Space and the Psychology of Personality Types: How Personality Influences Reactions to Architectural Space

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Researchers in both architecture and psychology agree that open office plans can have significant negative consequences for employees. This, though, is where universal agreement ends: researchers in both fields have struggled to identify specific and repeatable negative effects of open offices. Some studies have linked open plans to privacy concerns and decreased job satisfaction (Oldham & Brass, 1979, p. 267; Brennan et al., 2002, p. 279), but others have found better communication and increased job satisfaction for some types of employees (Zalesny & Farace, 1987, p. 253). Employee reactions to open office spaces seem to vary by task, organizational status, age, and a myriad of other factors, which makes it difficult for architects to determine how offices should be designed.

The mixed results on open offices are indicative of larger problems in the environment-behavior field. Psychological research should inform architectural design solutions, but before that can happen, communication between architectural and psychological researchers must improve. The environment-behavior discipline provides a forum for this communication, but current research in the field is published in several different journals and interested parties are unlikely to see all relevant studies. For example, environment-behavior researchers often ignore purely psychological research that might be relevant to their studies of behavior and perception.

This paper reviews literature on open offices and personality characteristics to illustrate how psychological research can enhance environment-behavior research. Psychological research suggests that personality dimensions like introversion/extraversion may explain mixed responses to open offices, but personality factors are largely ignored in existing environment-behavior studies. Architects strive to design specifically for their clients and occupants, but are often forced to

guess about how occupants will respond to a space. Improved communication between designers and psychologists may lead to better understanding of how different people react to the same architectural spaces.

Open Offices

Studies of open offices illustrate problems with the environment-behavior field, and psychological research on personality can help researchers better understand mixed results from these studies. Studies of open offices in the environment-behavior field often reach conflicting conclusions that could be better understood if architectural researchers took personality differences into account when designing studies and analyzing results. The idea that architectural research often produces conflicting results on open offices is not new: in 1986, *Building Design and Construction* editor Christopher Olson wrote that research on open office plans led to mixed conclusions about productivity and employee satisfaction (p. 90). Similarly, researchers have presented the idea that these mixed results may be related to social and psychological variables. For example, Dan Soen warned that in studying the effects of environment on social structure, researchers must not forget that social structure also alters the physical environment (1974, p. 44). Intuitively, perceived office environments are highly dependent on the personalities of the people working in them, but environment-behavior research has largely ignored personality factors in studies of open offices. Instead, researchers have tried to develop theoretical frameworks that explain and predict general reactions to open offices.

Theoretical Perspectives on Open Office Plans

Three conflicting theoretical perspectives on open offices influence interpretation of mixed research results. In general, the 'social relations' perspective emphasizes open offices' potential to foster workplace communication and personal relationships, and the 'sociotechnical' approach argues that the lack of acoustical and

visual barriers in open offices prevent meaningful interactions that can only happen in private spaces. The 'symbolic meaning' perspective focuses less on communication and privacy, and explores physical status symbols as determinants of employees' reactions to spatial characteristics.

A 1979 study by Greg Oldham and Daniel Brass outlined the social relations perspective on open offices. Oldham and Brass explained that proximity encourages interaction, which increases attraction and task productivity (1979, p. 269). Judging by the popularity of open offices, this perspective has been the dominant one: a lack of visual barriers will encourage people to share work-related and personal information, which will increase their job performance and allow them to form friendships at work. Oldham and Brass note that while empirical research has shown that open plans do encourage more social interaction and better communication, it has been difficult to link open office characteristics to work performance or job satisfaction (1979, p. 269).

Rashid, Wineman, and Zimring analyzed two open-plan offices and found, as predicted by the social relations perspective, that increased accessibility and visibility led to more face-to-face interaction (2009, p. 444). Like Oldham and Brass, though, the authors found that increased accessibility, visibility, and face-to-face interaction did not have statistically significant impacts on job satisfaction (2009, p. 445). While some conditions in open offices are consistent with the social relations perspective, the framework does not explain why increased interaction and visibility do not lead to increased job satisfaction.

