

## Long working hours and exhaustion: A test of rumination as a mediator among mobile-flexible employees in activity-based offices

### Largas jornadas de trabajo y agotamiento: una prueba de la rumiación como mediadora entre los trabajadores móviles-flexibles en oficinas basadas en la actividad

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#### Abstract

The present study examines the effect of extended working hours on experienced exhaustion in the evening in mobile-flexible employees who work in activity-based offices. In a seven-day diary study, we predicted that daily rumination is a mediator, linked to additional daily exhaustion in individuals. In a morning questionnaire, mobile-flexible employees completed daily questions about the link between extended work hours and exhaustion. Thirty-three employees completed daily questions on long working hours, rumination, and exhaustion. Multilevel analyses of up to 238 daily measurements revealed that more intense extension of working hours predicted more rumination as well as exhaustion. Extended work hours and rumination both predicted more exhaustion. A test of the indirect effects showed no mediation from long working hours via rumination to exhaustion. When designing mobile-flexible work models, overtime is a risk. Occupational prevention of exhaustion should promote recovery processes, especially as new work models may lead to increased rumination due to more personal responsibility of employees.

Keywords: activity-based working, mobile-flexible work, rumination, exhaustion

#### Resumen

El presente estudio examina el efecto de la ampliación de las horas de trabajo sobre el agotamiento experimentado por la tarde en empleados móviles-flexibles que trabajan en oficinas de actividad flexible. En un estudio de diario de siete días, se predijo que la rumiación diaria es un mediador, vinculado al agotamiento diario adicional en los individuos. En un cuestionario matutino, los empleados con flexibilidad de actividad completaron preguntas diarias sobre la relación entre las horas de trabajo prolongadas y el agotamiento. Treinta y tres empleados completaron preguntas diarias sobre la extensión de las horas de trabajo, la rumiación y el agotamiento. Los análisis multinivel de hasta 238 mediciones diarias revelaron que una extensión más intensa de las horas de trabajo predecía más rumiación, así como agotamiento. Tanto la prolongación de la jornada laboral como la rumiación predecían un mayor agotamiento. Una prueba de los efectos indirectos no mostró ninguna mediación desde la extensión de las horas de trabajo a través de la rumiación hasta el agotamiento. Cuando se diseñan modelos de trabajo móviles y flexibles, las horas extras son un riesgo. La prevención del agotamiento en el trabajo debería promover los procesos de recuperación, especialmente porque los nuevos modelos de trabajo pueden conducir a un aumento de la rumiación debido a una mayor responsabilidad personal de los empleados.

Palabras clave: trabajo basado en la actividad, trabajo móvil-flexible, rumiación, agotamiento

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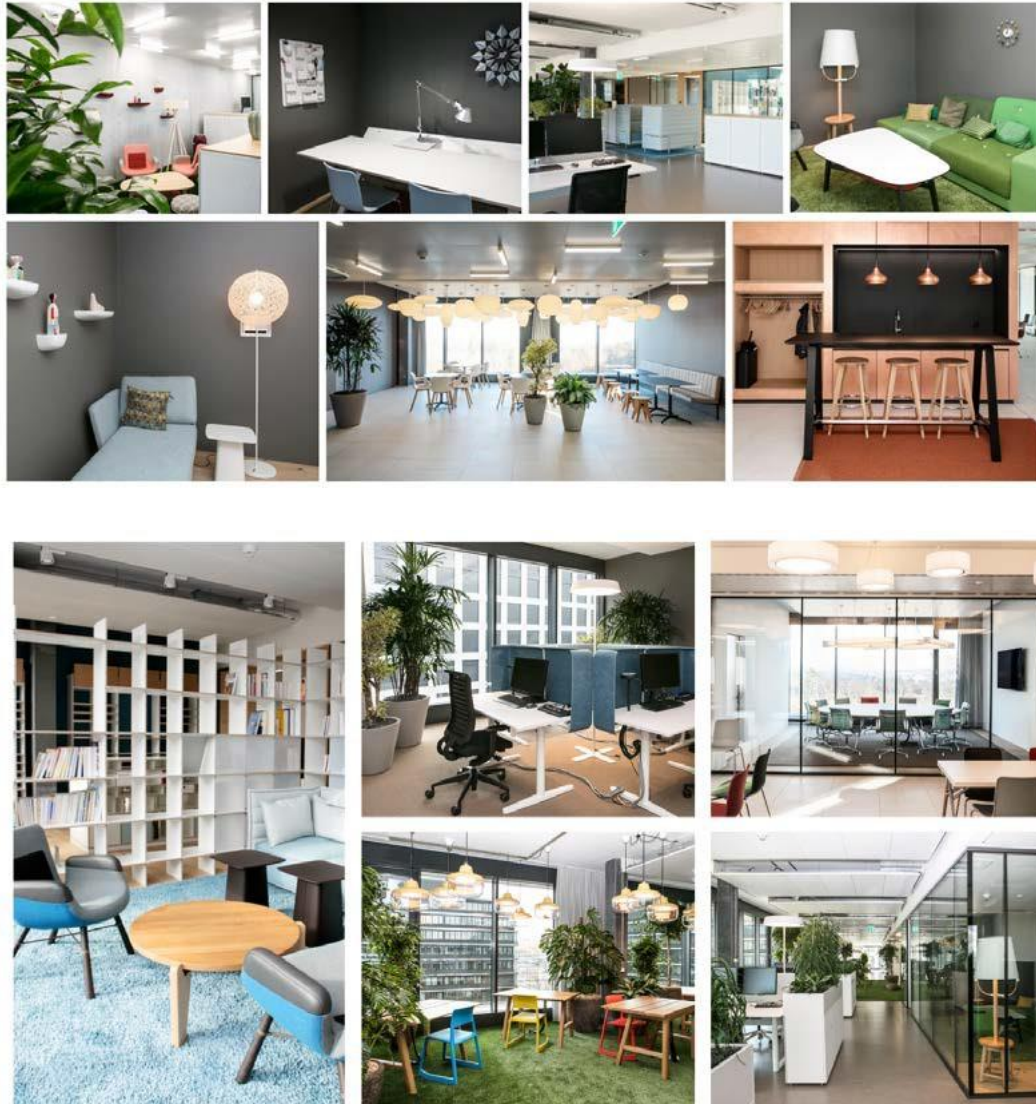


