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Effects of control over office workspace on perceptions of the work environment and work outcomes

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Abstract

Increasingly, workplaces must support rapid technology development and implementation, dynamic organizational changes, and concomitant employee needs for balancing privacy, collaboration and other work processes. Open plan offices have been positioned as providing at least partial solutions to many of these historic and contemporary challenges. However, many problems with open offices have been documented, such as noise, lack of privacy and other distractions; yet enclosed, private offices hamper communication, teamwork and flexible use of space as well. In an effort to elucidate workers' perceptions of some of these trade-offs, this study examined the effects of distractions, flexible use of workspace and personal control over the work environment on perceived job performance, job satisfaction, group cohesiveness, and inclinations to work alone or in an enclosed space and their interrelationships. The proposed path model was tested by LISREL 8.54. All fit indices for the model remained within acceptable levels. The results showed that more personal control over the physical workspace (e.g., adjustment) and easy access to meeting places led to higher perceived group cohesiveness and job satisfaction. Contrary to expectation, the results indicated that distractions may have little influence on self-rated performance.

Keywords: Personal control; Distraction; Office workspace; Job satisfaction; Group cohesiveness; Perceived performance

1. Introduction

Most of its relevant constituencies anticipate that the workplace will continue to change rapidly (Challenger, 2000), with technology developments, innovative communication methods, virtual reality, e-market improvements, and alternative work patterns all playing a role. To accommodate these rapid changes while maintaining or improving outcomes, organizations have increasingly turned to some version of work teams (e.g., cross-functional teams; self-managing work groups; see DeMatteo, Eby, & Sundstrom, 1998); thus, employees' ability to work within team environments has been emphasized (Terricone & Luca, 2002). To ensure that the work environment supports these new styles of working, flexible workplaces are often recommended (Becker, 2002). Open workplaces have been seen as providing this needed flexibility since they offer interpersonal access and ease of communication compared to fully enclosed private offices, yet this approach may still be considered too rigid (Hedge, 1982). Moreover, researchers have also reported problems with open offices from the perspective of occupants such as noise, lack of privacy and other distractions (Evans & Johnson, 2000; Sundstrom, Bell, Busby, & Asmus, 1996).

In an effort to alleviate these problems with open offices while still facilitating better communication and collaboration, alternative office concepts that provide flexibility in terms of freedom to choose the time and place for working—both within and outside the office—have been explored (Oldham, 1988; Olson, 2001). However, due to some disadvantages of these and other reactions to the limitations of open offices, their allowing flexible use of workspace has been emphasized more recently. Becker (2002) argued that by exploiting workplace flexibility, organizations may enhance organizational effectiveness. In an effort to elucidate the specific ways that flexible, open work environments might more readily respond to contemporary organizational challenges and opportunities,

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Moleski and Lang (1982) suggested that user needs be redefined to recognize the importance of "freedom of choice" in personal behavioral patterns. Additionally, Becker (1991) emphasized the idea of personal control as a critical unanswered question related to workplace issues. He decried the lack of research on such topics as the types of environmental control employees actually want or need, employee involvement in the process of planning and designing their workplace, and the effects of control—both actual and perceived—on performance.

Given the potential importance of personal control issues in the success of office environments (defined in terms of organizational outcomes), this study examined how perceived individual control and flexible use of space may influence individual and work group outcomes. More specifically, this study sought to develop a path model specifying the multiple relationships among several latent factors related to the physical-environment features of offices along with individual and group level outcomes; in order to test these multiple relationships simultaneously, Structural Equation Modeling was used.

2. Literature review

Much of the research literature addressing office environments has focused on either subjective assessments of physical components or attributes and how these affect employee satisfaction and performance (Larsen, Adams, Deal, Kweon, & Tyler, 1998; Sundstrom, Town, Rice, Osborn, & Brill, 1994), or they have involved pre-post occupancy evaluations of office renovations, or moves, adds and changes (Oldham, 1988; Spreckelmeyer, 1993; Zalesny & Farace, 1987). However, the available empirical evidence has paid somewhat less attention to individual control, flexible use of space, and how these office design features might inter-relate with each other. In an effort to integrate employees' use and ratings of space flexibility with perceived levels of personal control, research on relevant physical environment features was reviewed; this led to several testable hypotheses.

2.1. Effects of ambient environment features

Open offices are popularly incorporated by organizations to increase communication; however, there are more distractions in an open plan than in conventional offices (Brennan, Chugh, & Kline, 2002; Brookes & Kaplan, 1972). In general, studies of the ambient features in office environments—including noise, lighting, temperature, existence of windows and others—suggest that such elements of the physical environment influence employee attitudes, behaviors, satisfaction and performance (Crouch & Nimran, 1989; Larsen et al., 1998; Veitch & Gifford, 1996). Sundstrom, Town, Rice, Osborn, and Brill (1994) identified noise as an ambient stressor relating to job satisfaction in the work environment. However, perhaps reflecting the complex relationship between job satisfaction and productivity, performance ratings were not related to any source of noise. Other studies have found that open office noise can be stressful and demotivating (Evans & Johnson, 2000), and that open plan offices may have high levels of distraction and disturbance and low privacy levels (Hedge, 1982). Perhaps if considered in isolation, each ambient feature of the physical environment may not have predictable effects on performance, but repeated distraction from a collection of such features may be negatively associated with performance. Distraction as a negative attribute is also expected to be negatively related to satisfaction with the physical work environment. Therefore, the following hypotheses were proposed:

H1a: Perceived distraction levels in the workplace will be negatively related to self-assessed employee performance.
H1b: Perceived distraction levels in the workplace will be positively related to employees' inclination to work alone or work in an enclosed space.
H1c: Perceived distraction levels in the workplace will be negatively related to satisfaction with the physical work environment.

