

Unseen consequences: the effect of activity-based work environments on work recovery

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ABSTRACT

Leaders implementing activity-based work environments seek benefits for their organizations. These include increasing employee activities such as communication, collaboration, and innovation and reducing housing expenses. While there are several benefits to implementing an activity-based work environment, research has highlighted various issues related to employee well-being in such environments. These include increased noise and distraction, reduced privacy, and heightened workplace stress. This study focuses on a novel issue concerning employee well-being by investigating how an activity-based work environment influences work recovery. Using a longitudinal design, we examine a public sector workplace whose employees were surveyed three times during the implementation of an activity-based work environment. Our results show that satisfaction with activity-based work environments plays an important role in well-being outside work. In contrast, employees less satisfied with activity-based environments are more likely to face difficulties recovering from work. Directions for further research and the implications of these results for organizations are discussed.

Introduction

Contemporary workplace design is increasingly diverse, with layouts tailored to the specific demands of the work and the resources at hand. The most notable recent development in workplace design has been the rise of activity-based work environments. While such environments are praised for enhancing collaboration, innovation, and space efficiency (Van der Voordt, 2004; Hoendervanger et al., 2018), their effects on employee well-being, particularly work recovery, are less understood (Appel-Meulenbroek et al., 2020; Sonnentag et al., 2022). Research has highlighted issues such as increased noise and distractions in activity-based work environments, which may hinder recovery, but this relationship has not been explored (Sonnentag et al., 2022). This study addresses this gap by using a longitudinal design to assess how an activity-based work environment affects work recovery over time and whether employees adapt, providing important insights for organizations and workplace design.

Activity-based work environments are predicated on employees selecting a workspace based on the task at hand (Wohlert and Hertel, 2017). Typically, employees spend most of their time in open areas. Still, private spaces are available when confidentiality or focus is paramount,

and collaborative zones are designed to facilitate group work without distractions. In activity-based work environments, hot-desking is a common practice, whereby employees do not have assigned fixed desks. In open-plan workspaces, the number of available desks often falls short of the number of employees, resulting in employees being unable to consistently occupy the same workstation. Consequently, policies regarding the management of personal belongings and the maintenance of a tidy workspace are typically implemented, particularly in settings where employees lack dedicated desks (Becker, 1999; Veldhoen, 2004). The financial benefits of activity-based work environments are multifaceted. One significant saving comes from reducing the physical space required, as activity-based work environments typically need fewer traditional workstations than there are employees (Kessler 2017). Technological advancements and the shift towards remote work, especially post-COVID, have further reduced the need for extensive office space. This shift optimizes space usage and decreases operational costs associated with more extensive facilities (Gerlitz and Hülsbeck, 2023).

Although there are clear benefits to adopting an activity-based work environment, its impact on employee health, both physical and psychological, is a matter of ongoing debate. Research findings are mixed; some studies highlight positive outcomes, while others point to potential

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adverse effects (Lansdale et al., 2011; Gerlitz and Hülsbeck, 2023). On the one hand, proponents of activity-based work environments argue that such environments can improve physical health by encouraging movement and varying postures throughout the day. This dynamism is said to combat the sedentary lifestyle often associated with traditional office settings (Ashkanasy et al., 2014). Furthermore, the opportunity to choose workspaces based on task requirements may reduce cognitive overload and boost mental well-being, as employees feel more in control of their work environment (Wohlers and Hertel, 2017).

On the other hand, critics of activity-based work environments raise concerns about the potential drawbacks of these environments. One primary concern is the increased noise levels and lack of privacy in open-plan settings, which can lead to increased stress and decreased productivity (Kaarala-Tuomaala et al., 2009). The constant need to find and settle into a new workspace can also disrupt workflow and add to cognitive burden, potentially leading to feelings of frustration and reduced job satisfaction (Peterson and Beard, 2004). Additionally, the lack of a permanent personal workspace can make employees feel less connected to their organization, impacting their sense of belonging and potentially affecting their overall job commitment, especially for women (Kaarala-Tuomaala et al., 2009).

Work recovery

For decades, organizational stress research has primarily examined how work, and job stressors specifically, influence employees' well-being, health, and performance (Bliese et al., 2017). With few exceptions, less attention was given to how individuals utilize their nonwork time to counteract the adverse effects of job-related stress. However, since the early 2000s, there has been a growing scholarly interest in understanding how employees recover and unwind after their workdays (Sonnentag et al., 2022). Work recovery refers to replenishing physical and mental resources that are depleted while at work (Sonnentag et al., 2008) and occurs when work-related demands are absent (Meijman and Mulder, 1998). Such work recovery is often assumed to occur during non-work periods, such as after work hours, on weekends, or during vacations (see Sonnentag et al., 2008).

