

Employee-workplace alignment: employee characteristics and perceived workplace requirements

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Employee-workplace alignment: Employee characteristics and perceived workplace requirements

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Abstract

Purpose: To identify the employee characteristics which are most strongly associated with perceived requirements for different aspects of the workplace environment.

Design/Methodology/Approach: A questionnaire was completed by 364 employees from a large private-sector organisation. Respondents were surveyed on different work-related, personality, and demographic characteristics. They then completed a series of items measuring perceived requirements for four aspects of the workplace environment (workspace segregation, workspace territoriality, individual environmental control, and aesthetic quality). Associations between employee characteristics and perceived workplace requirements were explored using multiple regression analyses.

Findings: Numerous significant associations emerged. For example, the requirement for more segregated workspaces was associated with higher susceptibility to distraction, and the requirement for higher workspace territoriality was associated with less positive perceptions regarding the impact of flexible working on work effectiveness.

Originality/Value: The individual difference factors which moderate satisfaction with the workplace environment have received relatively little attention in past research. The present study addresses this knowledge gap by including a wider range of employee characteristics and comprehensively investigating which of these most strongly predict differences in perceived requirements for the workplace.

According to Person-Environment Fit theory, workplace stress arises as a result of misalignment between the needs of the employee and the characteristics of the environment (Edwards *et al.*, 1998). The ‘environment’ here has typically been defined in terms of psychosocial characteristics, but it is becoming increasingly recognised that misalignment can also occur with the physical workplace environment (Gerdenitsch *et al.*, 2018; Haynes, 2012; Vischer, 2007). Specifically, Haynes (2012) has stressed the need for the characteristics of the office environment to be aligned to both the working patterns and psychological characteristics of the office occupants.

The physical workplace environment can be viewed as a composite of individual environmental features, which can be classified as ‘demands’ (if they cause physiological and/or psychological strain) or ‘resources’ (if they stimulate engagement and motivation, and/or aid recovery from demands) (authors, manuscript accepted for publication). Thus, a workplace environment which is perfectly aligned to the occupants is one which is free of demands and abundant in resources. However, the judgment over what constitutes a demand or a resource may vary significantly between employees, as a result of different characteristics. Thus, the aim of the present study was to comprehensively explore the relationship between employee characteristics and perceived workplace requirements.

In particular, we focus on requirements for four aspects of the workplace environment: *workspace segregation*, *workspace territoriality*, *individual environmental control*, and *aesthetic quality*. As we will discuss in the next section, numerous potential moderators of these preferences have been identified in past research, including characteristics of the work being completed as well as the employee’s personality traits and demographic characteristics. However, the existing evidence base is limited in that it typically considers only one or two characteristics at a time, meaning that there is limited insight into exactly which characteristics are most strongly associated with divergent

workplace requirements. To address this limitation, we aimed to concurrently explore the influence of a wider range of employee characteristics in the present study.

Furthermore, there are also limitations in the fact that the existing research primarily explores outcomes in real workplace environments or experimental chambers. Whilst this approach has enabled researchers to identify various antecedents of satisfaction and dissatisfaction in specific contexts, there remains limited insight into the types of working environment which the users themselves believe would enable their most effective work, if they had a completely free choice of different options. To address this knowledge gap and adopt a more user-centred approach to research, we used a survey-based methodology which allowed respondents to stipulate the characteristics of a hypothetical 'ideal' workplace.

Non-Uniformity in Workplace Requirements

Workspace Segregation. Office layouts differ with respect to the extent to which individual workspaces are in 'segregated' or 'open' locations, as a result of physical architectural characteristics. In general, employee satisfaction and productivity tends to worsen as office openness increases (Bodin Danielsson and Bodin, 2008; Kim and de Dear, 2013), however there is also evidence to suggest that responses are significantly moderated by various characteristics, meaning different employees are more or less suited to open office environments.

For example, employees completing complex and concentration-demanding tasks tend to report higher stress and distraction in shared workplaces (Fried *et al.*, 2001; Seddigh *et al.*, 2014), suggesting that this type of work is more effectively completed in segregated spaces. Similarly, tasks which require the processing of verbal/numerical (rather than

visual/spatial) information are particularly susceptible to disruption by the presence of background speech (Haka *et al.*, 2009; Jahncke *et al.*, 2013), so employees completing this type of work may also be less suited to open office environments. Finally, typical interaction levels with colleagues may also be important. Employees who primarily perform more collaborative work tend to rate open-plan offices more positively than those who primarily perform individual work (Haynes, 2008), presumably because the various interactions which naturally emerge in open offices are viewed as useful rather than distracting.

Other studies have highlighted the importance of personality traits. In particular, introversion-extraversion has received significant research attention, with studies showing that introverts are more dissatisfied and disrupted than extraverts in the presence of background noise in general (Geen, 1984) and in open-plan offices in particular (Hartog *et al.*, 2018; Oseland and Hodsman, 2018). Researchers have also considered the role of sensory processing sensitivity, an innate trait concerning the individual's sensitivity to external stimuli. Individuals who are less capable at disregarding environmental stimuli also experience more distraction and dissatisfaction in open-plan offices (Maher and von Hippel, 2005; Oldham *et al.*, 1991).

Finally, in terms of demographic characteristics, it has been demonstrated that older employees (Pullen, 2014) and high-tenured employees (Fried *et al.*, 2001) are less satisfied in densely-populated open offices than their younger and lower-tenured counterparts. Older employees also tend to place less emphasis on workplaces which support collaboration and socialisation (Rothe *et al.*, 2012). Lastly, it is also possible that men may prefer more segregated workspaces than women, given that women tend to rate interpersonal interactions in open-plan offices more positively than men (Bodin Danielsson *et al.*, 2015; Haynes *et al.*, 2017).

This overview of the literature identifies numerous potential moderators of workplace layout preferences, however at present it remains unclear whether some of these have a stronger influence than others. We aimed to concurrently explore the influence of each of these characteristics, and predicted that the perceived requirement for a more segregated workspace would be associated with: (a) higher need for concentration; (b) use of verbal information rather than visual-spatial information; (c) lower interactivity with colleagues; (d) higher introversion; (e) higher sensory processing sensitivity; (f) higher age; (g) organisational tenure; and (h) being male (*Hypothesis 1*).

