 2012; Schmitt et al., 2015), while others have not (e.g. Rydstedt et al., 2006; Schmidt & Diestel, 2011).

It is important to note that most studies examining the curvilinear effects of workload were conducted at the between-person level. However, the main tenets of activation theory are based on a within-person level conceptualization: The typical level of activation is theorized to be different for each person, and deviations from this level can vary from day to day. When the typical level is exceeded or not reached for a specific individual on a given day, that person will likely experience negative outcomes. This conceptualization can be applied to the between-person level, such that if a person perceives their job to be constantly too demanding or alternatively, not stimulating enough (compared to a universal optimal level of workload), they will generally cope more poorly and experience negative outcomes.

However, we argue that activation theory is more readily applicable at the within-person level, capturing daily fluctuations in workload. According to this application of the theory, an employee has a typical daily workload to which they are accustomed. On days when the workload is close to this typical level, the employee can easily focus and stay engaged in the task. However, when an employee experiences a lower workload compared to their typical level, the resulting boredom, frustration, and lack of value attainment in this situation will be perceived as stressful or unpleasant. When an employee experiences a higher workload day than typical, however, they may feel overwhelmed, leading to increased anxiety and frustration. Thus, both daily underload and daily overload likely lead to more negative emotions.

Despite the above rationale for the curvilinear effects of workload at the within-person level, not many studies have directly examined them. One study conducted at the daily level found a curvilinear relationship between workload and detachment (Germeys & De Gieter, 2017) while another study did not replicate this finding, perhaps because of a smaller sample size that limited statistical power (Haun et al., 2018). In the current study, we build upon this prior research and focus on the within-person curvilinear lingering effect of workload on employee negative rumination and subsequent negative emotions. Specifically, we suggest that the negative experience of having a workday that is characterized by workloads that are substantially lower or higher than typical will result in increased work-related negative rumination after work on the same day, which will then result in increased negative emotions the following morning.

Curvilinear effects of workload on strain

There is evidence that the negative effects of work stressors extend beyond working hours, persisting and even strengthening later in the same day as the experienced stressor (Pindek et al., 2019) and carrying over to the next day (Tremmel & Sonnentag, 2018; Wang et al., 2013). The persistence of negative emotional reactions to stressful work events is often explained using the cognitive mechanism of rumination (e.g. Wang et al., 2013). Work-related rumination, or the inability to detach mentally from work during non-work time, is theorized to be the main reason that longer-term strain cumulates (Sonnentag & Fritz, 2015). Put simply, the negative effects of experiencing work stressors such as daily overload or underload continue to impact employees after working hours because employees continue to think about their negative experiences at work even after leaving it. This extended exposure produces strain (Meurs & Perrewé, 2010).

It is important to note that negative work-related rumination is not analogous to lack of detachment, but rather it is one type of lack of detachment (Wendsche & Lohmann-Haislah, 2017): It is possible to experience positive affective benefits from lack of detachment that is focused on positive work experiences (Sonnentag & Niessen, 2020). For example, employees who are not detached from work may engage in problem-solving pondering or positive work reflection, which are less harmful or even beneficial for employee mental well-being (Weigelt et al., 2019; Wendsche et al., 2021). Therefore, our study focuses specifically on the negative aspect of lack of detachment in the form of negative rumination: repetitive thoughts about negative work situations. This negatively valenced lack of detachment is stronger than neutral or positive work-related thoughts in predicting subsequent affect (Wendsche & Lohmann-Haislah, 2017).

Prior studies have found that different daily stressors are associated with increased rumination (e.g. Cropley et al., 2006; Vahle-Hinz et al., 2014; Wang et al., 2013). Of particular note is the study by Vahle-Hinz et al. (2014) that showed a substantial correlation between daily overload and rumination. While previous studies have explored this relationship using a linear perspective, based on activation theory and findings from the Germeys and De Gieter (2017) study, we expect a curvilinear relationship (U-shaped) between daily workload and rumination later in the day. That is, a day with either a substantially lower or higher workload than typical will be experienced negatively, and such experiences would result in a cognitive focus on this negative work experience (i.e. rumination).

Hypothesis 1: There is a U-shaped curvilinear relationship between daily workload and subsequent rumination, such that rumination levels are lower at moderate levels of workload, compared to their levels at low or high levels of workload.