### Introduction

In recent decades, but certainly since COVID-19, the way employees work has changed, affecting the physical workspace environment. The number of organizations that have shifted from traditional cellular offices with personal desks to modern office designs with more open, shared, and flexible workplaces has increased (Appel-Meulenbroek et al., 2020; Engelen et al., 2019).

**Figure 1.**

Impression of an activity-based flexible office (A-FO) from the Health Promotion Switzerland.



At present, interest in the so-called activity-based flexible office (A-FO) concept is resurging (Haapakangas et al., 2019; Hodzic et al., 2021; van der Voordt, 2004). A-FOs are designed to offer a variety of work zones employees can choose from in accordance with their work activities and individual needs (Appel-Meulenbroek et al., 2020; Bergsten et al., 2021; Rolfö et al., 2018). However, allowing employees to select their workspaces freely also means that they must share desks (Appel-Meulenbroek et al., 2020; Rolfö et al., 2018). Engelen et al. (2019) consider A-FOs as a holistic approach uniting work activities, individual needs and technology. Figure 1 shows examples of what an A-FO looks like. The increased interest in A-FO designs, on the one hand, is directly linked to the growth of mobile-flexible employees, who can perform their jobs in a time-flexible and location-independent setting due to technological innovations (Haapakangas et al., 2019; Harris, 2016; Ojala & Pyoria, 2018) and, on the other hand, arises from changes in previous working models because of the COVID-19 pandemic. A trend toward increasing acceptance of mobile-flexible work arrangements is predicted (Rudolph et al., 2020; Sinclair et al., 2020). The current situation leads to a practical gap between traditional work environments and the reality of modern work. For that reason, companies need to reconsider the design of

the future office. Frequently mentioned advantages of A-FOs include their representation of a positive image of a modern organization for future employees and public marketing, providing more flexibility and ultimately generating lower financial costs due to mobile-flexible work arrangements (Ojala & Pyoria, 2018; Skogland, 2017; van der Voordt, 2004). In the literature to date, little is known about the health effects of mobile-flexible work arrangements in combination with the A-FO (Nielsen & Knardahl, 2020). This demonstrates the theoretical gap between presumed advantages of A-FOs and a lack of empirical knowledge about their actual effects on employees. The main focus in the area of activity-based working or open-plan offices has been on how acoustic and visual disturbances affect employees' well-being and satisfaction (Bodin Danielsson & Theorell, 2019; Colenberg et al., 2020). The systematic review from Engelen et al. (2019) shows limited evidence that A-FOs affect employees' perception of exhaustion or fatigue. Nielsen and Knardahl (2020) have shown that employees who worked in a shared and open-plan office had a significantly higher risk of having medically certified sickness absences compared to employees who worked in cellular offices. The most negative findings regarding health outcomes, such as perceived cognitive stress and exhaustion, have been found among employees in medium-sized and open-plan offices (Seddigh et al., 2014). These findings are also confirmed by the systematic review of Richardson et al. (2017). One of the latest systematic reviews from James et al. (2021) found that health outcomes included decreased overall health and increased perceived stress levels. The literature has also shown that exposure to open workplace design can result in short-term effects such as building-related illnesses and productivity loss (Bodin Danielsson & Theorell, 2019; Colenberg et al., 2020). Long-term effects are in correlation with mental health illnesses such as exhaustion that take longer to manifest (Bluyssen et al., 2011; Bodin Danielsson & Theorell, 2019; Nielsen & Knardahl, 2020).

Thus, more research is needed to improve the environmental design of future workspaces. This paper aims to investigate the impact of long working hours on exhaustion and rumination among mobile-flexible employees based in A-FOs.