2.2. Effects of control on job satisfaction and performance

Some research has found a positive association between high work control and job satisfaction, work performance and psychological well-being (Greenberger, Strasser, Cummings, & Dunham, 1989; MacLaney & Hurrell, 1988; O'neill, 1994; Sargent & Deborah, 1998). In related work, locus of control influences job perceptions and job-related outcomes, according to Jackson (1989). In the present study, personal control differs somewhat from the notion of locus of control. While locus of control refers to an inherent tendency to attribute life outcomes to either intrinsic or extrinsic factors, a sense of personal control can result from the opportunity to influence aspects of one's environment. For example, control can moderate the relationship between environmental conditions and employee reactions to the environment (Evans, Johansson, & Carrere, 1994). In a similar vein, Paciuk (1989) found that perceptions of control over thermal features of a work environment moderated the effects of other environmental and behavioral variables; the degree of influence in shaping thermal conditions correlated with satisfaction, but the actual use of this control seemed to be negatively related to satisfaction. In support of these inconsistent effects from providing control over aspects of the physical environment, Veitch and Gifford (1996) found that if participants had personal control over lighting, they performed tasks more poorly and slowly compared to those who did not have such controls. This finding suggests that providing individuals who have little understanding of lighting with controls might not be appropriate; at the very least, given the opportunity, people may spend precious time and effort applying the provided controls.

One possible explanation for this finding might be that personal control plays a moderator role to help employees cope with distraction. Yet in spite of studies finding that individual differences may moderate the effects of physical environment features such as the way desks and other equipment are arranged in the work area (e.g., Greenberger et al., 1989), very little empirical research has dealt with personal control over the physical environment. In one notable exception, MacLaney and Hurrell (1988) used multidimensional measures of work control—task control, decision control, control over the physical environment, and resource control—to assess the influence of control on task outcomes. Their results showed a positive relationship between personal control and job satisfaction. O'Neill (1994) investigated the effects of adjustability as related to the concept of control over the workplace on work outcomes such as communication, environmental satisfaction and perceived performance. He found that adjustability was positively related to communication, environmental satisfaction and perceived performance.

Unfortunately, previous studies have not consistently defined the term 'control.' Fisher (1990) defined control as mastery over the environment, stating, "Individuals with control can act to change or reverse situations which are disliked." More specifically, Allen and Greenberger (1980) argued that "In the case of the built environment, an individual can experience an increase in the sense of control by altering, modifying or transforming it in some manner." According to their view, people can attain perceived control through such means as personalization of individual work places, altering the exterior or interior of a building, or even through drastic acts of destruction. Paciuk (1989) conceptualized control as incorporating two dimensions: Perceptions of thermal control and exercised control. In her study, perceived control and exercised control were negatively associated, since exercised control was operationally defined as the relative frequency with which workers engaged in several types of thermally related behaviors to regain thermal comfort when needed. In contrast, perceived control was measured using thermal comfort ratings rather than direct control in the experimental setting. Veitch and Gifford (1996) measured control in terms of lighting control, environmental control and session control. Huang, Robertson, and Chang (2004) measured control over the physical environment as adjustability and layout flexibility.

The concept of personal control has spawned vast literatures covering everything from stress inoculation and other determinants of clinical health outcomes to the well-known idea of self-efficacy within personal and social psychology. Related literatures include locus of control, attribution theory and consumer behavior. It is beyond the scope of the present investigation to provide an exhaustive introduction to the psychology of personal control. However, its application and relationship to the physical environment (and in particular, to office work environments) has been comparatively more recent. In this context it is still necessary to distinguish between objective levels of control (in terms of the availability and ease of adjustment of various aspects of the physical or psychosocial work environments) and subjective levels of control (in terms of perceived personal influence over, importance of, and neutrality of consequences from applying various control behaviors). Architects, interior designers and ergonomists may assume that by providing adjustment capabilities for specific features of the environment, they have impacted personal control; however, such design intentions should be verified by actual changes in measures of perceived personal control. In this regard, in the present study, personal control refers to the degree to which employees perceive they can change their physical work environment, especially by determining, altering, or modifying work areas as necessary to support or allow their work behaviors.