Negative work-related rumination, or the extended reliving of the stress experiences, is theorized to result in sustained negative emotional states via cognitive and behavioral mechanisms (Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008; Wang et al., 2013). First, negative rumination is a cognitive focus on negative thoughts and memories that creates a negative bias and more pessimistic thinking. Furthermore, rumination prevents individuals from engaging in activities that could improve their affective states (Lyubomirsky & Nolen-Hoeksema, 1993). These ruminative thoughts will extend employees' negative emotions to last longer hours, making negative environmental

cues more salient. In addition, the rumination also makes it less likely for them to engage in recovery activities (distracting or enjoyable activities) that could potentially stop the rumination and reduce negative emotions. In this sense, rumination and negative emotions have a reciprocal relationship (Moberly & Watkins, 2008), and sustained negative emotions are expected to last even into the following morning, prior to the start of the new workday (Wang et al., 2013), before new experiences are likely to occupy the employee's mind.

We therefore propose that evening rumination predicts higher levels of negative emotions on the following morning. Additionally, rumination is the mechanism by which negative daily work experiences, including imbalanced workload, lead to sustained negative emotions that persist and carry over to the following morning.

Hypothesis 2: There is a positive relationship between daily rumination and negative emotions the following morning.

Hypothesis 3: There is a within-person indirect curvilinear effect from daily workload to negative emotions the following morning via evening rumination.

The moderating effect of trait negative affectivity

Individuals with high levels of trait negative affectivity (trait NA) tend to view the world more negatively in general (Watson et al., 1987; Watson & Clark, 1984), and are consequently more likely to experience negative reactions to workplace stressors (see Pindek & Spector, 2016). Individuals who score high on trait NA, as compared to those who score low on trait NA, are more likely to perceive situations as stressful or threatening, and therefore, they are expected to find deviations from the normal daily workload more threatening, resulting in increased rumination levels.

This effect can be explained using the main idea behind contextualized trait models such as the Trait Activation Theory (Tett & Guterman, 2000) or the Traits as Situational Sensitivities Model (Marshall & Brown, 2006). According to this class of theories, traits represent individual differences in the reactivity to situational cues. Specifically, employees with higher levels of trait NA are more sensitive to stressful situations, or situations that tend to elicit negative affect. If the situation is not stressful, those high on trait NA and those low on trait NA are not expected to differ in their reaction and would likely experience similarly low levels of rumination and subsequent negative emotions. However, when encountering stressful situations, those high on trait NA would experience stronger negative state reactions (Debusscher et al., 2016).

The moderating role of trait NA on the stressor-strain relationship has been documented in many studies, including within-person (daily) stressor-strain associations generally (e.g. Yang & Diefendorff, 2009; Zhou et al., 2015) and for daily workload specifically (Debusscher et al., 2016). These studies all show a greater vulnerability or reactivity to stressors for those individuals higher on trait NA. The current study builds on these prior findings, and we expect trait NA to moderate the curvilinear effects of workload on employee rumination, such that deviations from the typical workload in either

direction would have more severe effects on employees who are high on trait NA, compared to those who are low.

Hypothesis 4: Trait NA moderates the curvilinear relationship between daily workload and rumination, such that the U-shaped effect is stronger for those high on trait NA than for those low on trait NA.

Current study

In the current study, we test our hypotheses as part of an integrative model. The model depicts the curvilinear effects of daily workload on subsequent negative emotions via evening rumination, with trait NA as a cross-level moderator. This model is presented in Figure 1.

Method

Participants and procedure

Study participants included 137 full-time non-teaching staff employees from a large university in the Southeastern U.S who worked typical office hours (between the hours 8–5 with a one-hour lunch break) and who do not typically work overtime. Participants were mostly female (83%), were 39 years old on average ($SD = 12$) and had an average organizational tenure of 7 years ($SD = 7$). Participants were invited to take part in the study via email and were given a \$50 gift-card as compensation for their time. The data were matched using automatically generated identification codes, thus maintaining the anonymity of the participants.