### **Long working hours among mobile-flexible employees**

As mentioned above, for purposes of lowering costs, A-FOs are mostly combined with mobile-flexible working arrangements, which describes the new way of working (NWW). The NWW is characterized by (1) time and location flexibility, (2) job autonomy, and (3) the increased use of information and communication technologies (ICT) (Austin-Egole et al., 2020; Rafnsdóttir & Heijstra, 2013). A systematic review from Tavares (2017) concludes that working hours have extended into evenings, nights, and weekends, especially for employees in flexible working arrangements. Rafnsdóttir and Heijstra (2013) have also shown that while flexibility simplifies some aspects of working life, it also initiates a higher workload, triggering an extension of working hours and a higher demand for availability. Eurofound (2020) supported these findings confirming that flexible working arrangements are associated with increased workloads and extended working hours. Scholars (Demerouti et al., 2014; Derks & Bakker, 2010; Eurofound, 2020; Sonnentag, 2018) explain longer working hours among mobile-flexible employees as follows: Constant connectivity leads to more work interruptions with an increased volume of work and pressure to respond to demands as quickly as possible. The interruptions force workers to extend their working hours to finish the work they intended to complete within the normal workday.

### **Long working hours and exhaustion among mobile-flexible employees**

In a cross-sectional study, Buruck et al. (2020) show that increased workload is related to increased exhaustion in mobile-flexible employees. This finding is closely linked to Sonnentag's (2018) recovery paradox, which states that workers in stressful occupations are more likely to work during non-working time and be consistently available on their mobile devices (Bliese et al., 2017; Demerouti et al., 2014; Eurofound, 2020; Sonnentag, 2018). Such a working mode leads to the paradoxical combination of high need for recovery due to high job stressors with a low propensity to rest. According to the recovery paradox, the constant connection to technology and thereby to work leads to more frequent states of negative activation and a depletion of energy resources. Mobile availability and mobile device use during non-working time create a behavioral pathway that combines high occupational stressors with low psychological detachment from work. A sign of such low psychological detachment is frequent rumination about work issues. According to Sonnentag (2018), this state of high stress and low detachment hinders the recovery process and natural recharge of energy resources (Åkerstedt et al., 2002; Litwiller et al., 2017; Pereira et al., 2016), which in turn may lead to the increased experience of exhaustion.

Exhaustion is defined by Demerouti et al. (2003) as the result of intense physical, affective, and cognitive stress and is the long-term result of prolonged exposure to specific work demands (p.14). Several studies could show that quantitative job demands, such as high workload or time pressure,

are the strongest predictors of exhaustion (Bennett et al., 2018; Seidler et al., 2014; Sonnentag, 2018). Exhaustion can be explained by the job demands-resources (JD-R) model (Demerouti et al., 2001), that postulates that every working environment has its own risks and protective factors in terms of health and motivation. These factors can be categorized into job demands (e.g., time pressure) and job resources (e.g., support by work colleagues; Bakker & Demerouti, 2017; Demerouti et al., 2001). The JD-R model proposes two psychological processes. The first is the health impairment process, which begins with persistent work demands that can decrease employees' energy, leading to constant overwork and exhaustion (Bakker & Demerouti, 2017; Kattenbach et al., 2010). The second is the motivational process, which starts with the availability of job resources and is likely to lead to work engagement and positive outcomes, such as higher organizational commitment and enhanced job performance (Bakker & Demerouti, 2017; Demerouti et al., 2003; Kattenbach et al., 2010). As these two processes show, job demands are not primarily negative, but they can turn into job stressors when the satisfaction of the demands involves great efforts (physical and mental) from which employees are unable to recover sufficiently and, therefore, experience physiological and/or psychological consequences (Bakker & Demerouti, 2017; Demerouti et al., 2007; Meijman & Mulder, 1998).

### **Long working hours, exhaustion, and rumination among mobile-flexible employees**

The aforementioned studies point out that mobile-flexible employees are exposed to several work stressors such as long working hours, and that these may lead to rumination. Rumination is defined as repeatedly thinking about negative personal feelings and/or the effects, causes, and meanings of a negative mood (Kinnunen et al., 2017). Rumination involves cognitive and emotional processing, which is the process of actively thinking about a stressor, the thoughts and feelings it elicits, and its impact on one's life and future (Watkins, 2008). According to the perseverative cognition (PC) hypothesis, repeated thinking about a problem prolongs immediate psychological and physiological responses to life events and daily stressors (Watkins, 2008). As a result, the body activates its biological stress-response systems chronically, which can increase the likelihood of disease (Kinnunen et al., 2017; Watkins, 2008). The PC hypothesis explains why rumination is linked to exhaustion: The act of rumination does not allow for recovery during non-working time (Berset et al., 2011; Egli et al., 2021; Jimenez et al., 2021; Kinnunen et al., 2017; Nolen-Hoeksema et al., 2008; Weigelt et al., 2019). In the stressor-detachment model, Sonnentag and Fritz (2015) propose that harm to the organism is not mainly the acute stress response but rather the persistent activation, even when the stressor is no longer present (p. 75). Multiple studies suggest that constantly thinking about previously experienced negative events is detrimental to health (Clark et al., 2020; Fritz & Sonnentag, 2006; Watkins, 2008). Cross-sectional studies (Galliker et al., 2020; Vandevala et al., 2017; Zoupanou & Rydstedt, 2019) as well as diary studies (Cropley et al., 2006; Egli et al., 2021) have shown that rumination reactivates the emotional and physiological stress response. After-work rumination is associated with physical and mental health risks such as increased risks of cardiovascular diseases (Cropley et al., 2017), increased cortisol responses (Cropley et al., 2015; Rydstedt, 2009), sleep issues (Berset et al., 2011), and work-related fatigue (Querstret & Cropley, 2012). Kinnunen et al. (2019) showed in a three-wave longitudinal study that work-related rumination predicted exhaustion and Firoozabadi et al. (2018) confirmed these findings in a five-day diary study. Regarding the relationship between work demands and rumination, several studies found that work stressors combining high demands and low control are significantly associated with work-related rumination (Cropley and Millward Purvis, 2003; Cropley et al., 2006; Grebner et al., 2005). Additionally, Höge and Hornung (2013) showed that mobile-flexible work is related to increased rumination. Hence, the present study assumes work-related rumination to be, like exhaustion, an individual stress reaction among mobile-flexible employees toward work stressors, such as long working hours.