Workspace territoriality. Another workplace trend relates to the growing adoption of non-territorial ‘flexible’ offices, in which employees do not have assigned desks but are instead encouraged to use different workspaces around the office on an ad-hoc basis. Notably, non-territorial workplaces restrict behaviours such as desk personalisation (e.g., photos of loved ones, artwork), which are typically performed to delineate personal territory and imbue the workstation with psychological comfort and meaning (Brunia and Hartjes-Gosselink, 2009; Wells, 2000). Again, there is evidence to suggest that certain characteristics moderate the perceived importance of these behaviours.

In particular, employees who are required to regularly work from the same workstation ascribe greater importance to having a workspace which feels like an ‘extension of home’ (Greene and Myerson, 2011), suggesting that location-dependency will predict workspace territoriality requirements. Additionally, it has been demonstrated that personalisation is more prevalent and important for wellbeing amongst women than men (Wells, 2000), suggesting there may also be a gender difference. As such, it was predicted that the perceived requirement for higher workspace territoriality would be associated with: (a) being female, and (b) higher location-dependency (*Hypothesis 2*).

Individual environmental control. Workplaces also differ in the extent to which individual employees are able to personally control local environmental conditions. Generally, employees are more satisfied and productive if they have personal control over the environment (Shahzad *et al.*, 2016), but in shared offices it is more common for employees to work under group settings. Once more, there is evidence to suggest that the importance of individual environmental control might differ between employees as a result of particular characteristics.

In particular, women may derive greater benefit than men from individual temperature control, as they tend to be more thermally sensitive than men and are more frequently dissatisfied with typical office temperatures (Hashiguchi *et al.*, 2010). Furthermore, the requirement for individual control might also be more important for location-dependent employees compared to mobile employees, as they tend to place a higher priority on comfort at their workspace (Greene and Myerson, 2011). As such, it was predicted that the perceived requirement for higher levels of individual environmental control would be associated with: (a) being female, and (b) higher location-dependency (*Hypothesis 3*).

Aesthetic quality. In contrast to the preceding aspects of the workplace environment, aesthetic quality has received very little attention in the research literature. However, it has been recognised that aesthetic judgments contribute to overall environmental satisfaction for some employees (Bodin Danielsson, 2015), and workplace professionals in practice are typically expected to provide workplaces which are not only functionally and strategically effective, but also aesthetically pleasing (Appel-Meulenbroek *et al.*, 2018). As such, we also included the perceived importance of aesthetic quality in the study for exploratory purposes, to identify whether this requirement might also be moderated by certain employee characteristics. Given the lack of previous research, we adopted the null hypothesis that none

of the employee characteristics would be significantly associated with perceived requirements for aesthetic quality (*Hypothesis 4*).

Method

Participants

The participants for this study were 364 employees (185 male, 176 female, 3 did not answer) at a large private-sector company in the United Kingdom. Initially, 22 employees evaluated a pilot version of the questionnaire, confirming that the user-friendliness of the questionnaire was very high ($M = 6.50$, on a 7-point scale) and that zero items had confusing or ambiguous wording. Thus, the questionnaire was deemed appropriate to be sent to the larger sample without revision. Subsequently, a study invitation was e-mailed to employees at 11 offices (~2,500 employees) and also placed on the company's intranet. Participation was completely voluntary.

Measures

Data were collected using an online questionnaire (items shown in Table 1) which measured employee characteristics (demographic information, task characteristics, and personality traits) and perceived workplace requirements. The majority of items were self-generated, although where possible items were taken from validated questionnaires. Cronbach's alpha values were attained for each scale as a measure of internal consistency. Given that our scales all had five or fewer items, and alpha values tend to be lower in scales with fewer items, $\alpha > 0.60$ was judged to be the acceptable threshold for internal consistency.

Demographic information. Participants reported *gender*, *age*, and *organisational tenure*.

Task characteristics. All items in this section used a 7-point response scale (1=Disagree completely, 7=Agree completely), with the exception of the item measuring *information type*, which had a dichotomous outcome (verbal/numerical or visual/spatial).

Three original items were used to measure *need for concentration*, as previous studies measuring similar constructs had used the average score of several independent factors (Fried *et al.*, 2001) or a single-item measure only (Seddigh *et al.*, 2014). However, our three items had very poor internal consistency ($\alpha = 0.24$), and would have not had reached the criteria for acceptability by dropping any individual items. As such, the three items were entered separately into the analyses as *task heterogeneity*, *concentration levels*, and *susceptibility to distraction*. It was predicted that requirements for more segregated workspaces would be associated with higher task heterogeneity, higher concentration levels, and higher susceptibility to distraction.

Three original items were also used to measure *location-dependency*, as the previous study on this topic had used a qualitative tool rather than a questionnaire (Greene and Myerson, 2011). However, these items also had poor internal consistency ($\alpha = 0.51$) and removing individual items would not have sufficiently increased reliability. Accordingly, the three items were also entered separately into the analysis as *internal mobility*, *importance of flexible working*, and *impact of flexible working on work effectiveness*. It was predicted that requirements for higher workspace territoriality and higher individual environmental control would be associated with lower internal mobility, less positive perceptions regarding the importance of flexible working, and less positive perceptions regarding the impact of flexible working on work effectiveness.

Three original statements were used to measure *interactivity*, as the measure used in past research consisted of a single item scored using a dichotomous rather than continuous response (Haynes, 2008). In this case, the internal consistency for the items was acceptable ($\alpha = 0.73$), so their average was used as the measure for interactivity.

Personality traits. For *introversion-extraversion*, participants viewed four personality descriptors from the Big-Five Mini-Markers Extraversion sub-scale (Saucier, 1994), and used a 7-point scale (1=Very inaccurate, 7=Very accurate) to rate the extent to which each described their personality. The internal consistency of these items was good ($\alpha = 0.84$), so their average was taken as the measure of introversion-extraversion.

