PREFERENCE FOR PLANTS IN AN OFFICE ENVIRONMENT

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ABSTRACT

Plants in the workplace are known to bring a number of benefits including psychological as well as aesthetic and air quality benefits. Therefore, plants can have an impact on overall organisational performance. However, findings of previous studies have rarely been applied in the FM context and yet strategic FM delivery in improving workplace productivity is essential for business survival.

The paper explores the importance of interior plants in maintaining the physical and psychological well-being of office occupants utilising a survey of participants' perceptions of photographs of an office with various levels of planting installed from no plants up to very high levels of planting. The paper provides preliminary results of a longer programme of research into the benefits of plants within the FM context.

The work demonstrates that a reasonable level of interior planting in offices is preferred over offices with no plants. These perceived benefits may have a direct impact on overall organisational performance and therefore incorporating elements of nature within building design and management may in future be considered imperative to achieving the desired strategic outcomes of the organisation.

KEYWORDS: plants, survey, workplace psychology

INTRODUCTION

With evidence that employee disengagement is increasing (Pech and Slade, 2006), it is important to provide workplaces that positively influence the workforce. Pech and Slade (2006) argue that the focus is on symptoms of disengagement such as distraction, lack of interest, poor decisions and high absence, rather than the root causes. The working environment is perhaps a key root cause in employee engagement or disengagement.

Research has indicated that improving the working environment reduces complaints and absenteeism and increases productivity (Roelofsen, 2002). Workplace satisfaction has been associated with job satisfaction (Wells, 2000) and perceptions of workplace quality have a significant effect on building users' psychology.

This research forms part of a larger study into the role of plants in the workplace in contributing to staff productivity and corporate profitability. This stage of research surveyed perceptions of plants in an office environment and gauged the volume of plants that the survey participants perceived to be appropriate. Subsequent stages of the research will measure air quality benefits, psychological benefits, productivity advantages and potential reductions in sickness rates afforded by office planting.

THE BENEFITS OF PLANTS

Privacy is a key requirement of workplaces and Sundstrom et al. (1982b) reported an approximately linear increase in perceived privacy with each number of enclosed sides around the workspace. Maher and von Hippel (2005), however, found that the number of partitions were not correlated with perceived privacy but they did find a positive correlation

between the height of partitions and perceived privacy. Sundstrom et al. (1982a) reported that office workers moving from enclosed to open-plan offices perceived a reduction in privacy, the most important component being the ability to hold confidential conversations. They found a parallel between physical workspace enclosure and privacy satisfaction. Their results led to extra panels being installed at workstation entrances to limit visibility and absorb sound.

However, Goodrich (1982) points out that some design solutions might unintentionally reduce perceived privacy by creating more spatial privacy. Partitions make individuals blind to their surroundings. Noises and movements outside are sudden and unanticipated, making them more distracting (Goodrich, 1982). Maher and von Hippel (2005) also found that, although higher partitions provide visual privacy, they may fail to block noise. Like Goodrich, they suggest that this noise may be more intrusive when employees do not have visual cues to determine the locus of the noise.

Duvall-Early and Benedict (1992) completed a survey of perceived privacy. They found that those working in private workspaces felt they could better use their abilities, had better perceptions of accomplishment and were able to keep busy all the time. A study of private offices with interior glass panels (Goodrich, 1982) found that these create a fishbowl effect. The glass invites passers by to look in making users feel exposed, and constantly distracted. Circulation routes are also a consideration in perceived privacy. Although Kupritz (1998) found support for partitions, these were considered less important than having minimal traffic routed through the worker's area and the workspace being located away from the main traffic flow. The engineers studied perceived that loss of production time and mistakes occur due to distractions (Kupritz, 1998).

There are, however, positive distractions, such as trees, plants and water (James, 2007) that may be incorporated into buildings to improve workplace quality, privacy and productivity. Goodrich (1982) also advocates using large plants to increase privacy perceptions. He states that workers agreed that plants made the office more pleasant and informal and this seemed to reduce their need for high privacy levels. Shibata and Suzuki (2002) found that peoples' mood may be affected by plants although they concluded that further research was necessary. Serpa and Muhar (1996) found that plants can be used to influence spatial perceptions outdoors in that smaller trees and light texture can be used to enlarge an open space while large trees with coarse texture have the opposite effect. These results may be relevant to the indoor environment in the selection of office plants.

Kaplan (1993) asserted that those with a view of nature such as trees and greenery were more satisfied and that even a short exposure to a natural setting can serve a restorative function. Kaplan states: 'Those with a view of nature felt less frustrated and more patient, found their job more challenging, expressed greater enthusiasm for it, and reported higher life satisfaction as well as overall health' (Kaplan, 1993).