It is hypothesized that the flexibility represented by freedom to choose or change various aspects of one's work space according to individual or group needs will relate to perceptions of personal control and levels of interpersonal communication, possibly leading to higher group cohesion. Recent work has found that higher levels of perceived control can influence employees' ability to use their work space and its adjustable features effectively, and can lead to higher environmental satisfaction and communication (Huang et al., 2004). Nonetheless, there is little evidence for a relationship between the use of flexible (or rigid) work spaces and other relevant group outcomes such as work effectiveness, performance and group cohesiveness. Yet much of the literature assumes that support for changing organizational structures, facilitation of instant team communication, and coping with a variety of work patterns can be achieved by using flexible work spaces (Berndt, 2000). Based on these considerations, the following hypotheses were proposed:

H2a: Perceived levels of personal control over the physical work environment will be positively related to self-reported job satisfaction.
H2b: Perceived levels of personal control over the physical work environment will be positively related to perceived group cohesiveness.
H2c: Perceived levels of personal control over the physical work environment will be positively related to satisfaction with the physical work environment.

2.3. Relationship between satisfaction with the physical environment and job satisfaction

Investigators have demonstrated that the perceived quality of the physical environment affects job perceptions, attitudes, and job satisfaction (Sundstrom et al., 1994; Zalesny, Farace, & Hawkins, 1985). In related work, Carlopio (1996) found that in general, employees' satisfaction with the workplace was positively related to job satisfaction and organizational commitment. More

specifically, Larsen et al. (1998) found that attractive settings positively affected participants' ratings of well-being and that the presence of indoor plants increased the comfort and attractiveness of office environments. In the interest of replicating this previous work, the following hypothesis was proposed:

H3: Environmental satisfaction with the physical work environment will be positively related to self-reported job satisfaction

2.4. Relationships between job satisfaction, perceived performance and group cohesion

According to Sundstrom (1986), individual work outcomes involve job satisfaction and job performance, but group outcomes involve communication, group formation and group cohesion. Although some research has found significant effects of physical environment features on dependent measures of job satisfaction and performance (Stone & Irvine, 1994; Sundstrom et al., 1994), other studies have failed to confirm a direct relationship between these variables. As the emphasis on teamwork grows, organizational performance can be usefully related not only to individuals, but also to teams and groups (DeMatteo et al., 1998). As one example of this shift in dependent measures to group level phenomena, physical enclosure may be associated with group cohesiveness (Sundstrom, 1986). In light of these possibilities, the following hypotheses were proposed:

H4a: Employee inclination to work alone or in an enclosed space will be negatively related to perceived levels of group cohesiveness;
H4b: Perceived levels of group cohesiveness will be positively related to self-reported job satisfaction;
H4c: Self-reported job satisfaction will be positively related to self-reported job performance.

Fig. 1 outlines the theoretical framework for this study based on the proposed hypotheses.

In Fig. 1, exogenous factors include distractions and personal control. Endogenous factors include satisfaction with the workplace, self-rated job performance, job satisfaction, perceived group cohesiveness and inclination to work alone or in an enclosed area.

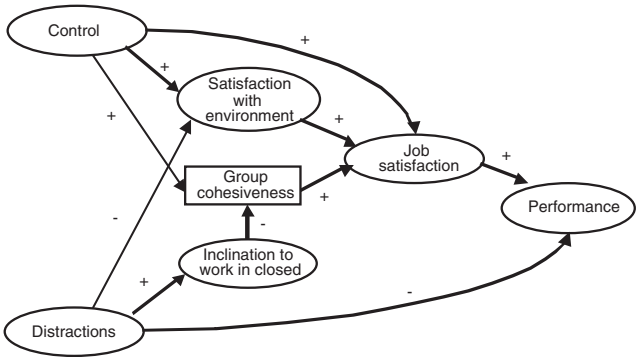

Fig. 1. The model of effects of control and distractions on individual and group work.

Table 1
Job type by office type

	Clerical	Technical	Manager	Other	Totals
Private office (4 walls enclosed with a door; 8′ × 10′ to 12′ × 15′)	0	4	5	1	10
High panels/ cubicles (>54″) (at least 3 walls; 6′ × 8′ to 10′ × 10′)	17	19	7	22	65
Low panels/ cubicles (<54″) (at least 2 walls; 6′ × 6′ to 8′ × 10′)	29	31	19	36	115
Open office (no partitions; 6′ × 6′ to 8′ × 10′)	1	8	2	8	19
Other (irregular partitions & configurations)	1	2	0	3	6
Totals	48	64	33	70	215

3. Method

Participants were from five different organizations, with *N*'s ranging from 7 to 143. The questionnaires were collected in a variety of ways, including physical distribution of hard copies, on-line broadcasting of a Word document containing the survey form, and via an on-line link for computer-mediated survey participation. The data used in this research were collected prior to facility renovations or relocations. Participants worked at a Midwest auto supplier, a Northeast General Services Administration (GSA) location, a Midwest manufacturer (customer service, logistics, distribution), a Southwest telecommunications firm, and a Midwest marketing firm. Of 376 total cases, 228 had adequate data on all relevant variables and were thus included in the analyses. In this usable sample, 48 respondents (22%) worked in clerical jobs, 64 (30%) in technical jobs, 33 (15%) in managerial jobs and 70 (33%) in other jobs. Table 1 presents the distribution of these job types across the four different types of office environments with some additional details about the ranges of office environments encountered. Chi-square tests indicated that across job type, there were no differences in office type.