Despite the intuitive appeal of the social relations perspective, Oldham and Brass found more support for the sociotechnical approach. Consistent with sociotechnical theory, an organization's move to an open plan office resulted in fewer friendship opportunities, less supervisor feedback, lower concentration, and lower task significance (Oldham and Brass, 1979, p. 278). Work satisfaction, interpersonal satisfaction, and internal motivation also declined, as predicted by sociotechnical theory (Oldham and Brass, 1979, p. 278).

Also consistent with the sociotechnical framework, Brennan et al. found that a move from a traditional office to an open one decreased satisfaction and perceived productivity (2002, p. 279). The move also created more physical stress and strained coworker relations, and there was no evidence that employees adapted over time to view the open office more favorably: six months after the move, dissatisfaction and stress were at their highest (Brennan et al, 2002, p. 293).

While there is certainly evidence to support the sociotechnical perspective, there are other explanations for these negative outcomes after a move to an open office. Oldham and Brass did collect data twice after the move, but they allow that dissatisfaction in the short term could be due to change, and not the environment itself (1979, p. 281). Brennan et al. found that dissatisfaction still existed six months after the move, but it may simply take more than six months for employees to adjust to changes in office plan (2002, p. 293). The results could also have been affected by changed organizational practices or perceived status of employees after the move.

Mary Zalesny and Richard Farace argue for a symbolic meaning approach to understanding office environments. Zalesny and Farace found that a move to an open office affected professionals least and clerical and managerial staff most (1987, p. 240). This result contrasts with Sundstrom, Burt, and Kamp's study (1980, p. 114), which found no difference in a move's effect on different types of employees and tasks. Zalesny and Farace explain that physical environments convey information about organizational and personal status (1987, p. 242), so from a symbolic meaning perspective, open plans distribute status symbols throughout the organization, which is good for lower level employees but bad for higher level ones (1987, p. 243). Higher level employees may perceive the loss of private offices "as a symbolic loss of status and the accompanying right to greater privacy" (Zalesny & Farace, 1987, p. 253). From this point of view, higher level employees experience lower job satisfaction not because privacy is inherently valuable, but because the loss of privacy signals the loss of status.

Psychological researchers have also studied status symbols in the workplace. While Zalesny and Farace focused on how status symbols affect employees' perceptions of their own status, Kimberly Elsbach explained that office arrangements and items can also impact individuals' perceptions of others' status (2004, p. 99). As the case of symbolic meaning exemplifies, environment-behavior and psychological researchers often study similar topics from different angles, and better communication would likely benefit both fields.

The symbolic meaning perspective differs from the social relations and sociotechnical approaches in that it allows for different people to respond differently to the same spatial change. The approach focuses on differences in status between employees, but the seemingly intuitive idea that responses to spatial characteristics may differ among individuals is important for future research.

Zalesny and Farace conclude that "the significant interactions found between organizational position and change in work environment suggest that individual and organizational factors generally ignored in this type of research may influence both employees' reactions to environmental changes and the changes themselves" (1987, p. 254). The reference to 'individual factors' seems to beg for analysis of personality dimensions, but the authors instead focus on the possibility that different types of employees derive job satisfaction from different sources. They suggest that professionals draw intrinsic satisfaction from their work, while clerical and managerial employees find extrinsic satisfaction through interactions with colleagues (Zalesny & Farace, 1987, p. 255), which would explain why a move to an open office, and the accompanying change in social interactions, had a larger impact on clerical and managerial employees. This is plausible, but it is curious that personality factors and other explanations for uneven reactions to architectural features have not been more thoroughly explored since Zalesny and Farace's 1987 study.

