



Short communication

Scand J Work Environ Health [2018;44\(3\):330-334](#)

doi:10.5271/sjweh.3707

The relationship between office type and job satisfaction: Testing a multiple mediation model through ease of interaction and well-being

by [Otterbring T](#), [Pareigis J](#), [Wästlund E](#), [Makrygiannis A](#), [Lindström A](#)

Employees who work in open-plan offices reported lower levels of job satisfaction, subjective well-being, and ease of interaction with co-workers than employees who work in cellular or shared-room offices. Therefore, decision-makers should consider the impact of open office environment on employees rather than focusing solely on cost-effective office layout, flexibility, and productivity.

Affiliation: Department of Management/MAPP, Aarhus University, Fuglesangs Allé 4, 8210 Aarhus V, Denmark. toot@mgmt.au.dk

Refers to the following text of the Journal: [2011;37\(5\):359-449](#)

Key terms: [cellular office](#); [ease of interaction](#); [job satisfaction](#); [mediation model](#); [office](#); [office type](#); [open office](#); [open-plan office](#); [productivity](#); [shared-room office](#); [subjective well-being](#); [well-being](#)

This article in PubMed: www.ncbi.nlm.nih.gov/pubmed/29334117

Additional material

Please note that there is additional material available belonging to this article on the [Scandinavian Journal of Work, Environment & Health -website](#).



This work is licensed under a [Creative Commons Attribution 4.0 International License](#).

The relationship between office type and job satisfaction: Testing a multiple mediation model through ease of interaction and well-being

by Tobias Otterbring, PhD,^{1,2} Jörg Pareigis, PhD,³ Erik Wästlund, PhD,² Alexander Makrygiannis, BA,³ Anton Lindström BA³

Otterbring T, Pareigis J, Wästlund E, Makrygiannis A, Lindström A. The relationship between office type and job satisfaction: Testing a multiple mediation model through ease of interaction and well-being. *Scand J Work Environ Health*. 2018;44(3):330–334. doi:10.5271/sjweh.3707

Objectives This cross-sectional study investigated the associations between office type (cellular, shared-room, small open-plan, and medium-sized open-plan) and employees' ease of interaction with coworkers, subjective well-being, and job satisfaction.

Methods A brief survey including measures of office type, ease of interaction with coworkers, subjective well-being, and job satisfaction was sent electronically to 1500 Swedish real-estate agents, 271 of whom returned usable surveys. The data were analyzed using a regression-based serial multiple mediation model (PROCESS Model 6), which tested whether the relationship between office type and job satisfaction would be mediated by ease of interaction and, in turn, subjective well-being.

Results A negative relationship was found between the number of coworkers sharing an office and employees' job satisfaction. This association was serially mediated by ease of interaction with coworkers and subjective well-being, with employees working in small and medium-sized open-plan offices reporting lower levels of both these aspects than employees who work in either cellular or shared-room offices.

Conclusions Open-plan offices may have short-term financial benefits, but these benefits may be lower than the costs associated with decreased job satisfaction and well-being. Therefore, decision-makers should consider the impact of office type on employees rather than focusing solely on cost-effective office layout, flexibility, and productivity.

Key terms cellular office; open office; open-plan office; productivity; shared-room office; subjective well-being.

Numerous private and public organizations have already adopted the concept of open-plan offices and many other companies are currently considering a switch from traditional cellular offices to such open layouts (1–3). In the United States, for instance, approximately 70% of all offices are now open-plan (4), characterized by the absence of interior walls and private workspaces (5). Common arguments for investing in such open spaces are their claimed cost efficiency and flexible layout, assumed ability to facilitate interaction among employees, and, ultimately, presumed potential to improve work performance and productivity (6–8). The problem with these arguments is that most empirical findings do not

support them. Extensive research shows that open-plan (versus cellular) offices are linked to decreased ease of interaction among coworkers, lower levels of job satisfaction, and reduced job performance and productivity (9–14). In addition, compared to cellular offices, such open-plan workspaces are linked to decreased well-being and other negative health-related outcomes, such as increased sickness absence, and higher levels of stress, distraction, and disturbance (15–20).