Activity-based work environments emphasize open workspaces, increasing sensory stimulation. Proximity to more people typically leads to higher noise levels and increased social interactions, which can escalate stress levels (Appel-Meulenbroek, R. et al., 2020). Stress manifests in various ways, including prolonged recovery from stressful situations (Frone and Tidwell, 2015). Employees in high-stress environments may find it more challenging to relax and "wind down" after the workday, potentially impacting on their overall well-being and productivity.

H1: Employee work recovery will decrease after moving to an activity-based work environment.

While an activity-based work environment may initially hinder work recovery, this effect is likely—at least in part—due to the stress and disruption involved in adapting to a novel and more dynamic workspace. Initial declines in recovery may result from increased cognitive load, reduced predictability, and challenges in establishing boundaries between work and nonwork mental states, especially when familiar routines and territorial cues are disrupted (Sonnentag et al., 2022). This aligns with the recovery paradox, which suggests that individuals may need recovery the most during periods of stress and strain, yet are least likely to achieve it due to elevated arousal and resource depletion (Sonnentag, 2018).

Over time, however, employees may experience habituation, the psychological process through which the intensity of behavioral and emotional responses to repeated stimuli diminishes (Rankin et al., 2009). This adaptation process likely includes developing strategies for navigating the flexible environment more effectively—such as selecting optimal workspace types for specific tasks, engaging in more intentional break-taking (e.g., microbreaks or physical activity), and building

routines that support detachment and relaxation (Sonnentag et al., 2022; Zacher et al., 2014). Research on recovery processes has shown that recovery-enhancing behaviors and experiences—such as psychological detachment, relaxation, and control—are dynamic and can improve over time, especially when supported by deliberate practice or structural supports in the work environment (Hahn et al., 2011; Ebert et al., 2015).

Therefore, it is plausible that initial recovery disruptions will diminish as employees acclimate to the demands and affordances of the ABW, develop recovery-supportive habits, and rebuild a sense of control within the flexible workspace.

H2: The negative impact of an activity-based work environment on employee work recovery (see H1) will decrease over time as employees adapt to the new work environment.

The impact of activity-based work environments on employees varies substantially depending on individual differences, particularly workspace satisfaction. Overall workspace satisfaction refers to employees' contentment with environmental factors such as lighting, temperature, air quality, noise levels, layout, and furnishings (Halldorsson et al., 2021). Research on recovery processes has consistently shown that the physical and psychological characteristics of one's work setting influence the ability to detach and recover, both during and after work (Sonnentag et al., 2022). Employees who are more satisfied with their workspace are likely to perceive the ABW more positively, experiencing it as a resource-rich and flexible setting that enables autonomy and supports well-being (ten Brummelhuis and Bakker, 2012). In such cases, individuals may more readily engage in recovery-enhancing behaviors—such as psychological detachment and relaxation—during and after the workday (Sonnentag and Fritz, 2007).

Conversely, employees with lower workspace satisfaction may find ABWs more disruptive. These individuals may struggle with environmental stressors like noise and lack of personal space, which can hinder recovery by impairing control and increasing cognitive load (Sonnentag et al., 2022; Steed et al., 2021). Moreover, individual differences in privacy preferences, adaptability, and perceived environmental control can moderate how effectively people utilize ABWs, with those experiencing a poor fit more likely to suffer from impaired recovery and elevated strain (Halldorsson et al., 2024; Ouyang et al., 2019). Recovery research has shown that the effectiveness of the work environment depends not only on its structural features but also on the subjective experience of fit, satisfaction, and autonomy—each of which contributes to recovery outcomes (Sonnentag et al., 2022; Hahn et al., 2011).

Thus, employees with higher workspace satisfaction are more likely to benefit from the potential advantages of ABWs and maintain stronger recovery, while those with lower satisfaction are at risk of experiencing reduced recovery in response to the same environment.

H3: Greater workspace satisfaction will be related to increased work recovery.

H4: Workspace satisfaction will interact with the work environment so that employees with lower workspace satisfaction will experience less work recovery after moving to an activity-based work environment.