Environment-behavior researchers' inability to settle on any one theoretical perspective is likely due to employees' varying reactions to office spaces. It is possible some people react as the social relations framework predicts, some react as the sociotechnical framework predicts, and some react as the symbolic meaning

framework predicts, muddying aggregate results. Psychological ideas about personality may clarify mixed results or suggest new research directions. An investigation of privacy in office environments helps illustrate how personality dimensions can affect reactions to space and augment environment-behavior research.

Privacy in Open Offices

Privacy is at the core of disagreement between the sociotechnical, social relations, and symbolic meaning frameworks. The symbolic meaning perspective focuses primarily on physical status indicators, while the social relations approach warns that too much privacy impedes communication, and the sociotechnical framework argues that in-depth communication can only occur in adequately private environments. Existing environment-behavior research does not link these perspectives to personality dimensions, but psychological studies of introversion and privacy suggest that the social relations view is informed by extraverted values, while the sociotechnical view is informed by introverted ones. Introverts value privacy and close, meaningful relationships (Stone, 1986, p. 371; Pederson, 1982, p. 13), and the sociotechnical approach emphasizes that a lack of privacy in open offices causes distraction and inhibits meaningful conversation. In contrast, extraverts are less bothered by noise (Fowles et al., 1977, p. 130) and draw energy from being around people, and the social relations framework predicts that less physical divisions lead to better communication and workplace relationships.

Olson found that despite other mixed results from studies of open offices, employees universally desired more privacy (1986, p. 90). Privacy, though, is not as simple a concept as it first appears. Sundstrom, Burt, and Kamp noted that architectural privacy and psychological privacy are different conditions. Architectural privacy is a physical feature, whereas psychological privacy is a mental state (1980, p. 101). An area may include visual and acoustical barriers, but these do not guarantee that occupants will perceive it as a private space. Many studies do not make the distinction between architectural and psychological privacy, even though they evaluate

one or the other: studies that ask respondents for their attitudes about privacy in a space measure psychological privacy, whereas studies that use enclosure, noise levels, or sightlines as proxies measure architectural privacy.

Sundstrom, Burt, and Kamp hypothesized that architectural privacy and psychological privacy are causally related and that workers with more complicated tasks need more privacy and freedom from distractions (1980, p. 102). The authors did not, though, find that less privacy led to more social interaction (Sundstrom et al., 1980, p. 113). This result is inconsistent with other studies (Rashid et al., 2009, p. 444; Oldham & Brass, 1979, p. 269) and with the social relations approach, but the authors noted that their study used workers who were already working in an open office, not workers who had just moved. Open plan offices might foster social interaction at first, but the social activity could revert to 'normal,' pre-move levels after some time as employees adjust to the new space, which would explain why this study did not find that less privacy led to more social interaction. It is also possible that personality mediates the relationship between privacy and social interaction. Psychological research on introversion/extraversion and privacy preferences supports this idea, and could explain why a connection between visibility and social interaction has been so difficult to establish.

Dianna Stone found that introverts and people with strongly held values about control of information tended to perceive more invasions of privacy than extraverts or those without strongly held values (1986, p. 371). This suggests that the introversion/extraversion dimension can explain Zalesny and Farace's mixed results. Zalesny and Farace found correlations between job functions and perceptions of privacy in an open office (1987, p. 253), and based on Stone's research, it is possible that job title acted as a proxy for introversion or privacy preference. Open offices create a lack of architectural privacy for everyone, but introverts experience a greater decrease in psychological privacy, which creates a disparity in how employees evaluate the privacy of open offices.

Darhl Pederson's psychological research provided further evidence that introverts have different privacy preferences than extraverts. Pederson studied several dimensions of privacy and found that introverts tended to prefer isolation and intimacy with family (1982, p. 13). Interestingly, introverts preferred geographical isolation to merely being shielded from others and unobserved (solitude) or being unnoticed in a crowd (anonymity) (1982, p. 12). The fact that individuals have preferences for types of privacy, in addition to preferences for levels of overall privacy, is important for environment-behavior research like that of Rashid, Wineman, and Zimring. Rashid et al. found that despite increased accessibility and visibility, perceived privacy increased in the new open office (2009, p. 445). This suggests that there are other ways to influence perceived privacy in open offices beyond visibility and accessibility, and that for the participants in the study, geographical isolation (or some other element of privacy) was a more important component of psychological privacy than visibility and accessibility.