Kaplan (1993) suggests that having natural areas at the workplace can be useful for views or direct involvement such as lunch areas and areas to walk. Bringing nature into buildings is becoming increasingly popular with the use of landscaped atria and "streets" within buildings.

Larsen et al. (1998) add support for workplace plants, finding that office plants increased participants' perceptions of office attractiveness and comfort. Surprisingly, however, they

found that productivity reduced with greater numbers of plants. They suggest this may be due to the repetitive nature of the task.

In Shibata and Suzuki's (2002) research on the effect of foliage plants on task performance and mood they noticed perceptual differences according to gender. Females found plants less distracting and they had greater feelings of familiarity towards the plants than did the male subjects.

As well as psychological benefits, indoor plants improve air quality within the workplace (Young, 1998). Air quality benefits include improving relative humidity and reducing Volatile Organic Compounds (VOCs), which in low concentrations can cause skin irritation and dry throats but in higher concentrations are linked to cancer. Plants also remove carbon dioxide from the air and produce oxygen. Carbon dioxide in offices can cause tiredness and fatigue, which will be reduced by greater oxygen concentration. Plants remove airborne particles, which were found in a recent study (He et al., 2007) to be produced in significant concentrations from office printers.

Wolverton (1985), during research for NASA into air quality in space stations and energy efficient buildings on Earth, demonstrated the ability of common plants such as spider plants and golden pothos to remove indoor pollutants such as formaldehyde and carbon monoxide.

METHOD

A survey was constructed to examine participants' perceptions of an office space using photographs of the office with various different levels of planting installed. The selected office had an area of approximately 32 square metres, with about 24 square metres visible in the photographs. The office contained three desks (two of which were visible in the photographs), a book case, two filing cabinets and a small desk pedestal. A laptop PC, telephone and diary were placed on one of the desks.

The office was decorated in neutral colours, with a light green carpet, chairs and desk dividers. A map of Scotland was positioned on the wall facing the camera, a pin board on the left wall and a fluorescent strip light on the ceiling. One of the two windows was visible in the photographs but the angle of the shots made it impossible to determine what view could be seen from the window.

The conditions tested in the survey were:

- No plants

- Minimal planting

- Low planting

- Medium low planting

- Medium planting

- Medium high planting

- High planting

- Very high planting

The no plants condition was a photograph of the office containing only the above items. The other photographs included plants as follows: Minimal (1 plant), low (2 plants), medium low (3 plants), medium (5 plants), medium high (8 plants), high (12 plants) and very high (13 plants). Example images used in the survey are shown in figure 1.

Figure 1: Example photographs used in the study

| **No plants** | **Low** | **Medium** | **High** |

The survey began with some demographic questions on age, gender and occupation. Participants were asked to go through the survey one page at a time without moving on to subsequent pages before completing the current page. The second page of the survey contained the photograph of the no plants condition with two questions requiring a yes or no response; "do you like this office?", and "would you feel comfortable?"

The following pages contained the photographs of the other plant conditions with two questions requiring a yes or no response; "would you be comfortable now?", and "is it better than the last office?"

The final page asked several questions around whether or not participants had previously considered plants in the workplace, if they would prefer air quality to be managed using mechanical methods or natural methods (plants), if they have been a smoker in the last 12 months and if they felt this exercise was pointless. Those who answered yes were asked to complete a follow-up question: "do you still feel the same after answering all the questions?" Participants were also asked to go back through all the photographs and, using the no plants condition as a benchmark of five out of ten, rate the other photographs out of ten according to their preference. For simplicity any ratings given that were not whole numbers were rounded up or down to the nearest whole number.

Participants consisted mainly of students from the School of the Built Environment at Liverpool John Moores University but also a range of other participants in other occupations. The participants were not informed as to the purpose of the research.

A total of 181 surveys were distributed and 124 of these were returned, ten of which were unusable due to ambiguous or incomplete responses, giving a response rate of 63% (114). Of these respondents 27 (24%) were female, 82 (72%) were male and 5 (4%) declined to specify. Students made up 85 (75%) of the respondents, 4 (3%) were employed with the

majority of their time spent in an environment other than an office and 22 (19%) were employed with the majority of their time spent in an office. One (1%) respondent indicated they were employed in a FM or property related role and 2 (2%) were retired.

The majority of respondents (87, 76%) were in the 16-30 age group. The 31-45 age group accounted for 16 (14%) of the respondents, with 8 (7%) in the 46-60 age group, 1 (1%) in the 61-70 age group and 2 (2%) declining to specify their age.

RESULTS

The results of the questions relating to the eight photographs are shown in table 1. The answers to the yes or no questions indicate that the general preference is for photograph 3, which was the low condition. However, the average ratings show the preferred photograph to be number 4 (5.95), the medium-low condition. Photograph 5, the medium condition is also rated higher on average (5.23) than the benchmark (5.00), which is photograph 1, the no plants condition. This would indicate there is a general preference for a reasonable number of plants rather than no plants, although if too many are present, this reduces the feeling of comfort within the workplace.