### **The Role of Rumination as a possible Mediator**

Another interesting question is whether the extension of previous day working hours directly affects mental health or whether rumination can act as a mediator. According to Verkuil et al. (2010), perseverative cognition like rumination or worry is an individual reaction to stressful situations. Brosschot et al. (2005) define the term perseverative cognition as the repeated or chronic activation of cognitive representations with stress-related content (p. 1045). Work-related perseverative cognition is defined as not being able to psychologically detach from work (Berset et al., 2011; Cropley et al., 2006). Interestingly, Gilboa and Revelle (1994) reported that even small negative everyday life events can activate perseverative cognition lasting up to 11 hours after the event. What does this finding mean with respect to mobile-flexible workers? Based on a systematic review by Tavares (2017), working hours of employees in flexible work models have extended to evenings, nights and weekends. Thus, it can be

assumed that mobile-flexible workers have less time for the recovery process. There may only be few, if any, hours between work and sleep and sleep itself, an important aspect of recovery, may be limited. Even in already very limited off-times, where the stressors are no longer present in the true sense, they may interfere with recovery in the form of work-related rumination. Donahue et al. (2012) show that rumination has mediated the effect of obsessive passion for work on exhaustion. The meta-analytical studies from Blanco-Encomienda et al. (2020) and Jimenez et al. (2021) demonstrate that rumination is positively related to exhaustion and can act as a mediator, especially when recovery is restricted during non-working time.

### Purpose of this Study

According to our current knowledge, there is a gap in the literature concerning how the extension of working hours and rumination are related to exhaustion among mobile-flexible workers based in A-FOs. The purpose of this study is to explore this research gap. Thus, we hypothesized—on a daily basis—that an extension in working hours is positively related to exhaustion in the evening (H1; long working hours → exhaustion) as well as to rumination after the end of work (H2; long working hours → rumination). Furthermore, we expected that rumination after work is positively related to exhaustion in the evening (H3; rumination → exhaustion). Finally, we assumed that rumination after work mediates the association between the long working hours and exhaustion in the evening (H4; long working hours → rumination → exhaustion).

## Method

### Sample and Procedure

The present longitudinal study selected only participants who had worked in an A-FO for one year or longer. Therefore, suitable A-FO organizations were directly contacted and asked to participate. Only those organizations in the German-speaking part of Switzerland that comprised the most important design elements of activity-related work, such as different zones (e.g., retreat, social, or quiet work) were contacted. All study participants provided informed consent and the study design was approved by the ethics committee of the University of Bern, Switzerland (Nr. 2010-08-00003). Only participants employed in Switzerland at a minimum of 40%, calculated on the basis of Swiss full-time employment, were included in the study. Originally, a total of 91 subjects were contacted and 57 of them participated by filling out the questionnaires, which corresponds to a response rate of 53%. For conclusive data, only participants who had completed more than three consecutive days of panel data were considered (Graham, 2009; Ohly et al., 2010), resulting in the exclusion of 5 participants. Three further participants were excluded due to an unrealistic questionnaire completion time (less than 4 minutes). The final analysis included 49 participants. The average number of questionnaires filled out by each participant was  $M = 4.53$ ,  $SD = 2.32$ .

The final sample included 17 (35%) male and 32 (65%) female participants. The average age was 36.8 years old, ranging between 20 to 59 years ( $SD = 10.93$ ). Participants were employed in different sectors including administration, public services, education, health and social services. Data collection took place between January and February 2020. Once participants completed the general online questionnaire, they entered the online diary study and filled in daily questionnaires from Monday to Sunday. The sample size at Level 1 varies for each variable (e.g., extended working hours, rumination, and exhaustion, daily hassles at home, social support at home) due to missing values. A well-known approach to deal with missing data is complete case or listwise deletion, where each case with missing data in any of the analyzed variables is removed from the analysis (Graham, 2009; Allison, 2003). Due to listwise deletion the sample size of Level 1 (day level) ranged from 227 to 238, and the sample size of Level 2 (person level) ranged from 33 to 38.

### Instruments

**Questionnaire:** Before collecting the diary measures, participants completed a general questionnaire assessing demographic and occupational background (Level 2 variables). Completion of the general questionnaire was obligatory before proceeding with the diary study.