For *sensory processing sensitivity*, three statements were adapted slightly from the Highly Sensitive Person Scale (Aron and Aron, 1997) to suit a 7-point response scale (1=Not at all, 7=Extremely). Unexpectedly, the internal consistency for these items was unacceptable ($\alpha = 0.41$), and would not have been sufficiently improved by dropping any individual item. Possibly, this surprising finding reflects recent research indicating that sensory processing sensitivity is actually a multi-factorial concept (Ershova *et al.*, 2018). Again, the three items were entered separately into the analyses, as *sensitivity to environmental subtleties*, *aesthetic sensitivity*, and *low sensory threshold*. It was predicted that requirements for more segregated workspaces would be associated with higher sensitivity to environmental subtleties, higher aesthetic sensitivity, and lower sensory threshold.

Perceived workplace requirements. All items in this section were self-generated. First, a novel method was used to capture *workspace segregation* requirements. Participants were asked to choose their favoured workspace from a floorplan (Figure 1) containing different workplace layouts from a common office typology: large open-plan, medium open-

plan, small open-plan, shared private room, and individual private room (Bodin Danielsson and Bodin, 2008). Five additional common workspaces were also included: ‘quiet pods’, hot-desking area, formal meeting room, open informal meeting area, and enclosed informal meeting area.

Because position relative to circulation route also affects the amount of background activity to which one is exposed (Oseland, 2009), each open-plan zone was sub-divided into a zone close to the circulation route and a zone close to the periphery. Thus, the floorplan contained 13 workspace choices, nine of which were rank-ordered prior to the study from least to most segregated (order shown in Figure 1). The meeting spaces and hot-desks were not ranked in terms of segregation, but were included in order to understand whether respondents might prefer to work from a non-standard type of workspace. These responses ($N = 16$) were omitted from the workspace segregation analysis.

INSERT FIGURE 1 HERE

Subsequently, participants used a 7-point scale (1=Very unhelpful/Not important at all, 7=Essential/Very important) to rate the importance of various environmental features in their ‘ideal’ workplace. Two additional items also related to workspace segregation, and were combined with the rank-ordered workspace choice (re-coded onto a 7-point response) to form a scale ($\alpha = 0.65$). The perceived requirement for workspace segregation was taken as the average of the three items.

Additionally, three items measured *workspace territoriality*, two items measured *individual environmental control*, and five items measured *aesthetic quality*. In all cases, the

internal consistencies of the scales were acceptable ($\alpha \geq 0.63$), so the perceived requirement for each workplace component was created by taking the average of the constituent items.

INSERT TABLE 1 HERE

Results

Main Analyses

To test the hypotheses, multiple linear regressions were performed for each perceived workplace requirement. In each case, a regression model was constructed with all of the potential predictors, using the forced entry method. Certain cases were omitted due to missing values for gender, age, and/or workspace segregation, meaning that the sample size was $N = 342$ for the workspace segregation analysis and $N = 358$ for the other three outcome variables. Summary statistics for the multiple regression models are shown in Table 2, including standardised beta values and significance values for each predictor, and the variance explained by the predictors.

Workspace segregation. The multiple regression model for predicting perceived workspace segregation requirements was significant ($F(15, 326) = 11.55, p \leq 0.001$), and indicated that the employee characteristics accounted for approximately 35% of the outcome variance ($R^2 = 0.35$). As expected, higher workspace segregation requirements were associated with higher susceptibility to distraction, being male, and higher introversion. Additionally, several predictors were also marginally above the cut-off point for statistical significance ($0.05 \leq p \leq 0.06$), and may warrant further investigation. These trends indicated that the requirement for a more segregated workspace may also have been associated with

older age, lower sensory threshold, and, contrary to expectations, *lower* task heterogeneity.

Results did not support predictions that interactivity, information type, or organisational tenure would be significantly associated with workspace segregation requirements.

Workspace territoriality. The model for predicting perceived workspace territoriality requirements was significant ($F(15, 342) = 9.07, p \leq 0.001$), and indicated that the employee characteristics accounted for approximately 28% of the outcome variance ($R^2 = 0.28$). As expected, higher requirement for territoriality was associated with being female. Additionally, higher requirement for territoriality was also associated with less positive perceptions of the impact of flexible working on work effectiveness, lower task heterogeneity, higher susceptibility to distraction, lower internal mobility, and by the use of verbal/numerical information. There was also a trend to indicate that higher territoriality requirements were also associated with less positive perceptions regarding the importance of flexible working, although this was marginally above the criteria for statistical significance ($p = 0.059$).

Individual environmental control. The model for predicting the perceived requirement for individual environmental control was significant ($F(15, 342) = 4.44, p \leq 0.001$), and indicated that the employee characteristics accounted for approximately 16% of the outcome variance ($R^2 = 0.16$). Requirements for higher levels of individual environmental control were associated with being female, lower task heterogeneity, more positive perceptions of the impact of flexible working on work effectiveness, lower sensory threshold, and lower internal mobility.

Aesthetic quality. The model for predicting the perceived requirement for aesthetic quality was significant ($F(15, 342) = 8.67, p \leq 0.001$), and indicated that the employee characteristics accounted for approximately 28% of the outcome variance ($R^2 = 0.28$).

Requirements for higher aesthetic quality within the workplace were associated with higher aesthetic sensitivity and with more positive perceptions regarding the impact of flexible working on work effectiveness.

INSERT TABLE 2 HERE

Discussion

Workspace Segregation

The results confirmed three of the twelve propositions in *Hypothesis 1*, and provided partial evidence for four others. As expected, more segregated workspaces tended to be preferred by employees who were more susceptible to distraction, more introverted, and male. There were also trends to suggest that the requirement for segregation was associated with higher time spent concentrating, lower interactivity, higher age, and lower sensory threshold, although these effects were marginally above the criteria for statistical significance ($0.052 \leq p\text{-values} \leq 0.082$). There was no evidence to support the predicted associations with task heterogeneity, information type, sensitivity to environmental subtleties, aesthetic sensitivity, and organisational tenure.

