Workplace Design Contributions to Mental Health and Well-Being

INVITED ESSAY

Jennifer A. Veitch, BSc, BA(Hons), MA, PhD
National Research Council of Canada
Institute for Research in Construction

ABSTRACT

People spend much of their waking time in their workplaces (approximately 33% on a weekly basis), which raises the possibility that the conditions they experience at work influence their health and well-being. The workplace design literature has given scant attention to mental health outcomes, instead focusing on healthy populations. Conversely, the mental health literature gives scant attention to the potential contribution of workplace design in preventing mental health problems; nor does it provide much insight into facilitating return to work. Taken together, however, the literature does suggest both lines of research and possible interventions. Existing knowledge proposes that workplace design can influence mental health via the effects of light exposure on circadian regulation, social behaviour and affect; the effects of aesthetic judgement on at-work mood and physical well-being and at-home sleep quality; access to nature and recovery from stressful experiences; and privacy regulation and stimulus control. This paper includes a short review of the literature in this area, proposals for new research directions and consideration of the implications of this information on the design choices made by business owners, designers and facility managers. Providing suitable working conditions for all employees avoids stigmatizing employees who have mental health problems, while facilitating prevention and return to work among those who do.

Time-activity studies have revealed that people in industrialized countries spend close to 90% of their time indoors (Leech et al. 2002; Schweizer et al. 2007). People who are employed full-time outside the home spend approximately 33% of their waking hours at their workplace. Thus, exposures to physical conditions at work that can affect one's physical or mental health are both lengthy and frequent. If one's working conditions affect one adversely, the unwanted consequences, such as reduced capacity to work, increased error rates and absences from work, influence both the employee and the employer. Conversely, a well-designed workplace can be supportive, removing potential stressors and freeing individuals to focus on productive work.

Environmental psychologists have long studied work environments (Hedge 2000; Sundstrom 1987), although the research focus has tended to be more on offices than on other settings (Sundstrom et al. 1996) and almost universally on the effects of workplace design on healthy individuals. Common outcome measures have been job satisfaction, environmental satisfaction, job performance and non-specific health outcomes such as symptoms of sick building syndrome symptoms (headache, fatigue, stuffy nose, musculoskeletal problems). Mental health outcomes do not appear directly in this literature.

Conversely, the abundant literature concerning mental health issues in workplaces includes little consideration of the role of the physical environment as an influence on employees. A literature search identified a few articles in which workplace design was mentioned as a potential factor in mental health issues (Ramsay 2009; Woo and Postolache 2008) but none that evaluated the success of interventions addressing design.

In the absence of evidence to the contrary, a reasonable starting point for designing and operating workplaces that support mental health is to draw upon the evidence derived from studying healthy individuals. This review focuses on four processes through which there is some evidence that workplace conditions can benefit employees with certain mental health problems: social relations, attention focus, stress reduction and photobiology. Each topic leads to suggestions for specific workplace designs. Mental health issues are diverse; therefore, design interventions that work for one condition might be inappropriate for another. In the absence of empirical evidence about specific effects, the design guidance provided here is necessarily preliminary and general. The review concludes with research recommendations to address this gap.

Social Relations

Personal space is "the dynamic spatial component of interpersonal relations" (Gifford 2007: 135). This concept encompasses dimensions of portable territoriality, inter-individual spacing and communication – the space around oneself, one's varying desires to be near other people and the degree to which one wants to know others and be known. Environmental psychologists study personal space through concepts such as territoriality, crowding and privacy. Workplace design choices are fundamental to the occupants' experience of personal space in that the layout and furnishings largely determine the physical boundaries between individuals, the spatial density of the workplace (the floor area per person), the social density (the number of people per room or area) and the degree of visual or acoustic privacy (Archea 1977).

Territoriality can be considered the ability to monitor and to regulate the use of space (Evans 2003). We commonly use spatial boundaries to define our territory, both individually and collectively. Work groups function best when they can create a shared identity that expresses their common goals

(Beal et al. 2003; Latham 2007). Architectural features contribute to the development of social cohesion in work groups, in part by defining the areas in which functional groups occur. Proximity facilitates social interaction (Fleming et al. 1985); thus, group territories that include common areas can provide opportunities for unplanned social interactions between group members. Such social interactions, in turn, foster social support, which buffers stress (Evans 2003). Workplaces in which employees report good communication and strong social support are perceived as healthier, and this in turn predicts higher job satisfaction and morale and lower absenteeism and intent to turnover (Lowe et al. 2003).