**Diary Study:** A morning questionnaire was used for the data collection of Level 1 variables to measure changes in rumination and exhaustion and to record the long working hours. The morning questionnaire had to be completed on all workdays before work. The morning questions were related to the experience of the previous day's nonwork time.

**Daily long working hours.** The ratings on the extension of working hours were created based on the four-item subscale from the self-endangering work behavior questionnaire of Krause et al. (2015).



The questions were rated on a 5-point Likert scale, ranging from 1 (rarely/none) to 5 (frequently/constantly). The item was introduced by "To what extent do the following statements apply to you? Yesterday evening after work, I had ...". An example item is "Foregone sufficient sleep in favor of work." The internal consistency for the scale was ( $\alpha = 0.87$ ).

*Daily rumination.* Rumination was measured with the three-item scale by Mohr et al. (2006). The questions were rated on a 5-point Likert scale, ranging from 1 (rarely/none) to 5 (frequently/constantly). The item was introduced by "To what extent do the following statements apply to you? Yesterday evening, I had ...". An example item is "Difficulty relaxing after work." The Cronbach's alpha coefficient was ( $\alpha = 0.93$ ).

*Daily exhaustion.* In the morning questionnaire, exhaustion was measured with four items following a German version of the Oldenburg Burnout Inventory from Demerouti and Bakker (1999). The items of the exhaustion subscale refer to general feelings of emptiness, over-taxation from work, a strong need for rest, and a state of physical exhaustion (Demerouti et al., 2001; Demerouti et al., 2003). The questions were rated on a 4-point Likert scale, ranging from 1 (totally disagree) to 4 (totally agree). An example item is "Yesterday evening after work . . . I felt worn out and weary." The internal consistency for the exhaustion scale was ( $\alpha = 0.90$ ).

*Control variables.* Exhaustion has been suggested to differ depending on age and gender (Elfering et al., 2018); wherefore, these two variables were controlled to avoid influencing the statistical model.

Daily hassles at home have been linked to psychological distress (Elfering et al., 2021). To make sure that the relationship between long working hours and exhaustion was not influenced by daily hassles at home, we controlled for this variable. Daily hassles at home were measured daily (Level 1) every morning through one item: "Have you had any conflicts yesterday with the following people?" The five answer categories were "spouse," "children," "friend," "family member", and "other person."

Social support at home has shown evidence for decreasing workplace stress (Wang, 2018). Thus, we controlled social support at home. This control variable was assessed daily (Level 1) every morning with one item: "Did the following people help you yesterday with problems or concerns?" Five answer categories ("spouse," "children," "friend," "family member", and "other person") were given.

### Statistical Analysis

The statistical analysis was done using the software program R 4.0.2 (R Core Team, 2020). The linear and logistic regressions were analyzed to estimate the association between rumination and long working hours as a predictor variable and exhaustion as an outcome variable. The tests were two-tailed. For hypotheses testing, multilevel analysis was used. Multilevel data with repeated measurements is nested within individuals and leads to a two-level model with series of repeated measures at the day level (within persons;  $n = 227-238$ ) and individual persons at the person level (between persons;  $n = 33-38$ ). In this study, the day level is represented by Level 1 variables, whereas person-level variables represent Level 2. The sample size on Level 1 varied for different variables (i.e., long working hours, rumination, exhaustion, daily hassles at home, and social support at home), but the variation did not affect the multilevel analysis (Allison, 2003; Bell et al., 2018; Graham, 2009). The predictor on Level 1, long working hours, was group-mean centered, as was the mediator rumination. This allowed the effect of the variable to be interpreted in relation to its own mean across all days. The age variable on Level 2 was grand-mean centered. Gender and the outcome variable exhaustion remained uncentered. It is worth mentioning that participants' perceptions for each workday may have varied depending on what they experienced. Therefore, we controlled the Level 1 variables for the previous day's score (i.e., long working hours, rumination, exhaustion). For this purpose, the stability of the previous day's scores was calculated using means of autocorrelations for each day except for the first day of the diary study. For multilevel mediation testing, the Monte Carlo method was used. This method is recommended since it allows for multilevel indirect effect analyses and parametric bootstrapping and is suitable for producing more accurate results for small sample sizes (Selig & Preacher, 2008).

### Results

Table 1 displays the means, standard deviations, and correlations of the measures at the day level (Level 1).

**Table 1**  
Descriptive Statistic and correlations for the study variables.

Variables	<i>M</i>	<i>SD</i>	<i>N</i>	1	2	3	4	5	6	7
1. Sex <sup>a</sup>	.60	.49	238	1	-.16*	.18**	.35**	.46**	-.17**	-.21**
2. Age	36.84	11.45	238	-.16*	1	.24**	-.19**	-.30**	-.17*	.02
3. Long working hours	1.54	.57	227	.11	.21**	1	.49**	.22**	-.27**	.08
4. Rumination	1.87	.82	227	.26***	-.18*	.24**	1	.55**	-.43**	-.33**
5. Exhaustion	2.12	.64	227	.34***	-.23**	.18*	.40***	1	-.31**	-.45**
6. Social support at home	.77	.26	231	-.11	-.15*	-.24**	-.29***	-.12	1	.35**
7. Daily hassles at home	.92	.19	231	-.12	.11	-.05	-.22**	-.17**	.23**	1

Note. <sup>a</sup> 0 = female, 1 = male. <sup>b</sup> previous day.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ , two-tailed.