This study is part of a larger project, and the variables used in the current study were collected at three time points during each day, as well as in a baseline survey. Trait NA

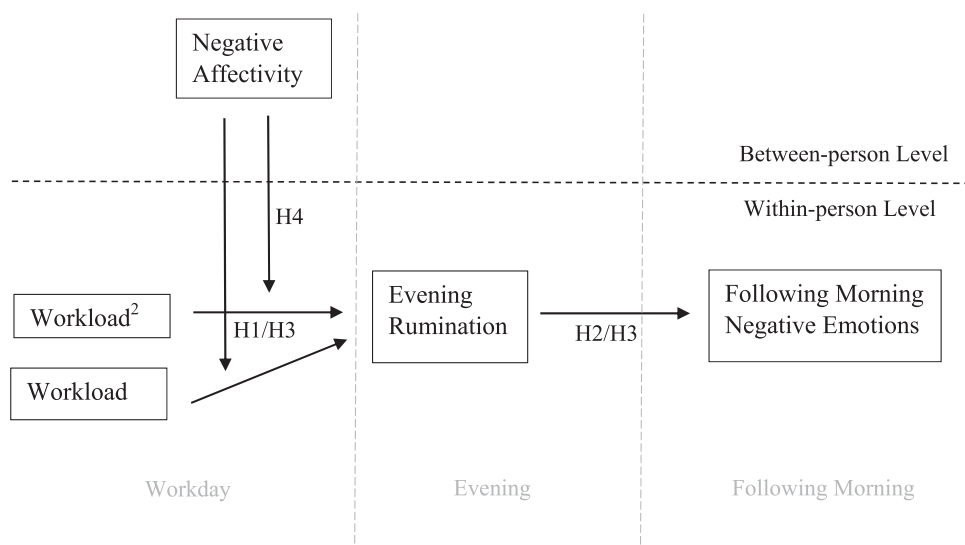


Figure 1. Hypothesized model.

was assessed once in the baseline survey. Daily workload was assessed shortly after the end of the workday (sent at 5pm and included in the data if participants answered within 2 h). Rumination was assessed before bedtime (sent at 9pm and included in the data if participants answered within 6 h, thus allowing participants to answer before going to bed regardless of the specific hour). Following-day negative emotions were assessed in the morning (sent at 7am and included in the data if participants answered within 2 h). Data collection lasted for 9 consecutive workdays (Monday to Friday on the first week, and Monday to Thursday on the second week, with the last morning survey being sent on the second Friday), and participant debriefing was scheduled before leaving work on the second Friday. The final between-person sample size was 119 (because of missing data) and within-person level sample size was 647 matched daily observations (based on 805 afternoon observations, 980 evening observations, and 902 morning observations), for an average of 5.44 usable matched observations per person included in the models.

Measures

All measures used a 5-point response scale. Participants indicated their agreement on a scale ranging from 1 (not at all) to 5 (extremely).

Daily perceived workload was measured in the afternoon, using four items from the quantitative workload inventory (Spector & Jex, 1998), adapted for a daily timeframe. One of the original items (“How often is there a great deal to be done?”) is not easily adapted for a daily perspective and was excluded. A sample item is “Today my job required me to work very fast”. The within-level alpha was .85 and the between-level alpha was .91.

Daily rumination was measured in the evening using three-items from the Ruminative Response Scale (Genet & Siemer, 2012; Nolen-Hoeksema & Morrow, 1991) referring to that work day: “I could not stop thinking about unpleasant situations over and over”, “I couldn’t stop thinking about how I was feeling”, and “I continued to think about an unpleasant situation, wishing it had gone differently”. The within-level alpha was .91 and the between-level alpha was .98.

Following morning negative emotions was measured in the morning, using three-items from the PANAS (Watson et al., 1988). Participants indicated the extent to which they felt each one of the included emotions (angry, anxious, discouraged) with regard to work, at that time. The within-level alpha was .60 and the between-level alpha was .80. The lower within-level alpha is common when measuring negative emotions (Brose et al., 2020).

Trait negative affectivity was measured at the baseline survey using the ten-item negative affectivity factor from the PANAS (Watson et al., 1988). Participants indicated the extent to which they generally felt one of the 10 included emotions (e.g. distressed). The alpha level was .87.