As social density increases, environmental satisfaction decreases.

The benefits of establishing group territories have limits, in that if group size is too large, cohesion remains elusive. If the social density of the office is too large, individuals must manage more relationships and there are more potential intrusions. As social density increases, in general environmental satisfaction decreases (Duval et al. 2002) and physical discomfort increases (Aries et al. 2010). The design community has adopted a social density of 10–15 people as its rule of thumb for team spaces, but there is no empirical evidence on which to base such guidance.

Social density and its cousin spatial density are not synonymous with crowding, which is "a motivational state … directed toward the alleviation of perceived spatial restriction" (Stokols 1972: 275). Increasing social density that leads to crowding is a stressor. This stressor can cause behavioural aftereffects such as reduced frustration tolerance (Sherrod 1974). Chronic exposure to uncontrollable environmental stressors can lead to learned helplessness, a motivational deficit with well-known connections to the affective and cognitive deficits of depression (Evans and Stecker 2004).

Office environment research consistently reports a strong desire for privacy among employees (Brill et al. 1984; Veitch et al. 2003). Privacy is largely a matter of controlling information flow: that is, one wants to regulate the degree to which others have information about oneself, and conversely the information one obtains about others (Archea 1977). The ability to control environmental inputs is an important moderator of environmental stress (Evans and Stecker 2004). When one has the ability to control one's environment, the adverse effects of stressors are diminished.

Taken overall, the personal space literature identifies the important dimensions of workplace design that can foster (or diminish) strong social relations among co-workers: using architectural features to define group boundaries; limiting the size of work groups within the boundaries; and providing adequate privacy mechanisms so that individuals can regulate social interactions. The literature does not provide specific prescriptive guidance as to the optimal design features to support good mental health outcomes. One study identified a range of workstation sizes (area >4.5 m^2) that reduce the risk of environmental dissatisfaction (Newsham et al. 2008), but the authors did not reach a firm conclusion concerning optimal panel height for modular office furniture. Reasonable conclusions based on the literature are to make workstation or office assignments that are mindful of the personal space needs of those with mental health problems, balancing the needs for social interaction, social support, territoriality and privacy. For example, an enclosed office at the

end of a long corridor might not be the best location for an employee with depression, but neither would an office beside a high-traffic area lacking in visual and acoustic privacy.

Attention Focus

Everyone experiences distraction from time to time; but for some individuals, the ability to focus attention is a persistent problem. Researchers and clinicians now recognize that the persistence of attention deficit hyperactivity disorder (ADHD) from childhood to adulthood has adverse effects on workplace performance and career success (Goodman 2007; Nadeau 2005). In reviewing the literature for this paper, the only architectural design recommendation I could find in the mental health literature concerned office assignments for adults with ADHD: Ramsay (2009) recommended individual enclosed offices for people with ADHD to enable them to screen potential distractions.

This is a reasonable recommendation, although not one that many organizations are able to provide because of the ubiquitous use of open-plan office design. Where a fully enclosed office is not available, other design features aimed at increasing privacy assist in reducing distractions. Increasing panel height to a minimum of 1.7 metres, using carpet and sound-absorbing ceiling tiles, adding masking sound and creating an office etiquette to promote quieter speech are all elements of providing good acoustical privacy in open-plan offices (Bradley 2003). The person with ADHD would likely also benefit from being located away from high-traffic areas.

Work environment research consistently finds that people desire access to a window view of the outside (Veitch et al. 2003). This might be particularly beneficial for individuals with ADHD. Experimental investigations in healthy adults have shown that exposure to nature, both by walking in it and by viewing pictures, can improve performance on directed-attention tasks (Berman et al. 2008). Children who have opportunities to play in green surroundings show improvements in ADHD symptoms compared with those whose play occurs indoors or in built outdoor settings (Kuo and Taylor 2004; Taylor et al. 2001). Interestingly, having a view of nature through the windows at home benefits the self-discipline of girls aged seven to 12 but not boys (Taylor et al. 2002). There are no workplace studies of the effects of window access on adults with ADHD; but as an interim recommendation, it is not unreasonable to consider providing such access as part of workplace accommodations to improve attention focus.

Stress Reduction

Understanding the stressor-strain relationship is a major focus of occupational health psychology. Psychosocial stress is a known predictor of mental health problems (see, e.g., Godin et al. 2005).