Lower triage = within-person correlations.

Upper triage = between-person correlations.

Table 2 displays an overview of all regression models. Note that the unstandardized coefficients are reported. Before hypotheses testing, the null model was calculated (see Model 1 in Table 2) to estimate the proportion of variance in exhaustion that is accounted for a day (Level 1) and person (Level 2) levels (Nezlek, 2001). The obtained intraclass correlation estimates of .35 for Level 2 and .28 for Level 1 variance indicate that 55% of the variance is within-person variance, implying that the use of multilevel modeling was adequate (Nezlek, 2001).

**Table 2**  
Fixed Effects Estimates and Standard Errors for the Predictor Models.

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Fixed Effects									
	Predictors of the output						Predictor of the mediator			
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Intercept	2.16***	.11	2.04***	.26	1.97***	.27	2.06***	.24	1.29***	.26
Level 1										
Daily hassles at home <sup>b</sup>			-.12	.22	-.13	.23	-.16	.21	.14	.22
Social support at home <sup>b</sup>			-.11	.13	.00	.14	-.10	.13	-.03	.14
Long working hours			.31***	.09			.30***	.09	.03*	.08
Exhaustion <sup>b</sup>			-.15	.09	-.17	.09	-.16	.09		
Rumination					.22**	.07	.15**	.07		
Level 2										
Age			-.01	.01	-.01	.01	-.01	.01	.01	.01
Sex <sup>a</sup>			.38*	.19	.42*	.20	.37*	.18	.20	.19

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ , two-tailed.

Note. N Level 2 = 33-38, N Level 1 = 227-238. Coeff. = Coefficient; SE = Standard Error.

<sup>a</sup> 0 = female, 1 = male.

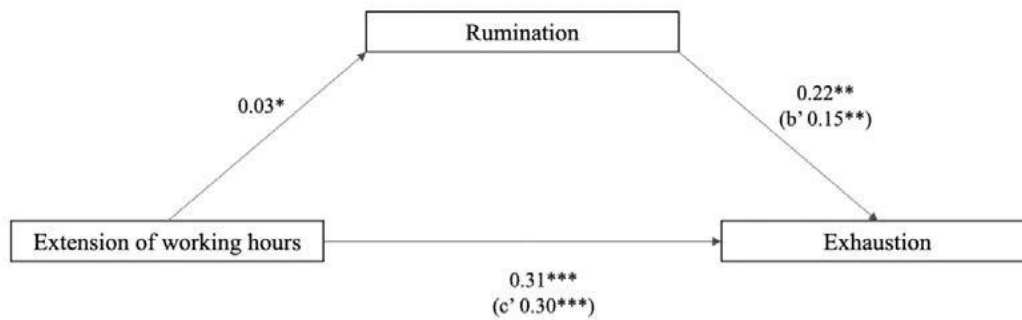
<sup>b</sup> of the previous day.

To test if long working hours were negatively related to exhaustion, the hypotheses were tested in four separate hypotheses-respective models. Model 1 was the null model, to which the predictors long working hours (Model 2) and rumination (Model 3) were added. Additionally, Model 5 tested if the predictor long working hours was positively related to rumination.

Long working hours had a positive effect on exhaustion ( $\gamma = .31$ ,  $p < .001$ ; see Model 2 in Table 2) and rumination ( $\gamma = .03$ ,  $p < .01$ ; see Model 5 in Table 2). Furthermore, it was found that rumination positively predicted exhaustion ( $\gamma = .22$ ,  $p < .01$ ; see Model 3 in Table 2). The relationship between rumination and exhaustion also remained significant when controlling for working hours ( $\gamma = .15$ ,  $p < .01$ ; see Model 4 in Table 2; Figure 2). Also, the effect of working hours on exhaustion remained significant when controlling for rumination ( $\gamma = .30$ ,  $p < .001$ ; see Model 4 in Table 2; Figure 2).

**Figure 2**

Mediation model: rumination mediating the effects of long working hours on exhaustion.



Note. Unstandardized Coefficients are reported.

Included control variables: daily hassles at home, social support at home, age, sex.

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ , two-tailed.

By means of a Monte Carlo simulation (Selig & Preacher, 2008), the multilevel mediation analysis was conducted with 20,000 bootstrap samples. In this study, we estimated a 95% bias-corrected confidence interval (CI). When using the bootstrapped CI procedure (lower limit of the CI [LL]; upper limit of the CI [UL]), the exclusion of zero from the CI for the indirect effect indicates mediation. If the bootstrapped CI does not include zero, then the mediating effect differs from zero (Preacher & Hayes, 2004). The distribution of the estimated 95% CI (LL = -0.07, UL = 0.09) includes zero. Thus, the indirect path can be considered insignificant (Selig & Preacher, 2008).

