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The role of work location in associations between need satisfaction and well-being at work: a daily diary design among Dutch office workers

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Abstract

Background After a quick rise of remote work during the COVID-19 pandemic, hybrid working (i.e., combining remote and on-site work locations) is becoming common post-pandemic. This study aimed to investigate to what extent daily work location (i.e., office, home, or hybrid - a combination within the same day) affects daily associations between psychological need satisfaction (i.e., relatedness satisfaction and autonomy satisfaction) and well-being of office workers (i.e., perceived stress and work pleasure).

Methods A daily diary study design with ecological momentary assessments (EMA) was used to investigate day-level relations between work location, need satisfaction, and employee well-being outcomes among 201 Dutch office workers. Measurements took place at the end of each working day (Mondays through Fridays) every month's first week for three consecutive months. In total, we collected 1,448 daily observations of 201 employees. Multilevel regression models were performed to examine the relationship between daily need satisfaction of relatedness and autonomy, and their association with both daily work pleasure and daily work stress. Additionally, we explored whether work location serves as a moderator in these relationships.

Results Employees reported higher relatedness satisfaction but less autonomy satisfaction on office or hybrid working days compared to home working days. Higher daily levels of relatedness and autonomy satisfaction were associated with increased work pleasure and reduced work stress. On office days, the positive relationship between relatedness satisfaction and work pleasure and the negative relationship between relatedness satisfaction and work stress were more pronounced than on home working days. In contrast, the positive relationship between autonomy satisfaction and work pleasure as well as its negative relationship with stress were consistent across work locations, showing no variation between office, home or combined settings.

Conclusions This study shows that daily work location may be an important factor to consider in the context of (enhancing) daily need satisfaction and daily employee well-being. Different work locations can contribute to daily

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need satisfaction and employee well-being in different ways. It seems particularly important that working in the office is organized in a way that employees are able to make meaningful connections with others.

Keywords Hybrid working, Work stress, Work pleasure, Need satisfaction, Relatedness, Autonomy, Diary study

Introduction

The COVID-19 pandemic has tremendously impacted ways of working for many employees worldwide. Specifically, it drastically increased the prevalence of employees working from home with the support of ICT (i.e., remote work). A report from Eurofound states that before the pandemic, 11% of European employees worked from home ‘sometimes’ or ‘usually,’ whereas this share increased to 22% in 2021 [1]. The same report shows that the most substantial increases in the prevalence of working from home were reported among highly educated white-collar workers and in larger businesses (i.e., 50+ employees). After the pandemic, the proportion of people working from home remained higher compared to pre-pandemic levels [2]. At the same time, relatively few employees are likely to work from home full-time [3]. Instead, hybrid working is becoming established in many post-pandemic workplaces. Hybrid working can be defined as working from home and on-site [4], sometimes called partial or part-time telework [1]. Whereas telework typically involves working remotely on a full-time or near-full-time basis, hybrid working involves a more balanced mix in which one’s work location can differ from day to day.

From a perspective of occupational well-being, an important yet unresolved inquiry pertains to the influence of hybrid working, characterized by alternating work locations, on employees’ daily well-being. To date, studies have primarily focused on the impact of telework rather than hybrid work on employee health and well-being and have yielded inconclusive results. A review study by Tavares [5] concludes that empirical evidence generally favors a positive association between telework and worker health and well-being but that there are also negative impacts, such as increased levels of stress and depression. More recent review studies from Lunde et al. [6] and Beckel and Fisher [7] conclude that evidence on the relationship between telework and employee health and well-being is scarce [6, 7]. Moreover, most of the studies included in these reviews focused on cross-sectional or longer-term, rather static associations between telework and employee outcomes. In the context of hybrid working, however, it is important to recognize that working conditions and employee outcomes may fluctuate from day to day due to frequent shifts in work locations. Studies that take into account such day-level dynamics are still lacking. Therefore, the current study uses a within-person daily diary study design to investigate how daily work location may affect daily well-being

of office workers. Such insights could provide practical guidelines for both employers and employees on how to engage in hybrid working from day to day while preserving or even enhancing employee well-being.

Daily work location, basic need satisfaction and employee well-being

To investigate the role of daily work location in daily employee well-being, we build on Ryan and Deci’s Self-Determination Theory [8]. This broad metatheory is a psychological framework that explores human motivation’s nature and the factors contributing to optimal functioning and well-being. It encompasses the basic psychological needs theory as one of its core components. This theory posits that individuals have an innate psychological need for relatedness, autonomy and competence, and that meeting these needs is essential for personal growth and well-being. Indeed, research shows that (daily) work-related basic need satisfaction (i.e., experiencing daily relatedness, autonomy, and competence satisfaction) relates positively to various indicators of (daily) employee well-being (e.g. work pleasure) and negatively to various indicators of (daily) employee ill-being outcomes (e.g., work stress) [9–13]. Moreover, based on their review of diary studies, Coxen et al. [11] concluded that different daily antecedents and outcomes seem to be associated with different daily needs, which calls for viewing the needs as distinct constructs rather than unidimensional.

When looking into the three different types of daily needs (i.e., relatedness, autonomy, and competence) and how they may relate to daily work location, first of all it seems plausible that *satisfaction of the need for relatedness* may differ depending on the specific work location. Relatedness is a psychological concept that encompasses feeling close and connected to others [14, 15] that can be elicited through experiencing satisfying social interactions [14, 16]. This can be a challenge when working from home, which is reflected in the common concern that teleworking poses a risk of social isolation [17, 18]. In contrast, a recent survey conducted among a diverse group of Dutch hybrid working employees reveals that an important motivation for employees to work at the office rather than at home was the opportunity for (more) face-to-face social interactions [19]. Such interactions are usually richer compared to the digitally driven interactions typically encountered in a work-from-home setup (e.g., e-mail, chat, video calls) in terms of, for instance, intonation, posture, and facial expression [20, 21]. As such,

working at the office generally facilitates more frequent and more satisfying social interactions than when working from home, which in turn may lead to experiencing higher levels of relatedness satisfaction on office days.

Secondly, daily *satisfaction of the need for autonomy* may also differ when comparing different work locations. Work-related autonomy refers to the subjective experience of having some degree of control over task-related decisions, planning work tasks, and choosing work methods [22]. When working from home, employees most likely have more discretion over the way or the timing in which they execute their working tasks compared to office days. Indeed, Müller and Niessen (2019) demonstrated with their daily diary study that employees reported higher levels of perceived autonomy on home working days compared to office working days [1, 23, 24].

Finally, in contrast to relatedness and autonomy satisfaction, there does not seem to be a rationale for expecting a link between work location and employees' sense of competence satisfaction (e.g. Schade, Digutsch, Kleinsorge, & Fan, 2021) [25]. In the present study, we therefore focus on the role of relatedness and autonomy satisfaction, while competence satisfaction is omitted.

Building upon these notions, we expect that a working day (partly) in the office may foster a higher level of relatedness satisfaction compared to a working day from home, which is reflected in Hypothesis 1a below (see also Fig. 1). Furthermore, we anticipate that a working day from home may cultivate a higher level of autonomy satisfaction compared to a working day (partly) in the office, as postulated in Hypothesis 1b (see also Fig. 1).

Next, we use daily work pleasure and daily work stress as indicators of employee well-being. This operationalization allows us to examine both potential well-being enhancing and ill-being mitigating effects of daily relatedness and autonomy satisfaction. In line with Ryan and Deci's (2000) Self-Determination Theory [19], we predict that both daily relatedness and autonomy satisfaction are positively related to daily work pleasure and negatively to daily work stress, which is reflected in Hypotheses 2a to 2d below (see also Fig. 1).

