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The hidden costs of working from home: examining loneliness, role overload, and the role of social support during and beyond the COVID-19 lockdown

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Objective: This study evaluated the impact of the number of days per week working from home (WFH) on employee loneliness during and 2 years after the COVID-19 lockdown, with a focus on role overload as a mediating factor and social support from coworkers as a moderating variable.

Methods: Data were collected via self-reports from a sample of 6,918 participants during the lockdown in January 2021 and 6,576 participants 2 years post-lockdown in January 2023.

Results: Analysis using a moderated mediation model showed that increased WFH days were associated with heightened loneliness during the lockdown, a link that weakened post-lockdown. Role overload served as a mediator, intensifying loneliness during WFH but less so after the lockdown. While higher social support was generally linked to reduced role overload and loneliness, it paradoxically intensified these issues in individuals with extensive WFH days.

Conclusions: The findings suggest that the number of days WFH can exacerbate loneliness and role overload among employees, with the effect being more pronounced during the lockdown. Employees with substantial social support faced more challenges as WFH duration increased. These results underscore the complex dynamics between WFH, social support, and employee wellbeing.

KEYWORDS

loneliness, working from home, hybrid work, role overload, social support, pandemic lockdown, COVID-19, moderated mediation model

1 Introduction

The outbreak of the COVID-19-pandemic, caused by the SARS-CoV-2 virus, generated large changes in the working conditions for many people (e.g., Diab-Bahman and Al-Enzi, 2020). Isolation was used actively to combat the spread of the virus and employees were ordered to work from home (WFH) if possible. Consequently, a large part of the workforce has gained experience with accomplishing their work virtually, either from their own home or from other suitable locations (Bick et al., 2020; Wyld, 2022; Brynjolfsson et al., 2023). Although most restrictions have been removed and both work- and social life seems to recover, many workers have learned

to appreciate the increased autonomy entailed by working from home (Wang et al., 2021) and are reluctant toward a full time return to the company office (Liu et al., 2020). Thus, hybrid work (i.e., the blend of WFH and work from the company office) has been touted as the new normal in the future (Yener, 2022; Değerli, 2023).

However, WFH does not only entail positive consequences. At the individual level, increased feelings of loneliness are among the adverse effects most often discussed (Lim et al., 2020). Loneliness is an individually perceived feeling of social isolation, which is only modestly associated with the experience of actually being alone (Hawkley and Cacioppo, 2010). Feeling lonely from time to time is quite common and innocuous, but recurring and overwhelming feelings of loneliness are regarded detrimental and conducive to reduced health and wellbeing as well as reduced productivity. This applies to both general loneliness (Hawkley and Cacioppo, 2010; Lim et al., 2020) and work-related loneliness (Erdil and Ertosun, 2011; Lam and Lau, 2012; Mohapatra et al., 2023).

Reports in the popular press have repeatedly referred to an increase in loneliness during the pandemic (e.g., Horch, 2020; Knight et al., 2022; Lewitt, 2022). The main message is that WFH, or remote work in general, limits access to one's work-related social network, which can exacerbate existing feelings of loneliness and even trigger feelings of loneliness in individuals who typically do not dwell upon such feelings. This assumption are supported by some studies (Buecker et al., 2020; Koyanagi and Santini, 2021; Ernst et al., 2022), whereas others failed to find an increase in loneliness during the pandemic (Luchetti et al., 2020; Prati and Mancini, 2021). However, it is important to acknowledge that the number of days individuals spent at WFH during the pandemic varied based on factors such as the nature of the work tasks, disease prevalence, and local infection control measures. It is reasonable to assume that this variation influenced individual feelings of loneliness, potentially affecting the results observed in various studies.

Moreover, WFH during the COVID-19 lockdown may not have the same consequences as remote work after the pandemic. In many countries, WFH during the pandemic became a mandatory measure that applied to everyone irrespective of their personal preferences (Michinov et al., 2022). This may have influenced the research outcomes (Torres and Orhan, 2023). This does not imply that voluntary WFH of today is identical to remote work practices before the pandemic. Although already growing in popularity, WFH on a regular basis was not considered a viable option for most workers prior to the pandemic (e.g., Allen et al., 2015; Felstead and Henseke, 2017; Pigini and Staffolani, 2019). The COVID-19 pandemic has accelerated this development and the rise of new hybrid work models makes it even more important to investigate the assumed link between WFH and loneliness. The number of days WFH, hence understood as the number of days per week allocated to work from home, is a central element in this discussion. It has been suggested that the number of home-based workdays in a hybrid arrangement should not exceed 2 or 3 days per week to provide optimal work conditions regarding both productivity and wellbeing (Barrero et al., 2021; Criscuolo et al., 2021; Yener, 2022). However, the empirical foundation for this recommendation appears to be limited.

To enhance our understanding of this relationship, the current study aims to examine the impact of the number of days per week WFH on loneliness. The relationship will be examined both during the COVID-19 lockdown and 2 years after the lockdown.

The relation between WFH and loneliness is likely influenced also by other salient factors in the work environment. Including additional variables not only offers a more comprehensive view of factors influencing loneliness but also allows for the investigation of mechanisms likely involved in the relationship between WFH and loneliness. Drawing upon assumptions derived from the Conservation of Resources (COR) theory (Hobfoll, 1989), two prevalent factors that merit consideration are role overload and social support.

Role overload refers to a situation in which an individual is confronted with excessive work demands and responsibilities that exceed their available resources, such as time, skills, or energy. The COVID-19 lockdown introduced several new challenges related to the implementation of work tasks. If not properly managed, this may intensify the experience of role overload. Role overload is recognized as a risk factor for diminished performance, health, and wellbeing (Örtqvist and Wincent, 2006; Nixon et al., 2011; Bowling et al., 2015). Previous research has shown role overload to mediate the relationship between work-related use of information and communication technologies after hours and work family conflict (Wang et al., 2022) and the relationship between technostress and productivity (Tarafdar et al., 2007). Work overload (a component of role overload) has also been shown to mediate the relationship between work schedule flexibility (i.e., when the worker decides when to work) and mental health outcomes (Yeves et al., 2022) and technostress and perceived strain (Ayyagari et al., 2011). Although scantly studied, it may be that an increased number of days spent WFH could initially increase role overload, which in turn, amplifies feelings of loneliness. Consequently, role overload was included as a mediator in the theoretical model tested in this study.

Social support is considered a resource in the work environment (Jolly et al., 2021) and refers to the belief or actuality that one is valued and can rely on one's social network for assistance. Within the workplace, this typically encompasses backing from coworkers and management. The most prevalent conception of the advantageousness of social support is the buffer hypothesis (Helgeson, 2003). According to this hypothesis, social support primarily affects outcomes indirectly, by mitigating the adverse effects of work demands (Haly, 2009). Consistent with this perspective, the theoretical model tested in this study included social support as a potential moderator. A further aim of the present study was thus to investigate if the relationship between the number of days WFH and loneliness was mediated by role overload and moderated by perceived social support. By doing so, this study adds to the theoretical and empirical knowledge of hybrid work and work-related loneliness, a psychosocial factor often undervalued in the work environment. The study primarily draws upon assumptions from COR-theory (Hobfoll, 1989). In addition, it also utilizes the Regulatory Loop Model of Loneliness (Cacioppo and Hawkley, 2009) and elements from Social Exchange Theory (Cook et al., 2013). By integrating the explanatory power of the COR theory along with these more specific models, this study

contributes to enhanced understanding of the social dynamics inherent in hybrid work arrangements and how this influence perceived access to work related resources.

The study goes beyond the scope of cross-sectional studies by comparing the posited relationships during and after the pandemic lockdown, thus providing a more comprehensive understanding of the influence of the lockdown on the relationships under investigation.

2 Theoretical framework and hypotheses

The COR theory (Hobfoll, 1989) posits that individuals strive to acquire, retain, and protect important resources in the environment. The theory accentuates that stress occurs when an individual experience loss, or potential loss, of resources. According to the theory, resources do not only encompass material and economic factors, but also include social assets like relationships, social status, and networks of support. As inherently social beings, social relations provide us with a sense of belonging, meaning, and purpose, as well as opportunities for personal growth and shared joy. For most people, reduced social interaction over time will therefore be perceived as threatening and result in increased stress and negative emotions. Stress, in this view, is not a purely individual or internal experience, but is significantly influenced by the social context (Hobfoll, 2001). Acknowledging that individuals differ in their ability to cope with social isolation, it seems justifiable to assume that the number of days WFH influenced feelings of loneliness during the pandemic. The posited positive link is further supported by empirical evidence obtained both prior to the COVID-19 pandemic (Hoornweg et al., 2016; Tavares, 2017), as well as during the pandemic (Wang et al., 2021; Bollestad et al., 2022; Miyake et al., 2022). Thus, drawing from both theoretical perspectives and empirical evidence, we propose the following hypothesis.