Analytic approach

The data include daily measures (e.g. workload, rumination, and negative emotions) that are nested within individuals. We therefore used multilevel path analysis with Mplus 7.4

(Muthén & Muthén, 1998-2012) to test our hypotheses. We estimated two models, whereby model 1 included only the within-person level paths (allowing us to test hypotheses 1-3) and model 2 included the cross-level moderation (allowing us to test hypothesis 4 in addition to hypotheses 1-3). Both models 1 and 2 included the within-person linear and curvilinear components of workload as predictors of rumination, and rumination as a predictor of the following morning's negative emotions. Model 2 also included the cross-level interactions (trait NA predicting both the linear and curvilinear effects of workload on rumination) and the between-person main effect of trait NA on rumination (trait NA predicting the intercept of rumination).

We manually decomposed the workload variance by creating the strictly within-person (by person-mean centering) and strictly between-person (by aggregating to the person level) components. The quadratic workload variable was created from the within-person component and is therefore a strictly within-person variable. We also grand mean-centered trait NA in Model 2. These centering strategies ensures that the within-person linear and curvilinear effects of workload, as well as the cross-level moderating effect of trait NA, are accurately examined (Enders & Tofighi, 2007). All effects were estimated using random slopes and intercepts, and the random slopes were allowed to covary with the random intercepts. Indirect effects were estimated using the Monte Carlo method (Preacher et al., 2010) to create 95% confidence intervals (CIs) with 20,000 bootstraps. In order to test the moderation hypothesis, we regressed both the linear and the quadratic slopes on the between-person moderator trait NA and calculated the conditional effects on rumination as well as the conditional indirect effects on following morning negative emotions.

Results

Descriptive statistics, ICC levels, and intercorrelations are presented in Table 1. All variables had sufficient variance. Multilevel confirmatory factor analyses (MCFA) were conducted for the daily measures. We first estimated a three-factor (per level) model in which each item loaded onto its factor at both the within and between person levels. The three-factor model indicated adequate fit ($\chi^2_{(64)} = 231.55, p < .001, RMSEA = .04; CFI = .95; TLI = .93; SRMR \text{ Within} = .04; SRMR \text{ Between} = .08$). This model also had significantly better fit ($\Delta SB\chi^2_{(6)} = 975.74, p < .001$) than a one-factor per level model ($\chi^2_{(70)} = 1505.82, p < .001, RMSEA = .13; CFI = .55; TLI = .42; SRMR \text{ Within} = .20; SRMR \text{ Between} = .20$). Moreover, all variables were significantly and positively correlated at

Table 1. Means, standard deviations, and correlations between variables.

	Mean	Between-person SD	Within-person SD	ICC	1	2	3
1. Workload (afternoon)	2.19	0.81	0.71	.42	-	.20**	.13**
2. Rumination (evening)	1.40	0.53	0.59	.34	.27**	-	.33**
3. Negative emotions (next morning)	1.36	0.47	0.36	.55	.32**	.73**	-
4. Negative affectivity	1.62	0.53	-		.14	.31**	.46**

Note. Correlations below the diagonal represent between-person correlations ($N = 137$), created by averaging the within-person variables across days. Correlations above the diagonal represent within-person correlations ($N = 621\text{--}805$). Each variable's measurement time is specified in parentheses.

* $p > .05$. ** $p > .01$.

Table 2. Direct fixed and random effects.

Effect	Estimate	SE Model 1	[95% CI]	Estimate	SE Model 2	[95% CI]
Fixed Effects						
<i>Level 1 effects</i>						
Workload -> Rumination	.21**	.06	[.090, .339]	.19**	.05	[.103, .285]
Workload ² -> Rumination	.08*	.04	[.015, .151]	.07**	.03	[.024, .121]
Rumination -> Negative emotions	.19**	.04	[.106, .270]	.20**	.04	[.121, .286]
<i>Level 2 effect</i>						
Trait NA -> Rumination	-	-		.28**	.09	[.109, .443]
<i>Trait NA moderation effects</i>						
Workload -> Rumination				.33**	.12	[.098, .567]
Workload ² -> Rumination				.14**	.05	[.043, .239]
Random Effects						
<i>Level 1 residual variances</i>						
Rumination	.34**	.02	[.222, .466]	.35**	.06	[.224, .476]
Negative emotions	.08**	.01	[.055, .112]	.08**	.02	[.056, .113]
<i>Level 2 intercept variances</i>						
Rumination	.13**	.04	[.043, .208]	.13**	.04	[.062, .203]
Negative emotions	.06	.04	[-.011, .133]	.06	.03	[-.008, .126]
<i>Slope variances</i>						
Workload -> Rumination	.11	.06	[-.019, .233]	.07	.06	[-.044, .190]
Workload ² -> Rumination	.02	.02	[-.014, .053]	.00	.02	[-.037, .041]
Rumination -> Negative emotions	.04**	.02	[.012, .076]	.04**	.02	[.012, .072]

Note. * $p > .05$. ** $p > .01$. Workload² is the squared term of the person-mean centered workload value, indicating the curvilinear effect.

the within-person level, in line with the hypotheses. Furthermore, at the between-person level, trait NA was significantly and positively correlated with rumination and negative emotions, but not with workload.