Hypothesis 1a: *Daily relatedness satisfaction is higher on office or hybrid working days than on home working days.*

Hypothesis 1b: *Daily autonomy satisfaction is lower on office or hybrid working days than on home working days.*

Hypothesis 2a and 2b: *Daily relatedness satisfaction is positively related to daily work pleasure (H2a) and negatively related to daily work stress (H2b)*

Hypothesis 2c and 2d: *Daily autonomy satisfaction is positively related to daily work pleasure (H2c) and negatively related to daily work stress (H2d)*

Potentially moderating role of daily work location

As previously mentioned, an important motivating factor for employees to work in the office seems to be the desire for face-to-face social interactions, whereas the desire for autonomy is a strong motivating factor for employees to work from home. A question that remains is what happens when relatedness satisfaction on an office day or autonomy satisfaction on a home workday is actually low. Although a solid ground for theory-driven specific hypotheses is lacking, it is conceivable that low relatedness satisfaction may have a more pronounced negative impact on well-being on an office or hybrid working day than on a home workday, due to unfulfilled expectations. In former studies, unmet (work-related) expectations have indeed been linked to undesirable work-related outcomes such as emotional exhaustion and turnover intentions (e.g., Proost, van Ruysseveldt, & van Dijke, 2011; Taris, Feij, & Capel, 2006) [26, 27]. With respect to the current study it could be that, in line with their motivation for choosing a specific work location, employees may be expecting a higher level of meaningful social interactions on an office or a hybrid working day than a home workday. In contrast, on a home workday, they may anticipate a certain level of autonomy, so a possible lack of it might have a more adverse effect on well-being. In other words, we are interested in exploring whether work location (i.e., office, home, or hybrid) *moderates* the relationships between daily relatedness and daily autonomy

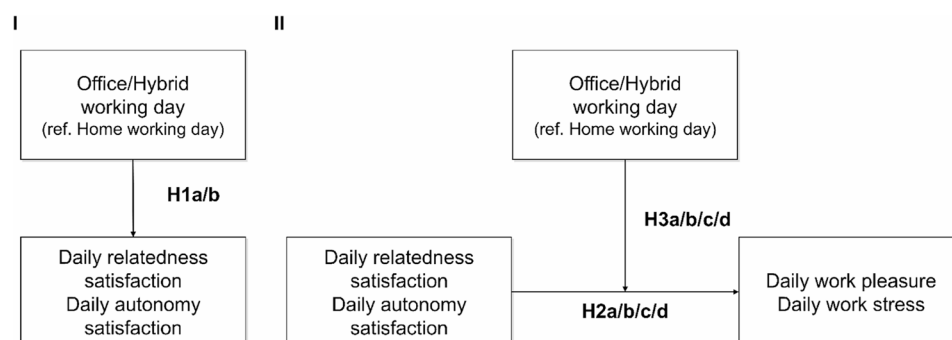


Fig. 1 Conceptual model. Note(s). Hypotheses indicated on the arrows

satisfaction on the one hand and daily well-being on the other. Our exploratory hypotheses are the following:

Hypothesis 3a and 3b: *The relationships of daily relatedness with daily work pleasure (H3a) and daily work stress (H3b) are stronger on office and hybrid working days compared to home working days.*

Hypothesis 3c and 3d: *The relationships of daily autonomy satisfaction with daily work pleasure (H3c) and daily work stress (H3d) are weaker on office and hybrid working days compared to home working days.*

In sum, in the current study, we will explore the role of employees' daily work location (i.e., home, office, or hybrid) in the relationship between daily relatedness and daily autonomy satisfaction on the one hand, and daily well-being (i.e., work pleasure and work stress) on the other (see Fig. 1). As such, the study will add to our understanding of daily intra-individual processes affecting hybrid workers' occupational well-being and may shed light on how to put hybrid working into practice on a daily basis while preserving or even enhancing employee well-being.

Data and methods

Study population and study design

Data was collected through a daily diary study design with ecological momentary assessments (EMA) to investigate day-level (i.e., within-person) relations between work location, need satisfaction, and employee well-being outcomes. EMA stands out from other data collection methods by collecting real-time momentary data, minimizing recall bias, and capturing dynamic processes in real-world contexts [28, 29].

All employees of a multidisciplinary research organization with multiple locations across the Netherlands, spanning disciplines such as engineering, social sciences, and applied sciences, and consisting primarily of highly educated white-collar workers engaged in computer or laboratory work, were invited to participate in the study via corporate email and the companies' intranet page. The selection process was impartial, with no influence from the researchers and no specific requirements regarding variation in work location. After asking for their informed consent, participants were instructed to download and use a smartphone-based EMA application to record various indicators, including participants' daily work stress and work pleasure, during working days (Monday to Friday) in the first week of each month over a three-month period (April to June 2022). Participants completed the daily questionnaire at the end of each working day and could set their preferred notification time on their smartphone, with 16:00 h as the default reminder. In total, we collected 1,448 daily observations.

After enrolment, participants were asked to complete a baseline questionnaire to obtain demographic information, including age, sex, and job tenure. For the daily questionnaires, respondents received daily reminder notifications on their phones via the app at pre-set times of preference per working day. The first question of this daily questionnaire asked respondents whether they worked that day. If not, the questionnaire ended immediately. If yes, the questionnaire continued with several questions about their work location(s) and, how they perceived their working day, and their current state of well-being.

Measures

Daily measures on work location, relatedness satisfaction, autonomy satisfaction, perceived stress, and work pleasure were included. We used single-item measurements to reduce the risk of response loss and minimize the efforts asked of participants, which is particularly high in the case of intensive longitudinal (EMA) study designs with repeated daily measurements such as the current one. Literature indicates that in this kind of study designs, the use of single items is appropriate when constructs are concrete and singular enough for the participants to rate without confusion [30–32].

For the daily *work location*, participants were asked whether they worked from home, at the office, at clients' offices, or elsewhere that day (e.g., a coffee bar or the house of a friend or family). A multiple answer question was used, as participants could have worked at multiple locations within a day. A categorical variable with three categories was constructed to distinguish office working days, home working days, and hybrid working days. If participants indicated they worked either at the office or at a clients' office, we considered it as an office working day due to the increased chance of having face-to-face interactions with colleagues or other people in the work context. Likewise, if participants indicated they worked solely at home or any other unspecified location, we considered it a home working day. A hybrid working day was considered as such when people worked both at the office or a clients' office and from home or any other unspecified location within the same day.

Daily relatedness satisfaction and *daily autonomy satisfaction* were measured with two items from the Work-Related Basic Need Satisfaction Scale [33]. Wordings of the items were slightly changed to make them applicable for day-to-day measurement ("Today I felt connected to other people at my work" and "Today I felt free to do my job the way I think is right"). The items were scored using a 10-point scale, where (1) stood for totally disagree and (10) totally agree.

Daily work stress was measured using the following single-item stress question (SISQ) [34]: "Stress is a state

in which a person feels tense, restless, nervous or anxious. Have you experienced this kind of stress today?" Response scales ranged from (1) "not at all" to (10) "very much".

Daily work pleasure was assessed with one item ("I enjoyed working today") based on a subscale of the Work-Related Flow Inventory (WOLF) [35]. The item was scored on a ten-point scale where the value of (1) represented not at all and (10) very much.

Statistical analyses

We performed multilevel regression modeling using R's lme4 package [36] to account for the hierarchical data structure. Random intercepts were specified for both individuals—to capture variability between respondents—and measurement occasions—to capture day-to-day variability. Residual variance accounted for the error at the intersection of these levels. This approach allowed us to investigate the associations between daily work location (i.e., office, hybrid, and home), relatedness satisfaction, autonomy satisfaction, work pleasure, and work stress, while systematically testing the study's hypotheses and exploring potential moderating effects of work location.