> *Hypothesis 1: The number of days WFH is directly and positively associated with feelings of loneliness.*

Role overload was included as mediator in the theoretical model as a potential mechanism through which WFH affects loneliness indirectly. At the core of the COR theory (Hobfoll, 1989) is the idea of preserving resources and the adverse effects of their depletion. Depletion of resources induce feelings of stress leading to negative emotions such as tension, anger, and frustration, which makes it even more difficult to cope with a challenging situation (Spector and Goh, 2001). In cases where supportive structures, typically found in an office setting, are absent, as was often the case during pandemic-induced lockdowns, the availability of resources needed to cope with the work demands may become insufficient. Prolonged WFH may lead to depletion of resources in several ways. Factors such as heightened technostress, the requirement to adapt to new work methods, and ambiguity surrounding job expectations, all drain resources and have been shown conducive to heightened experience of role overload (Tarafdar et al., 2007; Kumar et al., 2021; Costin et al., 2023; Sommovigo et al., 2023).

Role overload may compel individuals to invest more effort into their work tasks, which in turn leads to a heightened need for recuperation (Meijman and Mulder, 1998). Unfortunately, the perceived time pressure inherent in role overload may prevent sufficient recovery. In an attempt to cope with the situation, individuals tend to invest even more effort, leading to escalating feelings of work-related fatigue (Ekstedt et al., 2006).

Just as in the development of work-related fatigue, feelings of loneliness can be a part of a negative feedback loop. Elucidated by the Regulatory Loop Model of Loneliness (Cacioppo and Hawkley, 2009), negative sentiments and thought patterns such as unhappiness, pessimism, and self-criticism lead to dysfunctional coping behaviors like reduced trust, self-protection, and social withdrawal, which reinforce the feelings of loneliness, causing emotional distress and disengagement from work. The loss spiral concept in COR theory posits that the depletion of one type of resource can lead to the subsequent depletion of other resources, creating a cascading effect (Hobfoll et al., 2018). Thus, it is reasonable to assume that if time resources are depleted due to role overload, this may trigger further depletion of socio-emotional resources. In situations where social exchange is restricted, as was evident during the pandemic lockdown, feelings of loneliness may be exacerbated. This assumption is supported by previous empirical work, which shows positive associations between loneliness and burnout (Card et al., 2022; Wood et al., 2023) as well as with both core elements of burnout, emotional exhaustion (Becker et al., 2022) and disengagement from work (Mohapatra et al., 2023). Although severely understudied, some studies have also reported positive associations between workload/job demands and loneliness (Kallioniemi et al., 2022; Lowman et al., 2023; Walz et al., 2023), as well as technostress and loneliness (Taser et al., 2022).

Based on the present discussion and the available empirical results, we propose the following hypothesis.

> *Hypothesis 2: The number of days working from home is indirectly and positively associated with loneliness through role overload.*

Social Exchange Theory posits that social interactions often involve reciprocal exchange processes, where resources such as social support and information that are provided are compensated with other resources at a later time (Cook et al., 2013). This willingness to provide resources to each other creates an exchange relationship that benefits both parties. In the context of COR-theory, this principle of reciprocity initiates what can be described as a gain spiral, contributing to an accumulation of resources for the members involved (Halbesleben and Wheeler, 2015). Social support is, consequently, an essential regulatory component of the work environment in most office settings, playing a crucial role in mitigating the depletion of resources caused by job demands and other challenges encountered at work .

Social support has consistently been linked to reduced feelings of loneliness, with individuals having easy access to support experiencing less loneliness (Wright, 2005; Wang et al., 2021; D'Oliveira and Persico, 2023; Lowman et al., 2023). It is reasonable to assume that this relationship also applies to the other associations included in the current mediation model. Findings from related research support this assumption. For example, Walz et al.

(2023) discovered that social support moderated the indirect path from job demands to loneliness through work/home interference. Similarly, Deschênes (2023) identified that perceived organizational support moderated the relationship between satisfaction with telework and professional isolation. Khedhaouria et al. (2024) demonstrated that emotional social support moderated the path from technostress to job strain. Additionally, Mohapatra et al. (2023) reported that perceived organizational support moderated the association between loneliness and work alienation. Drawing on theoretical assumptions, available empirical evidence, and the absence of indications suggesting otherwise, we propose the following hypotheses.

> *Hypothesis 3: Social support moderates both the direct relationship between the number of days working from home and loneliness, and the indirect relationship mediated by role overload, such that these effects become weaker when the level of social support is high.*

As research on hybrid work is still in its infancy, our understanding of how the relationship between WFH and loneliness changes in the context of post-pandemic normalization and employees' ability to choose between WFH and work at the office is limited. Choices about where to work are probably influenced by individual preferences and desire for social contact, ultimately leading to increased person-environment fit and thereby reduced feelings of loneliness. Nevertheless, reviews of the literature conducted before the pandemic have reported increased loneliness associated with WFH (Tavares, 2017), as well as increased risk of role overload (Demerouti et al., 2014). Additionally, studies indicate that risk factors for loneliness present prior to the pandemic persisted during the lockdown (Bu et al., 2020). Thus, it appears reasonable to expect that the same relationships exist, albeit weaker, in the post-lockdown period. Thus, based on the present discussion, the following hypotheses are proposed regarding the relationships after the pandemic lockdown.

> *Hypothesis 4: The direct association between the number of days working from home and loneliness is positive, but weaker, after the pandemic lockdown as compared to during the lockdown.*
>
> *Hypothesis 5: The indirect association between the number of days working from home and feelings of loneliness, mediated by role overload, is positive, but weaker, after the pandemic lockdown as compared to during the lockdown.*

Finally, the effect of the moderator variables in the post pandemic period were considered. Based on the logic leading to Hypotheses 4 and 5, we expect that social support will continue to moderate the associations described in the mediated model, even in the post-pandemic period. However, it remains uncertain whether this moderation will increase, decrease, or remain unchanged after the pandemic.

The lockdown altered the social context and thereby changed the rules by which social exchange unfold. Relying on electronic communication, social support from colleagues became more challenging as it must be planned ahead, making regular informal contact less convenient and less likely to happen (Collins et al., 2016; Lal et al., 2023). While some late effects may be expected, it is likely that the end of the lockdown period will bring about a resumption of social exchange in the workplace, making social support more easily available. If so, the buffering effect of social support should be expected to increase its importance after the pandemic lockdown. However, it is also possible that the pandemic lockdown and the experience of extensive WFH have permanently altered social exchange patterns at the workplace. Months WFH may have stimulated the development of new coping strategies that reduce the impact of social support as a buffer against work demands. Thus, considering the current knowledge in the field, it seems difficult to confidently predict the nature of potential post-pandemic changes in the moderator effect of social support. To acknowledge this uncertainty, it was decided to frame this part of the analysis as an exploratory research question.

3 Methods

3.1 Procedure and participants

The study was conducted as a part of a large electronic work environment survey directed toward the administration of a large public organization in Norway. The data were collected in January 2021 and January 2023.

Informed written consent was obtained from all participants and the participants were informed of the purpose of the study and their right to terminate participation without reason. The participants were allowed to answer the questionnaire during working hours. The study was approved by the Internal Ethics Committee at the Department of Psychology, University of Oslo, Norway.

The sample consisted of 6,918 participants at time 1, and 6,576 at time 2, compromising 13,494 observations. The sample also included 698 dental healthcare workers, who were unable to work remotely during the COVID-19 lockdown. Consequently, these individuals were excluded from subsequent analyses. Of the remaining 12,796 participants, 61.0 % were females. The age ranged from 19 to 75 years; 6.0% were under 30 years of age, 19.5% were between 30 and 39 years, 29.6% were between 40 and 49 years, and 31.5% were between 50 and 59 years, and 13.4% were over 60 years of age. In terms of education, 1.4 % had elementary school, 17.1 % had high school, 13.3% had until 3 years university education, and 68.2% had more than 3 years of university education. A total of 10.0% worked as leaders.

3.2 Measures

3.2.1 Number of days working from home

The participants were asked to report how many days per week they currently were working from home, on a seven-point scale from 0–7 days. Most employees work 5 days a week on the weekdays. However, some employees and leaders choose to work also in the weekends. Hence, maximum number of days' working from home per week is 7 days.

3.2.2 Role overload

Role overload were assessed by three items (Q1, Q2, and Q3) from the "job demands" section of the General Nordic Questionnaire for Psychological and Social Factors at Work (QPS Nordic) (Pahkin et al., 2007). The three items assess the subjective perception of excessive quantitative demands, which is in alignment with the current definition of role overload and operationalizations made in previous literature (e.g., Turner et al., 2010; Adil and Kamal, 2020). The items were assessed on a five-point scale ranging from "very seldom or never" (1) to "very often or always" (5). A total score was computed, on the mean of the three items, where higher score means higher levels of role overload. Sample item: "Do you have too much to do (at work)?" Cronbach's alpha at T1 and T2, was 0.765 and 0.772, respectively.