Hypotheses were tested using the two models described above. The results from both models are presented in Table 2 (for direct effects) and Table 3 (for indirect, conditional, and conditional indirect effects). Daily workload had a significant curvilinear ($\gamma = .08$, $p < .05$) relationship with rumination, in support of Hypothesis 1. This model explained

Table 3. Indirect, conditional, and conditional indirect effects (unstandardized coefficients).

Effect	Estimate	SE Model 1	[95% CI]	Estimate	SE Model 2	[95% CI]
<i>Indirect effects</i>						
Workload -> Rumination -> Negative emotions	.04*	.02	[.013, .078]	.04*	.01	[.014, .065]
Workload ² -> Rumination -> Negative emotions	.02*	.01	[.002, .034]	.02*	.01	[.002, .027]
<i>Conditional effects</i>						
Workload -> Rumination						
-1 SD Negative affectivity				.01	.05	[-.079, .103]
+1 SD Negative affectivity				.38**	.05	[.284, .466]
Workload ² -> Rumination						
-1 SD Negative affectivity				.00	.03	[-.053, .044]
+1 SD Negative affectivity				.15**	.03	[.100, .198]
<i>Conditional indirect effects</i>						
Workload -> Rumination -> Negative emotions						
-1 SD Negative affectivity				.00	.01	[-.016, .021]
+1 SD Negative affectivity				.08*	.02	[.039, .114]
Workload ² -> Rumination -> Negative emotions						
-1 SD Negative affectivity				.00	.01	[-.011, .009]
+1 SD Negative affectivity				.03*	.01	[.013, .047]

Note. * $p > .05$. ** $p > .01$. Workload² is the squared term of the person-mean centered workload value, indicating the curvilinear effect.

15.68% of the within-person variance in rumination. Rumination had a significant positive relationship with the following morning negative emotions ($\gamma = .19, p < .01$), supporting Hypothesis 2. To test Hypothesis 3, we estimated the indirect curvilinear effects of workload on morning negative emotions via rumination. The indirect curvilinear effect estimate was .02 with the 95% CI excluding zero, [0.002, 0.034], thus supporting Hypothesis 3. This model explained 44% of the within-person variance in the following morning negative emotions.

Trait NA significantly moderated the curvilinear effect of workload on rumination ($\gamma = .14, p < .01$), providing support for Hypothesis 4. The conditional indirect effects at high and low levels of trait NA were also estimated with the Monte Carlo method (Preacher et al., 2010) and presented in Table 3. The indirect effect was significant for those with high trait NA levels (linear effect = .08, 95% CI = [.043, .116], and curvilinear = .03, 95% CI = [.016, .048]) but not for those with low trait NA levels (linear effect = .00, 95% CI = [-.016, .022], and curvilinear = .00, 95% CI = [-.011, .009]), and the pattern of the relationship for those with high (+1SD) and low (-1SD) trait NA is shown in Figure 2.

Discussion

Based on activation theory (Gardner, 1986; Pierce & Aguinis, 2013; Scott, 1966), we hypothesized that workload would have a curvilinear effect on negative rumination at

