



# FORUM ACUSTICUM EURONOISE 2025

## HOW DID THE ADDITION OF SOUNDPROOF PODS INFLUENCE OFFICE EMPLOYEES' EXPERIENCE?

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### ABSTRACT

One way to mitigate the disturbance of speech and lack of privacy in office is to use mobile, soundproof workspaces (pods). We examined how the addition of pods affects employees' job satisfaction and experience in an activity-based office where challenges in speech privacy were experienced. In this quasi-field experiment, seven pods were added to the activity-based office. The office had 58 employees, with 38 undesignated and reservable workstations. The survey was conducted before (Phase 1) and after (Phase 2) the addition of pods. Job satisfaction was higher in Phase 2 than in Phase 1. Satisfaction with indoor environmental factors was higher in Phase 2 regarding speech and visual privacy, ease of interaction, amount of storage and workspace, temperature, and cleanliness. In Phase 2, the employees were also more satisfied with the availability of different types of workspaces. The results show that adding pods to an activity-based office can improve employees' experience of the space in terms of both privacy and availability of different workspaces. Improvement of job satisfaction may be caused by proper change management, elevated feeling of control, and satisfaction with supervision.

**Keywords:** *Office, sound pressure level, indoor environmental quality, Pods, Work satisfaction*

### 1. INTRODUCTION

Even 27% of office occupants are disturbed by noise in offices [1]. The most common annoying noise in offices is speech [2]. Working during task irrelevant speech can raise stress level, reduces performance, and elevates perceived workload and noise annoyance [3]. Room acoustic solutions can reduce subjective noise annoyance, but only when a speaker is farther than the adjacent workspace, i.e., beyond 4–6 m distance [4]. Another way that can reduce distraction and improve work environmental satisfaction is to offer quiet workspaces [5]. Traditional workspaces are fixed office rooms. Their acoustic properties can be designed so that the adverse effects of irrelevant speech (arriving behind wall) are eliminated [6]. Since 2015, mobile pods have become very common in offices. They can be flexibly positioned in the office, and they are available with different sizes, furniture layouts, working styles, and number of seats (from one to ten). There is very little independent research on how office employees experience pods.

The aim of this study was to examine the experiences before and after adding pods to an office, where occupants have complained about disturbing speech and the lack of places for confidential communication. Also, the sound pressure levels in the office were monitored throughout the study.

### 2. METHODS

#### 2.1 Design

The study was a quasi-field experiment, where the conditions and experiences were examined before and after the installation of pods to an office. The conditions were examined with objective measurements of sound level as well as indoor environment. The experience was examined with a survey to the office employees before and after the

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installation of pods. Table 1 presents the timeline of the study.

**Table 1.** The timeline of the study.

Year	2023					2024				
Month	9	10	11	12	1	2	3	4	5	
Survey (Phases 1 and 2)		1				2				
Pods installation										
Pods functioning										
Sound level measurements										
Indoor environment measurements			1							

## 2.2 Office

The study was conducted in an activity-based office at the University of Oulu, where administrative staff was mostly handling students' financial and academic matters online or by phone. The office had 58 employees and 38 workstations. All workstations were undesignated and could be reserved through a booking system. Remote work was common. The space was renovated in 2020. In 2022, the staff raised concerns about speech privacy. As a result, the unit's management agreed to investigate the impact of pods. A total of seven pods were installed: four single-person pods and three 4-person meeting pods (Fig. 1). The speech level difference ( $D_{S,A}$ ) of the single-person pods reached class A, while for the meeting pods it was class B [7].

## 2.3 Survey

Employees' experiences were examined through two surveys: before (Phase 1) and after (Phase 2) the pod installation (Table 1). The surveys assessed satisfaction with indoor environmental factors, work, and the work environment, as well as the availability of different types of workspaces.

Satisfaction with indoor environmental factors was assessed with the question "How satisfied are you with the following factors at your workstation?" on a seven-point scale (-3 very unsatisfied, +3 very satisfied). The assessed indoor environmental factors are listed in Figure 3.

The availability of different types of workspaces was estimated using the statements reported in Table 2 using a five-point scale (1 completely disagree, 5 completely agree).



**Figure 1.** Layout of the office in Phases 1 and 2. The pods in Phase 2 are marked with pink (single-person pod) and green (4-person pod) squares.

Job satisfaction was assessed by answering the question "How satisfied are you with your job as a whole?" on a five-point scale (-2 very dissatisfied, +2 very satisfied). Environmental satisfaction was asked with the question "How satisfied are you with your work environment at your workstation as a whole?" and assessed using a seven-point scale (-3 very unsatisfied, +3 very satisfied).

The survey results were analyzed using R Studio (version 4.3.0) with linear mixed models (LMM). The model considers the responses of the same subjects in different phases.

## 2.4 Objective measurements

The sound level was measured throughout the study period (nine months) with 11 stationary noise level meters (Miran DLS, Pietiko Oy) that continuously recorded one-minute average sound levels ( $L_{Aeq,60s}$ ) to the cloud. They were evenly located in the whole office. The average sound levels during working days (8 am–5 pm) were compared between Phases 1 and 2. Additionally, in Phase 1, indoor environment measurements were conducted (room acoustics, sound insulation, lighting, carbon dioxide concentration, and temperature).