3.2.3 Social support from co-workers

Social support from co-workers was measured by four items adapted from the Leiden Quality of Work Questionnaire (van der Doef and Maes, 1999). Each item was scored on a five-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). The total score was computed on the mean of the four items, where higher scores mean higher degree of perceived social support from colleagues. Sample item: "If I have problems in my job, I can ask others for help." Cronbach alpha at T1 and T2, was 0.840 and 0.846, respectively.

3.2.4 Loneliness

Loneliness was assessed by three items from Hughes et al. (2004). Each item was scored on a five-point scale ranging from "never" (1) to "very often" (5). The mean of the three items was calculated, to produce a total score, where higher scores mean higher levels of loneliness. Sample item: "How often do you feel isolated from others?" Cronbach alpha at T1 and T2 was 0.846 and 0.864, respectively.

3.3 Analyses

The sample comprised 12,796 observations across two time points. Among these, 775 observations (6.1%) had missing values for the predictor variables and were thus excluded from the analysis. Consequently, the refined sample consisted of 12,021 observations distributed over the two time points (see Table 1). These observations were nested within a cohort of 9,827 employees. Of these, 7,633 had valid scores at only one of the time points, while 2,194 had valid scores on both occasions. We conducted checks to compare participants who responded at both time points with those who responded only once and found no significant differences in mean scores on the study variables. Additionally, analyzing the moderated mediation model with only the respondent who answered on both occasions resulted in minimal differences in parameter estimates compared to the single-time respondents. The extra analyses are detailed in Supplementary Tables S1, S2.

To evaluate common method bias (CMB) in our data, we used Harman's Single-Factor Test (Fuller et al., 2016), conducting an exploratory factor analysis on the 11 items related to role overload, social support, loneliness, and days working from home. The analysis revealed three factors with eigenvalues over 1.0, with the first factor accounting for 30.2% of the variance, below the suggested 50% threshold, indicating that CMB was not a major concern in our dataset.

TABLE 1 Number of observations at each point in time.

	Valid score, one occasion	Valid score, both occasions	Total
COVID-19 Lockdown (2021)	3,977	2,194	6,171
After lockdown (2023)	3,656	2,194	5,850
Total	7,633	4,388	12,021

We utilized path analyses in Mplus Version 8.10 to examine the proposed mediation and moderated mediation effects. The nesting of 12,021 observation within 9,827 employees was accounted for by employing the "complex" and "cluster" commands in Mplus. These commands adjust for non-independence in residuals making the tests for statistical significance trustworthy. Twenty-five observations had missing data on the dependent variable, loneliness. These 25 observations were included in the model, as the Maximum Likelihood (ML) estimation method in Mplus is capable of including data that are missing at random in the outcome variable (Muthén and Muthén, 2017). Age and gender were included as covariates in the analyses.

Figure 1 illustrates the hypothesized moderated mediation model. As hypothesized in the introduction, we expect that the effect of the number of days WFH (X_1) has on the mediator role overload (M), and on loneliness (Y) is stronger during the COVID-19 lockdown compared to after the lockdown period. These moderator effects were tested by including an interaction term between days WFH (X_1) and whether the lockdown (Z) was present or not in the model ($X_1 \times Z$). Similarly, the effect of role overload on loneliness was believed to be stronger during the COVID-19 lockdown and was tested by including an interaction term between M and Z ($M \times Z$). The proposed moderator effects of social support (W) were tested in the same manner as described above.

The hypothesized moderator effects suggest that the indirect influence of days WFH on loneliness, mediated by role overload, depends on two factors: (1) the presence or absence of the COVID-19 lockdown, and (2) the level of social support. The Moderated Mediation Index quantifies this relationship (Hayes, 2022), serving as a measure of how the indirect effects of days WFH on loneliness through role overload vary at different levels of social support or whether lockdown was present or not. A significant Moderated Mediation Index indicates a variation in the strength or direction of the mediation effect, contingent on the moderator's level.

For testing the unconditional and conditional indirect effects of WFH on loneliness via role overload, as well as the Moderated Mediation Index, bootstrapping with 5000 samples was employed. We used the 95% confidence interval (CI) of the bootstrap estimates for hypothesis testing, as recommended by Hayes (2022). All predictors in the model were mean-centered before the analysis.

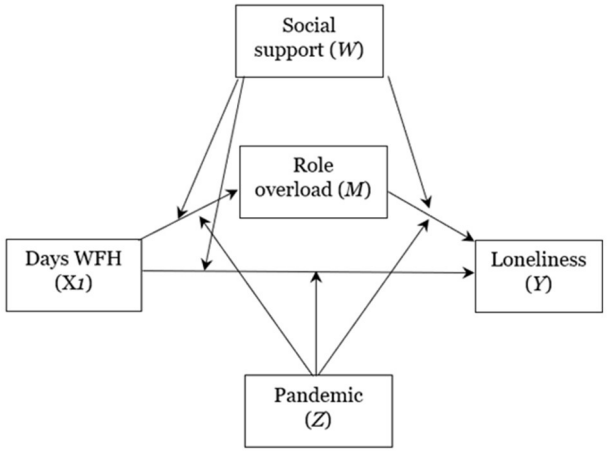

FIGURE 1
Conceptual moderated mediation model.

4 Results

4.1 Descriptive analyses

Descriptive statistics for the study variables during and after the COVID-19 lockdown are detailed in Tables 2, 3. Notably, the average number of days WFH was significantly higher ($p < 0.001$, $d = 0.79$) during the lockdown ($M = 3.16$, Median = 3) compared to the period following it ($M = 1.75$, Median = 1). Between these two periods, there was a significant reduction in the mean score for feelings of loneliness ($p < 0.001$, $d = -0.24$). In contrast, the level of role overload remained consistent across both time points. A minor, but statistically significant, increase in the level of social support was observed after the lockdown ($p < 0.001$, $d = 0.07$). Although the majority of the correlations between the study variables reached statistical significance, their magnitude was relatively modest.

4.2 Moderated mediation analysis

The results from the moderated mediation model are presented in Table 4. Increasing number of days WFH was found to be directly associated with heightened feelings of loneliness ($\beta = 0.121$, $p < 0.001$). Additionally, a greater number of days WFH was linked to an increased experience of role overload ($\beta = 0.088$, $p < 0.001$). In turn, role overload was associated with an increase in feelings of loneliness ($\beta = 0.089$, $p < 0.001$). Consequently, the number of days spent WFH was indirectly related to increased feelings of loneliness via a rise in role overload ($\beta = 0.008$, 95% CI [0.005, 0.010]; see Table 5).

Furthermore, analyses provided evidence for moderating effects of the COVID-19 lockdown period. Notably, the association between the number of days WFH and role overload was observed to be weaker in the period following the COVID-19 lockdown, compared to during the lockdown. This observation is supported by a significant interaction term between the number of days WFH and the post-lockdown period ($\beta = -0.038$, $p < 0.001$), graphically represented in Figure 2. In a similar vein, the relationship between the number of days WFH and loneliness was also found to be less pronounced post-lockdown, as evidenced by the significant interaction term ($\beta = -0.040$, $p < 0.001$), with further details depicted in Figure 2. Simple slope analysis revealed that all the slopes illustrated in Figure 2 were statistically significant ($p < 0.05$).

Moderated mediation effects were also estimated (Table 6), demonstrating that the indirect effect of days WFH on loneliness via role overload was stronger during the COVID-19 lockdown ($b = 0.006$) compared to the post-lockdown period ($b = 0.001$).

An increase in social support was significantly related to both a lower level of role overload ($\beta = -0.082$, $p < 0.001$), and, particularly, reduced loneliness ($\beta = -0.402$, $p < 0.001$). Two significant interaction effects between social support and the days WFH were observed: one on role overload ($\beta = 0.023$, $p < 0.05$), and the other on feelings of loneliness ($\beta = 0.025$, $p < 0.05$). These results suggest that individuals with higher levels of social support experience a slightly more pronounced increase in perceived role overload and feelings of loneliness as the number of days working from home increases. Both moderating effects of social support are depicted in Figure 3. Simple slope analysis showed that all the slopes illustrated in Figure 3 were statistically significant ($p < 0.05$). As depicted in Figure 3, individuals with high social support exhibit lower levels of role overload and loneliness compared to those with low social support. However, this difference diminishes with an increasing number of days WFH.

Moderated mediation effects of social support were also estimated (see Table 7), demonstrating that the indirect effect of days WFH on loneliness via role overload was stronger at high levels of social support ($b = 0.005$) as compared to low levels of social support ($b = 0.002$).

We also examined the potential variation in the moderating effects of social support during vs. after the COVID-19 lockdown. This was accomplished by incorporating three-way interaction terms into the model, as detailed in Table 4. Since none of these interaction terms reached statistical significance, no support for differential moderation effects of social support across these two time-periods was found. Finally, the possibility of non-linear effects of days WFH on both role overload and loneliness was investigated by incorporating a quadratic term for days WFH into the model. However, no evidence of such non-linear effects was found, indicating that a linear model is more suitable.