The development of the original 39-item questionnaire from which the 23 items listed in the Appendix were derived involved several stages. First, several items were adapted from standard job satisfaction, group work

inventories and subjective measures of individual and group productivity (e.g., Anderson & West, 1998; Balzer et al., 1997; Clements-Croome, 2000; McNeese, Salas, & Endsley, 2001) to assess individual perceptions of both individual and group aspects of—and outcomes from—work environments. Next, 20 open-ended questions were circulated among five conveniently sampled content experts to elicit issues of concern and interest to occupants of office work environments—particularly issues that might possibly be addressed by re-designing, re-configuring or otherwise renovating aspects of the immediate as well as the overall physical work environment. Third, a volunteer sample of 167 office workers from three different corporations responded to the items generated by the content experts in addition to the 20 open-ended questions. Fourth, the top three responses to each of the open-ended questions (based on frequencies) were reduced to semantic differential items using Likert-type scales from 1 to 7. This complete set of items was then field-tested with 152 office employees at five different companies to ascertain factor structure. Those items that appeared to address the same issue and were highly correlated ($r = 0.75$ or greater) were collapsed to a single item—the one with the least variance across all the samples. Test-retest reliability estimates for the 39 original measures range from 0.65 to 0.94; twenty-three of these items reflected variables modeled in the present study.

Demographic items allowed comparisons based on participant age, sex, job type (administrative [e.g., administrative assistant, secretary, reservations, customer service]; technical staff [e.g., industrial designer, graphics designer, engineer, scientist]; manager/executive [e.g., supervisor, manager, VP, CEO]; or other; office type (private office [four walls enclosed to the ceiling with a door]; high-paneled workstation [partitions > 54 inches]; low-paneled workstation [partitions < 54 inches]; open workstation [no partitions or barriers of any kind]; or other (included irregular or uneven partitions/panels or additional arrangements). Additional questions used a 7-point semantic differential scale (e.g., 1-Yes, Very Much So to 7-No, Not at All, see Appendix).

To examine the multiple relationships simultaneously, the proposed structural relations were tested with Lisrel 8.54 using the raw data. Table 2 gives the covariance matrix.

4. Results

Each variable of interest was uniformly distributed with the following exceptions: Perceived performance (quality of

Table 2
Covariance matrix to be analyzed

	P1	p2	p3	js1	js2	js3	gc	i1	i2	di1	di2	di3	di4	di5	c1	c2	c3	c4	c5	c6	sw1	sw2	sw3
P1	1.87																						
p2	0.77	1.05																					
p3	1.05	0.81	2.27																				
js1	1.05	0.64	1.17	2.11																			
js2	0.93	0.37	0.93	1.54	2.78																		
js3	0.65	0.36	0.68	1.23	1.56	2.06																	
gc	0.63	0.44	0.94	1.05	1.10	0.94	1.98																
i1	0.04	0.20	0.28	−0.01	0.20	0.05	0.09	2.43															
i2	0.11	0.06	0.07	0.04	0.34	0.14	0.05	1.28	1.68														
di1	−0.37	−.036	−0.39	−0.75	−0.59	−0.62	−0.60	0.15	0.38	2.88													
di2	−0.23	−0.15	−0.32	−0.36	−0.57	−0.42	−0.19	0.32	0.44	1.32	2.68												
di3	−0.08	−0.21	−0.14	−0.33	−0.60	−0.53	−0.37	0.17	0.22	0.96	1.32	3.52											
di4	−0.09	−0.25	−0.16	−0.31	−0.20	−0.46	−0.27	−0.09	0.04	1.08	0.96	1.30	2.82										
di5	−0.29	−0.32	0.39	−0.37	−0.37	−0.37	−0.32	0.42	0.61	1.34	1.77	1.59	1.13	2.55									
c1	0.45	0.23	0.19	0.48	0.28	0.45	0.02	−0.28	−0.04	−0.64	−0.53	−0.68	−0.65	−0.59	3.36								
c2	0.44	0.28	0.35	0.46	0.69	0.47	0.25	−0.05	0.23	−0.60	−0.34	−0.70	−0.30	−0.60	1.22	2.66							
c3	0.46	0.32	0.83	1.18	1.04	0.86	0.55	−0.15	0.09	0.23	−0.50	−0.72	−0.50	−0.63	0.65	0.69	2.62						
c4	0.11	−0.06	0.24	0.23	0.53	0.46	0.24	−0.43	−0.17	0.09	−0.39	−0.82	−0.24	−0.57	0.99	1.07	0.70	2.51					
c5	0.45	0.07	0.43	0.68	0.88	0.82	0.41	0.21	0.35	−0.17	−0.38	−0.56	−0.47	−0.47	1.01	0.89	0.73	0.51	2.45				
c6	0.44	0.06	0.31	0.35	0.34	0.37	0.15	−0.43	−0.15	0.35	−0.42	−0.62	−0.74	−0.71	1.07	1.12	0.45	1.05	0.88	4.27			
sw1	0.42	0.32	0.45	0.70	0.83	0.74	0.32	0.20	0.24	−0.15	−0.55	−0.62	−0.71	−0.66	0.78	0.79	0.61	0.60	0.96	0.63	2.82		
sw2	0.52	0.36	0.51	0.66	0.87	0.69	0.38	0.04	0.19	0.24	−0.71	−1.26	−0.72	−0.96	1.07	1.28	0.69	0.91	1.32	1.10	1.62	2.83	
sw3	0.41	0.37	0.50	0.71	0.84	0.74	0.39	0.18	0.34	0.19	−0.39	−0.76	−0.64	−0.67	0.73	0.94	0.71	0.61	1.03	0.56	1.96	1.71	2.40