The strongest effect was observed for susceptibility to distractions, an item originally intended to measure need for concentration. Another item from the original scale, measuring time spent in concentration, also showed an effect in the expected direction, although this did not meet significance criteria. As such, our results were broadly in line with previous research indicating open offices are most unsuitable for those with high concentration requirements (Seddigh *et al.*, 2014), with distraction susceptibility emerging as especially

important. This phenomenon can be interpreted through perceptual load theory, which demonstrates that susceptibility to environmental distractions is highest when the task requires high cognitive load but low perceptual load (Lavie, 2010).

We had also expected that those who primarily worked with verbal/numerical rather than visual/spatial information would prefer higher segregation, given that this type of work also involves low perceptual load and increases susceptibility to environmental distractions, particularly speech. However, this was not supported in our data. Possibly, this may have been due to highly uneven distribution between the two categories amongst our sample. Future research would help to clarify this.

Higher introversion also predicted requirements for more segregated workspaces, in accordance with previous research (Hartog *et al.*, 2018; Oseland and Hodsman, 2018). This is thought to occur because introverts have higher natural psychophysiological arousal than extraverts, and so require workspaces which are more shielded from additional acoustic and visual stimuli, as these can cause overstimulation (Geen, 1984). The same explanation could account for the effect, marginally above statistical significance ($p = 0.055$), that lower sensory threshold was associated with the requirement for a more segregated workspace.

In terms of demographics, there was a small effect, also marginally above significance ($p = 0.052$), to suggest that higher segregation was associated with higher age, but no evidence to suggest an association with organisational tenure. It has been previously demonstrated that higher age is associated with higher noise susceptibility (Horvath *et al.*, 2009), so it is possible that the previous study which found an effect of tenure (Fried *et al.*, 2001) may simply have captured an age-related difference, as this was not controlled in their study.

Finally, in terms of gender, the results confirmed that men also tended to prefer more segregated workspaces. Possibly, this reflects findings that women more effectively use social support to support recovery from stress than men (Belle, 1991; Schwarzer and Leppin, 1989), and so require workplaces where interpersonal contact is more easily afforded.

Workspace Territoriality

The results confirmed three of the four propositions within *Hypothesis 2*, that higher workspace territoriality requirements would be associated with being female, lower internal mobility, and less positive perceptions regarding the impact of flexible working on work effectiveness. There was also a small effect, marginally above the criteria for statistical significance, to indicate that higher workspace territoriality requirements were associated with less positive perceptions regarding the importance of flexible working. As such, *Hypothesis 2* was supported.

The results relating to gender are in line with previous research indicating that desk personalisation is particularly important for supporting wellbeing amongst women (Wells, 2000). To account for this finding, it has been suggested that women have a greater need for affiliation than men and personalisation helps to prompt social interactions. Another suggestion is that women have traditionally been viewed as homemakers in western society, and so have a greater tendency to prioritise the familiarity and attractiveness of their working area.

Although the items intended to measure location-dependency transpired to be relatively independent of one another, their associations with workspace territoriality requirements were as expected. In particular, perceptions regarding the impact of flexible

working on work effectiveness had the strongest effect. This supports previous findings that more location-dependent employees have a higher requirement for familiar and homely working areas (Greene and Myerson, 2011), and may explain the common observation from case studies that many employees resist non-territorial office concepts and persist with a fixed working style and territorial behaviours (Appel-Meulenbroek *et al.*, 2011; Hoendervanger *et al.*, 2016; Skogland, 2017).

Unexpectedly, higher territoriality requirements were also associated with lower task heterogeneity. Presumably, employees completing more repetitive and procedural work do not need a variety of different functional workspaces to do so, and therefore do not believe flexible working will improve their productivity. Instead, they prioritise those psychological aspects which help to imbue the workspace with a sense of meaning.

Finally, there was another unexpected finding that higher territoriality requirements were associated with higher susceptibility to distractions. Possibly, this suggests that employees are generally able to develop coping strategies to deal with distractions at their workspace, but this capability is diminished if they change workspaces regularly. As such, individuals who are more susceptible to distractions prefer to have an assigned desk they can work from regularly, so they can learn what sorts of distractions to expect at that location and how these might be mitigated.

Individual Environmental Control

The results supported three of the four original propositions in *Hypothesis 3*. As expected, requirements for higher individual environmental control were associated with being female, with lower internal mobility, and with less positive perceptions regarding the

impact of flexible working on work effectiveness. However, there was no evidence to suggest that individual environmental control requirements were associated with perceptions regarding the importance of flexible working. Thus, *Hypothesis 3* was mostly supported.

Gender was the strongest predictor, which may reflect the fact that women tend to be more thermally sensitive than men (Hashiguchi *et al.*, 2010). Similarly, lower sensory threshold was also associated with higher requirements for individual environmental control, and can be interpreted with the same explanation. When individuals are naturally more attuned to environmental stimuli they are more likely to be dissatisfied under group-level conditions, so personal comfort devices may be required to optimise environmental comfort.

The results also showed that higher individual environmental control requirements were associated with lower internal mobility, supporting previous research indicating more location-dependent employees place a higher priority on comfort at their workspace (Greene and Myerson, 2011). Unexpectedly, however, higher control requirements were also associated with more positive perceptions regarding the impact of flexible working on work effectiveness. Taken together, these two findings possibly indicate that the employees most in need of individual environmental control are those who would prefer to work flexibly but have no opportunity to do so. Such individuals cannot simply move to a more appropriate area in the event of environmental discomfort, and so prioritise individual control over local conditions.

Aesthetic Quality

Due to the paucity of past research, *Hypothesis 4* made no specific predictions regarding the influence of individual differences on requirements for aesthetic quality, and a

more exploratory approach was adopted. The results indicated that two employee characteristics were associated with aesthetic quality requirements. There was a strong effect to suggest that individuals with higher aesthetic sensitivity tend to ascribe more importance to the look and feel of the workplace. This is perhaps an intuitive and unsurprising finding, but nonetheless demonstrates that the perceived importance of aesthetic quality differs between employees.

Additionally, aesthetic quality requirements were stronger amongst employees who had less positive perceptions regarding the impact of flexible working on work effectiveness. Presumably, given that additional functional workspaces are less important to such employees, the aesthetic quality of the workplace takes higher priority amongst the factors that can make the office more appealing.