The first set of models focused on testing Hypotheses 1a and 1b, which addressed the associations between daily work location and relatedness and autonomy satisfaction. The primary predictor was daily work location, coded as a categorical variable (i.e., 1 = hybrid, 2 = office, and 0 = home). Control variables, including sex, job tenure and job type. Job type is categorized based on the primary work activity, distinguishing between laboratory and computer-based roles, with the latter as the reference category. These control variables were included to account for individual demographic and occupational differences, while age was excluded due to multicollinearity with job tenure. These models tested whether office and hybrid working days were associated with higher levels of daily relatedness satisfaction and lower levels of autonomy satisfaction compared to working-from-home days.

The second set of models examined Hypotheses 2a through 2d, exploring the relationships between daily relatedness or autonomy satisfaction and daily work pleasure and stress. Specifically, we tested whether relatedness satisfaction was associated with higher work pleasure (Hypothesis 2a) and lower work stress (Hypothesis 2b) and whether autonomy satisfaction was positively associated with work pleasure (Hypothesis 2c) and negatively associated with work stress (Hypothesis 2d). Relatedness and autonomy satisfaction were the primary predictors, and all models included sex, job tenure and job type as control variables, consistent with the first set of analyses.

Finally, exploratory analyses included interaction terms to test whether the relationships between daily relatedness or autonomy satisfaction and work pleasure and stress varied by work location. That is, we tested whether the strength or the direction of the relation between relatedness satisfaction and work pleasure or stress differed between office, hybrid, and home working days by including an interaction term between relatedness satisfaction and work location. Similarly, we added an interaction term between autonomy satisfaction and work location to examine whether the strength or direction of the associations between autonomy satisfaction and these outcomes depended on the work location. These models also controlled for sex, job tenure, and job type to ensure consistency across all analyses.

Results

Characteristics of the study population

The sample comprised of 46.0% men, 52.5% women, and 1.5% unknown. The respondents had an average age of 45.6 years ($SD=10.8$). Respondents had different organizational tenures: less than 2 years (14.4%), 2–5 years (21.3%); 5–10 years (12.4%); 10–20 years (24.3%); more than 20 years (26.7%); and unknown (1.0%). With regard to household situation, 14.9% lived independently, 29.7% lived together with partner, 47.0% lived together with partner and children, 2.5% lived together with children, 4.5% lived together with other adults, 1.5% lived with their parents, 1.0% reported a different household situation (see Table 1).

When examining employees' home working, office working, and hybrid working behaviors between April and June 2022, clear shifts emerge in response to the easing of COVID-19 measures in the Netherlands. With the government lifting the formal advice to work from home, hybrid working on working day level gained traction initially, though it became less common by June. Office working, while still the most prevalent, gradually declined over the period, while home working peaked in May before decreasing again in June. These trends highlight the gradual adjustment to more flexible working arrangements in the post-pandemic era.

Control variable relationships with daily relatedness/ autonomy satisfaction and daily work pleasure/stress

Initial models including only control variables were fitted on daily relatedness satisfaction, daily autonomy satisfaction, work pleasure, and work stress (see Table A.2 in the Supplementary Material). The model that assessed the relationship between work location and daily relatedness satisfaction showed positive significant estimates for females ($\beta=0.11$, $p<0.05$) compared to males, while those with 2–5 years of tenure ($\beta = -0.16$, $p<0.05$) and unknown tenure ($\beta = -0.10$, $p<0.05$) reported lower

Table 1 Descriptive statistics by work location and month of measurement

	April				May				June				Total			
	Hybrid working day	Office working day	Home working day	(N = 197)	Hybrid working day	Office working day	Home working day	(N = 197)	Hybrid working day	Office working day	Home working day	(N = 197)	Hybrid working day	Office working day	Home working day	(N = 197)
<i>Means</i>	(N = 41)	(N = 197)	(N = 197)		(N = 50)	(N = 187)	(N = 280)		(N = 33)	(N = 138)	(N = 175)		(N = 124)	(N = 506)	(N = 818)	
Daily perceived stress	4.15 (2.28)	3.97 (2.18)	3.78 (2.37)		4.06 (2.26)	4.18 (2.14)	3.69 (2.15)		4.27 (2.36)	4.09 (2.12)	3.80 (2.28)		4.15 (2.28)	4.08 (2.14)	3.75 (2.27)	
Daily work pleasure	7.34 (1.53)	7.41 (1.78)	7.21 (1.96)		7.46 (1.84)	7.43 (1.93)	7.26 (1.78)		7.52 (2.00)	7.21 (2.02)	7.31 (2.12)		7.44 (1.78)	7.36 (1.89)	7.25 (1.94)	
Daily relatedness satisfaction	7.05 (2.01)	7.93 (1.67)	6.88 (2.09)		8.02 (1.73)	7.72 (1.74)	6.85 (2.14)		7.64 (2.42)	7.75 (1.71)	6.78 (2.27)		7.60 (2.05)	7.81 (1.70)	6.85 (2.14)	
Daily autonomy satisfaction	7.10 (1.76)	7.50 (1.79)	7.93 (1.71)		7.42 (1.93)	7.45 (1.73)	7.89 (1.69)		7.67 (1.59)	7.36 (1.88)	7.70 (1.96)		7.38 (1.79)	7.44 (1.79)	7.87 (1.76)	
<i>Frequencies</i>																
<i>Sex</i>																
Male	17 (41.5%)	79 (40.1%)	171 (47.1%)		22 (44.0%)	72 (42.1%)	138 (49.3%)		19 (57.6%)	63 (45.7%)	77 (44.0%)		58 (46.8%)	214 (42.3%)	386 (47.2%)	
Female	23 (56.1%)	113 (57.4%)	186 (51.2%)		27 (54.0%)	97 (56.7%)	139 (49.6%)		13 (39.4%)	74 (53.6%)	92 (52.6%)		63 (50.8%)	284 (56.1%)	417 (51.0%)	
Other	1 (2.4%)	5 (2.5%)	6 (1.7%)		1 (2.0%)	2 (1.2%)	3 (1.1%)		1 (3.0%)	1 (0.7%)	6 (3.4%)		3 (2.4%)	8 (1.6%)	15 (1.8%)	
<i>Job tenure</i>																
< 2 years	3 (7.3%)	31 (15.7%)	54 (14.9%)		6 (12.0%)	28 (16.4%)	41 (14.6%)		8 (24.2%)	18 (13.0%)	23 (13.1%)		17 (13.7%)	77 (15.2%)	118 (14.4%)	
2–5 years	4 (9.8%)	35 (17.8%)	81 (22.3%)		14 (28.0%)	37 (21.6%)	38 (13.6%)		2 (6.1%)	24 (17.4%)	42 (24.0%)		20 (16.1%)	96 (19.0%)	161 (19.7%)	
5–10 years	8 (19.5%)	31 (15.7%)	49 (13.5%)		3 (6.0%)	26 (15.2%)	39 (13.9%)		2 (6.1%)	26 (18.8%)	18 (10.3%)		13 (10.5%)	83 (16.4%)	106 (13.0%)	
10–20 years	13 (31.7%)	42 (21.3%)	79 (21.8%)		10 (20.0%)	35 (20.5%)	60 (21.4%)		13 (39.4%)	30 (21.7%)	38 (21.7%)		36 (29.0%)	107 (21.1%)	177 (21.6%)	
20 years or longer	13 (31.7%)	58 (29.4%)	94 (25.9%)		17 (34.0%)	45 (26.3%)	97 (34.6%)		8 (24.2%)	40 (29.0%)	54 (30.9%)		38 (30.6%)	143 (28.3%)	245 (30.0%)	
Tenure unknown	0 (0%)	0 (0%)	6 (1.7%)		0 (0%)	0 (0%)	5 (1.8%)		0 (0%)	0 (0%)	0 (0%)		0 (0%)	0 (0%)	11 (1.3%)	
<i>Job type</i>																
Computer work	37 (90.2%)	176 (89.3%)	349 (96.1%)		44 (88.0%)	142 (83.0%)	276 (98.6%)		30 (90.9%)	127 (92.0%)	164 (93.7%)		111 (89.5%)	445 (87.9%)	789 (96.5%)	
Laboratory work	4 (9.8%)	21 (10.7%)	14 (3.9%)		6 (12.0%)	29 (17.0%)	4 (1.4%)		3 (9.1%)	11 (8.0%)	11 (6.3%)		13 (10.5%)	61 (12.1%)	29 (3.5%)	
<i>Household position</i>																
Living independently	4 (9.8%)	32 (16.2%)	57 (15.7%)		7 (14.0%)	29 (17.0%)	40 (14.3%)		6 (18.2%)	16 (11.6%)	29 (16.6%)		17 (13.7%)	77 (15.2%)	126 (15.4%)	
Living with partner	10 (24.4%)	59 (29.9%)	104 (28.7%)		11 (22.0%)	51 (29.8%)	88 (31.4%)		6 (18.2%)	49 (35.5%)	54 (30.9%)		27 (21.8%)	159 (31.4%)	246 (30.1%)	
Living with partner and children	24 (58.5%)	90 (45.7%)	171 (47.1%)		28 (56.0%)	76 (44.4%)	128 (45.7%)		17 (51.5%)	63 (45.7%)	77 (44.0%)		69 (55.6%)	229 (45.3%)	376 (46.0%)	
Living with children	0 (0%)	1 (0.5%)	12 (3.3%)		0 (0%)	5 (2.9%)	6 (2.1%)		0 (0%)	2 (1.4%)	2 (1.1%)		0 (0%)	8 (1.6%)	20 (2.4%)	
Living with others adults	3 (7.3%)	15 (7.6%)	14 (3.9%)		4 (8.0%)	8 (4.7%)	11 (3.9%)		1 (3.0%)	7 (5.1%)	8 (4.6%)		8 (6.5%)	30 (5.9%)	33 (4.0%)	
Living with parents	0 (0%)	0 (0%)	0 (0%)		0 (0%)	2 (1.2%)	2 (0.7%)		1 (3.0%)	1 (0.7%)	2 (1.1%)		1 (0.8%)	3 (0.6%)	4 (0.5%)	
Other household position	0 (0%)	0 (0%)	5 (1.4%)		0 (0%)	0 (0%)	5 (1.8%)		2 (6.1%)	0 (0%)	3 (1.7%)		2 (1.6%)	0 (0%)	13 (1.6%)	