The office plays a major role in many people's lives, and a recent Gallup investigation estimated that distracted and disengaged employees cost companies approximately US\$500 billion in lost productivity per

¹ Department of Management/MAPP, Aarhus University, Fuglesangs Allé 4, 8210 Aarhus V, Denmark.

² Department of Psychology & CTF, Service Research Center, Karlstad University, Universitetsgatan 2, 65188 Karlstad, Sweden.

³ Department of Business Administration & CTF, Service Research Center, Karlstad University, Universitetsgatan 2, 65188 Karlstad, Sweden.

Correspondence to: Tobias Otterbring, Department of Management/MAPP, Aarhus University, Fuglesangs Allé 4, 8210 Aarhus V, Denmark. [E-mail: toot@mgmt.au.dk]

year in the United States alone (21). Therefore, it is important to understand the effects of different office types on individuals' well-being and job satisfaction. Hence, the present study examined whether office type is associated with employees' ease of interaction with coworkers, as well as with their subjective well-being and job satisfaction.

Our main hypothesis was that there would be a negative relationship between the number of coworkers sharing an office and employees' job satisfaction, defined as the level of satisfaction experienced with one's job (5). We based this prediction on the fact that a large body of literature, including longitudinal studies and experimental research, has shown a negative relationship between open (versus cellular) offices and employees' job satisfaction (9–10, 12, 14–15). Indeed, a systematic review (12) of the effects that various office concepts have on workers' health and performance concluded that “there is *strong evidence* that working in open workplaces reduces job satisfaction” (p128).

Multiple studies, some comprising samples larger than 40 000 occupants, have also documented a negative association between open (versus cellular) offices and employees' ease of interaction with coworkers (5, 9–13), operationalized as the extent to which it is easy to communicate and collaborate at work (13, 15). Moreover, previous research has found a negative relationship between open (versus cellular) offices and various well-being-related outcomes, such as internal motivation to perform effectively at work and feelings of engagement, calmness, and harmony, with ease of interaction at work being conceptualized as an antecedent of such well-being-linked variables (5, 15, 17). Given these research findings, we further expected that the hypothesized association between the number of coworkers sharing an office and employees' job satisfaction would be serially mediated by a decreased ease of interaction with coworkers and, in turn, by lower levels of subjective well-being.

Method

A cross-sectional survey was sent out electronically to 1500 individuals working as real-estate agents throughout Sweden, distributed across three different real-estate agencies and 30 different offices during May 2017. In total, 305 agents replied to the survey, yielding a response rate of 20%, which is similar to the response rates obtained in other studies utilizing web-based surveys (22). Thirty-four surveys had missing values on the crucial item of how many other people (if any) the respondent shared an office with, resulting in a final sample of 271 participants [61% female; mean age 39.70, standard deviation (SD) 11.80 years].

Participants were informed that all responses were anonymous and that the data would be analyzed at an aggregate level, ensuring that it would be impossible to identify individual responses or companies. They then replied to a set of items related to office type, subjective well-being, job satisfaction, and other study-specific variables. Participants were initially asked to indicate whether they shared an office with someone, and if so, how many people. We created groups based on the number of coworkers with whom the participants shared their office using a pre-defined categorization from Danielsson & Bodin (11, 15). Participants who worked alone in a room (N=76) were classified as belonging to a cellular office, while those who worked in a room with 1–2 colleagues (N=45) were classified as belonging to a shared-room office. Participants working in a room with 3–9 coworkers (N=113) were categorized as belonging to a small open-plan office, while the remaining participants, who worked in rooms with 10–20 coworkers (N=37), were categorized as belonging to a medium-sized open-plan office. Next, participants completed eight items from the Satisfaction with Travel Scale (STS) (23), which measures subjective well-being (for items, see supplementary material, www.sjweh.fi/show_abstract.php?abstract_id=3707). Items were rated on 9-point semantic differential scales (range -4–4), and were averaged to form a composite well-being index ($\alpha=0.90$). Using the same 9-point response format, participants continued by replying to two items about ease of interaction at work: “I perceive the communication at my office as: very bad/very good;” and “The collaboration with my coworkers is: bad/good.” Items were averaged to form a composite ease of interaction index ($\alpha=0.80$). Lastly, participants indicated their job satisfaction on a single-item scale (“How satisfied are you with your job?”) using the same response format (-4=very dissatisfied; 4=very satisfied). Single-item scales are reliable if, as in the present case, they represent clear and unambiguous constructs (24–25).