Limitations

The most notable limitation of the present study was the poor internal consistency of the items originally intended to measure need for concentration, location-dependency, and sensory processing sensitivity. Regarding need for concentration and location-dependency, the original items we used actually transpired to be relatively independent of one another. Similarly, recent research (published after our data collection) confirmed that the measure we used for sensory processing sensitivity actually captures multiple factors (Ershova *et al.*, 2018). In all three cases, we were able to re-interpret the precise meaning of each item and enter the items into the analysis separately. However, in future research it will be necessary to more tightly operationalise the characteristics under consideration, using previously-validated scales where possible.

Secondly, whilst our data identified several characteristics which explain inter-individual variability in perceived workplace requirements, it is not yet clear to what extent meeting these requirements will improve wellbeing and productivity. In general, it is predicted that working environments which are more aligned to the needs of the users will improve job performance (authors, manuscript accepted for publication), but future research is needed to determine whether some aspects of environmental comfort are more important than others. For example, it has been demonstrated that the behavioural environment (i.e., the ability to minimise distractions and maximise useful interactions) has a stronger influence upon productivity than the physical environment (Haynes, 2007), suggesting that aspects of the workplace which directly influence these factors should be prioritised over those which are less functional in nature.

Finally, although efforts were made to choose the most appropriate employee characteristics to measure on the basis of past research, it remains possible that a larger proportion of outcome variance would have been explained had additional characteristics been included. For example, in recent studies, the personality traits of neuroticism (Oseland and Hodsman, 2018) and the psychological need for privacy (Hoendervanger *et al.*, 2018) were identified as important individual difference factors in the workplace. As research evolves, it will be necessary to hone in on those factors which are most strongly associated with workplace requirements, so that practitioners have greater clarity on what needs to be considered when providing workplace solutions.

Practical Implications

The most important practical implication of the present findings is that employees have considerably non-uniform workplace requirements, and so the strategies required for

aligning the workplace to the needs of the occupants may be very different at different organisations. Based on the characteristics of the workforce, the exact same office environment could be perceived as perfect or highly stress-inducing. As such, it is crucial to perform a thorough consultation of the workplace end users prior to any workplace renovation or relocation.

For example, practitioners tasked with determining whether a higher proportion of segregated workspaces are necessary might consider the extent to which the typical tasks undertaken in the office are susceptible to distraction, and/or the introversion-extraversion of the workforce. Practitioners tasked with determining the likely impact of a transition to flexible working practices might consult the employees on their perceptions regarding whether or not the opportunity to use different functional workspaces would be beneficial to them. By consulting the workplace end users and feeding the results into plans for workplace design and strategy, practitioners can help to reduce demands and increase resources in the workplace environment for the employees at that site, resulting in improved wellbeing and productivity.

References

- Appel-Meulenbroek, R., Clippard, M. and Pfnür, A. (2018). "The effectiveness of physical office environments for employee outcomes: An interdisciplinary perspective of research efforts", *Journal of Corporate Real Estate*, Vol. 20 No. 1, pp. 56-80.
- Appel-Meulenbroek, R., Groenen, P. and Janssen, I. (2011). "An end user's perspective on activity-based office concepts", *Journal of Corporate Real Estate*, Vol. 13 No. 2, pp. 122-135.
- Aron, E. and Aron, A. (1997). "Sensory-processing sensitivity and its relation to introversion and emotionality", *Journal of Personality and Social Psychology*, Vol. 73 No. 2, pp. 345-368.
- Belle, D. (1991). "Gender differences in the social moderators of stress", in Monat, A. and Lazarus, R. (Eds.), *Stress and Coping: An Anthology*, Columbia University Press, New York, pp. 258-274.
- Bodin Danielsson, C. (2015). "Aesthetics versus function in office architecture: Employees' perception of the workplace", *Nordic Journal of Architectural Research*, Vol. 27 No. 2, pp. 11-40.
- Bodin Danielsson, C. and Bodin, L. (2008). "Office type in relation to health, well-being, and job satisfaction among employees", *Environment and Behavior*, Vol. 40 No. 5, pp. 636-669.
- Bodin Danielsson, C., Bodin, L., Wulff, C. and Theorell, T. (2015). "The relation between office type and workplace conflict: A gender and noise perspective", *Journal of Environmental Psychology*, Vol. 42, pp. 161-171.

- Brunia, S. and Hartjes-Gosselink, A. (2009). "Personalization in non-territorial offices: A study of a human need", *Journal of Corporate Real Estate*, Vol. 11 No. 3, pp. 169-182.
- Edwards, J, Caplan, R., & Harrison, R. (1998). "Person-environment fit theory: Conceptual foundations, empirical evidence, and directions for future research", in Cooper, C. (Ed.), *Theories of organizational stress*, Oxford University Press, Oxford, pp. 28-67.
- Ershova, R., Yarmotz, E., Koryagina, T., Semeniak, I., Shlyakhta, D. and Tarnow, E. (2018). "A psychometric evaluation of the Highly Sensitive Person Scale: The components of sensory-processing sensitivity", *Electronic Journal of General Medicine*, Vol. 15 No. 6, pp. em96.
- Fried, Y., Slowik, L., Ben-David, H. and Tiegs, R. (2001). "Exploring the relationship between workspace density and employee attitudinal reactions: An integrative model", *Journal of Occupational and Organizational Psychology*, Vol. 74 No. 3, pp. 359-372.
- Gardner, D., Cummings, L., Dunham, R. and Pierce, J. (1998). "Single-item versus multiple item measurement scales An empirical comparison", *Educational and Psychological Measurement*, Vol. 58, pp. 898-915.
- Geen, R. (1984). "Preferred stimulation levels in introverts and extraverts: Effect on arousal and performance", *Journal of Personality and Social Psychology*, Vol. 46 No. 6, pp. 1303-1312.
- Gerdenitsch, C., Korunka, C. and Hertel, G. (2018). "Need-supply fit in an activity-based flexible office: A longitudinal study during relocation", *Environment and Behavior*, Vol. 50 No. 3, pp. 273-297.