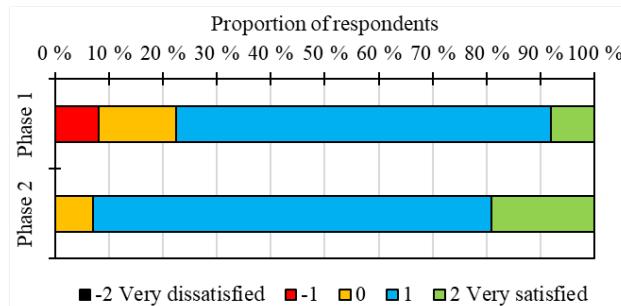


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### 3. RESULTS

Indoor environment measurements showed that the office acoustics and air quality were in conformance with the current Finnish target values. Therefore, the office was suitable for the investigation of pod intervention since the occupants did not suffer from poor indoor environment.

Unexpectedly, the sound levels were practically equal in Phase 1 (months 9/2023 and 10/2023, mean 34.8 dB  $L_{Aeq}$ ) and Phase 2 (months 12/2023 and 1/2024, mean 35.0 dB). The survey was administered twice, and the number of respondents was 49 and 42 in Phases 1 and 2, respectively. Job satisfaction was higher in Phase 1 (mean=4.1, SD=0.5) than in Phase 1 (mean=3.9, SD=0.7) (Figure 2) ( $t(67) = -2.748$ ,  $p = 0.008$ ). Figure 2 shows the respondents job satisfaction answers.

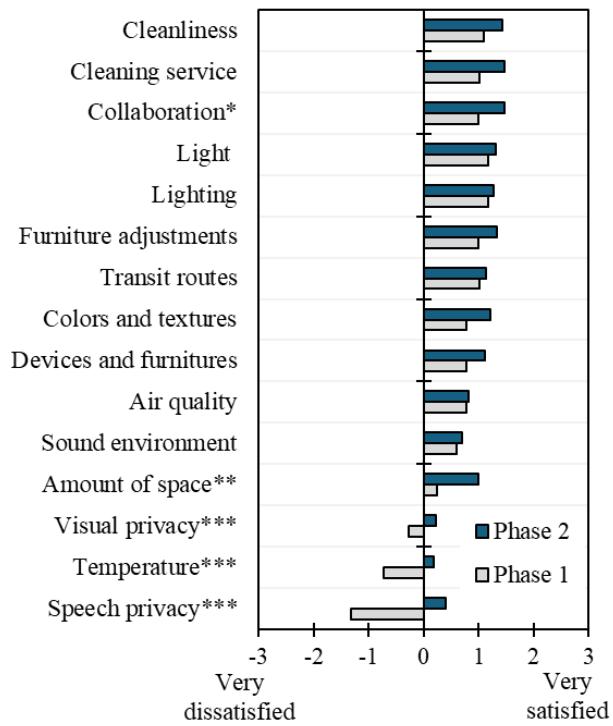


**Figure 2.** The proportion of respondent answers in job satisfaction scale.

Satisfaction with indoor environmental factors increased between Phases 1 and 2 in terms of speech privacy, visual privacy, temperature, the amount of workspace and storage space, and collaboration (Figure 3).

The experience of the adequacy of the spaces improved between Phases 1 and 2 (Table 2): the participants felt that meeting rooms were more readily available, and it was easier to find a place for conversations, and remote meetings, as well as quieter places for working.

Environmental satisfaction did not differ the phases ( $t(73) = -1.429$ ,  $p = 0.157$ ).



**Figure 3.** The mean satisfaction with indoor environmental factors in Phases 1 and 2. Asterisks denote the significance of difference between the phases (\*  $p < 0.05$ , \*\*  $p < 0.01$ , and \*\*\*  $p < 0.001$ ).

**Table 2.** The statements regarding workspace availability in phases 1 and 2. The estimation scale was from 1 completely disagree to 5 completely agree. Asterisks denote the statistically significant difference between the phases (\*\*\*  $p < 0.001$ )

Statements	Phase 1	Phase 2
There are enough meeting rooms.***	2.2	3.1
If I can't concentrate at one workstation, I can easily move to a quieter place to work.***	2.7	3.6
It's easy to find a place where I can discuss or talk on the phone about things I don't want others to hear.***	1.9	3.5
It's easy to find a space to participate in remote meetings.***	2.0	3.2





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## 4. DISCUSSION

Our quasi-field experiment was conducted in an activity-based office where the occupants had reported about problems in speech privacy. Our results showed that job satisfaction was higher when the pods had been installed. The finding is very unexpected since job satisfaction usually depends more on non-tangible (salary, work content, importance of work, supervisor, colleagues, and control over work) than tangible issues (physical work environment). We believe that job satisfaction improved because occupants felt higher control over the workplace and better trust towards the supervisors, who paid attention to the occupants' speech privacy complaints. Occupants felt that their opinions were respected.

Furthermore, addition of pods improved satisfaction with privacy, amount of space, and collaboration as well as the perceived availability of different types of workspaces. We attribute the improvement on privacy estimations to pods, but the improvement in temperature estimations to the different seasons, when the surveys were made (Autumn and Winter). Furthermore, collaboration between employees was improved in Phase 2, which may reflect that pods may also influence organizational behavior.

Our study was conducted in an office, where the sound levels were very low, only 35 dB  $L_{Aeq,08-17}$ . This is much below the usual range of office sound levels (38–73 dB) reviewed by Yadav et al. [8]. The reason may be that remote working was mostly applied: some occupants worked in the office only a couple of days per month. It also seems that the employees were not talking in the open office space before or after the installation of pods. Therefore, our study may not give a complete picture of the influences of office pods.

## 5. CONCLUSION

The pods can improve the privacy among office employees by improving availability of different types of workspaces in an activity-based office. These improvements can be even reflected to job satisfaction.

## 6. ACKNOWLEDGMENTS

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