Performance: p1, p2, p3.
Job satisfaction: js1, js2, js3.
Group Cohesiveness: gc.
Inclination to work alone: i1, i2.
Distraction: di1, di2, di3, di4, di5.
Control: c1, c2, c3, c4, c5, c6.
Satisfaction with workplace: sw1, sw2, sw3.

work and quantity of work), job satisfaction indicators, and inclination to work in an enclosed space were all positively skewed, while one of the control variables—perceived ability to adjust, re-arrange and reorganize one's work area as needed—was negatively skewed.

4.1. Confirmatory factor analysis

Exploratory factor analyses were conducted which yielded a set of tentative constructs. In agreement with past work, the item measuring adequacy of privacy correlated negatively with all items measuring distraction levels. A previous exploratory factor analysis (Hedge, 1982) also grouped lack of privacy with distraction issues.

Factor constructs were then developed based on these initial results, and confirmatory factor analysis was used to test these constructs, employing Maximum Likelihood estimation. Results showed a moderately good fit for the measurement model. The ratio of the obtained chi-square value to its degrees of freedom was 1.39 with a goodness of fit index of 0.91, a comparative index of 0.98, and a root mean square error of approximation (RMSEA) of 0.042 (see Table 3). The reliability coefficients (Cronbach's alphas) are all higher than 0.70. Factor loadings of each individual indicator with its respective construct reached significance ($p<0.01$). Such factor loadings can be considered "practically significant" at ± 0.50 or greater (Hair, Anderson, Tatham, & Black, 1998). However, correlations of indicators within the same construct were not always higher than those within other constructs; thus, these data fall short of the ideals of good convergent and discriminant validity.

4.2. Proposed structural equation model test

Once the measurement issues were satisfied, the structural model in Fig. 1 was tested. The initial model failed to show a good fit ($\chi^2 = 443.60$, df = 220, RMSEA = 0.067,

Table 3
Results of confirmatory factor analysis

Constructs and measurement items[a]	Construct loading			
	Estimates[b]	*t*-values	Mean	s.d.
Performance (0.7553)				
P1: Perceived job performance is very creative	0.76	12.18	3.02	1.37
P2: Quality of my work	0.71	11.34	2.36	1.03
P3: Quantity of my work	0.70	11.04	2.98	1.51
Job satisfaction (0.8310)				
JS1: Job satisfaction	0.84	14.06	3.37	1.45
JS2: Recommend my job to a friend	0.72	11.30	2.93	1.67
JS3: Choose to work here again	0.66	10.06	2.56	1.44
Inclination to work in a closed area (0.7691)				
I1: Prefer a completely open office to more typical cubicles (R)	0.65	10.85	2.18	1.56
I2: Most effective in a private, enclosed kind of workspace	0.97	20.34	2.63	1.30
Distraction (0.7985)				
DI1: Difficult to concentrate	0.62	9.59	4.02	1.70
DI2: Auditory distraction	0.67	9.80	3.03	1.64
DI3: Lack of privacy	0.64	9.74	3.40	1.88
DI4: Visual distraction	0.54	7.96	4.20	1.68
DI5: Noisy	0.81	12.87	3.34	1.60
Control (0.7115)				
C1: Determine the organization/appearance of work area	0.56	8.54	3.17	1.83
C2: Personalize	0.65	10.05	3.26	1.63
C3: Under my control	0.49	7.29	3.53	1.62
C4: Adjust, re-arrange, and re-organize	0.59	8.67	5.35	1.58
C5: Variety of work environment is available	0.65	9.84	3.48	1.57
C6: Prompt meeting either my office or work areas	0.44	6.45	4.20	2.07
Satisfaction with workplace (0.8513)				
SW1: Appropriate work environment	0.64	9.86	3.46	1.68
SW2: Like style/quality	0.89	14.93	3.57	1.68
SW3: Like furniture	0.73	11.72	3.37	1.55

Unconstrained model: $\chi^2 = 259.03$ (df = 186), RMSEA = 0.042, GFI = 0.91, CFI = 0.98.
All loadings are significant at $p<0.01$.
[a]Cronbach alphas are in parentheses.
[b]Standardized.