Standard deviations or percentages in parentheses. See Table A.1 in the Supplementary Material for the means, standard deviations, and both between-person and within-person correlations for the study variables

relatedness compared to those with less than 2 years of tenure. In the model assessing daily autonomy satisfaction, laboratory work ($\beta = -0.12, p < 0.05$) was negatively related to daily autonomy satisfaction compared to computer work. No significant estimates were found for control variables in the daily relatedness satisfaction–work pleasure model. Lastly, laboratory work ($\beta = 0.12, p < 0.05$) was positively related to daily work stress, while employees with 5–10 years of tenure reported lower stress ($\beta = -0.14, p < 0.05$).

The relationship between work location and daily relatedness/autonomy satisfaction

Table 2 shows that work location, treated as a categorical variable, is significantly associated with daily relatedness satisfaction. Specifically, office working days ($\beta = 0.62, p < 0.001$) and hybrid working days ($\beta = 0.41, p < 0.001$) are both positively associated with daily relatedness satisfaction, compared to home working days.

In addition, office working days ($\beta = -0.13, p < 0.05$) and hybrid working days ($\beta = -0.19, p < 0.05$), are negatively related to daily autonomy satisfaction compared to working days from home. These findings support both Hypotheses 1a and 1b. In other words, people feel a stronger sense of relatedness satisfaction when they work (partly) at the office and they experience more autonomy satisfaction when they work from home.

The relationship between daily relatedness satisfaction and daily work pleasure/daily work stress

Table 3 shows that daily relatedness satisfaction, irrespective of work location, has a positive relationship with daily pleasure in work ($\beta = 0.55, p < 0.001$), indicating that

a stronger sense of relatedness satisfaction is associated with larger daily work pleasure. This finding supports Hypothesis 2a. In simpler terms, when people's need for relatedness is more satisfied during their workday, they enjoy their work more.

A higher relatedness satisfaction during the workday, irrespective of work location, leads to lower perceived stress ($\beta = -0.21, p < 0.001$). This finding suggests that increased daily relatedness satisfaction is linked to reduced daily work stress among employees and confirms Hypothesis 2b. Put another way, when people's need for relatedness is more satisfied during their workday, they experience less daily work stress.

The relationship between daily autonomy satisfaction and daily work pleasure/daily work stress

For Hypothesis 2c, we found a significant positive relationship between daily autonomy satisfaction and daily work pleasure ($\beta = 0.45, p < 0.001$), indicating that higher daily autonomy satisfaction enhances daily work pleasure (see Table 3). This finding confirms Hypothesis 2c. In other words, perceiving more autonomy satisfaction during the day enhances employees' daily work pleasure, irrespective of the work location.

Further in Table 3, testing Hypothesis 2d, we found a negative relationship between daily autonomy satisfaction and daily work stress ($\beta = -0.34, p < 0.001$), indicating that higher daily autonomy satisfaction decreases daily work stress irrespective of the work location. This finding confirms Hypothesis 2d. In simpler words, perceiving more satisfaction of the need for autonomy during the work day is associated with lower daily stress levels.

Table 2 The relationship between work location and relatedness/autonomy satisfaction

Predictors	Daily relatedness satisfaction (1)	Daily Autonomy satisfaction (2)
	β	β
Intercept	−0.30*** (0.06)	0.07 (0.07)
Hybrid working day (ref. Home working day)	0.41*** (0.07)	−0.19* (0.08)
Office working day	0.62*** (0.05)	−0.13* (0.05)
Random Effects		
σ^2	2.11	1.90
τ_{00}	1.93 Individual	1.22 Individual
	0.01 Weekdays	0.03 Weekdays
ICC	0.48	0.40
N	201 Individual	201 Individual
	5 Weekdays	5 Weekdays
Observations	1,448	1,448
Marginal R2/Conditional R2	0.114/0.539	0.034/0.417

Estimates are controlled for sex, job tenure, and job type. Standard errors in parentheses. The regression tables with the control variable estimates can be found in the Supplementary Material's Table A.3

*** $p < 0.001$

** $p < 0.01$

* $p < 0.05$

Table 3 The relationship between relatedness/autonomy satisfaction on work pleasure/work stress

	Daily work pleasure		Daily work stress	
	(1)	(2)	(3)	(4)
Predictors	β	β	β	β
Intercept	−0.04*** (0.04)	−0.04*** (0.05)	−0.00*** (0.07)	0.01 (0.05)
Daily relatedness satisfaction	0.55*** (0.02)		−0.21*** (0.02)	
Daily autonomy satisfaction		0.45*** (0.02)		−0.34*** (0.02)
Random Effects				
σ^2	1.69	1.82	2.09	1.91
τ_{00}	0.51 Individual	0.80 Individual	2.215 Individual	1.93 Individual
	0.01 Weekdays	0.00 Weekdays	0.06 Weekdays	0.01 Weekdays
ICC	0.24	0.31	0.51	0.51
N	201 Individual	201 Individual	201 Individual	201 Individual
	5 Weekdays	5 Weekdays	5 Weekdays	5 Weekdays
Observations	1,448	1,448	1,448	1,448
Marginal R ² /Conditional R ²	0.344/0.500	0.238/0.471	0.114/0.569	0.187/0.596

Estimates are controlled for sex, job tenure, and job type. Standard errors in parentheses. The regression tables with the control variable estimates can be found in the Supplementary Material's Table A.3

*** $p < 0.05$

** $p < 0.001$

* $p < 0.01$

The moderation of work location on the relationship between daily relatedness satisfaction and daily work pleasure and daily work stress

We begin by exploring the moderation of work location on the relationship between relatedness satisfaction, work pleasure, and work stress all at day level. Table 4 shows a positive relationship between daily relatedness satisfaction and the daily pleasure in work ($\beta = 0.55$, $p < 0.001$). Office working days ($\beta = 0.13$, $p < 0.01$), compared to working days from home, moderate the relationship between daily relatedness satisfaction and daily pleasure in work. This finding suggests that the relationship between daily relatedness satisfaction and daily pleasure in work varied depending on work location, with a stronger relationship for office working days than for working days from home.