Among the environmental features known to assist in recovery from stressful experiences is a window with a view. Ulrich (1984) demonstrated that hospitalized patients whose windows provided views of nature recovered more quickly from surgery and used less pain medication than did those with a view of a brick wall. Exposure to nature, both directly (Morita et al. 2007) and through viewing images (Chang and Chen 2005; Hartig et al. 1991), leads to physiological and affective responses consistent with stress reduction.

These effects might partly relate more to aesthetic judgements of the quality of the scene and surroundings rather than to its content (natural versus built). Aries et al. (2010) found that people whose office views were more attractive, regardless of content, reported reduced discomfort at work and better sleep quality at home. Oddly, those with natural views reported increased discom-

fort at work, although there was an indirect pathway through which people in offices with views of nature reported more favourable office impressions, which in turn predicted lower discomfort. Clearly there is more to be understood about the relationships between view content and quality and their effects on health and well-being.

Access to nature, or to a pleasant view, is most easily provided through windows. In many European countries, employers must by law provide window access within a prescribed distance from each desk or workstation (Danish Building and Housing Agency 1995; Government of Norway 1985). This is not the case in North America, with the consequence that many workplaces lack window access (Veitch et al. 2003). Given the potential to buffer the adverse effects of work stress, those who are most vulnerable to stress-related health problems are good candidates for priority in receiving window access.

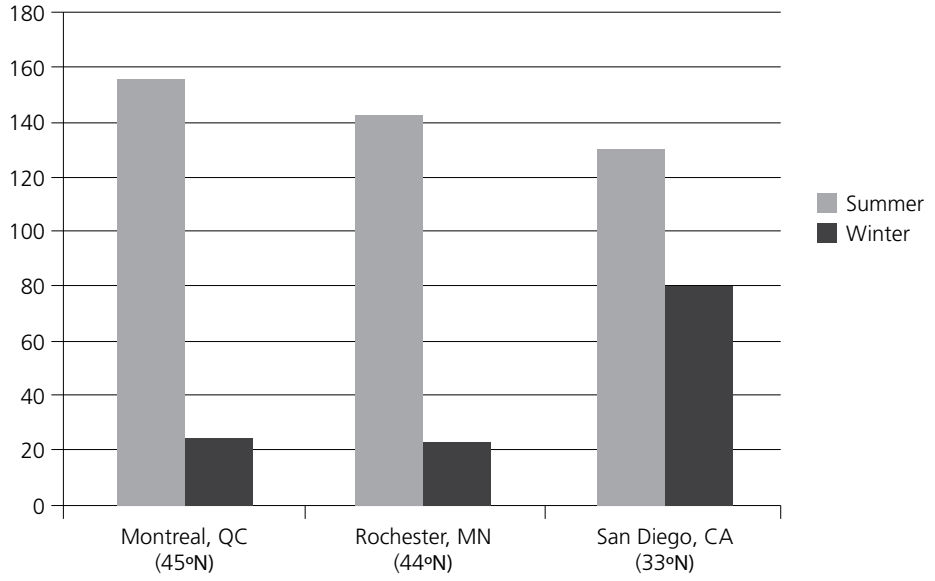
Photobiology

Estimates vary as to the prevalence of seasonal mood disorders, but there is little controversy concerning the potential for light therapy as an effective non-pharmacological treatment (Ravindran et al. 2009). Light therapy in that context involves the delivery of approximately 10,000 lux of white light (measured at the eye) for 30 minutes daily, usually in the early morning. This is a specific intervention for a diagnosed ailment, without a direct workplace application because of both the light intensity and timing. However, related research is revealing potential mental health benefits of increased light exposure in non-clinical populations (Commission Internationale de l'Eclairage [CIE] 2004).

Light exposure monitoring has revealed that total daily light exposure among North Americans is low (Figure 1). One study combined the wearing of wrist monitors for light and activity levels, with recurrent questionnaires about mental health status. Although the study was conducted in San Diego during a temperate and sunny period, the light level monitoring showed that people spent most of their time indoors (Espiritu et al. 1994). The median person spent 4% of each 24 hours in illumination greater than 1,000 lux and more than 50% of the time in illuminance levels from 0.1 to 100 lux. (An additional 38.6% of the time was below 0.1 lux, consistent with sleeping, driving at night, etc.) The people with the shortest daily exposure time to high light levels reported the lowest mood, with a moderate correlation between atypical seasonal affective disorder mood symptoms and time in bright light ($r = -.27$). Other investigators have replicated the light exposure measurements in summer in Rochester, Minnesota (Cole et al. 1995) and Montreal, Quebec (Hébert et al. 1998). Winter season high light exposures are considerably shorter even in San Diego but are much shorter at more northerly latitudes (see Figure 1). These findings, among others, led an international committee to conclude that the daily light dose received by people in industrialized societies might be too low for good mental health (CIE 2004). The same report concluded that there is insufficient evidence to set a recommended daily dose at this time. This is an active area of research, but international consensus recommendations take many years to develop.