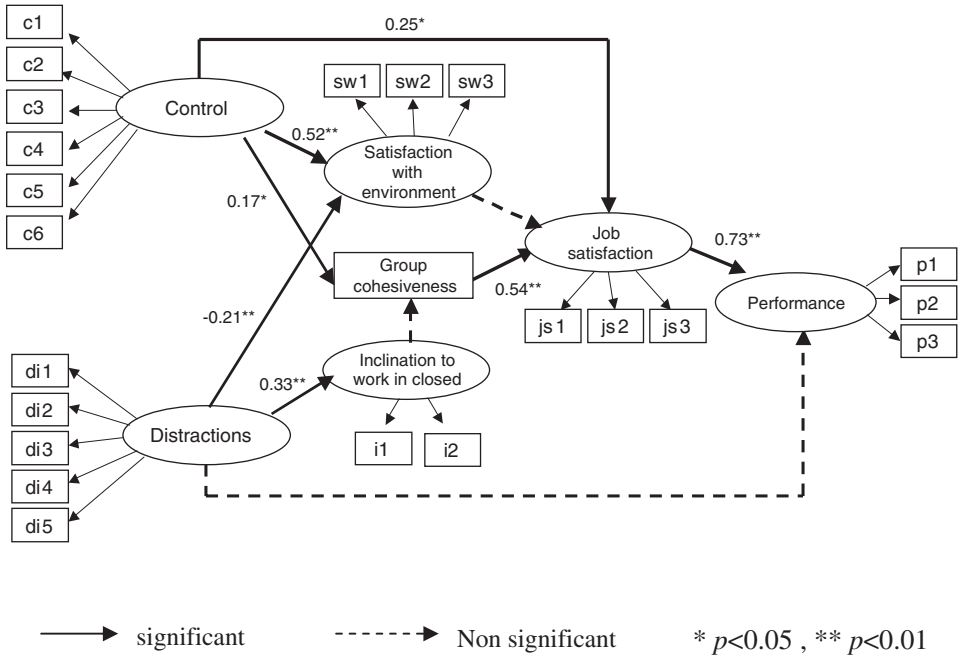

Fig. 2. Structural equation model (standardized).

GFI = 0.85, CFI = 0.94, NFI = 0.89). By correlating errors and disturbances from the restrictive starting model, the model fit significantly improved. Evaluation of measurement error correlations reflects the assumption that the two indicators measure something in common not represented in the model (Kline, 1998). The final results of the path model are shown in Fig. 2. As shown in Table 4, the seven paths reached statistical significance. All fit indices for the model reached acceptable levels ($\chi^2 = 295.54$, df = 207, RMSEA = 0.043, GFI = 0.90, CFI = 0.98, NFI = 0.93, CN = 193.74); fitted residuals ranged from −0.33 to 0.57 (median, 0.02).

Each specific hypothesis was tested using the path coefficients presented in Table 4.

H1a: Perceived distraction levels in the workplace will be negatively related to self-assessed employee performance.
H1b: Perceived distraction levels in the workplace will be positively related to employees' inclination to work alone or work in an enclosed space.
H1c: Perceived distraction levels in the workplace will be negatively related to satisfaction with the physical work environment.

Table 4
Results of path analysis

	Estimates[a]	*t*-values	Hypotheses
Distraction-Performance	0.05	0.95	H1a
Distraction-Inclination to work in a closed area	0.33**	3.83	H1b
Distraction-Work environment satisfaction	−0.21**	−2.75	H1c
Control-Job satisfaction	0.25*	2.26	H2a
Control-Group cohesiveness	0.17*	2.12	H2b
Control-Work environment satisfaction	0.52**	5.13	H2c
Work environment satisfaction-Job satisfaction	0.15	1.56	H3
Job satisfaction-Performance	0.73**	6.37	H4a
Group cohesiveness-Job satisfaction	0.54**	8.97	H4b
Inclination to work-Group cohesiveness	−0.38	−1.79	H4c

Model fit $\chi^2 = 295.54$ (df = 207), RMSEA = 0.043, GFI = 0.90, CFI = 0.98, NFI = 0.93.
*$p < 0.05$.
**$p < 0.01$.
[a]Standardized.

Regarding the predicted relationship between distractions and performance, the results indicated no significant effect of perceived distractions on perceived performance (H1a was not supported). This result might be due to the particular choice of performance measures; such methods vary, and few widely accepted instruments currently exist (Yan & Gary, 1994). In addition, perceived control may have functioned as a moderator of the expected relationship between distraction and perceived performance; this suggestion would require testing a different path model based on additional theoretical development.

However, the proposed model supported a relationship between distractions and preference for a private office as well as an indication of being more effective in enclosed work areas—as summarized in Hypothesis 1b. Thus, perceived distraction levels appeared to relate more to

preferences or expectations than to actual space performance (based on subjective measurement of these factors). Nonetheless, as proposed in Hypothesis 1c, distraction was negatively related to satisfaction with the physical work environment.

H2a: Perceived levels of personal control over the physical work environment will be positively related to self-reported job satisfaction.
H2b: Perceived levels of personal control over the physical work environment will be positively related to perceived group cohesiveness.
H2c: Perceived levels of personal control over the physical work environment will be positively related to satisfaction with the physical work environment.