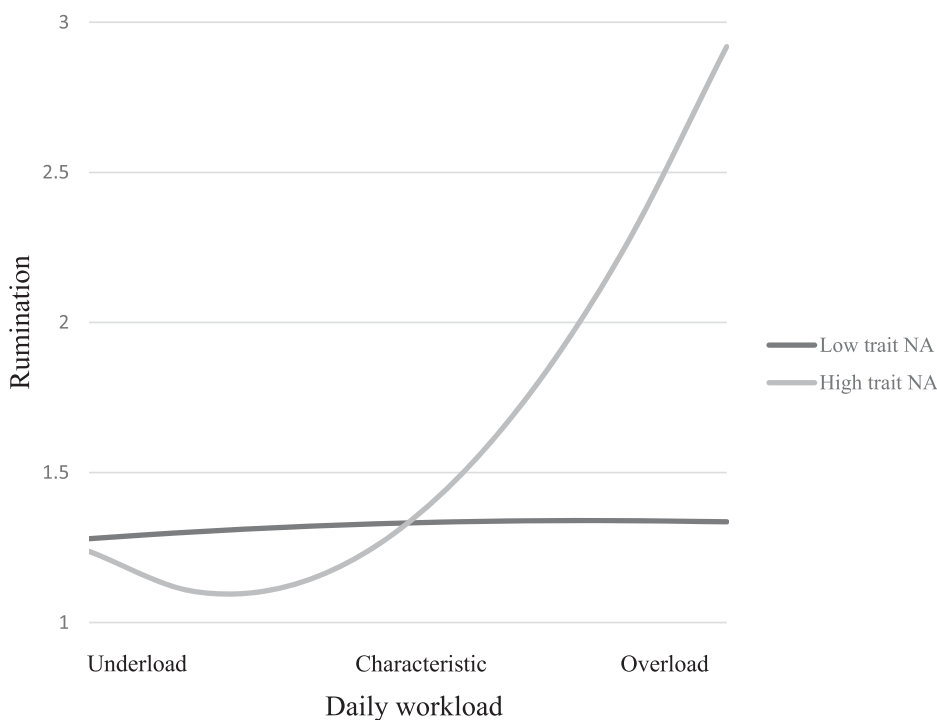


Figure 2. The moderating effect of trait negative affectivity on the daily curvilinear effect of workload on rumination.

the within-person level. This approach allows us to examine whether daily deviations from a typical daily workload are indirectly related, via negative rumination, to increased negative emotions in the subsequent workday morning. Our results supported the within-person curvilinear effect of workload on subsequent rumination, which was then associated with negative emotions the following morning. A low level of workload is associated with higher levels of rumination, at least for those with high trait NA. As workload increases, rumination levels initially subside. However, when workload levels exceed a certain point, rumination levels start to increase, following the curvilinear pattern that is expected based on activation theory.

Our results are in line with the findings from Germeys and De Gieter (2017), who found that the effect of overload was more substantial than the effect of underload despite their hypothesis that both daily overload and underload would result in lower detachment levels. The similar result pattern is seen in our finding such that the curvilinear effect resembles a J-shape rather than a U-shape (i.e. rumination is low at intermediate levels of workload, is moderately high at low levels of workload, and very high at high levels of workload). One possible explanation for this pattern of a non-symmetrical curvilinear relationship is that the effects of daily overload are worse than the effects of daily underload, such that smaller deviations upwards from the typical workload would result in rumination; in contrast, it would take a larger deviation downwards to have such an impact on employees. It is reasonable to assume that, at least for some individuals, smaller downward deviations may be experienced as a welcome break. Another possible explanation is that the average workload in our sample was rather low ($M = 2.19$, on a 1–5 scale), making downward deviations more restricted. It is possible that the workload scale that was used does not measure workload equally well on the low end and high end of workload, and we call for a more comprehensive measure that captures the entire workload range. Such efforts could also incorporate the idea that an imbalance in workload can be a challenge or a hindrance (Crawford et al., 2010).

Another interesting finding emerged from the significant interaction between trait NA and the daily effects of workload. Specifically, employees who are low on trait NA generally did not experience changes in rumination and the resulting negative emotions as a result of deviations (in either direction) from their typical workload, while those high on trait NA demonstrated a clearer J-shape pattern. This is consistent with the idea that those high on trait NA are more sensitive to stressful situations. In this case, the deviation from the typical level of daily workload, especially in the upwards direction will likely make employees high on trait NA experience an increase in rumination and subsequent negative emotions. One alternative explanation is that those low on trait NA are no less sensitive to deviations from their typical workload level, but rather that they do not perceive as many deviations as their high trait NA colleagues. This explanation was tested with the current data and ruled out¹ as there was no significant association between the daily workload variance and the level of trait NA. That is, regardless of trait NA levels, employees do perceive experiences of both slower and busier days. However, the negative effects in the form of subsequent rumination and negative emotions are more severe for employees the higher they are on trait NA.