Furthermore, we observed a moderation where the office working days ($\beta = -0.11$, $p < 0.05$) strengthen the negative relationship between daily relatedness satisfaction and daily work stress. In other words, the relationship between daily relatedness satisfaction and daily work stress is stronger for days employees work at the office than days when they work from home.

Figure 2 shows this moderation of work location on the relationship between daily relatedness satisfaction on daily work pleasure and daily work stress. For the relationship between daily relatedness satisfaction and daily work pleasure, Fig. 2A clarifies that there is a steeper upward slope for working days at the office compared to working days from home. Thus, moderation suggests that the positive relationship between relatedness satisfaction and daily work pleasure is stronger for working days at the office than on working days from home. Regarding

Fig. 2B, the moderation suggests that the negative relationship between relatedness satisfaction and perceived stress is stronger on office working days than on working from home. Figure 3A and B depict the moderation of work location on the relationship between daily relatedness satisfaction and daily work pleasure/daily work stress.

The moderation of work location on the relationship between daily autonomy satisfaction and daily work pleasure and daily work stress

We proceed with our exploratory analyses, examining how the work location potentially moderates the relationship between daily autonomy satisfaction and daily work pleasure and daily work stress. Table 4 further presents the standardized coefficients for daily work pleasure and daily work stress involving their association with daily autonomy and the proposed moderation of work location.

Even though working days from home are positively related to daily autonomy satisfaction, we found no empirical evidence supporting the idea that work location moderates the relationship between daily autonomy satisfaction and either daily work pleasure or daily work stress levels. Thus, these findings imply that Hypotheses 3c and 3d need to be rejected—hence no moderation plot has been drawn. Figure 4A and B illustrate the (lack of) moderation of work location on the relationship between daily autonomy and daily work pleasure/daily work stress.

Table 4 The moderation of work location on the relationship between relatedness/autonomy satisfaction and work pleasure/work stress

Predictors	Daily work pleasure		Daily work stress	
	(1)	(2)	(3)	(4)
	β	β	β	β
Intercept	0.06 (0.04)	−0.13** (0.04)	0.08 (0.07)	0.01 (0.06)
Hybrid working day (ref. Home working day)	−0.06 (0.07)	0.24** (0.07)	0.14* (0.07)	−0.02 (0.07)
Office working day	−0.21*** (0.05)	0.23*** (0.07)	0.23*** (0.05)	0.03 (0.04)
Daily relatedness satisfaction	0.55*** (0.03)		−0.21*** (0.03)	
Daily relatedness satisfaction x				
Hybrid working day (ref. Home working day)	−0.05 (0.07)		−0.07 (0.07)	
Office working day	0.13** (0.05)		−0.11* (0.05)	
Daily autonomy satisfaction		0.47*** (0.04)		−0.35*** (0.03)
Daily autonomy satisfaction x				
Hybrid working day (ref. Home working day)		−0.01 (0.04)		−0.03 (0.062)
Office working day		−0.05 (0.08)		0.04 (0.04)
Random Effects				
σ^2	1.68	1.78	2.05	1.91
τ_{00}	0.47 Individual	0.81 Individual	2.15 Individual	1.93 Individual
	0.01 Weekdays	0.00 Weekdays	0.05 Weekdays	0.01 Weekdays
ICC	0.22	0.31	0.52	0.51
N	201 Individual	201 Individual	201 Individual	201 Individual
	5 Weekdays	5 Weekdays	5 Weekdays	5 Weekdays
Observations	1,448	1,448	1,448	1,448
Marginal R ² /Conditional R ²	0.365/0.505	0.249/0.484	0.131/0.580	0.188/0.598

Estimates are controlled for sex, job tenure, and job type. Standard errors in parentheses. For the interaction terms between work relation and relatedness, relatedness has been centered on its mean for a better interpretation of the moderation. The regression tables with the control variable estimates can be found in the Supplementary Material's Table A.3

*** $p < 0.001$

** $p < 0.01$

* $p < 0.05$

Discussion

The current study explored the role of daily work location in relation to daily need satisfaction and daily employee well-being outcomes. First, in line with Hypotheses 1a and 1b, the findings indicate that, compared to home working days, participants reported higher levels of relatedness satisfaction but lower levels of autonomy satisfaction on office and hybrid working days. The analyses further revealed that on days that participants experienced higher levels of relatedness satisfaction, they generally experienced higher levels of work pleasure and lower stress levels. Similarly, daily autonomy satisfaction was found to be positively related to daily work pleasure and negatively to daily work stress. These findings provide support for Hypotheses 2a, 2b, 2c and 2d. We also exploratively examined whether the relationships between relatedness and autonomy satisfaction on the one hand and daily work pleasure and perceived stress on the other are moderated by work location. Partly in line with our exploratory Hypotheses 3a and 3b, we found that associations between relatedness satisfaction on the one hand, and work pleasure and work stress on the other were stronger on office working days compared to

home working days. Finally, we did not find any moderating effects for work location on the relationship between autonomy satisfaction on the one hand and work pleasure and work stress on the other. As such, Hypotheses 3c and 3d were not supported by the results.

With regard to employees' need for relatedness, results indicate that this need may be more easily satisfied on days that employees work (partly) at the office than at home. A potential risk, however, is that experiencing low levels of relatedness satisfaction also seems more detrimental for employee well-being when working a full day at the office compared to home. A possible explanation for this moderating effect of work location, as we argued in the introduction section, is that employees may go to the office with the particular motivation and expectation that they will experience more meaningful social interactions than when working from home. Moreover, in the case of daily free choice of work location, it may also be that employees' need for relatedness is particularly high on days they choose to spend a full day at the office, compared to days they choose to work (partly) from home. This, in turn, may result in unfavorable well-being outcomes when their expectations and/or needs are unmet.

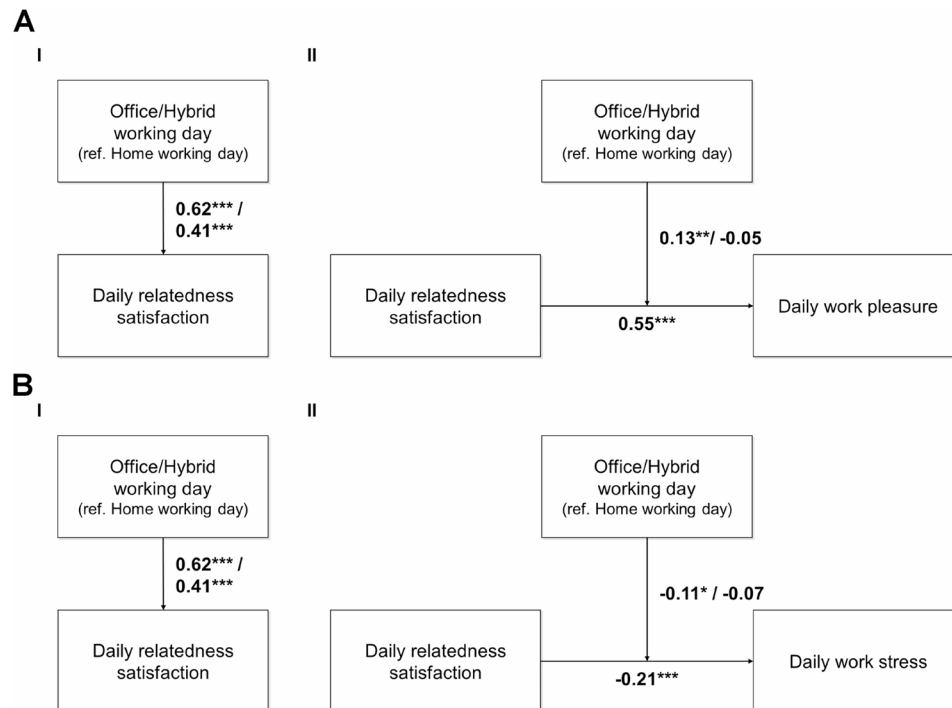


Fig. 2 Path models of (I) the direct effect of work location on daily relatedness satisfaction and of (II) the moderation of work location on the relationship between daily relatedness satisfaction and either daily pleasure in work (A) or daily work stress (B). Note(s). Estimates entail standardized coefficients based on Tables 2 and 4