Method

Participants

The study involved 100 employees (about 75 % female) from a public sector organization transitioning to an activity-based work environment. Participants were office personnel who primarily engage in specialized tasks requiring various levels of focused attention. While their work environment changed between the first and second data collections, their tasks and work routines did not change. They were surveyed three times via on-line questionnaires, with response rates of 81 %, 74 %, and 69 % at each time point, for 224 responses across the three surveys. The effective sample consisted of 79 employees providing 199 observations. The data used in the study is described in more detail

by Halldorsson et al. (2022).

Procedure

The study was conducted using a longitudinal research design, during which all participants simultaneously experienced the same workplace modifications. Since the changes were identical for all participants, there was no control or comparison group. The data generated are panel data, which enables the tracking within-subject over time. This methodological approach is considered robust for assessing causality and drawing conclusions about the effects of organizational interventions, as it allows for comparisons of the pre- and post-implementation states for each participant (Haapakangas et al., 2019; Halldorsson et al., 2021; Gerlitz and Hülsbeck, 2023).

Initially, the organization operated out of two buildings. The older building featured a combination of wholly enclosed private offices and designated workstations in open-plan spaces with dividers. The newer building had a mix of private offices with glass fronts and assigned workstations in open-plan areas, partially separated by partitions. Post-implementation, the workspace was entirely converted into an activity-based model, eliminating private offices and assigned desks.

Data collection spanned about twelve months and involved surveys at three different times. The initial survey occurred roughly two months before transitioning to an activity-based work environment (T0). The second survey was administered about four months after implementation (T1), and the final survey took place about nine months after implementation (T2). Invitations for each survey were distributed via email, which included a study description and a link to the online survey. Two follow-up reminders were sent for each survey. Participation was voluntary, and participants needed to consent to participate. It was noted that participants could withdraw at any time without any consequences and could skip any survey items. Anonymous study identifiers matched responses to assess the impact on individuals over time. While each survey was structurally similar, background details such as age, tenure, and education were only included in the first survey.

Measures

Work recovery

Employees reported recovery from work using four items. Participants were asked, “Does it occur frequently or rarely after the workday ends that...” 1) “You find it hard to stop thinking about work so that it negatively affects your spare time or personal life,” 2) “You’re worried that an issue will arise at work that you can’t solve,” 3) “You don’t feel like going to work the next day,” and 4) “You’re so tired that you have trouble getting yourself to do anything.” Responses were given using a five-point scale (Almost never, Rarely, Sometimes, Often, and Almost daily). All items were reversed to create a composite work recovery scale. Alpha reliabilities for the scale were 0.78, 0.81, and 0.82 across the three measurement points.

Workspace satisfaction

Employees’ overall satisfaction with their physical work environment was measured with a single item. The purpose was to capture employees’ overall attitude toward their physical work environment. Single-item measures have been argued to be appropriate when capturing such overall attitudes (Wanous et al., 1997). Participants rated their work overall environment on a 7-point scale, ranging from ‘Very unsatisfactory’ to ‘Very satisfactory.’

Control variables

Potentially influencing experienced demands at work, women have been found to report lower workspace satisfaction compared to men (Kim et al., 2013; Halldorsson et al., 2024). Also, employee attitude toward an activity-based work environment can impact perceptions of privacy and psychological ownership at work (Halldorsson et al., 2021).

Analysis

The data collected has a hierarchical structure that includes multiple measures for each participant. Since repeated responses obtained from the same participant cannot be considered independent, hierarchical linear modeling (HLM) (Raudenbush and Bryk, 2002) was used to test hypotheses, as HLM can account for such dependency (Harrison et al., 2018). Further, HLM can handle missing data and unbalanced datasets without requiring listwise deletion, helping to maximize statistical power (Bagiella et al., 2000).

All analyses were conducted using Stata 18. The HLM analysis used the ‘mixed’ command to run a random intercept model with workspace satisfaction as a time-varying covariate (level 1) and attitude toward activity-based work environments at time 0 (ABW-attitude) and gender as level 2 variables. R² values were obtained using the R2_MLM package (Gambino, 2023).

A Monte Carlo simulation was used to assess statistical power. While the needed parameter estimates are optimally obtained from pilot data or previous studies (Brysbaert and Stevens, 2018), using observed estimates provides an indication of power (Zhang et al., 2019). The simulation focused on the interactions and involved creating 1000 samples, each with 75 participants measured at three times. The proportion of samples with at least one significant interaction ($\alpha \leq 0.05$) was 0.92, indicating sufficient statistical power (Cohen, 1988).