Lisa Block and Garnett Stokes also found evidence for the importance of personality to privacy perceptions in open offices. This was a fairly unique study, in that it controlled many aspects of the environment rather than studying a natural move from a traditional office to an open one: study participants were randomly assigned to different spaces and questioned about their perceptions of privacy. This allowed the authors to isolate factors and draw more specific conclusions than many other environment-behavior researchers could. Controlled experiments, rather than 'naturally occurring quasi-experiments,' are crucial to future environment-behavior research because of the wide variety of variables relevant to the field. In studies that examine organizational moves from one office to another, too many spatial and interpersonal variables change to draw any conclusions about causal relationships. Studies should use control groups and manipulate one variable at a time to discover how elements of open offices impact their occupants. This seems basic, but too often researchers attempt to determine how open offices as a whole change their occupants' behavior, which makes findings hard to explain or generalize.

In their controlled experiment, Block and Stokes found that work satisfaction was greater in private offices, especially when study participants were working on complex tasks (Block & Stokes, 1989, p. 277). The authors also claimed that individual personality differences were most relevant to privacy concerns in open offices, as opposed to perceptions of other spatial characteristics (Block & Stokes, 1989, p. 295).

Block and Stokes found that satisfaction in private offices was likely due to a desire to work alone, not status concerns, because study participants were randomly assigned to private spaces and no status markers were associated with the offices (Block & Stokes, 1989, p. 295). While participants could have generated status comparisons independently, this provides evidence that privacy affects satisfaction and other perceptual variables independently of symbolic meaning.

Since privacy affects job satisfaction, and introverts have a greater need for privacy than extraverts do, the lack of privacy in open offices is likely to more negatively affect introverts' job satisfaction. Why, though, do introverts have strong privacy preferences, and why is privacy so important to job satisfaction? Psychological research suggests that stress is the mechanism for these correlations.

Stress in Open Offices

Privacy and introversion are also related to different perceptions of stress among individuals. Stress, while largely ignored in existing environment-behavior research, has been extensively studied in psychology. Fowles, Roberts, and Nagle found that introverts' skin conductance response (level of nervous system arousal) was more responsive to changes in stress and stimuli at low levels, but responded about the same as extraverts' SCL at high levels of stimulation (1977, p. 130). According to the authors, this supports an existing theory that introverts have a "weak nervous system" that responds more to initial stress and builds up a "protective inhibition" as stress increases, which results in lower SCLs at higher levels of stimulation (1977, p. 130). From this point

of view, when introverts complain of increased stress in an open office, they are likely still in a low-stimulation situation. Introverts may respond comparatively well to extreme stimulation and stress, but they are more bothered by changes from no stimulation to moderate stimulation, which could explain mixed reactions to the increased noise levels in open offices. While extraverts are not bothered by increased noise and stimulation after a move to an open office, introverts may experience decreased job satisfaction because of stressful overstimulation, leading to disparate assessments of privacy and job satisfaction in the new space.

Fowles et al.'s conclusion that introverts experience stress at lower levels of stimulation than extraverts do (1977, p. 130) may be related to Pederson's finding that introverts prefer geographical isolation to anonymity or solitude (1982, p. 12). Since introverts prefer low stimulation, a preference for spatial removal from others makes sense. Introverts avoid stress in low-stimulation environments, so they prefer forms of privacy that limit stimulation.