## Discussion

This study tested long working hours as a predictor of exhaustion among mobile-flexible employees based in A-FOs. Our aim was to understand the role of rumination as a mediator between long working hours and exhaustion. Accordingly, we hypothesized that long working hours are positively related to exhaustion (H1) as well as to rumination (H2). Furthermore, we expected that rumination is positively related to exhaustion (H3). Finally, we assumed that rumination mediates the association between long working hours and exhaustion (H4). Except for the last hypothesis, all other hypotheses could be confirmed. According to current knowledge, this study makes an important contribution to the field of work and organizational psychology. It fills the research gap with respect to employers' views of changes in work life and the findings contribute to employers' increasing interest in contextual factors of mobile work (Bundesvereinigung der Deutschen Arbeitgeberverbände, 2021). To the best of our knowledge, the impact of long working hours on exhaustion mediated through rumination has not been investigated regarding mobile-flexible employees based in A-FOs.

In line with our expectations, long working hours were found to have a positive association with employees' mental health. This finding reflects the theoretical propositions of the JD-R model (Demerouti et al., 2001), that postulates that every working environment has its own risks and protective factors in terms of health and motivation. In the present case, long working hours were perceived as a job demand and act as a stressor. Present findings can be explained with the health impairment process: it begins with persistent job demands such as long working hours that can decrease employees' energy, leading to constant overwork and exhaustion (Kattenbach et al., 2010). Job demands can turn into job stressors when the satisfaction of the demands involves great physical and mental efforts from which employees are unable to recover sufficiently and, as a result, experience physiological and/or psychological consequences (Bakker & Demerouti, 2017; Demerouti et al., 2007; Meijman & Mulder, 1998). The present results are in line with studies finding long working hours to be a predictor for exhaustion, particularly in mobile-flexible employees (Graf, 2018; Rafnsdóttir & Heijstra, 2013). Interestingly, the study of Buruck et al. (2020) highlights that workload had a significant positive relation to exhaustion but a negative relation to work flexibility. This finding could explain the mixed evidence in the literature regarding mobile-flexible working arrangements as well as the impact of A-FO designs on mental health (Bodin Danielsson & Theorell, 2019; Colenberg et al., 2020). Whereas work flexibility is perceived as a beneficial effect of the NWW, work overload is perceived as a job demand that, over time, can turn into a job stressor (Austin-Egole et al., 2020; Demerouti et al., 2014).

As expected, results also found the within-person daily long working hours to antecede employees' daily rumination behavior. Mobile-flexible employees especially were associated with work stressors



such as high workload, and this, in turn, predicts rumination (Höge & Hornung, 2013; Krause et al., 2015; Kvanne, 2007). These findings are significant, as they indicate possible interference with employees' recovery processes after post-stress events (Kinnunen et al., 2017; Sonnentag & Fritz, 2015).

The present study shows interference with employees' recovery processes in that rumination had a positive relationship to daily experienced exhaustion. This result can be explained by the PC hypothesis. The PC hypothesis emphasizes that employee rumination reactivates and prolongs stress responses, limiting the experience of recovery, therefore resulting in exhaustion (Watkins, 2008). Several studies have demonstrated the positive relationship between rumination and exhaustion (Berset et al., 2011; Egli et al., 2021; Jimenez et al., 2021; Kinnunen et al., 2017; Nolen-Hoeksema et al., 2008; Weigelt et al., 2019).

Contrary to our expectations, rumination did not mediate the relationship between extended working hours (work-related stressor) and exhaustion (individual stress-related response). Although rumination does not act as a mediator, the present paper shows that rumination acts as an independent predictor of daily experienced exhaustion among mobile-flexible employees based in A-FOs. How can the observed lack of mediation be explained? Sonnentag (2018) emphasized that not everyone reacts in the same way to work stressors; that is, stress responses vary between individuals. Several individual and job-related factors may moderate or mediate the relationship between work stressors and affective responses. Yet, they do not necessarily have to (Bennett et al., 2018; Lee & Brand, 2010). If we seek theoretical reasons for why rumination does not play a mediating role in the present study, we must consider the effect of different work demands and resources. Time and work pressure, role conflict and quantitative workload are well known to be work demands, as shown by the meta-analytical review of the JD-R model by Lesener et al. (2018). However, most employees can also rely on additional job resources, for example appreciation, performance feedback, social support and supervisor coaching (Schaufeli and Bakker, 2004). Several studies have shown a positive relationship between job resources and work engagement (Bakker & Demerouti, 2008; Bakker & Demerouti, 2017). Furthermore, literature has shown that work resources buffer the effect of job demands on work stress (Stocker et al., 2019). Another possible explanation for the non-significant mediation is provided by Verkuil et al. (2010): PC is a standard reaction to stressful events and can only be compensated for by psychological safety. It must be noted that the present sample consists of employees who have been working in A-FOs for at least one year. Thus, they may have already adapted and acquired psychological safety in relation to the stressors of their specific working environment (Verkuil et al., 2010). The duration it takes for a person to feel "safe" depends on how quickly the individual can assess the safety of the situation (LeDoux, 2000; Verkuil et al., 2010). Existing defensive reactions may continue for the long term or may be terminated after a new assessment process and acclimation period (LeDoux, 2000). The results found in present study show that although rumination does not mediate the relationship between long working hours and exhaustion, the stressor of long working hours predicts both individual stress responses—rumination and exhaustion—among mobile-flexible employees even after more than a year in A-FOs.