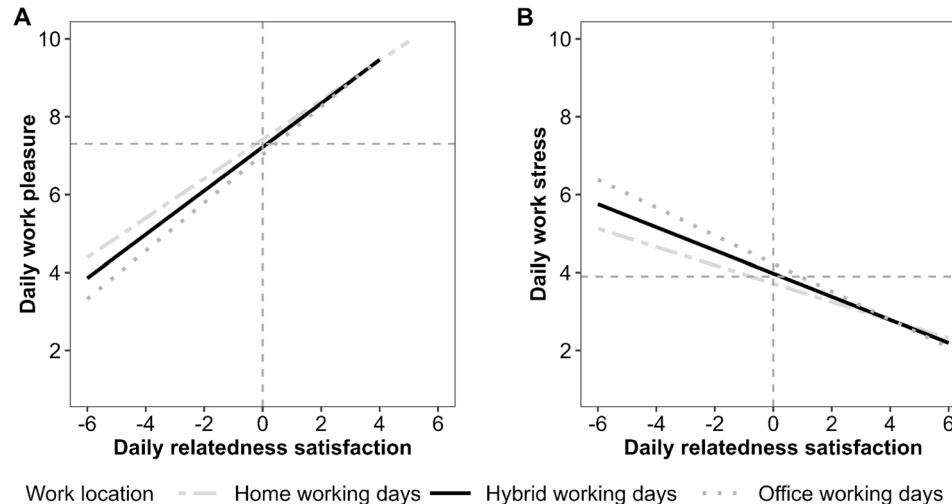


Fig. 3 Moderation plot for the relationship between work location and the relationship between daily relatedness satisfaction and either daily pleasure in work (A) or daily work stress (B)

Further investigation of this issue would require explicit measures of the concepts of “daily need for relatedness” and “unmet expectations” [37].

When it comes to satisfying employees’ need for autonomy, results indicate that this may be easier when working the entire day from home rather than spending time at the office. However, no moderation effects were found for work location on the relation between daily autonomy satisfaction and daily employee well-being. In

other words, our above reasoning about met or unmet needs and/or expectations does not seem to hold when it comes to the satisfaction of daily autonomy. A potential reason for not finding such an effect may be that the difference in autonomy satisfaction levels on office versus home working days is relatively small ($\beta = -0.08$). This implies that the current sample consists of employees that can generally count on a certain (relatively high) daily level of autonomy, regardless of their work location.

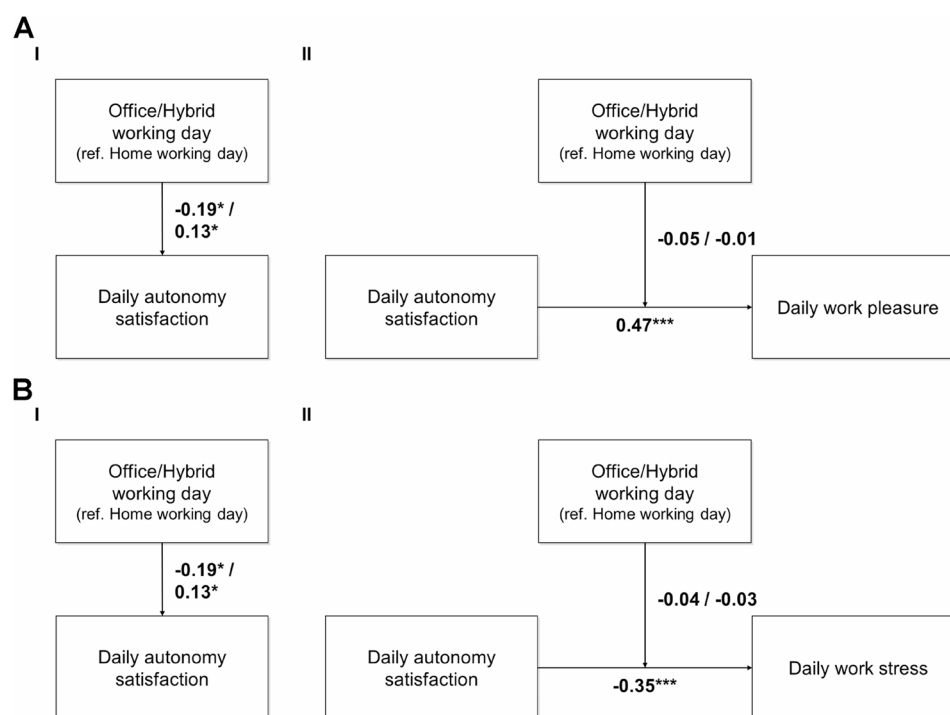


Fig. 4 Path models of (I) the direct effect of work location on daily autonomy satisfaction and of (II) the moderation of work location on the relationship between daily autonomy satisfaction and either daily pleasure in work (A) or daily work stress (B). Note(s). Estimates entail standardized coefficients based on Tables 2 and 4

In this case, needs and expectations about experiencing autonomy would also not vary much from day to day. A more heterogeneous study sample with higher daily variations in levels of autonomy would be necessary to test this assumption. Furthermore, recent literature also points towards the notion that excessive job autonomy can have a negative impact on employees, also referred to as a “too-much-of-a-good-thing” effect [38]. It might be interesting in future studies to investigate whether this effect can be detected at day-level, and if so, how it relates to daily autonomy satisfaction.

Theoretical contribution

Overall, the results of the current study confirm the essential role of basic need satisfaction in relation to employee well-being, as stipulated in Ryan and Deci’s (2000) Self-Determination Theory (SDT) [8]. Also, in line with other diary studies [11], they show that associations between basic need satisfaction and employee well-being outcomes can fluctuate from day to day. Most importantly, the current study demonstrates that at least part of these fluctuations may be attributed to differences in daily work location, as discussed above. As such, SDT proves to be a suitable theoretical framework for day-level studies on the link between hybrid working and employee outcomes.

Strengths, limitations & future research

An important strength of this study is the daily diary study design with three measurement waves consisting of ecological momentary assessments. This design allows for minimization of recall bias and investigation of dynamic day-level (within-person) processes in real-world contexts [28, 29]. Another strength is the high (practical) relevance of the topic, given the rising trend of hybrid workers [1, 2]. The current study is, to our knowledge, one of the first to provide insight in the potential consequences of hybrid working for daily employee well-being.

The results of this study must be considered in light of several limitations and provide directions for future research. First, as we investigated daily associations between variables that were assessed within the same measurement moment (i.e., the end of each working day), no causal inferences can be made. However, it is likely that in short time spans (e.g. within a day) psychological constructs such as need satisfaction and employee well-being are dynamically related to each other [39], implying that a focus on causal sequences may be less relevant in this particular context. An interesting avenue for future research, though, would be potentially day-to-day accumulating or cross-over relations between the study variables. For instance, to what extent is daily well-being affected by characteristics of the previous working day(s) (e.g., work location, need satisfaction)? And what amount

and sequence of weekly office versus home working days would be associated with the highest levels of employee well-being and for whom?