Results

We screened the data for outliers and excluded nine cases prior to analysis, using a cut-off of 3 SD from the mean on our key constructs. We then performed a serial multiple mediation analysis (PROCESS Model 6; 26) in which missing values were replaced by group means (27). Office type (cellular office, shared office, small open office, medium-sized open office) was the predictor, ease of interaction at work was the first mediator, subjective well-being was the second mediator, and job satisfaction was the outcome variable. We found that the total effect of office type on job satisfaction was

statistically significant ($\beta=-0.15$, $T=-2.02$, $P=0.04$), with employees experiencing lower job satisfaction as the office type become relatively more open (table 1). Office type also had significant negative effects on both ease of interaction at work ($\beta=-0.27$, $T=-3.26$, $P=0.001$) and subjective well-being ($\beta=-0.19$, $T=-2.53$, $P=0.01$). Furthermore, ease of interaction at work had a positive effect on subjective well-being ($\beta=0.68$, $T=12.11$, $P<0.001$), with the former variable also being positively associated with job satisfaction ($\beta=0.27$, $T=4.60$, $P<0.001$), just as subjective well-being was ($\beta=0.24$, $T=4.52$, $P<0.001$). Central to the current investigation, when job satisfaction was regressed on office type, ease of interaction at work, and subjective well-being, the effect of office type was clearly reduced and was no longer significant ($\beta=0.01$, $T=0.19$, $P=0.85$). Finally, this mediation effect was assessed using a bootstrap procedure with 5000 bootstrap samples. The results of a 95% confidence interval (CI) revealed that the indirect effect of office type through ease of interaction at work and, in turn, subjective well-being, was significantly different from zero (95% CI -0.09 – -0.02 , figure 1).

Discussion

Several studies have demonstrated negative associations between open (versus cellular) offices and ease of interaction with coworkers, well-being-related outcomes, and job satisfaction (5, 9–15, 17). However, as far as we can ascertain, this is the first study to unite all these concepts in one testable model. Our results revealed that employees working in small or medium-sized open-plan offices consistently reported lower levels of job satisfaction, subjective well-being, and ease of interaction with coworkers than employees working in cellular

Table 1. Interaction at work, subjective wellbeing, and job satisfaction across office types. [SD=standard deviation.]

	Cellular	Shared	Small open	Medium-sized open
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Ease of interaction	2.62 (1.13)	2.53 (1.17)	2.12 (1.66)	1.80 (1.25)
Subjective well-being	1.99 (1.41)	1.83 (1.21)	1.36 (1.76)	0.78 (1.64)
Job satisfaction	3.15 (1.00)	3.16 (1.21)	2.82 (1.50)	2.78 (0.89)

or shared-room offices, with the association between office type and job satisfaction being serially mediated by ease of interaction and, in turn, subjective well-being. Companies may wish to consider these findings before switching to such open office layouts, since their purported financial savings may be substantially lower than the costs associated with decreased job satisfaction and well-being, as well as impaired job performance, increased sickness absence, and higher degrees of stress and distraction (9–20).

However, it should be noted that the mean values for all constructs in the present study were consistently above the scale midpoint, regardless of office type, which means that employees generally gave positive ratings on job satisfaction as well as ease of interaction with colleagues and subjective well-being. Hence, the question may not be which office type produces satisfied and dissatisfied employees, but rather which office type produces more or less satisfied employees.