Thayer et al. explored stress as a mechanism for decreased work satisfaction in open offices. According to the researchers, factors associated with job satisfaction like good ventilation, natural light, views, and privacy affect physiological measures of stress (vagally mediated HRV and morning cortisol rise) (Thayer et al., 2010, p. 437). The authors concluded that "the physical work environment may affect at least some of the underlying physiological factors associated with the negative health effects of increased work stress without the subjects being consciously aware of a stressful experience" (Thayer et al., 2010, p. 437). This kind of study is important for the future of environment-behavior research. To truly understand how spaces influence behavior and to apply this understanding to architectural practice, researchers and designers must understand the mechanisms that mediate space's effects on behavior, whether these mechanisms are stress reactions, personality dimensions or something else entirely.

Synthesizing conclusions from environmental and psychological research produces a much clearer picture of stress and privacy in open offices than either type of research could generate alone. Introverts prefer privacy and isolation because they

experience stress at relatively low levels of stimulation, and in open offices with little privacy, introverts experience more stress than extraverts do. And because stress negatively affects job satisfaction, introverts likely experience lower job satisfaction in open offices than extraverts do, contributing to mixed results in studies of open offices' effects on job satisfaction.

If the introversion/extraversion dimension is the true driver of differences in perceptions of privacy and job satisfaction in open offices, why have researchers found correlations between attitudes about open offices and non-personality variables like organizational status? Psychological research also suggests that people of similar personality types tend to end up in the same professions and levels within organizations through self-selection, selection by others, and attrition. Boone, van Olffen, and Roijakkers found that personality influences students' choice of educational path and subsequent career (2009, p. 74), and Sutin et al. found that different personality characteristics were correlated with various dimensions of career success (2009, p. 80). Chauhan and Chauhan noted that employees in the same organizational position tended to have similar Myers-Briggs personality types (2006, p. 370). This suggests that when higher ranking employees and lower ranking employees respond differently to a space, or when offices in different industries respond differently to similar changes, differences in personality traits among organizational levels or across industries may be the underlying cause. Future research should include both personality variables and organizational ones to investigate the effects of each on reactions to architectural space.

This hypothesis that introversion/extraversion mediates responses to open offices is just one example of how psychological research might explain mixed conclusions in the environment-behavior field. More than anything, relationships between personality dimensions and architectural features need to be empirically tested. Ignorance of individual personality differences, though, is not the only problem with existing environment-behavior research.

Common Problems with Environment-Behavior Research

The environment-behavior field is relatively young, and researchers have had problems defining its parameters and agreeing on consistent methodology. In addition to specifically integrating individual differences into analysis of reactions to space, researchers need to address several other issues.

Research in the field tends to look for monolithic, one-to-one correlations between spatial features and behavioral changes. This is likely because researchers have had some success finding these universal correlations in the past. For example, Mehta and Zhu found that red environments lead participants to perform better on detail oriented tasks, and blue leads to better performance on creative tasks (2009, p. 1226). Some reactions to architecture might be universal, but researchers must use controls to investigate whether or not reactions depend on personality or some other nuance of the spatial environment. Rashid et al. noted that in their study that face-to-face interaction did not increase uniformly everywhere in the office (2009, p. 444), and this kind of analysis is too rare. Studies often treat spaces as if they are uniform and expect to see overarching behavioral patterns throughout the space. There is now a body of evidence to suggest that such general patterns rarely emerge, and research needs to move beyond looking for them.

Researchers might also gravitate towards simple, general correlations because they make better headlines. For example, a 2013 CNN article noted that people thought curvy architecture was more beautiful and emotional than architecture with straighter lines (Adams). This conclusion is interesting and easy to understand, but not all correlations in the environment-behavior field are so straightforward, and researchers should avoid hoping that they will be.