5 Discussion

The aim of the present study was to investigate how the number of days per week working from home (WFH) influence feelings of loneliness. The results affirmed Hypothesis 1, indicating a positive association between the number of days spent WFH and increased feelings of loneliness. Similarly, Hypothesis 2 was supported, revealing an indirect relationship where more days WFH led to heightened feelings of loneliness via an increase in role overload. High social support was associated with both lower levels of role overload and a significant reduction in loneliness. However, an intriguing pattern emerged for those with high social support: as the number of days WFH increased, they experienced

TABLE 2 Means scores and standard deviations on study variables during and after COVID-19 lockdown with *t*-test for mean score changes.

	During lockdown ($N = 6,171$)		After lockdown ($N = 5,850$)			
	M	*SD*	*M*	*SD*	*t*	*d*
Days working from home[a] (X_1)	3.16	(2.14)	1.75	(1.35)	−47.27***	0.79
Role overload[b] (M)	3.21	(0.82)	3.21	(0.82)	0.18	0.00
Loneliness[b] (Y)	2.26	(0.87)	2.06	(0.83)	−14.96***	0.24
Social support[b] (W)	4.15	(0.73)	4.20	(0.74)	4.13***	−0.07

[a]Range 0–7; [b]Range 1–5; ***$p < 0.001$. All p-values are adjusted for the clustering of participants within occasions. A total of 7,633 participants were measured on one occasion, and 2,194 were measured on both occasions.

TABLE 3 Zero-order correlation coefficients for study variables ($N = 12,021$).

	X_1	M	Y	W	Z	X_2
Days working from home[a] (X_1)	-					
Role overload[b] (M)	0.093***	-				
Loneliness[b] (Y)	0.186***	0.143***	-			
Social support[b] (W)	−0.049***	−0.071***	−0.409***	-		
Lockdown[c] (Z)	−0.366***	−0.004	−0.120***	0.036***	-	
Gender[d] (X_2)	−0.012	0.123***	0.039***	0.071***	0.009	-
Age (X_3)	−0.023*	−0.067***	−0.051***	−0.033***	0.017	−0.026*

[a]Range 0–7; [b]Range 1–5; [c]0 = during, 1 = after; [d]1 = male, 2 = female; *p <0.05, ***p <0.001. All p-values are adjusted for the clustering of participants within occasions. A total of 7,633 participants were measured on one occasion, and 2,194 were measured on both occasions.

a more pronounced increase in both perceived role overload and feelings of loneliness. The indirect effect of number of days WFH on loneliness, mediated by role overload, was found to be stronger at higher levels of social support than at lower levels. This moderated effect of social support was thus in the opposite direction as the prediction made in Hypothesis 3. Furthermore, the data corroborated Hypothesis 4, showing that the relationship between days WFH and loneliness was less pronounced post-lockdown. Hypothesis 5 was also supported, as the indirect effect of days WFH and loneliness, mediated by role overload, weakened after the lockdown. Regarding the proposed exploratory research question, the results showed no differential moderation effects of social support across the two time periods.

Overall, the results corroborate previous findings that the number of days WFH tends to increase loneliness. The effect may be both direct and indirect, mediated by other salient factors in the work environment. The findings are in line with the impression from previous research suggesting that the same psychosocial precursors of loneliness are active before, during (Bu et al., 2020), and after the pandemic. Thus, these results challenge the notion that work experiences from the pandemic lockdown have fundamentally altered the social exchange relationship at work. This appears to remain true even though the decision to work from home was largely based on personal preferences after the pandemic.

Following the pandemic, the levels of both loneliness and role overload were reduced compared to their levels during the pandemic lockdown. Although this study did not directly investigate the emotional challenges of social isolation and limited opportunities for social exchange, the results are consistent with tenets of COR-theory emphasizing the benefits of social interaction at the workplace (Hobfoll, 2001). In the same vein, the results support the view that the depletion of psychosocial resources may lead to elevated stress and thereby diminished wellbeing.

The obtained results may seem contrary to pre-pandemic literature showing increased feelings of job-autonomy among employees engaged in WFH and other types of telework (Gajendran and Harrison, 2007; Allen et al., 2015). Increased job-autonomy has repeatedly been linked to improved job satisfaction, productivity, and performance (Kubicek et al., 2017; Knight and Parker, 2021). WFH should, accordingly, contribute to increased productivity and performance.

This apparent paradox can be explained by two different mechanisms. One explanation may be that role overload does not always lead to reduced productivity, at least not within the relatively short timeframes used in most studies. As explicated by Meijman and Mulder (1998), the experience of time pressure associated with role overload may increase the investment of work effort and thereby contribute to increased productivity. In the long run, however, role overload, excessive workload, and time pressure can become exhausting, lead to disengagement, and contribute to the development of burnout (Örtqvist and Wincent, 2006; Lubbadeh, 2020). The positive association between role overload and feelings of loneliness does little to halt or reverse this development.

An alternative explanation suggests that employees may not always perceive autonomy as enabling. The idea, stemming from the empowerment leadership literature, is that increased autonomy comes with an inherent cost. When power and autonomy are delegated to an employee, this also transfers some leadership

TABLE 4 Moderated mediation analysis of the effect of days working from home (independent variable) on feelings of loneliness (dependent variable) with role overload as a mediator and COVID-19 lockdown and social support as moderators ($N = 12{,}021$).

	Role overload (M)		Loneliness (Y)	
	b	β	b	β
Intercept	3.019***	-	2.131***	-
Main effects				
Days WFH (X_1)	0.037***	0.088	0.053***	0.121
Social support (W)	−0.092***	−0.082	−0.468***	−0.402
Lockdown (Z) (0 = during, 1 = after)	0.051***	0.031	−0.106***	−0.062
Role overload (M)	-		0.093***	0.089
Two-way interactions				
Lockdown × Work days	−0.035***	−0.038	−0.039***	−0.040
Lockdown × Role overload	-		−0.035*	
Social sup. × Days WFH	0.013*	0.023	0.014*	0.025
Social sup. × Lockdown	0.001	0.000	0.000	0.000
Social sup. × Role overload	-		−0.023	−0.017
Three-way interactions				
D. WFH. × Social sup. × Lock.	−0.007	−0.006	−0.009	−0.008
Social sup. × Role ol. × Lock.	-		−0.033	−0.012
Covariates				
Gender (X_2) (1 = male, 2 = female)	0.213***	0.127	0.098***	0.056
Age (X_3)	−0.049***	−0.064	−0.041***	−0.053
R^2	0.037		0.216	

All predictors are grand mean centered. *$p < 0.05$, ***$p < 0.001$.

TABLE 5 The effect of days working from home (X_1) on loneliness (Y), mediated via role overload (M). $N = 12{,}021$.

	b	95%CI [a]	β	95%CI [a]
Indirect $X1->M->Y$	0.003	[0.002, 0.005]	0.008	[0.005, 0.010]
Direct $X1->Y$	0.053	[0.044, 0.063]	0.121	[0.100, 0.142]
Total effect	0.057	[0.048, 0.066]	0.128	[0.107, 0.150]

[a]Estimated from 5000 bootstrap samples.

responsibility and liabilities into their management (Langfred, 2004). Increased autonomy may thus sometimes contribute to inconsistent role expectations, uncertainty, cognitive distractions, and additional cognitive resources spent on decision-making. The burden of cognitive distraction is assumed to increase in proportion with the complexity of the task (Kim and Beehr, 2017; Cheong et al., 2019). Given the uncertainty and extraordinary conditions that prevailed in the aftermath of the COVID-19 lockdown, it seems relatively unsurprising that many workers did not experience the sudden increase in autonomy as enabling but rather as an added burden and worry. Nevertheless, this does not explain why the positive effect of autonomy was not observed after the pandemic lockdown. This implies that the benefits of job autonomy cannot be taken for granted and that increased autonomy at the workplace should be planned and supported by organizational measures.

As anticipated, the results confirm the beneficial effect of perceived access to social support during and after the pandemic lockdown. However, a surprising moderating effect emerged, indicating that workers reporting high access to social support experienced a steeper increase in role overload and feelings of loneliness with an increasing number of days WFH. This counterintuitive result seems to challenge the commonly accepted understanding of social support as a buffer against negative conditions in the work environment. Interpreted within the COR-theory (Hobfoll, 2001), one could argue that the results indicate that the employees with the most access to resources also appear to be the most depleted.

Individual differences in the desire for social interaction may be one explanation. Recent experimental research has shown that forced isolation evokes activity in the same brain regions as hunger, instigating a subjective desire or craving for social interaction (Tomova et al., 2020). Most interesting in this context is the discovery of a form of habituation effect. Although inter individual variation exists, it appears that participants who were exposed to pre-experimental isolation expressed less craving for social interaction than participants who had recently been socially active.