- Greene, C. and Myerson, J. (2011). "Space for thought: Designing for knowledge workers", *Facilities*, Vol. 29 Nos. 1/2, pp. 19-30.
- Haka, M., Haapakangas, A., Keränen, J., Hakala, J., Keskinen, E. and Hongisto, V. (2009). "Performance effects and subjective disturbance of speech in acoustically different office types – a laboratory experiment", *Indoor Air*, Vol. 19 No. 6, pp. 454-467.
- Hartog, L., Weijs-Perrée, M. and Appel-Meulenbroek, R. (2018). "The influence of personality on user satisfaction: Multi-tenant offices", *Building Research & Information*, Vol. 36 No. 4, pp. 402-416.
- Hashiguchi, N., Feng, Y. and Tochihara, Y. (2010). "Gender differences in thermal comfort and mental performance at different vertical air temperatures", *European Journal of Applied Physiology*, Vol. 109 No. 1, pp. 41-48.
- Haynes, B. (2007). "Office productivity: A theoretical framework", *Journal of Corporate Real Estate*, Vol. 9 No. 2, pp. 97-110.
- Haynes, B. (2008). "Impact of workplace connectivity on office productivity", *Journal of Corporate Real Estate*, Vol. 10 No. 4, pp. 286-302.
- Haynes, B. (2012). "Corporate real estate asset management: Aligned vision", *Journal of Corporate Real Estate*, Vol. 14 No. 4, pp. 244-254.
- Haynes, B., Suckley, L. and Nunnington, N. (2017). "Workplace productivity and office type: An evaluation of office occupier differences based on age and gender", *Journal of Corporate Real Estate*, Vol. 19 No. 2, pp. 111-138.

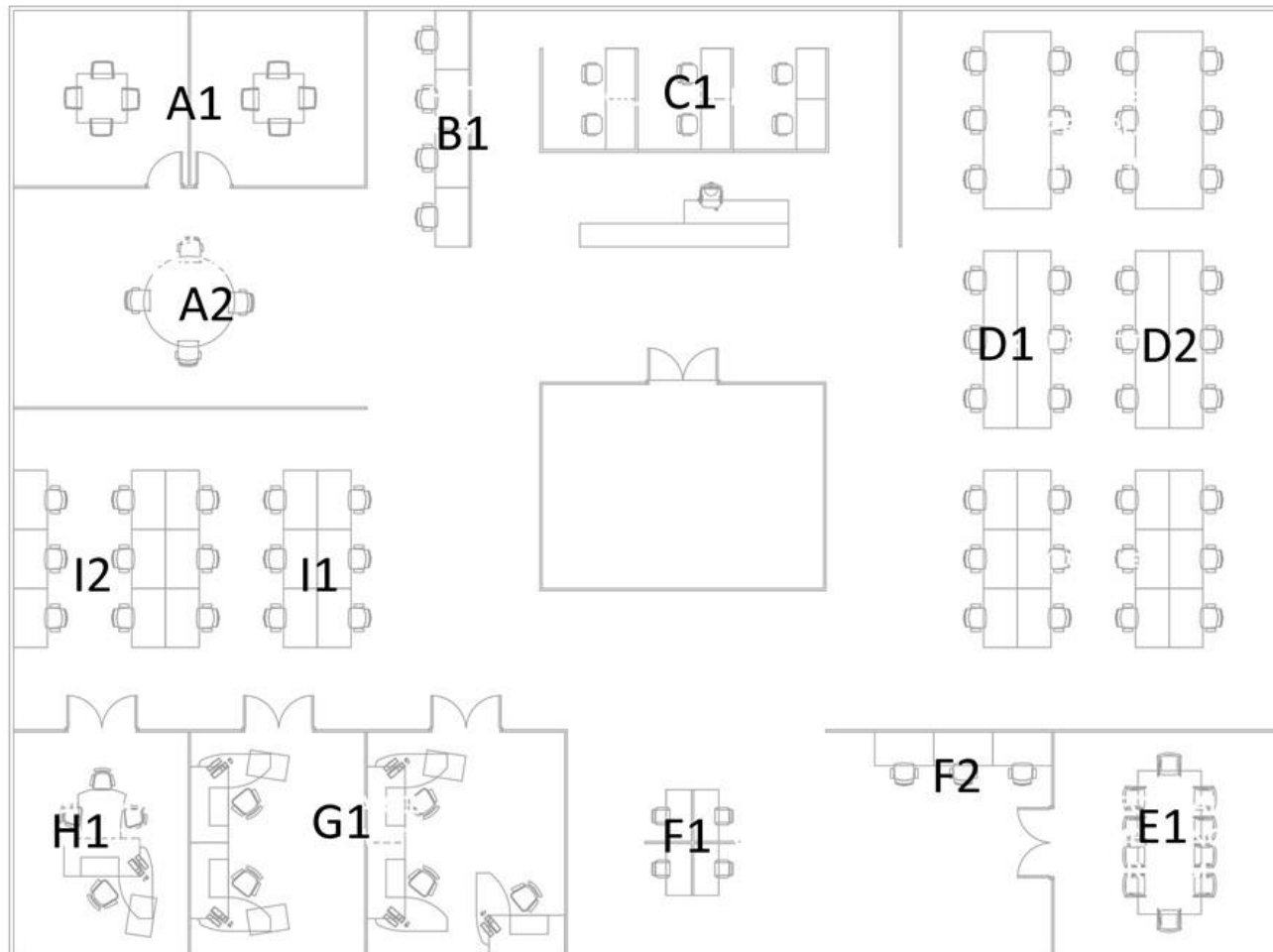
- Hoendervanger, J., de Been, I., van Yperen, N., Mobach, M. and Albers, C. (2016). "Flexibility in use: Switching behaviour and satisfaction in activity-based work environments", *Journal of Corporate Real Estate*, Vol. 18 No. 1, pp. 48-62.
- Hoendervanger, J., Ernst, A., Albers, C., Mobach, M. and van Yperen, N. (2018). "Individual differences in satisfaction with activity-based work environments", *PLoS ONE*, Vol. 13 No. 3, pp. e0193878.
- Horvath, J., Czigler, I., Birkas, E., Winkler, I. and Gervai, J. (2009). "Age-related differences in distraction and reorientation in an auditory task", *Neurobiology of Aging*, Vol. 30 No. 7, pp. 1157-1172.
- Jahncke, H., Hongisto, V. and Virjonen, P. (2013). "Cognitive performance during irrelevant speech: Effects of speech intelligibility and office-task characteristics", *Applied Acoustics*, Vol. 74 No. 3, pp. 307-316.
- Kim, J. and de Dear, R. (2013). "Workspace satisfaction: The privacy-communication trade-off in open-plan offices", *Journal of Environmental Psychology*, Vol. 36, pp. 18-26.
- Lavie, N. (2010). "Attention, distraction, and cognitive control under load", *Current Directions in Psychological Science*, Vol. 19 No. 3, pp. 143-148.
- Maher, A. and von Hippel, C. (2005). "Individual differences in employee reactions to open-plan offices", *Journal of Environmental Psychology*, Vol. 25, pp. 219-229.
- Oldham, G.R., Kulik, C.T. and Stepina, L.P. (1991). "Physical environment and employee reactions: Effects of stimulus-screening skills and job complexity", *The Academy of Management Journal*, Vol. 34 No. 4, pp. 929-938.