Some mixed results in the environment-behavior field are likely due to problems in research design. Architects usually do not learn research methods in school, so they and other researchers from design backgrounds may be prone to mistakes in study design or statistical analysis. Many studies of open offices discussed above

analyzed an organization's move from a traditional office to an open one, which provides a convenient way to study the same people in different environments. However, none of these studies used control groups, and many lacked objective criteria to evaluate behavior. Amos Rapoport argued that that environment-behavior research can help establish better criteria for successful architecture and reduce reliance on shallow design judgments like 'I like this' or 'I don't like this' (2008, p. 277), but many environment-behavior studies fail to establish objective quantitative criteria even within their own experiments, let alone accepted criteria for the whole field.

A study by Peponis et al. provides an excellent example of how environment-behavior studies can establish criteria and measurement methods for spatial and behavioral analysis. The authors rightly point out that "development of techniques for describing spatial behaviors is critical to the development of theories of layout function" (2004, p. 472). The authors created diagrams of movement in spaces with labeled points of interest throughout the space, and analyzed the diagrams with various software (Peponis et al., 2004, p. 472). This seems simple, but many studies rely on participant self-reports even when objective criteria might be developed. Peponis et al. created spatial diagrams by hand, and today's technology could improve the data that feeds into analysis software. For example, the NBA uses motion-tracking sensors to monitor player movement (Goldsberry, 2015), and similar technology could be applied to architectural research.

Environment-behavior researchers need to design studies that take into account individual differences in reactions to space and define measurable criteria for analysis of spatial and behavioral characteristics. Researchers have done many interesting studies on open office environments, but the lack of control groups and measurement of personality dimensions limited the conclusions of these studies.

Conclusion and Suggestions for Future Research

Environment-behavior researchers have found that employees do not react uniformly positively or negatively to changes in office spaces, that employees prefer some elements of open offices and some elements of traditional ones, and that preferences vary by organizational status. These mixed results have led to several theoretical perspectives on responses to open offices, but psychological research suggests that personality characteristics like introversion may be the underlying cause of differing attitudes about office environments.

Introverts and extraverts have different privacy preferences, which may help explain why employees in similar spaces do not always react similarly. Introverts highly value privacy, so they may react negatively to the public nature of open offices. Increased visual and auditory stimuli in open offices likely stress introverts more than extraverts, and since stress contributes to decreased job satisfaction, introverts may experience lower job satisfaction in open offices. Extraverts, who are relatively less stressed by increased noise and visual information, may not experience the same decrease in job satisfaction, contributing to mixed evaluations of open office spaces. Differences between introverts and extraverts also might explain conflicting theoretical perspectives on open offices: the social relations framework describes extraverts' reactions to open offices, while the sociotechnical framework describes introverts' reactions.

Open office research in the environment-behavior field and psychological personality research provide an example of how psychological theories can clarify mixed findings in the environment-behavior field. Because many other kinds of environment-behavior research also largely ignore personality dimensions and other psychological factors that might influence behavioral reactions to architectural space, researchers should design future studies to investigate how individuals' psychological characteristics mitigate reactions to space.

Future research in the environment-behavior field should include psychological factors as independent variables, utilize

control groups, and deliberately manipulate single variables to observe their effects. Research should also follow Peponis et al.'s example and establish quantitative criteria for spatial characteristics and behavior (2004, p. 472). Similarly, researchers should emulate Rashid et al. (2009, p. 444) and study specific features within spaces, rather than analyze whole spaces as if they had no internal variation. Once researchers study specific features and understand how personality characteristics mitigate reactions to them, conclusions from several studies can be combined to understand how entire spaces affect behavior. There is certainly merit to top-down study of behavior in spaces, but these studies would greatly benefit from bottom-up understanding of the features that make up those spaces and how personality might cause variation in individual responses to space.

References

Adams, William Lee. "Do These Buildings Turn You On? The Strange Psychology of Curvy Architecture." *CNN*. Last modified November 26, 2013. http://www.cnn.com/2013/11/26/world/do-these-buildings-turn-you-on/

Block, Lisa, and Garnett Stokes. "Performance and Satisfaction in Private and Nonprivate Work Settings." *Environment and Behavior* 21, no. 3 (1989): 277-297.