Regarding issues related to personal control, perceived control had a significant, positive influence on both job satisfaction and group cohesiveness (H2a & b were supported). Additionally, results indicated that perceived control, flexible use of space (as measured by the ability to adjust one's workspace, the variety of work environments necessary for one's job being available, and the availability and convenience of meeting rooms where/when needed) also had a positive influence on group cohesiveness. Therefore, the frequent assumption within the office design industry that flexible use of space can play a role in increasing communication, perhaps contributing to higher group cohesiveness, received tentative support. These results suggest that providing office workers with more control over their individual workplace may address individual, interpersonal, and group needs for flexibility; this, in turn, may contribute to group cohesiveness. Although these possible intervening variable structures were not directly tested by the model derived here and thus remain speculative, perceived personal control over the environment was positively associated with satisfaction with the physical work environment, lending support for H2c.

H3: Environmental satisfaction with the physical work environment will be positively related to self-reported job satisfaction

The present results indicated no significant effect of environmental satisfaction on job satisfaction (H3 was not supported). This finding is inconsistent with previous findings (Carlopio, 1996; Sundstrom et al., 1994; Zalesny et al., 1985). Further examination of individual correlations indicated that all indicators of work environment satisfaction were significantly associated with all indicators of job satisfaction. To address this apparent contradiction, remember that "typical" regression coefficients estimate the direct effects of variables, while path analysis includes both direct and indirect effects from other factors, variables, and errors (Bollen, 1989, p. 38). Although the relevant coefficient estimate in this model did not reach significance ($t = 1.56$), the direction of the relationship was positive; thus, the failure to achieve significance for the overall path coefficient may have been due to indirect effects from other unaccounted-for variables or measurement errors. For at least these reasons and perhaps others, this result might best be interpreted within the overall model structure being suggested here.

H4a: Employee inclination to work alone or in an enclosed space will be negatively related to perceived levels of group cohesiveness;
H4b: Perceived levels of group cohesiveness will be positively related to self-reported job satisfaction;
H4c: Self-reported job satisfaction will be positively related to self-reported job performance.

These results indicated that inclination to work alone or work in an enclosed area were not significantly associated with group cohesiveness as anticipated by H4a—although the direction of the N.S. relationship was negative (estimate $= -0.38$, $t = -1.79$). As expected in H4b, group cohesiveness was positively associated with job satisfaction (estimate $= 0.54$, $t = 8.97$). Additionally, H4c—that job satisfaction would be positively associated with perceived performance—received support from these results (estimate $= 0.73$, $t = 6.37$).

5. Discussion

Seven of the ten paths related to specific hypotheses and all of the proposed path directions except one reached statistical significance; along with the acceptable fit indices, these results seem to provide support for the proposed model. In spite of the suggestive implications from these results regarding at least limited causal inference, such interpretation still requires much caution for a number of reasons. The hypotheses tested were based on the proposed structural model, and each path in the model included both direct and indirect effects. Therefore, cause-effect implications must remain limited to the context provided by the proposed model. The model may enjoy internal consistency, but this does not necessarily imply that each path in the model specifies a cause-effect relationship (Bollen, 1989).

As with many studies using multivariate analysis techniques, these results have several limitations. For example, fundamental aspects of the factors tested in this model may not have been adequately captured by the set of measurements used (sufficiency of measurement); for example, the endogenous factor of group cohesiveness relied on only one measure. Additionally, measures of control used in previous research (MacLaney & Hurrell, 1988) suggest a somewhat richer portrayal of the concept of personal control compared to that used in this study. The measurements of control in this study were limited since the purpose was to examine the aspects of personal control directly related to the physical environment. To contribute to theory development in this area, future

research would be improved by a multidimensional perspective of control that includes aspects of the work task, work pacing, work scheduling, decision making and mobility as well as the physical environment (Ganster, 1989). This required conceptual expansion for the construct of personal control suggests the need for more theoretical integration between those worker concerns traditionally addressed in the Human Resource Management literature (cf. Maslach, 2003) and those occupant needs more typically associated with the design of work environments. Practitioners have long recognized the need for this conversation between Human Resources and Real Estate & Facility Management, but since academic literatures tend to be analytic rather than synthetic, this deficiency in dialogue appears likely to continue.

An additional weakness of this study involves the requirement—when using SEM and related statistical tools—of a mature theory for the exogenous factors tested in order to draw unambiguous implications (predictions) for the endogenous outcomes. Since the exact nature of the simultaneous relationships among personal control, distraction, individual satisfaction with workspace features, job satisfaction, perceived performance and group cohesiveness have not been finalized, this study in some respects must be considered exploratory; nevertheless, it provides some useful directions for future research. At the very least, the oft-encountered relationship between a sense of personal control and job satisfaction reproduced here suggests that this association may extend to offering workers control over their physical environment—since the measures of perceived control used in this study reflected this environmental interpretation of personal control.