Limitations and future research

Because this is a cross-sectional study, it is not possible to infer causality. While we assume that office type has influenced ease of interaction, subjective well-being, and job satisfaction, we cannot rule out the possibility that these assumed consequences or other associated vari-

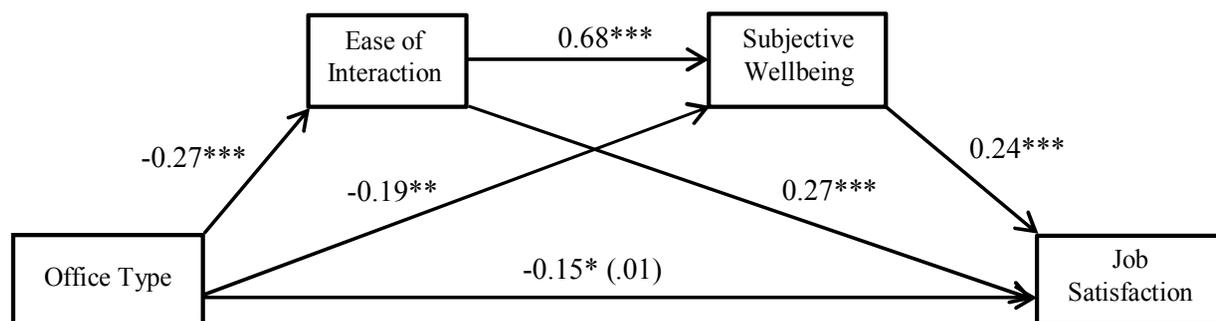


Figure 1. Serial multiple mediation model. *** $P\leq 0.001$; ** $P\leq 0.01$; * $P<0.05$

ables may have contributed to the pre-selection of individuals into different office types. It is also possible that job satisfaction is a cause, rather than a consequence, of subjective well-being and ease of interaction. However, in light of existing theorizing and the fact that each of our hypothesized relationships has been shown in previous research (albeit not together in a single coherent study), we believe that the use of a multiple mediation model is reasonable.

The low response rate is another limitation of our study. However, because we are testing the model per se rather than trying to infer population values from sample data, we believe it is unlikely that the low response rate should invalidate our findings. Nevertheless, our results – based exclusively on self-report data and with a relatively low response rate – should be taken with caution, and we call for replications with improved research designs, such as cohort studies and studies utilizing cluster-randomized designs, to ascertain whether the direction of causation is as hypothesized.

Acknowledgements

This research was conducted in accordance with the principles expressed in the Declaration of Helsinki and without any funding source. The first author analyzed the data and lead-authored the article, with input from the other authors. The two first authors developed the survey, and the two last authors collected the data under supervision of the second author. All authors approved the final version of the article prior to submission and jointly declare that they have no conflicts of interest.