- Oseland, N. (2009). "The impact of psychological needs on office design", *Journal of Corporate Real Estate*, Vol. 11 No. 4, pp. 244-254.
- Oseland, N. and Hodsman, P. (2018). "A psychoacoustical approach to resolving office noise distraction", *Journal of Corporate Real Estate*, Vol. 20 No. 4, pp. 260-280.
- Pullen, W.R. (2014). "Age, office type, job satisfaction and performance", *Work&Place*, Vol. 3 No. 2, pp. 9-22.
- Rothe, P., Lindholm, A., Hyvönen, A. and Nevonen, S. (2012). "Work environment preferences – Does age make a difference?", *Facilities*, Vol. 30 No. 1/2, pp. 78-95.
- Saucier, G. (1994). "Mini-markers: A brief version of Goldberg's unipolar big-five markers", *Journal of Personality Assessment*, Vol. 63 No. 3, pp. 506-516.
- Schwarzer, R. and Leppin, A. (1989). "Social support and health: A meta-analysis", *Psychology & Health*, Vol. 3 No. 1, pp. 1-15.
- Seddigh, A., Berntson, E., Bodin Danielsson, C. and Westerlund, H. (2014). "Concentration requirements modify the effect of office type on indicators of health and performance", *Journal of Environmental Psychology*, Vol. 38, pp. 167-174.
- Shahzad, S., Brennan, J., Theodossopoulos, D., Hughes, B. and Calautit, J. (2016). "A study of the impact of individual thermal control on user comfort in the workplace: Norwegian cellular vs. British open plan offices", *Architectural Science Review*, Vol. 60 No. 1, pp. 49-61.
- Skogland, M. (2017). "The mindset of activity-based working", *Journal of Facilities Management*, Vol. 15 No. 1, pp. 62-75.

Soriano, A., Kozusznik, M., Peiro, J. and Mateo, C. (2018). “The role of employees’ work patterns and office type fit (and misfit) in the relationships between employee well-being and performance”, *Environment and Behavior*. Advance online publication.

Vischer, J. (2007). “The effects of the physical environment on job performance: Towards a theoretical model of workspace stress”, *Stress and Health*, Vol. 23 No. 3, pp. 175-184.

Wells, M. (2000). “Office clutter or meaningful personal displays: The role of office personalization in employee and organizational well-being”, *Journal of Environmental Psychology*, Vol. 20 No. 3, pp. 239-255.



Integration-segregation ranking

(from most integrated to most segregated)

1. Large open-plan (central) **(D1)**
2. Large open-plan (periphery) **(D2)**
3. Medium open-plan (central) **(I1)**
4. Medium open-plan (periphery) **(I2)**
5. Small open-plan (central) **(F1)**
6. Small open-plan (periphery) **(F2)**
7. Shared private office **(G1)**
8. Quiet pods **(C1)**
9. Individual private office **(H1)**

(not ranked in terms of integration-segregation)

- Hot-desk area **(B1)**
- Informal meeting area (enclosed) **(A1)**
- Informal meeting area (open) **(A2)**
- Formal meeting room **(E1)**

Table 1: Full list of questionnaire items, including the means and standard deviations for all items and scales, and the Cronbach's alpha values for each of the original scales

Scale and item(s) used	M	SD
EMPLOYEE CHARACTERISTICS		
Gender (Open-ended: Male [N = 185], Female [176], Did not answer [3]) “Please indicate your gender”	n/a	n/a
Age (Open-ended, re-coded into birth decade: 1950s [17], 1960s [60], 1970s [78], 1980s [134], 1990s [70], Did not answer [5]) “Please indicate your year of birth”	n/a	n/a
Organisational Tenure (Multiple choice: Less than 6 months [35], 6-12 months [40], 1-2 years [50], More than 2 years [239]) “How long have you been working for your current employer?”	n/a	n/a
Information type (Binary choice: 340 Verbal/Numerical information, 24 Visual/Spatial information) “What type of information do you deal with most often?”	n/a	n/a
Need for Concentration ($\alpha = 0.24^*$) (7-point Likert scale: 1=Disagree completely, 7=Agree completely)	n/a	n/a
[Task Heterogeneity] “My work typically follows a simple, well-learned procedure”. [reverse-scored]	4.15	1.83
[Concentration Levels] “Most of my working day is spent in periods of intense concentration”.	5.26	1.35
[Susceptibility to Distraction] “It is necessary for me to work in a distraction-free environment”.	4.58	1.58
Interactivity ($\alpha = 0.73$) (7-point Likert scale: 1=Disagree completely, 7=Agree completely)	4.61	1.41
“I need to work in close proximity with my colleagues to be able to complete my work effectively”.	4.51	1.72
“In my role, I typically work in a group and need to communicate regularly with colleagues”.	5.07	1.69
“Having my colleagues nearby isn't necessary for the type of work I do”. [reverse-scored]	4.23	1.81
Location-dependency ($\alpha = 0.51^*$) (7-point Likert scale: 1=Disagree completely, 7=Agree completely)	n/a	n/a
[Internal Mobility] “All of my work can be completed at a single location within the office”. [reverse-scored]	3.38	2.22
[Importance of Flexible Working] “Having the flexibility to move around the office throughout the working day, to complete different types of task, is important to me”.	4.73	1.9
[Impact on Work Effectiveness of Flexible Working] “I would work more effectively if I had the opportunity to work at a range of different workspaces”.	4.1	1.9
Introversion-Extraversion ($\alpha = 0.84$) (7-point Likert scale: 1=Very inaccurate, 7=Very accurate)	4.64	1.31
“Generally, is it accurate or inaccurate that you are shy?” [reverse-scored]	4.83	1.73