Our findings suggest that the consequences of an imbalanced daily workload are not momentary, but rather that they linger after workhours via negative work-related rumination, and even carry over to the following morning in the form of negative emotions.

This finding, like other studies that found extended effects for daily stressors (e.g. Tremmel & Sonnentag, 2018; Wang et al., 2013) highlights the importance of studying work stress using a daily perspective. When placing this study in the context of the broader occupational stress literature, it is conceivable that stress effects from one workday carry over not only into the morning but into the following workday. For example, although beyond the scope of the current study, there is evidence (e.g. Binnewies et al., 2009; Sonnentag et al., 2012) that morning well-being predicts the experience of work stressors, and self-rated performance that day, and our data points to a similar pattern.² Put together, these two streams of the literature, establishing the extended effects of daily stressors on mental strain, and the effects of morning mental strain on subsequent experiences of stressors, increase our understanding of how longer-term work stress is formed.

Limitations and future research

This study has several limitations. First, although we measured workload, rumination, and negative emotions at three different time points, we used only self-reported data, raising concerns for common method variance (Podsakoff et al., 2003). However, the temporal separation of the measurement of our variables reduces this concern somewhat. The interaction included a variable that can contribute to patterned responding, namely negative affectivity (Spector et al., 1999), but interactions themselves are unlikely the result of common method variance (Evans, 1985; Siemsen et al., 2010). Nevertheless, future studies could incorporate external measures of some of the studied variables, and there could be different practical implications to our findings depending on how workload is measured, for example as perceptions or objectively. This is because changing the objective workload can be done only by changing the design of the job, but changing the perceived workload can be done in additional ways.

Second, research suggests that employees who already have a high workload will be less likely to participate in research studies since doing so adds to this general load (see discussion in Dormann & van de Ven, 2014). It is possible that this occurred in the current study—employees skipped answering surveys on days where they had a higher workload. However, the resulting potential restriction in range is likely to attenuate relationships (Bobko, 1983; Muchinsky, 1996), whereas our hypotheses were supported. Therefore, concern surrounding this possibility is somewhat ameliorated.

Third, our data were collected from a single organization in only one country, and the sample was predominantly female, thus limiting the generalizability of our results. Specifically, there is some evidence that trait NA and rumination or lack of detachment are more strongly associated for men than they are for women (Wendsche & Lohmann-Haislah, 2017). Unfortunately, we had too few men to consider gender as a moderator.³ Replication across other organizations and cultures with different gender compositions are therefore encouraged.

Fourth, the current study did not account for differences in the objective level of workload and other demands experienced by the employees. Typical workloads were assessed as the mean of our *perceptual* measure for each employee, but this does not necessarily reflect the *objective* levels across people. Thus, some employees might have an objectively higher volume of work than others, and this might have affected the patterns we have

examined. Specifically, employees who generally have objectively high work volume versus low work volume might experience days that are atypically high or low differently. For example, an employee who is almost always overloaded may not suffer any negative consequences from an occasional “slower” day that would serve as a respite that allowed recovery. By contrast, employees who are only moderately busy most days might see an unusually slow day as boring and stressful. The patterns we have uncovered are relative to the person’s own average perceived level of workload, but future studies could take a more nuanced approach and examine the effects of objective differences among people in their typical and desired levels of demands.

In the current study we assume that, at least for most individuals, their typical workload is balanced. Although we cannot know how many of the employees in our sample are generally overloaded or underloaded, our assumption for the sample as a whole is reasonable considering our chosen sample of university non-teaching staff employees (while avoiding particularly busy times such as first week of classes), but might not hold for samples from employee populations that are typically over-worked (e.g. nurses, lawyers), where it is established that many employees suffer from chronic overload or underload (Shultz et al., 2010). It is possible that those who are generally over-worked would mostly find relief in a slow day, and those who are generally underloaded would experience better mental well-being on the busier days. The within-person curvilinear relationship is based theoretically on deviations from the optimal level, while the operationalization is of deviations from the level that was typical during the time of the study. Future studies could address whether it is deviations from normal, deviations from optimal, or both, that affect mental well-being at the within-person level.

