



Self-rated productivity and employee well-being in activity-based offices: The role of environmental perceptions and workspace use



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ABSTRACT

Activity-based offices are increasingly popular. However, productivity and well-being in these work environments have been little researched. The aims of this study were to quantitatively determine perception and use of the activity-based office environment in relation to self-rated productivity and well-being at work, and to identify important predictors of these outcomes. Four activity-based offices in a large Swedish government agency were surveyed 12 months after implementation. Two hundred and thirty-nine respondents were included in the analyses. Linear regression models, adjusted for relevant covariates, were constructed separately for predictors measuring satisfaction with different aspect of the environment (physical environment, privacy, communication, personalization, personal storage, IT functions and cleaning) and office use (the number of daily workspace switches, different workspaces used and the time spent looking for a workspace). Satisfaction with the physical environment, privacy and communication had the strongest positive associations with self-rated productivity and well-being at work. Increased workspace switching was associated with higher productivity, while an increase in self-reported time spent searching for a workspace was associated with lower productivity and well-being. However, predictors related to office use generally explained only a small proportion of variance in the two outcomes. The results suggest that office developers should focus particularly on privacy needs but also on communication, personalization, smooth workspace switching and minimization of work time spent looking for available workspaces.

1. Introduction

An activity-based workplace (ABW) refers to an office where workers do not have dedicated desks but are supposed to switch between workspaces designed for specific activities, such as collaboration, concentration and speech privacy [1]. The popularity of this office design is enhanced by several trends in society, particularly the rapid technological development and the increase in knowledge work [2]. As office work gets increasingly mobile and multi-locational, the ABW enables organizations to use office space more efficiently, while at the same time allowing for different tasks contained in modern office work [3,4]. Facilitating interaction is a common goal in office re-design [5,6] as collaboration is assumed to contribute to organizational performance in knowledge work [7]. ABWs are claimed to enable organizations to reduce facility costs, accommodate changes in personnel and team structure easily, and even promote sustainability through a paperless

office and decreased commuting to work [4]. Improved productivity is also a common goal when implementing an ABW [4,8].

However, there is still limited scientific knowledge on the effects of ABWs on employee productivity and well-being. The perception of the office environment has been investigated more, showing generally positive results for ABWs, particularly in comparison with open-plan offices, e.g. Refs. [8–11]. Yet, productivity and well-being have clearer financial implications for organizations than satisfaction with different aspects of the environment. Any negative effects of the office design on productivity or well-being could easily exceed the intended savings in facility costs which are normally only a fraction of personnel costs [12].

Productivity is generally defined as the ratio between the input (i.e., resources, labor) and output (i.e., what is actually produced) [4]. In office work, an objective measurement of workers' performance is often not feasible, and researchers have to rely on self-ratings of perceived productivity. An advantage of subjective ratings is, however, that they

Abbreviations: ABW, an activity-based workplace

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may capture certain aspects of the input, such as motivation, effort and perceived hindrances to efficient working, which would be difficult to quantify objectively. Well-being at work, on the other hand, is by definition a subjective state, characterized by positive emotions and perceptions related to the context of work [13,14].

Several studies have compared ABWs to other office designs in terms of productivity, e.g. Refs. [4,10,11,15–18], and well-being, e.g. Refs. [10,11,17–19]. However, factors that may influence perceived productivity and well-being in ABWs have received little attention. To our knowledge, only Kim et al. [11] have examined the perception of different environmental factors in ABWs in relation to perceived productivity and health, using quantitative methods. The use of ABWs (e.g., the frequency of workspace switching) has not been examined in relation to productivity and well-being at work by any study. Identifying environmental factors associated with productivity and well-being is, however, important because it may help designers and workplace managers address the most relevant determinants of these outcomes, even before an ABW is implemented.

In many previous studies, the relation between the ABW and productivity or well-being has been assessed subjectively, i.e., researchers have examined how these outcomes are *perceived* to be affected by the environment, e.g. Refs. [4,10,11,16]. Such measures are likely biased by the respondent's general attitude towards the ABW. The relation between ABW features, productivity and well-being should be evaluated more objectively, by examining the perceived level of productivity or well-being at work in *general* and relating that to the perception of the ABW environment.

Several features of ABWs may, in theory, be relevant to productivity and well-being. Open office spaces, which are also characteristic for ABWs, decrease perceived privacy [20,21] and expose workers to different distractions, particularly coworkers' speech [22–24]. Lack of privacy is associated with lower environmental satisfaction [25,26] and stress symptoms [21,22,27], whereas irrelevant background speech has been shown to impair cognitive performance [28–31]. Thus, distractions can even be considered as an indirect indicator of decreased productivity [4]. As insufficient privacy and distractions are well-documented disadvantages of the ABW [10,16,18,32], their relation to perceived productivity and well-being in ABWs should be investigated.