“Generally, is it accurate or inaccurate that you are talkative?”	4.62	1.52
“Generally, is it accurate or inaccurate that you are outgoing?”	4.78	1.5
“Generally, is it accurate or inaccurate that you are reserved?” [reverse-scored]	4.33	1.63
Sensory processing sensitivity ($\alpha = 0.41^*$) (7-point Likert scale: 1=Not at all, 7=Extremely)	n/a	n/a
[Sensitivity to Environmental Subtleties] “I seem to be aware of subtleties in my environment”.	5.05	1.3
[Aesthetic Sensitivity] “I notice and enjoy delicate fine scents, tastes, sounds, works of art”.	4.61	1.62
[Low Sensory Threshold] “I get bothered by intense stimuli, like loud noises or chaotic scenes”	4.54	1.72
PERCEIVED WORKPLACE REQUIREMENTS		
Workspace segregation ($\alpha = 0.65$) (7-point Likert scale: 1=Very unhelpful/Not important at all, 7=Essential/Very important, with exception of the workstation choice from the floorplan)	4.00	1.39
“Which workstation would you choose as your primary working location?” [from floorplan presented in Figure 1] [re-coded from 9-point scale to 7-point scale]	4.31	1.72
“An enclosed workspace, where my desk is separated from others using partitions”.	3.58	1.87
“Opportunity to work in complete silence”.	4.1	1.83
Workspace territoriality ($\alpha = 0.63$) (7-point Likert scale: 1=Very unhelpful/Not important at all, 7=Essential/Very important)	4.62	1.38
“Opportunity to decorate desk with personally meaningful items (e.g. photos of loved ones, trophies and certificates, motivational phrases)”	4.52	1.88
“Being assigned a fixed desk which is mine, and which nobody else should use”.		
“Having a ‘flexible’ or ‘agile’ working concept, where I can work at different spaces throughout the day”.*	5.34	1.86
	4.00	1.73
Individual environmental control ($\alpha = 0.75$) (7-point Likert scale: 1=Very unhelpful/Not important at all, 7=Essential/Very important)	5.43	1.31
“Opportunity for personal control of temperature (e.g. through individual heaters or fans)”.	5.6	1.42
“Opportunity for personal control of lighting (e.g. through dimmable desk lamp)”.	5.26	1.5
Aesthetic quality ($\alpha = 0.74$) (7-point Likert scale: 1=Very unhelpful/Not important at all, 7=Essential/Very important)	4.33	1.16
“Presence of natural design features (e.g. interior plants, designs which mimic nature, window views to nature”.	5.55	1.37
“Presence of inspirational artwork or photographs”.	4.07	1.7
“An aesthetic internal colour scheme”.	4.91	1.53
“Presence of pleasant aromas (e.g. through diffusion of essential oils in the air)”	4.3	1.77
“At your primary workspace, an acoustic soundscape playing soothing sounds (e.g. birdsong, waves, rain)”	2.85	1.85

* Due to low Cronbach’s alpha, the scale was disbanded and the individual items were entered separately into the analyses.

Table 2: Results of the four multiple regression analyses, with effects significant at $p \leq 0.05$ shown in bold and italics

	Workspace Segregation ($R^2 = 0.35$)		Workspace Territoriality ($R^2 = 0.28$)		Individual Environmental Control ($R^2 = 0.16$)		Aesthetic Quality ($R^2 = 0.28$)	
	β	p	β	p	β	p	β	P
Gender	<i>-0.14</i>	<i><0.01</i>	<i>0.1</i>	<i>0.036</i>	<i>0.23</i>	<i><0.001</i>	0.01	0.85
Age	0.09	0.052	0.01	0.91	-0.05	0.32	-0.03	0.47
Organisational tenure	0.01	0.82	0.03	0.51	0.07	0.2	-0.02	0.74
Task heterogeneity	-0.09	0.055	<i>-0.19</i>	<i><0.001</i>	<i>-0.16</i>	<i><0.01</i>	-0.01	0.88
Concentration levels	0.09	0.082	0.05	0.31	0	0.99	-0.03	0.59
Susceptibility to distraction	<i>0.38</i>	<i><0.001</i>	<i>0.14</i>	<i>0.01</i>	0.04	0.54	0.04	0.49
Interactivity with colleagues	-0.09	0.082	0.1	-0.11	0.07	0.22	0.04	0.4
Internal mobility	0.02	0.64	<i>-0.13</i>	<i>0.016</i>	<i>-0.11</i>	<i>0.049</i>	-0.08	0.13
Importance of flexible working	-0.09	0.065	-0.1	0.059	0.01	0.87	-0.01	0.8
Impact on work effectiveness of flexible working	0.08	0.12	<i>-0.27</i>	<i><0.001</i>	<i>0.15</i>	<i><0.01</i>	<i>0.22</i>	<i><0.001</i>
Information type	-0.02	0.69	<i>-0.1</i>	<i>0.037</i>	-0.08	0.11	-0.02	0.66
Introversion-Extraversion	<i>-0.12</i>	<i>0.013</i>	-0.06	0.18	0.04	0.4	0.07	0.14
Sensitivity to subtleties in environment	-0.04	0.38	-0.04	0.38	0.01	0.92	-0.02	0.62
Aesthetic sensitivity	0.04	0.47	-0.03	0.61	0.01	0.87	<i>0.43</i>	<i><0.001</i>
Low sensory threshold	0.1	0.055	-0.01	0.79	<i>0.13</i>	<i>0.02</i>	0.1	0.07