Fifth, given this was a nonexperimental survey study, we cannot be certain that workload was the cause of evening rumination or rumination was the cause of next morning negative emotion (and it is extremely likely that negative emotions were experienced in the evening, together with the increased rumination). However, a strength of this study is that we assessed a series of hypothesized events: workload during the workday, rumination, and emotion in a temporal sequence. As discussed by Spector (2019), we did not merely assess variables at arbitrary points in time. We assessed workload before rumination had occurred, and we assessed rumination before next morning emotion had occurred. This enabled us to place our variables in a temporal order, which adds strength to the evidence provided by our model tests.

Sixth, future studies could benefit from incorporating specific affective reactions to overload and underload, additional well-being outcomes (e.g. positive emotions, physical well-being), potential attenuating daily factors (e.g. sleep quality; Cropley et al., 2006) and person level moderators. One example for a relevant moderator is employee skill, as it is possible that skilled employees can work more efficiently and handle deviations from the typical workload better. This would have implications in terms of selection and training. Moderators that are known to buffer the stressor-rumination relationship, particularly those that can be trained, such as mindfulness (Hülshager et al., 2013; Sutcliffe et al., 2016) would also be of great value. Including the specific cognitive mechanisms underlying the ruminative process and how it extends the duration of negative emotions is also a worthy avenue for future research (Wendsche & Lohmann-Haislah, 2017).

Practical implications

The focus of the current study on the within-person curvilinear effects of workload on employee rumination and negative emotions has several practical implications. First, whereas a between-person curvilinear effect would indicate that employees' work situation can be improved by optimizing the average, objective workload level, the within-person effect found in the current study suggests that optimizing the average workload level is not enough. Rather, the finding that employees' within-person variability in workload affects their mental strain implies that this variance needs to be optimized as well. A relatively simple way to address this is to provide employees with some degree of autonomy, particularly surrounding when they start or stop working, and how to pace their tasks (Morgeson & Humphrey, 2006). Another option would be to provide employees with time management training so that they could structure their tasks to avoid experiencing the imbalanced workload episodes observed in the current study (e.g. Green & Skinner, 2005). These approaches could help employees who are more susceptible to deviations from their typical load to balance their workload better across days.

Second, our results support the mediating role of rumination. Rumination is thought to be the main reason that longer-term strain cumulates because it extends the effects of the stressor to beyond the time of actual exposure (Sonnentag & Fritz, 2015). Therefore, interventions that can help reduce ruminative thoughts have the potential to promote employee mental well-being even if the workload is not balanced across days. For example, mindfulness training has been shown to reduce rumination and increase well-being (Deyo et al., 2009; Jain et al., 2007) and also buffer the stressor-detachment relationship in employees (Haun et al., 2018).

Finally, the significant moderation effect of trait NA suggests that managers can help decrease employee strain by individualizing their approach to assigning workloads. Employees higher on trait NA may need more help keeping their daily loads balanced, while such practices might not be as beneficial to those low on trait NA. Skilled managers should be able to maintain justice perceptions while providing employees with individualized instruction and supervision. They would balance the workload needs of the team, the differential resilience of employees in the face of work pressure, and the need to protect employees from undue strain.

Conclusion

As there is very limited research on the curvilinear effects of daily variations in workload on employee outcomes, the current study answers several questions but raises many more. Nevertheless, the main takeaways from the current study are that employees have a typical workload level. On days when that level is exceeded or not met, employees generally experience higher work-related rumination, which then carries over to the next day in the form of morning negative emotions. These effects are stronger for individuals high on trait negative affectivity, while deviations from the typical workload might not have as much of an effect on the rumination levels of individuals low on trait NA. This study has important implications for employees and organization managers, highlighting that not only is the general workload level in need of consideration, but that the daily fluctuation in workload affects employees as well.

Notes

1. We calculated the workload *SD* for each person and correlated it with trait NA (a between-person level correlation). The results revealed a small non-significant association ($r = .11$, $p = .22$), indicating that it is unlikely that higher variability in daily workload for those high in trait NA explains the obtained pattern of results.
2. We calculated the within-person correlation between morning negative emotions and subsequently measured workload that same day and found a significant positive correlation ($r = .13$, $p < .01$), in line with the referenced findings.
3. Nevertheless, we re-ran our model using only the female participants and the result pattern did not change, indicating it was not the male participants who are driving the results. Furthermore, gender was not significantly associated with any of the study's variables at the between-person level.

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