The lack of dedicated desks is also associated with certain complaints. Limited possibilities for workspace personalization are associated with decreased satisfaction with the work environment [33], perceived identity threat [34] and lower team identification [35]. The effects of low privacy on emotional exhaustion could also be mitigated by workspace personalization [21] – a way of coping that is prevented by the clean-desk policy. The time spent looking for a workspace, setting up and, eventually, clearing the desk is often perceived as non-productive [4,9,11]. Other complaints in ABWs include dissatisfaction with limited storage and insufficient hygiene related to desk-sharing [11], as well as problems with ICT which may hinder workspace switching [4]. It would be important to investigate whether the complaints related to the ABW concept are also associated with productivity and well-being at work.

Interaction and collaboration are, in turn, perceived positively in the ABW according to several studies [8,32,36,37]. The only earlier study on the relation between ABW features, productivity and well-being [11] found that interaction with colleagues had the strongest relation with perceived productivity. Another factor, which could be expected to show a positive association with productivity and well-being, is workspace switching behavior. An active use of workspaces might facilitate productivity by ensuring appropriate conditions for different work tasks. Furthermore, it might enhance the sense of autonomy and control which could positively affect motivation, performance and well-being, cf. [1].

The aim of this study is to examine the extent to which workers' perception of different environmental factors and the reported use of workspaces at an ABW are associated with self-rated productivity and

well-being at work. We expect that the perception of environmental factors identified in the literature (i.e., environmental satisfaction, privacy, personalization, storage space, IT functions, and cleaning), satisfaction with communication, and use of office (i.e., workspace switching, the variety of workspaces used, the time spent searching for a workspace) will be associated with both productivity and well-being at work.

2. Methods

2.1. ABWs

Employees working for a large Swedish government agency (the Swedish Transport Administration), were recruited at four office sites at different geographical locations where a relocation to ABWs had been implemented 12 months earlier. The data were originally collected for a longitudinal study with three measurement points: (I) prior to relocating to the ABW, (II) three months after relocation, and (III) 12 months after relocation (for more details, see Ref. [38]). Due to the nature of the research questions, only cross-sectional data from the 12-months follow-up in the ABW is used in this study.

The four ABWs generally contained web-meeting rooms, project rooms, single rooms for telephone calls, conversation rooms, meeting rooms, large open-plan room(s) accommodating 24 workers or more, quiet rooms/zones, and conference rooms. The four ABWs differed, however, in size and spatial design. The total area of the office ranged from 775 m² to 14,714 m², and the area per employee ranged from 12 m² to 22 m². Prioritized workstations (i.e., workstations giving priority to employees with special needs), a lounge area, and single rooms for phone calls were available in some, but not all, ABWs. Photographs of the ABWs are provided in Supplementary material.

The relocation to ABWs was planned, initiated and implemented by the agency without interference from the researchers. The study was approved by the Regional Ethical Review Board in Uppsala, Sweden (Dnr.2015/118) and all respondents provided their written informed consent prior to participation.

2.2. Respondents

We approached 514 employees at the four ABWs with a questionnaire 12 months after the relocation, achieving response rates of 60% (Office A), 64% (Office B), 76% (Office C) and 66% (Office D). Respondents who did not work in an ABW and who were not present at their primary office for at least 30% of time were excluded. Data from, in total, 239 respondents (49, 57, 33 and 100 in Offices A–D, respectively) were included in further analyses. Descriptive statistics of the sample are given in Table 1.

2.3. Measures

The questionnaire addressed several issues. The following items were analyzed in this study.

Age and gender were included as basic demographic covariates. *Managerial position* (yes, no) was also used as a covariate because initial analyses showed that managers gave higher ratings for productivity and well-being than employees in non-managerial positions. In addition, *perceived general health* was included as another covariate because it is associated with self-ratings of performance [39] and can be viewed as a sub-component of well-being [13]. It was measured with one item from the SF-36 Health Survey (“Overall, would you say your health is ...? Excellent, very good, good, fair, poor” [40]). The highest two and the lowest two categories were combined to arrive at a 3-category variable.

Satisfaction with the physical environment was measured on a 5-point scale. The responses were merged into three categories: satisfied (comprising satisfied and very satisfied), neutral (neither satisfied nor dissatisfied) and dissatisfied (comprising dissatisfied and very dissatisfied).

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