According to COR-theory, the experience of stress at the workplace is always perceived within a specific contextual frame, providing cues on how individuals should interpret and understands the situation (Hobfoll, 2001). Considered in the context of the Social Exchange Theory (Cook et al., 2013), participating in frequent social interactions provides more opportunities to engage in social exchange processes while at the same time also yielding contextual cues informing trust in others' willingness to provide support if needed.

Considering this, it seems likely that employees reporting high access to social support also tend to be more socially active. Consequently, individuals with high access to social support may find the reduction in social interaction, due to increased number of days WFH, more challenging than employees who are expected to be less socially active. The principle of reciprocity may contribute to refinement of this tentative explanation. In their writings Buunk et al. (1993) and Buunk and Schaufeli (1999) explicates the consequences of not experiencing reciprocity. Both providing more support than one receives and receiving more support than one provides have been shown to evoke negative emotional responses. Receiving more support than one is able or willing to reciprocate appears to be the most problematic, fostering feelings of guilt, shame, and indebtedness.

WFH during the pandemic lockdown likely made the informal provision of social support more challenging and, as a result, more evident to both the providers and the recipients. Increased visibility has been shown to heighten the emotional burden of receiving more support than one is able to reciprocate (Bolger

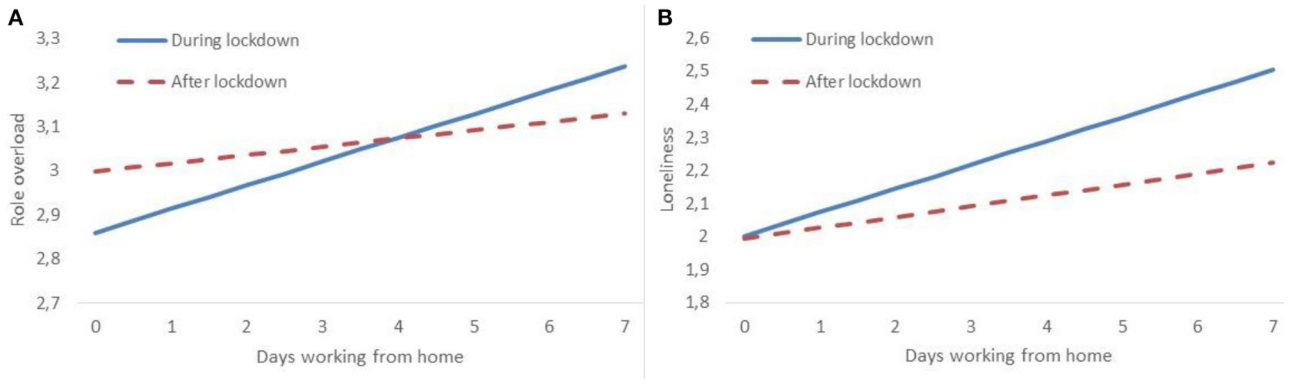

FIGURE 2
Relationships between Days working from home and **(A)** Role overload, **(B)** Loneliness, during and after the COVID-19 lockdown. Unstandardized regression coefficients.

TABLE 6 **Moderated mediation effects of days working from home on loneliness via role overload Conditional values of COVID-19 lockdown period vs post-lockdown period ($N = 12{,}021$).**

	Indirect effect	95% *CI*[a]	Standardized indirect effect
Covid-19 lockdown (2021)	0.006	[0.005, 0.008]	0.014
Post-lockdown period (2023)	0.001	[0.000, 0.003]	0.002
Moderated mediation Index	−0.003	[−0.005, −0.002]	−0.007

[a]Estimated from 5000 bootstrapped samples.

and Amarel, 2007). In an attempt to cope with this challenge, individuals may refrain from seeking help, leading to a reduction in the availability of social support that was previously offered by colleagues. This may lead to an increase in perceived role overload and feelings of loneliness, which might explain the reversed buffering effect observed in the present study. This interpretation gains some support by Nahum-Shani and Bamberger (2011), showing a reversed buffering effect of social support on the relationship between work hours and employee wellbeing when support received exceeds the support provided. However, it should be noted that this is a tentative *post-hoc* explanation that warrants further investigation in future research.

5.1 Limitations

The use of self-reported data was considered the most appropriate method for collecting data in this study, as it aimed to capture employees' personal experiences of social support, role overload, and loneliness. However, this approach may introduce Common Method Variance (CMV), potentially leading to spurious correlations between study variables due to factors such as social desirability bias or stable personality traits like negative affectivity (e.g., Chen and Spector, 1991). To address this concern, we applied Harman's Single-Factor test, which indicated that CMV did not significantly impact our findings.

Another potential limitation of this study is the absence of data on whether employees lived alone or with others during the lockdown. It could be hypothesized that the impact of working from home on feelings of loneliness would be more pronounced among those living alone, owing to their potentially reduced access to social support from partners or family members. Nonetheless, considering that 19% of the Norwegian population is living alone (SSB, 2023), the absence of household composition data is not deemed a significant drawback. Therefore, the observed association between the number of days working from home and increased feelings of loneliness is considered to be a robust finding, despite this limitation.

About one-third of participants responded on both occasions, with the rest answering just once. This discrepancy could introduce bias, yet separate analyses showed negligible differences in parameter estimates between the two groups. Therefore, the mix of single-time and dual-time respondents was not considered a significant issue.

5.2 Theoretical implications

Generally, work is seen as beneficial to both the individual and society, but it may also have repercussions that are both unforeseen and undesired. One important development the last decades is the rise of flexible work arrangements, a trend that the COVID-19 pandemic has only accelerated. The lockdown facilitated the adoption of new technologies that enabled workers to tackle complex tasks in a flexible and innovative manner (Becker et al., 2013; Thelen, 2019). However, much of the existing empirical data has been gathered from groups of employees presumed to benefit from these flexible arrangements. This study aims to fill this gap by examining how typical workers experience a workday with greater emphasis on telework and WFH.

Much of the existing literature within the field appears to rely on theories addressing specific phenomena, like technostress (e.g.,

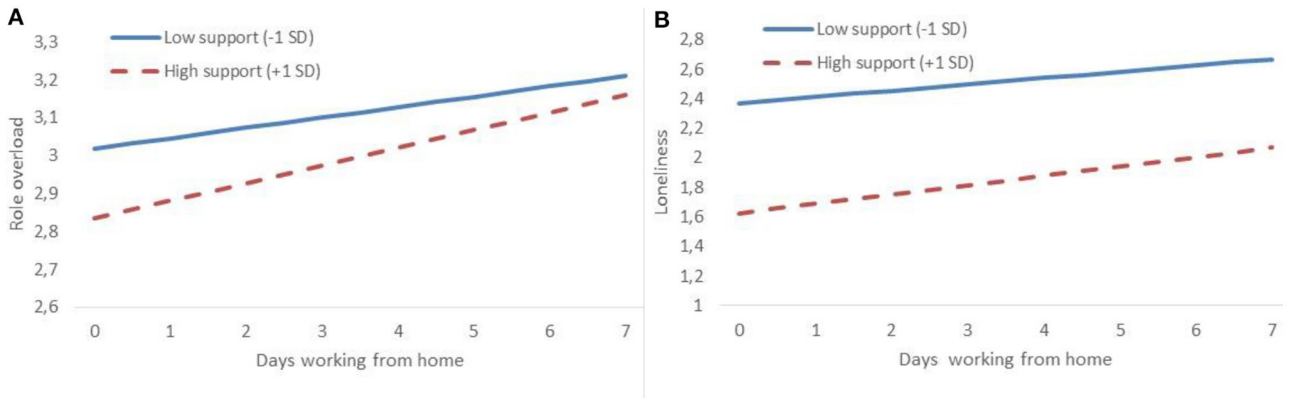

FIGURE 3
Graphical representation of the moderating effect of social support on the relationship between **(A)** number of days working from home and role overload, and on the relationship between **(B)** number of days working from home and loneliness. Unstandardized regression coefficients.

TABLE 7 **Moderated mediation effects of days working from home on loneliness via role overload at specific conditional values of social support ($N = 12{,}021$).**

	Indirect effect	95% *CI*[a]	Standardized indirect effect
Low support (-2SD)	0.002	[0.000, 0.004]	0.005
High Support (+2SD)	0.005	[0.003, 0.008]	0.011
Moderated mediation index	0.001	[0.000, 0.002]	0.002

[a]Estimated from 5000 bootstrapped samples.