Somewhat independent of personal control considerations, the assumption that people with higher inclination to work alone or in enclosed areas might experience lower group cohesiveness (as a result of working in isolation) remains questionable based on these results. In some respects, an indicator of inclination to work alone or in an enclosed area might measure individual preference rather than a behavioral pattern resulting from exposure to workplace distractions; thus, measures for these variables in future work should carefully distinguish among personal preferences, group processes, and work outcomes. Surprisingly, the results from this study did not confirm the assumption that openness and accessibility affect communication (Hedge, 1982) and thus group cohesiveness. In this regard, the additional suggestion has been made that if a group has its own enclosed area, this may contribute to higher group cohesiveness by shielding the group from observation and interference from outside the group (Sundstrom, 1986). It would seem that if group cohesiveness represents one goal for an office design project, then perhaps different strategies should be employed for individual as compared to group settings. That is, perhaps enclosure strategies should address group/teaming areas rather than merely designating individual work environments. However, as mentioned earlier, open offices have typically endured negative reviews regarding distractions for individual work; therefore, it would seem that informed workplace planning should carefully incorporate not only openness and accessibility to support group collaboration but also choices (a variety of space options) to support distraction-free individual work. While many of these ideas have no doubt been explored in a number of design projects, very few such projects have enjoyed the empirical support provided by these results.

Even the strong, direct relationship found in this study between job satisfaction and perceived job performance could be viewed as a limitation, perhaps involving measurement deficiencies for some of those constructs. This possibility should at least be considered, because careful work has uncovered subtle moderating and mediating variables characterizing this association (cf. Dipboye, Smith, & Howell, 1994) apparently not represented in these seemingly more straightforward results. Finally, the possible indirect association between perceptions of personal control over the physical environment and group cohesiveness may be a step toward the somewhat elusive goal of linking aspects of the physical environment with performance, since group cohesion has been related to group performance (see Beal, Cohen, Burke, & McLendon, 2003). Nevertheless, facility strategies in isolation from human resource management considerations rarely deliver the organizational outcomes promised. An integrated approach that relates office design to critical organizational outcomes is needed in order to yield a richer theoretical understanding as this area of research develops.

Despite these limitations, the external validity of these results demands attention, since they are based on a broad, cross-section of incumbent office workers from five different organizations—both public and private. Given such realistic estimates of within-group variability, the model developed and tested here demonstrates both the strengths and weaknesses of applied research in real-world settings.

Appendix. Measures used

Performance

Compared to my typical performance, right now I would rate my job performance as

Very creative 1 2 3 4 5 6 7 Not at all creative

Compared to my typical work, right now I would rate the quality *of my work as*

Very good 1 2 3 4 5 6 7 Very bad

Compared to my typical work, right now I would rate the quality *of my work as*

Very good 1 2 3 4 5 6 7 Very bad

Job satisfaction

Compared to how I typically feel, right now I would rate my job satisfaction as

Very high 1 2 3 4 5 6 7 Very low

I would recommend my job to a friend who was qualified and looking for work.
Yes, most definitely 1 2 3 4 5 6 7 No, definitely not

If I had it to do over, I would choose to work here again.
Yes, most definitely 1 2 3 4 5 6 7 No, definitely not

Group cohesiveness

Cohesiveness is a group characteristic involving whether members like one another, work well together, communicate fully and openly, and coordinate their work efforts. Compared to the typical level, right now I would rate my work group's cohesiveness as
Very high 1 2 3 4 5 6 7 Very low

Inclination to work in an enclosed area

I prefer a completely open office (no partitions) to more typical "cubicles."
Yes, very much so 1 2 3 4 5 6 7 No, not at all

I am most effective in a(n) _____ kind of work space.
Private, enclosed 1 2 3 4 5 6 7 Open, barrier-free

Distraction

I find it difficult to concentrate on my work.
Yes, all the time 1 2 3 4 5 6 7 No, never

I experience auditory distractions in my work area.
Yes, all the time 1 2 3 4 5 6 7 No, never

I have adequate privacy in my primary, individual work area.
Yes, most definitely 1 2 3 4 5 6 7 No, definitely not

I experience visual distractions in my work area.
Yes, all the time 1 2 3 4 5 6 7 No, never

My work environment is too noisy.
Yes, all the time 1 2 3 4 5 6 7 No, never

Control

I determine the organization/appearance of my work area.
Yes, very much so 1 2 3 4 5 6 7 No, not at all

I can personalize my workspace.
Yes, very much so 1 2 3 4 5 6 7 No, not at all

I feel my work life is under my personal control.
Yes, very much so 1 2 3 4 5 6 7 No, not at all

I can adjust, re-arrange, and re-organize my furniture as needed.
Yes, very much so 1 2 3 4 5 6 7 No, not at all

The variety of work environments needed for my job is available to me.
Yes, very much so 1 2 3 4 5 6 7 No, not at all

I can hold small, impromptu meetings in my office or work area as needed.
Yes, any time 1 2 3 4 5 6 7 No, never

Satisfaction with workplace

Overall, my work area is appropriate for my work.
Yes, most definitely 1 2 3 4 5 6 7 No, definitely not

I like the style/quality of my furniture.
Yes, very much so 1 2 3 4 5 6 7 No, not at all

Overall, I like my furniture.
Yes, very much so 1 2 3 4 5 6 7 No, not at all

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