Researchers are beginning to understand the effects of bright light from a physiological perspective and the consequences for social behaviour. In one study of people with mild seasonal mood shifts, bright light exposure increased tryptophan uptake (aan het Rot et al. 2007); tryptophan is a precursor of serotonin, a neurotransmitter implicated in affective pathways. This effect might explain the observation that hospitalized patients with

Figure 1. Mean daily exposures to light levels over 1,000 lux, by latitude and season



The measurements were taken from wrist-mounted devices following similar protocols.
Sources: The data for Montreal are taken from Hébert et al. (1998); for Rochester, Cole et al. (1995); and for San Diego, Espiritu et al. (1994).

depression had shorter hospital stays if they were assigned to rooms receiving sunshine than to rooms with no direct sunlight (Beauchemin and Hays 1996).

The current evidence is not sufficient for specific recommendations about the quantity, timing or spectral properties of the necessary daily light dose. Nonetheless, it seems reasonable to recommend that employees have an opportunity to obtain bright light exposure each day, particularly if they have a history of seasonal mood disorders. People with this history show persistent preferences for higher light levels across all seasons (Heerwagen 1990), and evidence from lighting quality research with healthy workers shows affective benefits to working under one's preferred light levels (Newsham and Veitch 2001; Newsham et al. 2004). Benefits to co-workers and employers could include more congenial social relationships; regarding individuals who have mild seasonal mood shifts, social interactions with these persons following bright light exposure (>1,000 lux) can be less quarrelsome and more co-operative than those following periods in low light levels (aan het Rot et al. 2008). The light exposure can be provided via direct sunlight through a nearby window or via time spent outdoors on breaks or lunch (Wirz-Justice et al. 1996). Merely adding a task light at the desk is unlikely to increase local light levels sufficiently to trigger this response. Any attempt at increasing light exposure at work must also avoid compromising task visibility and causing discomfort; recommendations for lighting design in workplaces are available (Illuminating Engineering Society of North America 2004; National Research Council Canada Institute for Research in Construction 2009).

Research Directions

There appear to be no studies of the effect of workplace design on mental health outcomes; nor are there evaluations of the success of office design accommodations in facilitating workplace success for individuals with mental health diagnoses. Recommendations made here are logical inferences from the literature, but they lack the imprimatur of peer-reviewed examinations of these precise research issues.

More generally, the literature reviewed here raises questions applicable to workplace design for any employee. A preliminary list of

research topics that flow from the literature cited here would include the following:

- What is the appropriate size of a work group to facilitate close ties between co-workers?
- Do people with mental health problems benefit from being attached to smaller work groups than others?
- What elements in the design and layout of work space most effectively promote group cohesion and social support?
- What designs most effectively balance the development of social connections against the need for distraction-free privacy?
- Does access to nature aid the attention focus of adults with ADHD? Is this access necessarily direct, or does viewing nature also confer benefits? Are there sex differences in these effects?
- What is the necessary light dose for optimal well-being: how much light, at what time of day, with what spectral properties and for how long?

Research programs addressing these questions need to include a mixture of laboratory and field investigations and appropriate combinations of outcome measures: physiological, affective, cognitive and behavioural. Field investigations, particularly evaluations of design interventions, would ideally include prospective longitudinal studies assessing both symptoms and work performance measures. Such investigations would not only address the direct effects of the workplace on mental health outcomes, but would also contribute to the development of strategies and inventions for effective job and career performance.

Concluding Remarks

By definition, good working conditions enable employees to work effectively. Investments in the physical workplace that create those conditions pay back quickly; salaries and benefits are approximately 80% of the cost of operating a building during its lifetime, whereas construction, furnishings, maintenance and operation total about 10% (Brill et al. 2001). Designing the workplace according to the empirical literature on workplace design (e.g., Aronoff and Kaplan 1995; Bauer et al. 2003; Becker and Steele 1995) will benefit all employees, not only those with mental health problems. Using this design sensibility to tailor the workplace design to individual needs of all kinds will have an added benefit for individuals and society, in that stigmas will disappear. No one is stigmatized when everyone's individual needs are, as much as possible, taken into account in the design, assignment and operation of the workplace.