Results

Descriptive statistics for all variables (i.e., work recovery and workspace satisfaction at each measurement time, as well as the control variables) are shown in Table 1.

Work recovery and activity-based work environments

To test hypotheses, a hierarchical linear model predicting work recovery using time, workspace satisfaction, time-by-workspace satisfaction interactions, and the control variable was run (Wald $\chi^2(7) = 54.86$, Prob > $\chi^2 = 0.00$), see Table 2. A likelihood ratio test (LR test) was significant, indicating that a hierarchical model fit the data better than a regular linear model.

Work recovery was lower in the activity-based work environment, but only significantly at time 2. This result partially supports hypothesis 1. Regarding hypothesis 2, the observed effect is opposite to expectations, with the negative impact of the activity-based work environment on work recovery being greatest at time 2.

Workspace satisfaction was found to be positively related to work recovery, providing support for hypothesis 3. Additionally, providing partial support for hypothesis 4, the results show a significant time-by-workspace satisfaction interaction effect at time 2, with employees experiencing lower workspace satisfaction reporting less work recovery. An illustration of the interaction effect is shown in Fig. 1.

Discussion

This study assessed how activity-based work environments influence

Table 1
Descriptive statistics.

	n	Min.	Max.	Mean	St.dev	α
Work recovery T0	80	1.0	5.0	3.70	0.83	0.78
Work recovery T1	69	2.0	5.0	3.77	0.85	0.81
Work recovery T2	66	1.5	5.0	3.61	0.90	0.82
Workspace satisfaction T0	80	1.0	7.0	5.04	1.50	–
Workspace satisfaction T1	71	1.0	7.0	5.03	1.66	–
Workspace satisfaction T2	66	1.0	7.0	5.42	1.34	–
ABW-attitude T0	80	1.0	7.0	5.21	1.72	–
Gender	80	0.0	1.0	.76	–	–

Table 2
Results of a hierarchical linear model predicting work recovery.

	Coef.	95 % conf. int.	
Time (0=pre-move baseline)			
Time 1	−0.45	−1.05	0.15
Time 2	−1.27**	−2.00	−0.53
Workspace satisfaction	0.10*	0.01	0.19
Time 1 x Workspace satisfaction	0.09	−0.03	0.20
Time 2 x Workspace satisfaction	0.20**	0.07	0.34
ABW-attitude at time 0	0.06	−0.03	0.15
Gender (0=male)	−0.31	−0.66	0.03
Intercept	3.13	2.42	3.85
Intercept variance	0.34	0.22	0.53
Residual variance	0.22	0.17	0.29
Wald χ^2	54.86**		
Groups (Observations)	79 (199)		
Marginal R ²	.22		
Conditional R ²	.70		

* $p < .05$.

** $p < .01$.

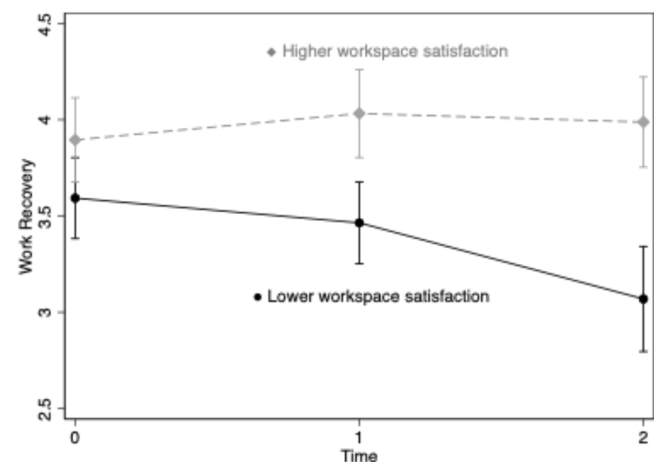


Fig. 1. Interaction of time and workspace satisfaction predicting work recovery.

employees' work recovery. Consistent with previous research, we observed a decline in work recovery following implementation of an activity-based work environment, though the negative impact is only significant for the third survey. Contrary to expectations, the observed negative effect is more pronounced at time 2 compared to time 1. This indicates that employees do not adapt to the new work environment—on the contrary—the negative effects seem to be getting more pronounced, at least during the study's timeframe.