References

- Billing M. Öppna kontorslandskap ett globalt problem [Open office workspaces, a global problem]. *Dagens Nyheter*. June 4, 2015. Available from: <http://webcache.googleusercontent.com>.
- Burkus D. Why your open office workspace doesn't work. *Forbes*. June 21, 2016. Available from: <https://www.forbes.com/sites/davidburkus/2016/06/21/why-your-open-office-workspace-doesnt-work/#69d22ab1435f>.
- Kinman G, Garfield I. The open-plan university – noisy nightmare or buzzing ideas hub? *The Guardian*. October 16, 2015. Available from: <https://www.theguardian.com/higher-education-network/2015/oct/16/the-open-plan-university-noisy-nightmare-or-buzzing-ideas-hub>.
- Borzykowski B. Why open offices are bad for us. *BBC*. January 11, 2017. Available from: <http://www.bbc.com/capital/story/20170105-open-offices-are-damaging-our-memories>.
- Oldham GR, Brass DJ. Employee reactions to an open-plan office: A naturally occurring quasi-experiment. *Admin Sci Quart*. 1979;24(2):267–84. <https://doi.org/10.2307/2392497>.
- Allen TJ, Gerstberger PG. A field experiment to improve communications in a product engineering department: The nonterritorial office. *Hum Factors*. 1973;15(5):487–98. <https://doi.org/10.1177/001872087301500505>.
- Ashkanasy NM, Ayoko OB, Jehn KA. Understanding the physical environment of work and employee behavior: An affective events perspective. *J Organ Behav*. 2014;35(8):1169–84. <https://doi.org/10.1002/job.1973>.
- Kamarulzaman N, Saleh AA, Hashim SZ, Hashim H, Abdul-Ghani AA. An overview of the influence of physical office environments towards employee. *Procedia Eng*. 2011;20:262–8. <https://doi.org/10.1016/j.proeng.2011.11.164>.
- Brennan A, Chugh JS, Kline T. Traditional versus open office design: A longitudinal field study. *Environ Behav*. 2002;34(3):279–99. <https://doi.org/10.1177/0013916502034003001>.
- Carlopio JR, Gardner D. Direct and interactive effects of the physical work environment on attitudes. *Environ Behav*. 1992;24(5):579–601. <https://doi.org/10.1177/0013916592245001>.
- Danielsson CB, Bodin L. Difference in satisfaction with office environment among employees in different office types. *J Archit Plan Res*. 2009;26(3):241–57.
- De Croon E, Sluiter J, Kuijer PP, Frings-Dresen M. The effect of office concepts on worker health and performance: a systematic review of the literature. *Ergonomics*. 2005;48(2):119–34. <https://doi.org/10.1080/00140130512331319409>.
- Kim J, de Dear R. Workspace satisfaction: The privacy-communication trade-off in open-plan offices. *J Environ Psychol*. 2013;36:18–26. <https://doi.org/10.1016/j.jenvp.2013.06.007>.
- Sundstrom E, Town J, Rice R, Osborn D, Brill M. Office noise, satisfaction, and performance. *Environ Behav*. 1994;26(2):195–222. <https://doi.org/10.1177/001391659402600204>.
- Danielsson CB, Bodin L. Office type in relation to health, well-being, and job satisfaction among employees. *Environ Behav*. 2008;40(5):636–68. <https://doi.org/10.1177/0013916507307459>.
- Evans GW, Johnson D. Stress and open-office noise. *J Appl Psychol*. 2000;85(5):779–83. <https://doi.org/10.1037/0021-9010.85.5.779>.
- Hedge A. The open-plan office: A systematic investigation of employee reactions to their work environment. *Environ Behav*. 1982;14(5):519–42. <https://doi.org/10.1177/0013916582145002>.
- Pejtersen JH, Feveile H, Christensen KB, Burr H. Sickness absence associated with shared and open-plan offices – a national cross sectional questionnaire survey. *Scand J Work Environ Health*. 2011;37(5):376–82. <https://doi.org/10.5271/sjweh.3167>.
- Seddigh A, Berntson E, Danielsson CB, Westerlund H.

- Concentration requirements modify the effect of office type on indicators of health and performance. *J Environ Psychol.* 2014;38:167–74. <https://doi.org/10.1016/j.jenvp.2014.01.009>.
20. Vischer JC. Towards an environmental psychology of workspace: How people are affected by environments for work. *Archit Sci Rev.* 2008;51(2):97–108. <https://doi.org/10.3763/asre.2008.5114>.
21. Sorenson S, Garman K. How to tackle U.S. employees stagnating engagement. *Business Journal.* June 11, 2013. Available from: <http://www.gallup.com/businessjournal/162953/tackle-employees-stagnating-engagement.aspx>.
22. Kaplowitz MD, Hadlock TD, Levine R. A comparison of web and mail survey response rates. *Public Opin Q.* 2004;68(1):94–101. <https://doi.org/10.1093/poq/nfh006>.
23. Ettema D, Gärling T, Eriksson L, Friman M, Olsson LE, Fujii S. Satisfaction with travel and subjective well-being: Development and test of a measurement tool. *Transport Res F-Traf.* 2011; 14(3):167–75. <https://doi.org/10.1016/j.trf.2010.11.002>.
24. Bergkvist L, Rossiter JR. The predictive validity of multiple-item versus single-item measures of the same constructs. *J Marketing Res.* 2007;44(2):175–84. <https://doi.org/10.1509/jmkr.44.2.175>.
25. Nagy MS. Using a single-item approach to measure facet job satisfaction. *J Occup Organ Psych.* 2002;75(1):77–86. <https://doi.org/10.1348/096317902167658>.
26. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford Press, New York; 2013.
27. Titterington DM, Murray GD, Murray LS, Spiegelhalter DJ, Skene AM, Habbema JDF, Gelpke GJ. Comparison of discrimination techniques applied to a complex data set of head injured patients. *J R Stat Soc Ser A-G.* 1981;145–75.

Received for publication: 19 September 2017