Ayyagari et al., 2011; Tarafdar et al., 2015). While this approach can contribute to an in-depth understanding of the subject at hand, it may also limit the understanding of how different phenomena interact within a broader context. To address this challenge, the present study adopts the framework from COR-theory (Hobfoll, 1989) as a starting point. The study expands its conceptual basis by integrating the Regulatory Loop Model of Loneliness (Cacioppo and Hawkley, 2009) and elements from Social Exchange Theory (Cook et al., 2013) into the theoretical framework. This renders deductions from these more specific theoretical approaches applicable within the broader context of COR-theory. By expanding its theoretical basis, this study makes knowledge about the ways in which WFH affects feelings of loneliness more generally available to the scholarly discussions regarding the interplay between new ways of working, workspace design, and other elements in the work environment, and how this affects humans at work.

Traditionally, research on loneliness at work has focused on its implications for employee health and wellbeing. The present study broadens this perspective by introducing role overload as a mediator, exploring how factors typically associated with performance and productivity can affect aspects generally considered to be psychosocial. By so doing, the results suggest that role overload should be considered an important factor when evaluating the dynamics of remote work.

5.3 Practical implications

The emerging trend of combining WFH with office work is becoming recognized as the future's "new normal" (Yener, 2022; Değerli, 2023). Supervisors should note that the option to WFH might heighten employees' sense of loneliness. A practical takeaway from this study could be encouraging more in-office presence to mitigate loneliness. The findings indicate that the adverse effects of WFH are most pronounced under mandatory conditions, as seen during the pandemic. While such scenarios are exceptional, compulsory WFH could also arise from situations like office renovations or cost-saving measures. Under these circumstances, it is crucial to facilitate engagement in work-related social networks, perhaps through physical meetings at alternative venues or organizing social events that enable direct interactions among employees.

Individuals may have many reasons for wanting to work from home, some of which may only be remotely connected to the work and the tasks being conducted. The current results indicate that choosing to WFH does not necessarily protect against feelings of loneliness. With continued digitalization, the need for flexible work arrangements will likely increase in the future. Also in this scenario, it seems important to establish meeting spaces that promote social exchange, both digitally and face-to-face, regardless of whether the employees themselves prefer to WFH or not. Facilitating opportunities for informal exchange of social support between co-workers appears to be particularly important.

6 Conclusion

The past few decades have witnessed a profound reorganization of traditional work life. Jobs are being digitized, automated, outsourced, and offshored, rendering the future of work less predictable and more demanding for many employees (Fostervold et al., 2018). In our opinion, labor market developments and work organization strategies should be evidence-based. Comprehensive knowledge about the impact of new work arrangements is

fundamental for cultivating a resilient, sustainable, and high-quality labor market.

The current findings suggests that WFH has detrimental impact on employees' feelings of loneliness and perceived role overload. The results also reveal pattern regarding social support that deviates from expectations from pre-pandemic research. While social support generally continues to have a beneficial effect, individuals with high social support appear to be most bothered by intensive WFH. Additionally, the results indicate that, although the impact has diminished, the same trend persists post-pandemic as well. The insights gained from this study could influence how the adoption of WFH and remote work is considered and implemented in future work life.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the Department of Psychology's Research Ethics Committee, Faculty of Social Sciences, Department of Psychology, University of Oslo. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

KF: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. PU: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. ON: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. AH: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/forgp.2024.1380051/full#supplementary-material

References

Adil, A., and Kamal, A. (2020). Authentic leadership and psychological capital in job demands-resources model among Pakistani university teachers. *Int. J. Leadership Educ.* 23, 734–754. doi: 10.1080/13603124.2019.1580772

Allen, T. D., Golden, T. D., and Shockley, K. M. (2015). How effective is telecommuting? Assessing the status of our scientific findings. *Psychol. Sci. Pub. Int.* 16, 40–68. doi: 10.1177/1529100615593273

Ayyagari, R., Grover, V., and Purvis, R. (2011). Technostress: technological antecedents and implications. *MIS Q.* 35, 831–858. doi: 10.2307/41409963

Barrero, J. M., Bloom, N., and Davis, S. J. (2021). *Why Working From Home Will Stick.* London: Centre for Economic Performance.

Becker, S. O., Ekholm, K., and Muendler, M. A. (2013). Offshoring and the onshore composition of tasks and skills. *J. Int. Econ.* 90, 91–106. doi: 10.1016/j.jinteco.2012.10.005

Becker, W. J., Belkin, L. Y., Tuskey, S. E., and Conroy, S. A. (2022). Surviving remotely: how job control and loneliness during a forced shift to remote work impacted employee work behaviors and well-being. *Hum. Res. Manage.* 61, 449–464. doi: 10.1002/hrm.22102

Bick, A., Blandin, A., and Mertens, K. (2020). Work from home before and after the COVID-19 outbreak. *Am. Econ. J. Macroecon.* 15, 1–39. doi: 10.24149/wp2017

Bolger, N., and Amarel, D. (2007). Effects of social support visibility on adjustment to stress: Experimental evidence. *J. Pers. Soc. Psychol.* 92, 458–475. doi: 10.1037/0022-3514.92.3.458

Bollestad, V., Amland, J. S., and Olsen, E. (2022). The pros and cons of remote work in relation to bullying, loneliness and work engagement: a representative study among Norwegian workers during COVID-19. *Front. Psychol.* 13:1016368. doi: 10.3389/fpsyg.2022.1016368

Bowling, N. A., Alarcon, G. M., Bragg, C. B., and Hartman, M. J. (2015). A meta-analytic examination of the potential correlates and consequences of workload. *Work Stress* 29, 95–113. doi: 10.1080/02678373.2015.1033037

Brynjolfsson, E., Horton, J. J., Makridis, C., Mas, A., Ozimek, A., Rock, D., et al. (2023). How many americans work remotely? A survey of surveys and their measurement issues. *National Bur. Econ. Res. Working Paper Series* 11:31193. doi: 10.3386/w31193

Bu, F., Steptoe, A., and Fancourt, D. (2020). Who is lonely in lockdown? Cross-cohort analyses of predictors of loneliness before and during the COVID-19 pandemic. *Public Health* 186, 31–34. doi: 10.1016/j.puhe.2020.06.036

Buecker, S., Horstmann, K. T., Krasko, J., Kritzler, S., Terwiel, S., Kaiser, T., et al. (2020). Changes in daily loneliness for German residents during the first four weeks of the COVID-19 pandemic. *Soc. Sci. Med.* 265:113541. doi: 10.1016/j.socscimed.2020.113541

Buunk, B. P., Doosje, B. J., Jans, L. G. J. M., and Hopstaken, L. E. M. (1993). Perceived reciprocity, social support, and stress at work: the role of exchange and communal orientation. *J. Pers. Soc. Psychol.* 65, 801–811. doi: 10.1037/0022-3514.65.4.801

Buunk, B. P., and Schaufeli, W. B. (1999). Reciprocity in interpersonal relationships: an evolutionary perspective on its importance for health and well-being. *Eur. Rev. Soc. Psychol.* 10, 259–291. doi: 10.1080/14792779943000080

Cacioppo, J. T., and Hawkley, L. C. (2009). Perceived social isolation and cognition. *Trends Cognit. Sci* 13, 447–454. doi: 10.1016/j.tics.2009.06.005

Card, K. G., Bodner, A., Li, R., Lail, S., Aran, N., Grewal, A., et al. (2022). Loneliness and social support as key contributors to burnout among Canadians workers in the third wave of the COVID-19 pandemic: a cross-sectional study. *J. Occup. Health* 64:12360. doi: 10.1002/1348-9585.12360

Chen, P. Y., and Spector, P. E. (1991). Negative affectivity as the underlying cause of correlations between stressors and strains. *J. Appl. Psychol.* 76, 398–407. doi: 10.1037/0021-9010.76.3.398

Cheong, M., Yammarino, F. J., Dionne, S. D., Spain, S. M., and Tsai, C. Y. (2019). A review of the effectiveness of empowering leadership. *The Leadership Q.* 30, 34–58. doi: 10.1016/j.leaqua.2018.08.005

Collins, A. M., Hislop, D., and Cartwright, S. (2016). Social support in the workplace between teleworkers, office-based colleagues and supervisors. *New Technol. Work Empl.* 31, 161–175. doi: 10.1111/ntwe.12065

Cook, K. S., Cheshire, C., Rice, E. R. W., and Nakagawa, S. (2013). "Social exchange theory," in *Handbook of Social Psychology*, eds J. Delamater, J., and A. Ward (Dordrecht: Springer).

Costin, A., Roman, A. F., and Balica, R. S. (2023). Remote work burnout, professional job stress, and employee emotional exhaustion during the COVID-19 pandemic. *Front. Psychol.* 14:1193854. doi: 10.3389/fpsyg.2023.1193854

Criscuolo, C., Gal, P., Leidecker, T., Losma, F., and Nicoletti, G. (2021). *The Role of Telework for Productivity During and Post-COVID-19. OECD Productivity Working Papers, No. 3.* London: OECD Publishing.