Second, we did not measure the underlying assumptions to our exploratory hypotheses explicitly. It seems plausible that the concept of met or unmet expectations plays an important role in daily associations between work location, basic need satisfaction, and employee well-being, but future studies will have to confirm whether this is indeed the case or whether alternative mechanisms may be at play.

Third, we used a relatively homogenous research sample, consisting of participants from within the same organization. Although this organization represents a group of organizations in which hybrid working is highly relevant (i.e., 50+ employees, highly educated white-collar workers; [1]), results cannot be generalized to all sorts of organizations. In future studies it may therefore be valuable to include a more diverse research sample.

Finally, all study variables were assessed with single-item measurements, which is uncommon in traditional, between-persons study designs. However, literature indicates that in daily diary studies the use of single items is appropriate when constructs are concrete and singular enough for the participants to rate without confusion [24–26]. We believe that in the current study these requirements were met and that the use of single-item measurements minimized loss of response from participants.

Practical implications

This study confirms that experiencing daily relatedness and autonomy satisfaction contributes to daily employee well-being. Thus, when aiming to enhance employee well-being, work should be designed in a way that employees' need for relatedness and autonomy can be satisfied as much as possible.

With respect to daily relatedness satisfaction, this seems to be easier when employees spend time at the office than when working the entire day from home. Consequently, when employees work from home frequently, employers should actively promote and facilitate social interactions to make sure satisfaction of the need for relatedness does not get compromised. A recent study of Brunelle and Fortin [18] in fact found a positive association between remote work and the satisfaction of the need for relatedness. By analyzing the organizational context in more depth, they found that the organization was very aware of the risks of social isolation for remote workers and that social connectedness was actively promoted. Furthermore, even though office and hybrid days may generally be associated with higher levels of relatedness as was shown in this study, employees and employers should not take this association for granted. Also at

the office, daily social interactions may become less self-evident due to hybrid working. For instance, it may vary greatly who is present on which days, and work meetings may be more often online even when (some) employees are present at the office. Therefore, active promotion of social connectedness should not just be aimed at remote work situations, but at the overall day-to-day work situation with alternating work locations. To prevent situations of unmet needs and expectations, it is also recommendable to actively involve employees in the promotion of social connectedness, by letting them share their needs and expectations and think along in developing and implementing practical solutions.

Regarding daily autonomy satisfaction, this need may be more easily satisfied when working a full day from home rather than (partly) at the office. This implies that when employees work at the office regularly, or if employers would like to increase their regular presence at the office, it may be particularly important to stimulate employees' sense of autonomy at the office. Of course, similar to relatedness satisfaction, the positive association between home working days and autonomy satisfaction should also not be taken for granted. It would be recommendable for employers to regularly inventory needs and expectations of employees with respect to (daily) autonomy, and create preconditions for satisfying these needs regardless of the specific work location.

Conclusions

Our study adds to the emerging body of research on the relation between hybrid working and employee well-being and provides practical guidelines for employers and employees on how to engage in hybrid working from day to day while preserving or even enhancing employee well-being. Specifically, our study shows that daily work location may be an important factor to consider in the context of (enhancing) daily need satisfaction and daily employee well-being. Working (part of the day) at the office is generally accompanied by a stronger sense of relatedness than exclusively working from home. Relatedness satisfaction, in turn, is positively related to employee well-being. Working a full day from home on the other hand generally comes with higher levels of autonomy satisfaction than working (part of the day) at the office. Similar to relatedness satisfaction, autonomy satisfaction is positively related to employee well-being. As such, both working from home and working in the office or a combination of both within the same day can contribute to need satisfaction and well-being. To create optimal conditions for the satisfaction of employees' needs for both autonomy and relatedness, a proper balance between the two work locations may be most beneficial. In addition, it is important that working at the office provides employees with sufficient opportunities

to make meaningful connections with colleagues, clients or other professional contacts. If employees are insufficiently able to engage in meaningful connections with other persons while working at the office, this may negatively impact their well-being.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12889-025-23794-x>.

Supplementary Material 1.

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Authors' contributions

R.P. performed the analyses. I.N., R.P., and M.Z. drafted the manuscript. K.O.H. and N.W. contributed to the writing and editing of the manuscript. All authors read and approved the final manuscript.

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Data availability

Data is available upon reasonable request from the corresponding author.

Declarations

Ethics approval and consent to participate

The TNO Internal Review Board approved the study and assessed the study as not being subject to the requirements of the Medical Research Human Subjects Act (ID number: 2021-094). The study followed all recommendations with regard to the privacy aspects including an informed consent, information letter and the possibility to voluntarily discontinue participation.

Consent for publication

N/A.

Competing interests

The authors declare no competing interests.