References

aan het Rot, M., C. Benkelfat, D.B. Boivin and S.N. Young. 2007. "Bright Light Exposure during Acute Tryptophan Depletion Prevents a Lowering of Mood in Mildly Seasonal Women." *European Neuropsychopharmacology* 18(1): 14–23.

aan het Rot, M., D.S. Moskowitz and S.N. Young. 2008. "Exposure to Bright Light Is Associated with Positive Social Interaction and Good Mood over Short Time Periods: A Naturalistic Study on Mildly Seasonal People." *Journal of Psychiatric Research* 42(4): 311–19.

Archea, J. 1977. "The Place of Architectural Factors in Behavioral Theories of Privacy." *Journal of Social Issues* 33(3): 116–37.

Aries, M.B.C., J.A. Veitch and G.R. Newsham. 2010. "Windows, View, and Office Characteristics Predict Physical and Psychological Discomfort." *Journal of Environmental Psychology* 30(4): 533–41.

Aronoff, S. and A. Kaplan. 1995. *Total Workplace Performance: Rethinking the Office Environment*. Ottawa, ON: WDL Publications.

Bauer, W., I. Lozano-Ehlers, A. Greisle, G. Hube, J. Kelter and A. Rieck, eds. 2003. *Office 21 – Push for the Future. Better Performance in Innovative Working Environments.* Stuttgart, Germany: Fraunhofer-Institut für Arbeitswirtschaft und Organisation IAO.

Beal, D.J., R.R. Cohen, M.J. Burke and C.L. McLendon. 2003. "Cohesion and Performance in Groups: A Meta-Analytic Clarification of Construct Relations." *Journal of Applied Psychology* 88(6): 989–1004. DOI: 10.1037/0021-9010.88.6.989.

Beauchemin, K.M. and P. Hays. 1996. "Sunny Hospital Rooms Expedite Recovery from Severe and Refractory Depressions." *Journal of Affective Disorders* 40(1–2): 49–51.

Becker, F.D. and F. Steele. 1995. *Workplace by Design: Mapping the High-Performance Workscape.* San Francisco, CA, US: Jossey-Bass.

Berman, M.G., J. Jonides and S. Kaplan. 2008. "The Cognitive Benefits of Interacting with Nature." *Psychological Science* 19(12): 1207–1212. DOI: 10.1111/j.1467-9280.2008.02225.x.

Bradley, J.S. 2003. "The Acoustical Design of Conventional Open Plan Offices." *Canadian Acoustics* 31(2): 23–31.

Brill, M., S.T. Margulis, E. Konar and the Buffalo Organization for Social and Technological Innovation, eds. 1984. *Using Office Design to Increase Productivity.* Buffalo, NY: Workplace Design and Productivity.

Brill, M., S. Weidemann and BOSTI Associates, eds. 2001. *Disproving Widespread Myths about Workplace Design.* Jasper, IN: Kimball International.

Chang, C.-Y. and P.-K. Chen. 2005. "Human Response to Window Views and Indoor Plants in the Workplace." *HortScience* 40(5): 1354–59.

Cole, R.J., D.F. Kripke, J. Wisbey, W.J. Mason, W. Gruen, P.J. Hauri et al. 1995. "Seasonal Variation in Human Illumination Exposure at Two Different Latitudes." *Journal of Biological Rhythms* 10(4): 324–34.

Commission Internationale de l'Eclairage. 2004. *Ocular Lighting Effects on Human Physiology and Behaviour* (CIE 158: 2004). Vienna, Austria: Author.

Danish Building and Housing Agency, ed. 1995. *Building Regulations.* Copenhagen, Denmark: Danish Ministry of Housing.

Duval, C.L., K.E. Charles and J.A. Veitch. 2002. *A Literature Review on the Effects of Open-Plan Office Density on Environmental Satisfaction* (IRC-RR-150). Ottawa, ON: National Research Council Canada Institute for Research in Construction.

Espiritu, R.C., D.F. Kripke, S. Ancoli-Israel, M.A. Mowen, W.J. Mason, R.L. Fell et al. 1994. "Low Illumination Experienced by San Diego Adults: Association with Atypical Depressive Symptoms." *Biological Psychiatry* 35(6): 403–07.

Evans, G.W. 2003. "The Built Environment and Mental Health." *Journal of Urban Health* 80(4): 536–55.

Evans, G.W. and R. Stecker. 2004. "Motivational Consequences of Environmental Stress." *Journal of Environmental Psychology* 24(2): 143–65.