Table 1: Results of questions relating to the photographs

	Do you like this office?		Would you feel comfortable?		
Photo	Yes	No	Yes	No	Average rating
1	58	56	67	47	5.00 (Benchmark)
	Would you be comfortable now?		Is it better than the last office?		
2	60	54	59	55	5.41
3	63	51	57	57	5.87
4	58	56	55	59	5.95
5	36	78	30	84	5.23
6	18	96	12	102	4.13
7	6	108	5	109	2.87
8	6	108	4	110	2.04

Previous studies have found a gender split in workplace perceptions, for example, Shibata and Suzuki (2002), Goodrich (1982) and Wells (2000). The ratings given to the photographs in this study also uncover gender differences in the preference for plants in the workplace as shown in table 2. The females gave higher ratings than the males for photographs 3 and 4, the low and medium-low conditions. The ratings concurred for photographs 5, 6 and 8, the medium, medium-high and very high conditions. However, the males gave a higher rating to photograph 7, the high condition, than did the females.

Table 2: Average ratings by gender

Photo	1	2	3	4	5	6	7	8
Male	5.00	5.41	5.82	5.95	5.00	4.00	3.00	2.00
Female	5.00	5.36	6.08	6.16	5.00	4.00	2.00	2.00

It was also considered likely that there would be perceptual differences depending on participants' occupation and previous experience of particular working environments. The highest average ratings were given by those employed in environments other than offices, followed by those employed in offices and the lowest ratings given by students. Of those who worked in FM or property roles and retired participants, the sample was not of significant size to give a meaningful average rating.

These results may also be affected by the age group of the participants, particularly as the majority of the students were in the 16-30 age group. An analysis of the results by age group shows that the 46-60 age group has a greater preference for higher numbers of plants, followed by the 31-45 age group, with the 16-30 age group having a preference for lower plant numbers. It was not possible to determine a meaningful average for the 61-70 age group due to the small sample size.

On the question regarding whether or not participants had previously considered the need for plants in the workplace, 50 (44%) respondents indicated they had while 64 (56%) responded no to this question. On the question regarding whether respondents would prefer air quality to be managed using mechanical methods or natural methods, i.e. plants, 69 (61%) preferred plants while 35 (31%) preferred mechanical. Ten (8%) respondents declined to comment. Interestingly, however, out of the 35 respondents who preferred mechanical methods, 32 (91%) of these were students. Given that the students were all studying built environment courses, this result may be due to prior experience or knowledge of air quality management among the students. Among all the student responses (85) there was still an overall preference for plants though with 45 (53%) preferring plants and 32 (38%) mechanical with 8 (9%) not specifying a preference.

It was anticipated that those respondents who were smokers may be less concerned about the quality of air within the workplace than non-smokers. This was not found to be significant however. Only 12 (39%) of the 31 smokers who completed the survey indicated that they felt this exercise was pointless. Among all respondents, 48 (42%) indicated that they felt the exercise was pointless and 20 (42%) of these indicated they felt it was still pointless after completing the survey.

RESEARCH LIMITATIONS

For convenience, the participant sample consisted mainly of students. This meant also that the majority of respondents were male and in the 16-30 age group. It is also likely that many students have little or no work experience, particularly in offices, although they may have had prior knowledge of the subject area as they were studying Built Environment courses. It would be useful to widen the participant range to investigate perceptions of participants of other occupations and age groups and to obtain a more representative sample.

CONCLUSIONS

This study confirms the general preference for a reasonable number of plants in office environments among the participants. The low and medium-low conditions were preferred to the no plant condition but the medium condition was also rated higher on average than the no plant condition.

As expected, a gender split was discovered with female participants generally preferring more plants to male subjects. However, it would have been useful to consider results from a larger female participant sample to increase the integrity of these results.

The results were also affected by the occupation of the participants with those employed in environments other than offices preferring the most plants, followed by those employed in offices and finally students, preferring the least number of plants. These differences may be due to previous knowledge or experience gained dependant on the occupation of the participants.

Results differed by age group with the 46-60 group preferring most plants, followed by the 31-45 age group and the 16-30 group preferring lower numbers of plants.

A general preference was also found for indoor air quality to be managed using natural methods such as plants rather than mechanical methods although the majority who opted for mechanical methods were students. Again, this may be down to previous knowledge gained on their courses.

The results show that there is a general preference for plants within offices, which indicates there is a likelihood of plants having a beneficial effect on organisational performance. It is likely that building users will derive psychological benefits from natural elements within, which may increase productivity. However, further research is required and it would be useful to undertake some physical tests rather than relying purely on self-reporting.

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