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References

1. Eurofound; Vargas Llave O, Vacas Soriano C, Hurley J, Staffa E, Peruffo E, Rodríguez Contreras R, Adascalitei D, Botey Gaude L. The Rise in Telework: Impact on Working Conditions and Regulations. Luxembourg: Publications Office of the European Union; 2022. ISBN 978-92-897-2297-1.
2. Piasna A, Zwysen W, Drahokoupil J. The platform economy in Europe: results from the second ETUI Internet and Platform Work Survey (IPWS). SSRN Electron J. 2022. Available from: https://www.ssrn.com/sol3/papers.cfm?abstract_id=4111111.
3. OECD. Teleworking in the COVID-19 pandemic: trends and prospects. Paris: OECD Publishing Paris; 2021. Available from: https://read.oecd-ilibrary.org/view/?ref=1108_1108540-p249kho0iu&title=Teleworking-in-the-COVID-19-pandemic-Trends-and-prospects.
4. Halford S. Hybrid workspace: re-spatialisations of work, organisation and management. *New Technol Work Employ*. 2005;20(1):19–33. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/j.1468-005X.2005.00141.x>.
5. Tavares AI. Telework and health effects review. *Int J Healthc*. 2017;3(2):30. Available from: <http://www.sciencedirect.com/journal/index.php/ijh/article/view/11308>.
6. Lunde LK, Fløvik L, Christensen JO, Johannessen HA, Finne LB, Jørgensen IL, et al. The relationship between telework from home and employee health: a systematic review. *BMC Public Health*. 2022;22(1):47. Available from: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-12481-2>.
7. Beckel JLO, Fisher GG. Telework and worker health and well-being: a review and recommendations for research and practice. *Int J Environ Res Public Health*. 2022;19(7):3879. Available from: <https://www.mdpi.com/1660-4601/19/7/3879>.
8. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol*. 2000;55(1):68–78. Available from: <http://doi.apa.org/getdoi.cfm?doi=10.1037/0003-066X.55.1.68>.
9. Aldrup K, Klusmann U, Lüdtke O. Does basic need satisfaction mediate the link between stress exposure and well-being? A diary study among beginning teachers. *Learn Instr*. 2017;50:21–30. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0959475216302262>.
10. Clausen T, Pedersen LRM, Andersen MF, Theorell T, Madsen IEH. Job autonomy and psychological well-being: a linear or a non-linear association? *Eur J Work Organ Psychol*. 2022;31(3):395–405. Available from: <https://www.tandfonline.com/doi/full/10.1080/1359432X.2021.1972973>.
11. Coxen L, van der Vaart L, Van den Broeck A, Rothmann S. Basic psychological needs in the work context: a systematic literature review of diary studies. *Front Psychol*. 2021;12. Available from: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.698526/full>.
12. Van den Broeck A, Ferris DL, Chang CH, Rosen CC. A review of self-determination theory's basic psychological needs at work. *J Manage*. 2016;42(5):1195–229. Available from: <http://journals.sagepub.com/doi/10.1177/0149206316632058>.
13. van Hooff MLM, Geurts SAE. Need satisfaction and employees' recovery state at work: a daily diary study. *J Occup Health Psychol*. 2015;20(3):377–87. Available from: <http://doi.apa.org/getdoi.cfm?doi=10.1037/a0038761>.
14. Chen B, Vansteenkiste M, Beyers W, Boone L, Deci EL, Van der Kaap-Deeder J, et al. Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motiv Emot*. 2015;39(2):216–36. Available from: <http://link.springer.com/10.1007/s11031-014-9450-1>.
15. Baumeister RF, Leary MR. The need to belong: desire for interpersonal attachments as a fundamental human motivation. In: Zuckerman R, editor. *Interpersonal Development*. 1st ed. London: Routledge; 2007. p. 57–89.
16. Sheldon KM, Elliot AJ, Kim Y, Kasser T. What is satisfying about satisfying events? Testing 10 candidate psychological needs. *J Pers Soc Psychol*. 2001;80(2):325–39. Available from: <http://doi.apa.org/getdoi.cfm?doi=10.1037/0022-3514.80.2.325>.
17. Athanasiadou C, Theriou G. Telework: systematic literature review and future research agenda. *Heliyon*. 2021;7(10):e08165. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S2405844021022684>.
18. Brunelle E, Fortin JA. Distance makes the heart grow fonder: an examination of teleworkers' and office workers' job satisfaction through the lens of self-determination theory. *SAGE Open*. 2021;11(1):215824402098551. Available from: <http://journals.sagepub.com/doi/10.1177/2158244020985516>.
19. Oude Hengel KM, Bouwens L, de Vroome E, Hooftman W. Hoe werken de werknemers uit 2019 na de pandemie? Resultaten van het NEA-COVID-19 cohort onderzoek. Leiden; 2023. Available from: <https://repository.tno.nl/SingLeDoc?find=UIDb7534c0e-8da7-43c5-90de-0054d0d9da57>.
20. Koester A. Why face-to-face communication matters: a comparison of face-to-face and computer-mediated communication. In: COVID-19, communication and culture. Routledge; 2022. pp. 115–34.
21. Sharma S, Durand RM, Gur-Arie O. Identification and analysis of moderator variables. *J Mark Res*. 1981;18(3):291–300. Available from: <https://journals.sagepub.com/doi/abs/10.1177/002224378101800303>. [cited 2023 Dec 18].
22. Lange M, Kayser I. The role of self-efficacy, work-related autonomy and work-family conflict on employee's stress level during home-based remote work in Germany. *Int J Environ Res Public Health*. 2022;19(9):4955. Available from: <https://www.mdpi.com/1660-4601/19/9/4955>.
23. European Agency for Safety and Health at Work, Caprielle M, Arasanz J, Sanz P. Telework and health risks in the context of the COVID-19 pandemic: Evidence

- from the field and policy implications. Luxembourg: Publications Office of the European Union; 2021. <https://doi.org/10.2802/84372>.
24. Müller T, Niessen C. Self-leadership in the context of part-time teleworking. *J Organ Behav*. 2019;40(8):883–98. Available from: <https://onlinelibrary.wiley.com/doi/10.1002/job.2371>.
25. Schade HM, Digutsch J, Kleinsorge T, Fan Y. Having to work from home: basic needs, well-being, and motivation. *Int J Environ Res Public Health*. 2021;18(10):5149. Available from: <https://www.mdpi.com/1660-4601/18/10/5149>.
26. Proost K, van Ruysseveldt J, van Dijke M. Coping with unmet expectations: Learning opportunities as a buffer against emotional exhaustion and turnover intentions. *Eur J Work Organ Psychol*. 2012;21(1):7–27. Available from: <http://www.tandfonline.com/doi/abs/10.1080/1359432X.2010.526304>.
27. Taris TW, Feij JA, Capel S. Great expectations— and what comes of it: the effects of unmet expectations on work motivation and outcomes among newcomers. *Int J Sel Assess*. 2006;14(3):256–68. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/j.1468-2389.2006.00350.x>.
28. de Vries LP, Baselmans BML, Bartels M. Smartphone-based ecological momentary assessment of well-being: a systematic review and recommendations for future studies. *J Happiness Stud*. 2021;22(5):2361–408. Available from: <https://link.springer.com/10.1007/s10902-020-00324-7>.
29. Shiffman S, Stone AA, Hufford MR. Ecological momentary assessment. *Annu Rev Clin Psychol*. 2008;4(1):1–32. Available from: <https://www.annualreviews.org/doi/10.1146/annurev.clinpsy.3.022806.091415>.
30. Van Hooff MLM, Geurts SAE, Kompier MAJ, Taris TW. How fatigued do you currently feel? Convergent and discriminant validity of a single-item fatigue measure. *J Occup Health*. 2007;49(3):224–34. Available from: <https://onlinelibrary.wiley.com/doi/10.1539/joh.49.224>.
31. Song J, Howe E, Oltmanns JR, Fisher AJ. Examining the concurrent and predictive validity of single items in ecological momentary assessments. *Assessment*. 2023;30(5):1662–71. Available from: <http://journals.sagepub.com/doi/10.1177/10731911221113563>.
32. Wanous JP, Reichers AE, Hudy MJ. Overall job satisfaction: how good are single-item measures? *J Appl Psychol*. 1997;82(2):247–52. Available from: <http://doi.apa.org/getdoi.cfm?doi=10.1037/0021-9010.82.2.247>.
33. Van den Broeck A, Vansteenkiste M, De Witte H, Soenens B, Lens W. Capturing autonomy, competence, and relatedness at work: construction and initial validation of the Work-related Basic Need Satisfaction scale. *J Occup Organ Psychol*. 2010;83(4):981–1002. Available from: <https://bpspsychub.onlinelibrary.wiley.com/doi/10.1348/096317909X481382>.
34. Arapovic-Johansson B, Wählin C, Kwak L, Björklund C, Jensen I. Work-related stress assessed by a text message single-item stress question. *Occup Med (Chic Ill)*. 2017;67(8):601–8. Available from: <http://academic.oup.com/occmed/article/67/8/601/4084572>.
35. Bakker AB. The work-related flow inventory: construction and initial validation of the WOLF. *J Vocat Behav*. 2008;72(3):400–14. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0001879107001236>.
36. Bates D, Mächler M, Bolker B, Walker S. Fitting linear mixed-effects models using lme4. *J Stat Softw*. 2015;67(1 SE-Articles):1–48. Available from: <https://www.jstatsoft.org/index.php/jss/article/view/v067i01>.
37. Turnley WH, Feldman DC. Re-examining the effects of psychological contract violations: unmet expectations and job dissatisfaction as mediators. *J Organ Behav*. 2000;21(1):25–42. Available from: [https://onlinelibrary.wiley.com/doi/10.1002/\(SICI\)1099-1379\(200002\)21:1%3C25::AID-JOB2%3E3.0.CO;2-Z](https://onlinelibrary.wiley.com/doi/10.1002/(SICI)1099-1379(200002)21:1%3C25::AID-JOB2%3E3.0.CO;2-Z).
38. Zhou E. The “Too-Much-of-a-Good-Thing” Effect of Job Autonomy and Its Explanation Mechanism. *Psychology [Internet]*. 2020;11(02):299–313. Available from: <https://doi.org/10.4236/psych.2020.112019>.
39. De Gieter S, Hofmans J, Bakker AB. Need satisfaction at work, job strain, and performance: a diary study. *J Occup Health Psychol*. 2018;23(3):361–72. Available from: <http://doi.apa.org/getdoi.cfm?doi=10.1037/ocp0000098>.

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