Workspace satisfaction emerges as a key variable for work recovery. Employees who are more satisfied with their workspace seem to face fewer environmental stressors, which facilitates better recovery from work. Furthermore, the time-by-workspace satisfaction interactions show work recovery for employees with higher workspace satisfaction seemingly unaffected by moving to an activity-based work environment. In comparison, work recovery declines over time for those with lower workspace satisfaction.

The literature concerning activity-based work environment and its effects on employee well-being have yielded mixed results, with some studies indicating positive outcomes while others suggest negative implications. There has been a lack of research that delineates causal relationships, particularly within longitudinal study designs. Consequently, these findings represent a valuable contribution, suggesting that the implementation of activity-based work environment is likely to have adverse effects on the well-being of certain employee groups. Furthermore, the results also shed light on the literature

surrounding work recovery, demonstrating a connection between satisfaction with the work environment and the ability to recover from work. Specifically, changes to the work environment that are poorly aligned with employee needs may impair individuals' capacity to recover effectively after work hours.

Strength, limitations, and future research

The study's key strength lies in its longitudinal design, with repeated measures before and after activity-based work environment implementation, providing robust statistical power. However, limitations include the small dataset and the focus on a single government organization, which may limit generalizability. A larger sample size and more extensive data collection before and after implementation would help better capture long-term effects and provide a more precise baseline for understanding employee adaptation.

In this case, the workplace went through a full implementation of activity-based work environment. This represented a transition from private desks and limited options for addressing daily needs to a model featuring hot-desking and a diverse range of workspace options for different tasks. The total square footage of the workplace was reduced, leading to employees being in closer proximity to each other throughout the day. This exemplifies a typical trade-off associated with activity-based work environment implementation, whereby employees forgo certain value aspects in favor of others. From this perspective, it is likely that the study's findings are generalizable to other full-scale activity-based work environment implementations, provided that activity-based work environment is implemented comprehensively, as in this case. Nevertheless, it is also likely that a variety of other factors could play a role hindering direct generalization from the findings, such as quality of change management or the quality of the work environment that was abandoned. An interesting observation from the current study is the indication that employees with lower workspace satisfaction are not adapting to the new environment. Collecting data over an extended period post-implementation would be beneficial in comprehensively understanding long-term effects. Further, it would be interesting to include background and individual difference variables to see if other differences between higher and lower workspace satisfaction employees can be found. Moreover, measuring employee attitudes at additional points before implementation could provide a more accurate baseline for understanding how these attitudes evolve throughout the transition to an activity-based work environment.

Another question is the importance of the activity-based work environment. The possibility cannot be excluded that it is not specifically the activity-based work environment that affects the group that did not like the work environment. It is possible that it was experiencing a radical change in the work environment that affected the group rather than the activity-based work environment. Here, comparison groups (control groups) would be very beneficial. This could include comparable employees who do not move to an activity-based work environment and those who move to a different office layout.

A final limitation is the reliance on self-reported data. Future research could incorporate objective measures, such as sleep quality and health assessments, to enrich our understanding of the impact of activity-based work environments. Additionally, the individual-level changes experienced by employees pre- and post-implementation, which are likely to play a significant role, were not deeply explored.

Conclusion

Introducing an activity-based work environment can have diverse effects on employees, a point underscored by this study's examination of work recovery. Our findings reveal a previously unexplored negative impact on employee well-being. Consequently, it is crucial for organizations contemplating the shift to an activity-based work environment to carefully weigh its overall influence on employee wellness, as

neglecting this aspect could result in long-term costs.

When considering the transition to an activity-based work environment, organizations need to align it with their strategic goals. Although activity-based work environments might adversely affect aspects such as work recovery, proactive measures like employee training and other adjustments could help alleviate some of these negative impacts. Moreover, such work environments could be particularly relevant for organizations increasingly embracing remote work. However, a comprehensive understanding of the full spectrum of benefits and drawbacks activity-based work environments offer to both employees and organizations requires further research.

In conclusion, activity-based work environments have diverse effects on employees, particularly regarding work recovery. Organizations must weigh these potential drawbacks carefully and consider proactive strategies, such as employee training, to mitigate adverse effects. This study provides important insights and contributes to ongoing debates about the effectiveness of activity-based work environments, guiding future research.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Further reading

- Halldorsson, F., Valgeirsson, H., Kristinsson, K., 2024b. The predictive power of prior attitudes: understanding employee workspace satisfaction in activity-based work environments. *J. Corp. Real Estate*. <https://doi.org/10.1108/JCRE-09-2023-0038>.