Değerli, M. (2023). New normal for gold and white-collar workers: the hybrid way. *Bus. Manage. Stu. Int. J.* 11, 168–183. doi: 10.15295/bmij.v11i1.2194

Demerouti, E., Derks, D., Ten Brummelhuis, L. L., and Bakker, A. B. (2014). "New ways of working: impact on working conditions, work–family balance, and well-being," in *The Impact of ICT on Quality of Working Life*, eds C. Korunka, and P. Hoonakker (Dordrecht: Springer).

Deschênes, A. A. (2023). Professional isolation and pandemic teleworkers' satisfaction and commitment: The role of perceived organizational and supervisor support. *Eur. Rev. Appl. Psychol.* 73:100823. doi: 10.1016/j.erap.2022.100823

Diab-Bahman, R., and Al-Enzi, A. (2020). The impact of COVID-19 pandemic on conventional work settings. *Int. J. Sociol. Social Policy* 40, 909–927. doi: 10.1108/IJSSP-07-2020-0262

D'Oliveira, T. C., and Persico, L. (2023). Workplace isolation, loneliness and wellbeing at work: the mediating role of task interdependence and supportive behaviours. *Appl. Erg.* 106:103894. doi: 10.1016/j.apergo.2022.103894

Ekstedt, M., Söderström, M., Åkerstedt, T., Nilsson, J., Søndergaard, H. P., Aleksander, P., et al. (2006). Disturbed sleep and fatigue in occupational burnout. *Scand. J. Work Environ. Health* 32, 121–131. doi: 10.5271/sjweh.987

Erdil, O., and Ertosun, Ö. G. (2011). The Relationship between social climate and loneliness in the workplace and effects on employee well-being. *Proc.- Soc. Behav. Sci.* 24, 505–525. doi: 10.1016/j.sbspro.2011.09.091

Ernst, M., Niederer, D., Werner, A. M., Czaja, S. J., Mikton, C., Ong, A. D., et al. (2022). Loneliness before and during the COVID-19 pandemic: a systematic review with meta-analysis. *Am. Psychol.* 77, 660–677. doi: 10.1037/amp0001005

Felstead, A., and Henseke, G. (2017). Assessing the growth of remote working and its consequences for effort, well-being and work-life balance. *New Technol. Work Empl.* 32, 195–212. doi: 10.1111/ntwe.12097

Fostervold, K. I., Koren, P. C., and Nilsen, O. V. (2018). "Defining sustainable and "decent" work for human factors and ergonomics," in *Ergonomics and Human Factors for a Sustainable Future*, eds A. Thatcher, and P. H. P. Yeow (Cham: Springer).

Fuller, C. M., Simmering, M. J., Atinc, G., Atinc, Y., and Babin, B. J. (2016). Common methods variance detection in business research. *J. Bus. Res.* 69, 3192–3198. doi: 10.1016/j.jbusres.2015.12.008

Gajendran, R. S., and Harrison, D. A. (2007). The good, the bad, and the unknown about telecommuting: Meta-analysis of psychological mediators and individual consequences. *J. Appl. Psychol.* 92, 1524–1541. doi: 10.1037/0021-9010.92.6.1524

Halbesleben, J. R. B., and Wheeler, A. R. (2015). To invest or not? The role of coworker support and trust in daily reciprocal gain spirals of helping behavior. *J. Manage.* 41, 1628–1650. doi: 10.1177/0149206312455246

Haly, M. K. (2009). A review of contemporary research on the relationship between occupational stress and social support: where are we now? *The Australian New Zealand J. Org. Psychol.* 2, 44–63. doi: 10.1375/ajop.2.1.44

Hawkley, L. C., and Cacioppo, J. T. (2010). Loneliness matters: a theoretical and empirical review of consequences and mechanisms. *Ann. Behav. Med.* 40, 218–227. doi: 10.1007/s12160-010-9210-8

Hayes, A. F. (2022). *Introduction to Mediation, Moderation, and Conditional Process Analysis.* New York, NY: The Guilford Press.

Helgeson, V. S. (2003). Social support and quality of life. *Q. Life Res.* 12, 25–31. doi: 10.1023/A:1023509117524

Hobfoll, S. E. (1989). Conservation of resources: a new attempt at conceptualizing stress. *Am. Psychol.* 44, 513–524. doi: 10.1037/0003-066X.44.3.513

Hobfoll, S. E. (2001). The influence of culture, community, and the nested-self in the stress process: advancing conservation of resources theory. *Appl. Psychol.* 50, 337–421. doi: 10.1111/1464-0597.00062

Hobfoll, S. E., Halbesleben, J., Neveu, J. P., and Westman, M. (2018). Conservation of resources in the organizational context: the reality of resources and their consequences. *Ann. Rev. Org. Psychol. Org. Behav.* 5, 103–128. doi: 10.1146/annurev-orgpsych-032117-104640

Hoornweg, N., Peters, P., and Van Der Heijden, B. (2016). "Finding the optimal mix between telework and office hours to enhance employee productivity: A study into the relationship between telework intensity and individual productivity, with mediation of intrinsic motivation and moderation of office hours," in *New Ways of Working Practices*, ed J. D. Leede (London: Emerald Group Publishing Limited).

Horch, A. J. (2020). *Remote Workers Suffer From Loneliness and Isolationism as the Pandemic in the U.S. Drags on. CNBC.* Available online at: https://www.cnbc.com/2020/08/25/remote-workers-suffer-from-isolationism-as-pandemic-in-us-drags-on.html (accessed June 23, 2023).

Hughes, M. E., Waite, L. J., Hawkley, L. C., and Cacioppo, J. T. (2004). A short scale for measuring loneliness in large surveys: results from two population-based studies. *Res. Aging* 26, 655–672. doi: 10.1177/0164027504268574

Jolly, P. M., Kong, D. T., and Kim, K. Y. (2021). Social support at work: an integrative review. *J. Org. Behav.* 42, 229–251. doi: 10.1002/job.2485

Kallioniemi, M. K., Kaseva, J., Kymäläinen, H. R., and Hakanen, J. J. (2022). Well-being at work and Finnish dairy farmers–from job demands and loneliness towards burnout. *Front. Psychol.* 13:9766456. doi: 10.3389/fpsyg.2022.976456

Khedhaouria, A., Montani, F., Jamal, A., and Hussain Shah, M. (2024). Consequences of technostress for users in remote (home) work contexts during a time of crisis: the buffering role of emotional social support. *Technol. Forecasting Soc. Change* 199:123065. doi: 10.1016/j.techfore.2023.123065

Kim, M., and Beehr, T. A. (2017). Self-efficacy and psychological ownership mediate the effects of empowering leadership on both good and bad employee behaviors. *J. Leadership Org. Stu.* 24, 466–478. doi: 10.1177/1548051817702078

Knight, C., Olaru, D., Lee, J., and Parker, S. (2022). *The Loneliness of the Hybrid Worker. MIT Sloan Management Review.* Available online at: https://espace.curtin.edu.au/bitstream/handle/20.500.11937/89229/89053.pdf?sequence=2 (accessed February 10, 2024).

Knight, C., and Parker, S. K. (2021). How work redesign interventions affect performance: an evidence-based model from a systematic review. *Hum. Relat.* 74, 69–104. doi: 10.1177/0018726719865604

Koyanagi, A., and Santini, Z. I. (2021). Loneliness and its association with depressed mood, anxiety symptoms, and sleep problems in Europe during the COVID-19 pandemic. *Acta Neuropsychiatr.* 33, 160–163. doi: 10.1017/neu.2020.48

Kubicek, B., Paškvan, M., and Bunner, J. (2017). "The bright and dark sides of job autonomy," in *Job Demands in a Changing World of Work: Impact on Workers' Health and Performance and Implications for Research and Practice*, eds C. Korunka, and B. Kubicek (Cham: Springer International Publishing).

Kumar, P., Kumar, N., Aggarwal, P., and Yeap, J. A. L. (2021). Working in lockdown: the relationship between COVID-19 induced work stressors, job performance, distress, and life satisfaction. *Curr. Psychol.* 40, 6308–6323. doi: 10.1007/s12144-021-01567-0

Lal, B., Dwivedi, Y. K., and Haag, M. (2023). Working from home during COVID-19: doing and managing technology-enabled social interaction with colleagues at a distance. *Inf. Syst. Front.* 25, 1333–1350. doi: 10.1007/s10796-021-10182-0

Lam, L. W., and Lau, D. C. (2012). Feeling lonely at work: investigating the consequences of unsatisfactory workplace relationships. *The Int. J. Hum. Res. Manage.* 23, 4265–4282. doi: 10.1080/09585192.2012.665070

Langfred, C. W. (2004). Too much of a good thing? Negative effects of high trust and individual autonomy in self-managing teams. *Acad. Manage. J.* 47, 385–399. doi: 10.2307/20159588

Lewitt, S. (2022). *Is Remote Working Fuelling a Loneliness Epidemic? The Hrdirector*. Available online at: https://www.thehrdirector.com/features/flexible-working/remote-working-fuelling-loneliness-epidemic/ (accessed November 27, 2023).