### **Advantages and Limitations of the Study**

Psychological responses are dependent on the situational context and are bound to daily fluctuations (Ohly et al., 2010). Thus, the main advantage of the present study is its longitudinal design. By using a diary design, we analyzed the interindividual daily variations (Ohly et al., 2010).

Although this study provided interesting findings, some limitations should be noted.

First, studies that use self-report measures are susceptible to common method bias (Podsakoff et al., 2003).

Second, if all variables in a study are based on one measurement method, significant results are likely to be tainted by common method variance (Donaldson & Grant-Vallone, 2002).

Third, a further disadvantage is that all included variables concern the evening of the last day, estimated the next morning. It would be advisable to measure the variables in a daily morning as well as a daily evening questionnaire (Donaldson & Grant-Vallone, 2002).

Furthermore, according to Maas and Hox (2004), for robust estimations of fixed effects in multilevel modeling, a sample of at least 50 at Level 2 is recommended. The present sample size at Level 2 ( $n = 33-38$ ) provides only limited statistical power for the required analyses. In this respect, we would like to mention that the original study was planned for a longer period with more subjects. The questionnaire period fell in the first lockdown declared by the state of Switzerland because of COVID-19. We waited for a year, but to date many of the study participants still work mainly from home and are very rarely, if at all, in the A-FOs.

### Future Research

Little research has been conducted on how job-related resources such as social support from supervisors or individual cognitive coping strategies influence mental health in mobile-flexible employees. For example, Bakker and van Wingerden (2021) showed that employees who use their imagination, fantasy, and humor to proactively reshape work tasks reported fewer depressive symptoms and fatigue as well as increased vitality. Consequently, Bakker and van Wingerden (2021) emphasized that self-determined behavior can be used to buffer the impact of negative thoughts and improve psychological and social resources. Interestingly, the JD-R model has recently been extended to include the role of personal resources assisting the individual in the balance of work demands and job-related resources (Demerouti & Nachreiner, 2018). We strongly suggest future research to examine mobile-flexible employees' individual coping strategies, such as playful work design (Bakker & van Wingerden, 2021) or mindfulness exercises (Bakker & Demerouti, 2017; Sonnentag, 2018).

Furthermore, we suggest examining the role of job-related resources such as appreciation by colleagues or supervisor support among mobile-flexible employees. Future research should investigate whether conclusions from present and previous findings on the relationship between job characteristics, job demands, and job resources need additions or modifications, as it must be assumed that new behavioral strategies or job demands have resulted of the COVID-19 pandemic.

### Practical Implications

The present results provide preliminary evidence that daily long working hours increase rumination and exhaustion among mobile-flexible employees in A-FOs. The results further suggest that daily rumination predicts exhaustion. What can we conclude from these relationships? The shift from traditional to mobile-flexible working arrangements in the NWW is not only reflected in modern flexible working arrangements, but also in novel office design concepts (Appel-Meulenbroek et al., 2020; Engelen et al., 2019; Rolfö et al., 2018). While A-FOs are being built in many places in Switzerland, it is crucial to consider the change in stressors associated with introducing new work environments and new forms of work into practice. Derks and Bakker (2010) describe the increased technical flexibility as a disproportionate burden that entails high pressure to respond to every request coupled with the feeling of constant accessibility. Additionally, several scientists (Costa et al., 2004; Demerouti et al., 2014; Kvande, 2007) argued that one reason why long working hours are likely to be a major stressor among mobile-flexible employees is the shift from external control and guidance to more self-control and self-management (Costa et al., 2004; Demerouti et al., 2014; Kvande, 2007). Costa et al. (2004) state that flexible working models increase demands on self-management and thus on coping strategies (Graf, 2018; Kattenbach et al., 2010; Krause et al., 2015). However, Derks and Bakker (2010) emphasized something very essential: The ongoing digitalization is neither a work demand nor a job resource in itself. Rather, it can become either work demand or resource through the way new working arrangements used by the individual. Therefore, to prevent negative effects of mobile-flexible work, employees should be given the chance to practice alternative coping mechanisms that support recovery processes, especially psychological detachment during non-working time (Sonnentag, 2018). When designing mobile-flexible work models, employers should be aware that mobile-flexible working arrangements involve a high level of self-regulation and the necessity of developing strategies to detach from work (Kvande, 2007). Because these skills cannot be taken for granted in every individual, they require the organizations' support and development (Bakker & Demerouti, 2017; Kniffin, 2021; Sonnentag, 2018). Moreover, psychological processes such as motivation, dependent on job resource availability, are likely to lead to increased work engagement and positive outcomes in terms of both work output and the employee's emotional state. The provision of sufficient job resources should always be considered when designing future flexible working models (Bakker & Demerouti, 2017).

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### Declaration

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*Conflict of interest.* On behalf of all authors, the corresponding author states that there is no conflict of interest.

*Availability of data and material.* The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

*Authors' contributions.* All authors contributed to the study's conception and design. Material preparation, data collection, and analysis were performed by [MSW]. The first draft of the manuscript was written by [MSW], and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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