Boone, Christophe, Woody van Olffen, and Nadine Roijakkers. "Selection on the Road to a Career: Evidence of Personality Sorting in Educational Choice." *Journal of Career Development* 31, no. 1 (2004): 61-78.

Brennan, Aoife, Jasdeep Chugh, and Theresa Kline. "Traditional Versus Open-Office Design: A Longitudinal Field Study." *Environment and Behavior* 34 (2002): 279-299.

Chauhan, Daisy, and S.P. Chauhan. "Personality at Workplace." *Indian Journal of Industrial Relations* 41, no. 3 (2006): 357-375.

Elsbach, Kimberly. "Interpreting Workplace Identities: The Role of Office Décor." *Journal of Organizational Behavior* 25, no. 1 (2004): 99-128.

Fowles, Don, Richard Roberts, and Kim Nagle. "The Influence of Introversion/Extraversion on the Skin Conductance Response to Stress and Stimulus Intensity." *Journal of Research in Personality* 11 (1977): 129-146.

Goldsberry, Kirk. "Department of Defense." *Grantland*. Last modified February 24, 2015. http://grantland.com/features/department-of-defense/

Mehta, Ravi and Juliet Zhu. "Blue or Red? Exploring the Effect of Color on Cognitive Task Performance." *Science* 323, no. 5918 (2009): 1226-1229.

Oldham, Greg and Daniel Brass. "Employee Reactions to an Open-Plan Office: A Naturally Occurring Quasi-Experiment." *Administrative Science Quarterly* 24, no. 2 (1979): 267-284.

Olson, Christopher. "Boosting Productivity and Privacy in the Open Office." *Building Design and Construction* 27, no. 8 (1986): 90-92.

Pederson, Darhl. "Personality Correlates of Privacy." *The Journal of Psychology* 112 (1982): 11-14.

Peponis, John, Ruth Conroy-Dalton, Jean Wineman, and Nick Dalton. "Measuring the Effects of Layout upon Visitors' Spatial Behaviors in Open Plan Exhibition Settings." *Environment and Planning B: Environment and Design* 31 (2004): 453-473.

Rapoport, Amos. "Environment-Behavior Studies: Past, Present, and Future." *Journal of Architectural and Planning Research* 25, no. 4 (2008): 276-280.

Rashid, Mahbub, Jean Wineman, and Craig Zimring. "Space, Behavior, and Environmental Perception in Open Plan Offices: A Prospective Study." *Environment and Planning B: Environment and Design* 36 (2009): 432-449.

Soen, D. "Physical Environment and Human Behavior." *The Canadian Architect* (May 1974): 44-47.

Stone, Dianna. "Relationship Between Introversion/Extraversion, Values Regarding Control Over Information, and Perceptions of Invasion of Privacy." *Perceptual and Motor Skills* 62, no. 2 (1986): 371-376.

Sundstrom, Eric, Robert Burt and Douglas Kamp. "Architectural Correlates of Job Satisfaction and Job Performance." *The Academy of Management Journal* 23, no. 1 (1980): 101-117.

Sutin, Angelina, Paul Costa, Richard Miech, and William Eaton. "Personality and Career Success: Concurrent and Longitudinal Relations." *European Journal of Personality* 23 (2009): 71-84.

Thayer, J. F., B. Verkuil, J. F. Brusschot, K. Kampschroer, A. West, C. Sterling, I. C. Christie, D. Abernethy, J.J. Sollers, G. Cizza, A. H. Marquez, and E. H. Sternberg. "Effects of the Physical Work Environment on Physiological Measures of Stress." *Eur J Cardiovasc Prev Rehabil* 17, no. 4 (2010): 431–439.

Zalesny, Mary, and Richard Farace. "Traditional Versus Open Offices: A Comparison of Sociotechnical, Social Relations, and Symbolic Meaning Perspectives." *The Academy of Management Journal* 30, no. 2 (1987): 240-259.