Lim, M. H., Holt-Lunstad, J., and Badcock, J. C. (2020). Loneliness: contemporary insights into causes, correlates, and consequences. *Soc. Psychiatry Psychiatric Epidemiol.* 55, 789–791. doi: 10.1007/s00127-020-01891-z

Liu, Z., Van Egdom, D., Flin, R., Spitzmueller, C., Adepoju, O., Krishnamoorti, R., et al. (2020). I don't want to go back: examining the return to physical workspaces during COVID-19. *J. Occup. Environ. Med.* 62, 953–958. doi: 10.1097/JOM.0000000000002012

Lowman, G. H., Kessler, S. R., and Pindek, S. (2023). The permeation of loneliness into the workplace: an examination of robustness and persistence over time. *Appl. Psychol.* 22, 1–21. doi: 10.1111/apps.12510

Lubbadeh, T. (2020). Job burnout: a general literature review. *Int. Rev. Manage. Marketing* 10:9398. doi: 10.32479/irmm.9398

Luchetti, M., Lee, J. H., Aschwanden, D., Sesker, A., Strickhouser, J. E., Terracciano, A., et al. (2020). *The Trajectory of Loneliness in Response to COVID-19*. New York, NY: American Psychological Association.

Meijman, T. F., and Mulder, G. (1998). "Psychological aspects of workload," in *Handbook of work and Organizational Psychology. Work Psychology*, eds P. J. D. Drenth, H. Thierry, and C. J. De Wolff (London: Psychology Press).

Michinov, E., Ruiller, C., Chedotel, F., Dodeler, V., and Michinov, N. (2022). Work-from-home during COVID-19 lockdown: when employees' well-being and creativity depend on their psychological profiles. *Front. Psychol.* 13:862987. doi: 10.3389/fpsyg.2022.862987

Miyake, F., Odgerel, C. O., Hino, A., Ikegami, K., Nagata, T., Tateishi, S., et al. (2022). Job stress and loneliness among desk workers during the COVID-19 pandemic in Japan: focus on remote working. *Environ. Health Prev. Med.* 27:33. doi: 10.1265/ehpm.22-00107

Mohapatra, M., Madan, P., and Srivastava, S. (2023). Loneliness at work: its consequences and role of moderators. *Glob. Bus. Rev.* 24, 433–450. doi: 10.1177/0972150919892714

Muthén, L. K., and Muthén, B. O. (2017). *Mplus User's Guide*. Los Angeles, CA: Muthén and Muthén.

Nahum-Shani, I., and Bamberger, P. A. (2011). Explaining the variable effects of social support on work-based stressor–strain relations: the role of perceived pattern of support exchange. *Org. Behav. Hum. Dec. Proc.* 114, 49–63. doi: 10.1016/j.obhdp.2010.09.002

Nixon, A. E., Mazzola, J. J., Bauer, J., Krueger, J. R., and Spector, P. E. (2011). Can work make you sick? A meta-analysis of the relationships between job stressors and physical symptoms. *Work Stress* 25, 1–22. doi: 10.1080/02678373.2011.569175

Örtqvist, D., and Wincent, J. (2006). Prominent consequences of role stress: a meta-analytic review. *Int. J. Stress Manage.* 13, 399–422. doi: 10.1037/1072-5245.13.4.399

Pahkin, K., Björklund, C., Mykletun, R. J., Furunes, T., Gard, G., Lindström, K., et al. (2007). *User's Guide for the QPSNordic-ADW*. Copenhagen: Nordic Council of Ministers.

Pigini, C., and Staffolani, S. (2019). Teleworkers in Italy: who are they? Do they make more? *Int. J. Manpower* 40, 265–285. doi: 10.1108/IJM-07-2017-0154

Prati, G., and Mancini, A. D. (2021). The psychological impact of COVID-19 pandemic lockdowns: a review and meta-analysis of longitudinal studies and natural experiments. *Psychol. Med.* 51, 201–211. doi: 10.1017/S0033291721000015

Sommovigo, V., Bernuzzi, C., Finstad, G. L., Setti, I., Gabanelli, P., Giorgi, G., et al. (2023). How and when may technostress impact workers' psycho-physical health and work-family interface? A study during the COVID-19 pandemic in Italy. *Int. J. Environ. Res. Pub. Health* 20:1266. doi: 10.3390/ijerph20021266

Spector, P. E., and Goh, A. (2001). "The role of emotions in the occupational stress process," in *Exploring Theoretical Mechanisms and Perspectives*, eds P. L. Perrewe, and D. C. Ganster (London: Emerald Group Publishing Limited).

SSB (2023). *Family and Housholds*. Available online at: https://www.ssb.no/en/befolkning/barn-familier-og-husholdninger/statistikk/familier-og-husholdninger (accessed January 13, 2024).

Tarafdar, M., Pullins, E. B., and Ragu-Nathan, T. S. (2015). Technostress: negative effect on performance and possible mitigations. *Inf. Syst. J.* 25, 103–132. doi: 10.1111/isj.12042

Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., and Ragu-Nathan, T. S. (2007). The impact of technostress on role stress and productivity. *J. Manage. Inf. Syst.* 24, 301–328. doi: 10.2753/MIS0742-1222240109

Taser, D., Aydin, E., Torgaloz, A. O., and Rofcanin, Y. (2022). An examination of remote e-working and flow experience: the role of technostress and loneliness. *Comput. Hum. Behav.* 127:107020. doi: 10.1016/j.chb.2021.107020

Tavares, A. I. (2017). Telework and health effects review. *Int. J. Healthcare* 3, 30–36. doi: 10.5430/ijh.v3n2p30

Thelen, K. (2019). Transitions to the knowledge economy in Germany, Sweden, and the Netherlands. *Comp. Politics* 51, 295–315. doi: 10.5129/001041519X15647434969821

Tomova, L., Wang, K. L., Thompson, T., Matthews, G. A., Takahashi, A., Tye, K. M., et al. (2020). Acute social isolation evokes midbrain craving responses similar to hunger. *Nat. Neurosci.* 23, 1597–1605. doi: 10.1038/s41593-020-00742-z

Torres, S., and Orhan, M. A. (2023). How it started, how it's going: Why past research does not encompass pandemic-induced remote work realities and what leaders can do for more inclusive remote work practices. *Psychol. Leaders Leadership* 26, 1–21. doi: 10.1037/mgr0000135

Turner, N., Chmiel, N., Hershcovis, M. S., and Walls, M. (2010). Life on the line: Job demands, perceived co-worker support for safety, and hazardous work events. *J. Occup. Health Psychol.* 15, 482–493. doi: 10.1037/a0021004

van der Doef, M., and Maes, S. (1999). The leiden quality of work questionnaire: its construction, factor structure, and psychometric qualities. *Psychol. Rep.* 85, 954–962. doi: 10.2466/pr0.1999.85.3.954

Walz, T., Kensbock, J. M., Jong, D., e., and Kunze, S. B. (2023). Lonely@Work@Home? The impact of work/home demands and support on workplace loneliness during remote work. *European Manag. J.* 24:1–15. doi: 10.1016/j.emj.2023.05.001

Wang, B., Liu, Y., Qian, J., and Parker, S. K. (2021). Achieving effective remote working during the COVID-19 pandemic: a work design perspective. *Appl. Psychol.* 70, 16–59. doi: 10.1111/apps.12290

Wang, H., Liu, P., Zhao, X., Li, A., and Xiao, C. (2022). Work-related use of information and communication technologies after hours (W_ICTs) and work-family conflict: a moderated mediation model. *SAGE Open* 12:21582440221120169. doi: 10.1177/21582440221120169

Wood, R. E., Bleich, M., Chung, J., Elswick, R. K., Nease, E., Sargent, L., et al. (2023). A mixed-methods exploration of nurse loneliness and burnout during COVID-19. *Appl. Nurs. Res.* 73:151716. doi: 10.1016/j.apnr.2023.151716

Wright, S. L. (2005). "Organizational climate, social support and loneliness in the workplace," in *The Effect of Affect in Organizational Settings*, eds N. M. Ashkanasy, W. J. Zerbe, and C. E. J. Härtel (London: Emerald Group Publishing Limited).

Wyld, D. C. (2022). The black swan of the coronavirus and how American organizations have adapted to the new world of remote work. *Eur. J. Bus. Manage. Res.* 7, 9–19. doi: 10.24018/ejbmr.2022.7.1.1170

Yener, H. (2022). Evaluating employee attitudes on working home style during COVID-19 pandemic management. *Technium Soc. Sci. J.* 28, 490–504.

Yeves, J., Bargsted, M., and Torres-Ochoa, C. (2022). Work schedule flexibility and teleworking were not good together during COVID-19 when testing their effects on work overload and mental health. *Front. Psychol.* 13:998977. doi: 10.3389/fpsyg.2022.998977