Fleming, R., A. Baum and J.E. Singer. 1985. "Social Support and the Physical Environment." In S. Cohen and S.L. Syme, eds., *Social Support and Health.* San Diego, CA: Academic Press.

Gifford, R. 2007. *Environmental Psychology: Principles and Practice* (4th ed.). Victoria, BC: Optimal Books.

Godin, I., F. Kittel, Y. Coppieters and J. Siegrist. 2005. "A Prospective Study of Cumulative Job Stress in Relation to Mental Health." *BMC Public Health* 5: 67.

Goodman, D.W. 2007. "The Consequences of Attention-Deficit/Hyperactivity Disorder in Adults." *Journal of Psychiatric Practice* 13(5): 318–27.

Government of Norway. 1985. "Belysning og renhold m.v." In, *Plan- og bygningslov* [Plans and Buildings Act] (Vol. LOV-1985-06-14-77). Oslo, Norway: Author.

Hartig, T., M. Mang and G.W. Evans. 1991. "Restorative Effects of Natural Environment Experiences." *Environment and Behavior* 23: 3–26.

Hébert, M., M. Dumont and J. Paquet. 1998. "Seasonal and Diurnal Patterns of Human Illumination under Natural Conditions." *Chronobiology International* 15(1): 59–70.

Hedge, A. 2000. "Where Are We in Understanding the Effect of Where We Are?" *Ergonomics* 43(7): 1019–29.

Heerwagen, J.H. 1990. "Affective Functioning, 'Light Hunger,' and Room Brightness Preferences." *Environment and Behavior* 22(5): 608–35.

Illuminating Engineering Society of North America. 2004. *American National Standard Practice for Office Lighting* (IEE-RP-1-2004). New York: Author.

Kuo, F.E. and A.F. Taylor. 2004. "A Potential Natural Treatment for Attention-Deficit/Hyperactivity Disorder: Evidence from a National Study." *American Journal of Public Health* 94(9): 1580–86.

Latham, G.P. 2007. *Work Motivation: History, Theory, Research, and Practice.* Thousand Oaks, CA: Sage.

Leech, J.A., W.C. Nelson, R.T. Burnett, S. Aaron and M.E. Raizenne. 2002. "It's about Time: A Comparison of Canadian and American Time-Activity Patterns." *Journal of Exposure Analysis and Environmental Epidemiology* 12(6): 427–32.

Lowe, G.S., G. Schellenberg and H.S. Shannon. 2003. "Correlates of Employees' Perceptions of a Healthy Work Environment." *American Journal of Health Promotion* 17(6): 390–99.

Morita, E., S. Fukuda, J. Nagano, N. Hamajima, H. Yamamoto, Y. Iwai et al. 2007. "Psychological Effects of Forest Environments on Healthy Adults: Shinrin-Yoku (Forest-Air Bathing, Walking) as a Possible Method of Stress Reduction." *Public Health* 121(1): 54–63.

Nadeau, K.G. 2005. "Career Choices and Workplace Challenges for Individuals with ADHD." *Journal of Clinical Psychology* 61(5): 549–63.

National Research Council Canada Institute for Research in Construction. 2009. *Open-Plan Office Lighting Environment.* Ottawa, ON: Author. Retrieved March 5, 2010. <http://www.nrc-cnrc.gc.ca/eng/projects/irc/cope/lighting.html>.

Newsham, G.R. and J.A. Veitch. 2001. "Lighting Quality Recommendations for VDT Offices: A New Method of Derivation." *Lighting Research and Technology* 33: 97–116.

Newsham, G.R., J.A. Veitch, C. Arsenault and C. Duval. 2004. "Effect of Dimming Control on Office Worker Satisfaction and Performance." In, *Proceedings of the IESNA Annual Conference, Tampa, FL, July 26–28, 2004.* New York: Illuminating Engineering Society of North America.

Newsham, G.R., J.A. Veitch and K.E. Charles. 2008. "Risk Factors for Dissatisfaction with the Indoor Environment in Open-Plan Offices: An Analysis of COPE Field Study Data." *Indoor Air* 18(4): 271–82. DOI: 10.1111/j.1600-0668.2008.00525.x.

Ramsay, J.R. 2009. *Nonmedication Treatments for Adult ADHD: Evaluating Impact on Daily Functioning and Well-Being.* Washington, DC: American Psychological Association.

Ravindran, A.V., R.W. Lam, M.J. Filteau, F. Lespérance, S.H. Kennedy, S.V. Parikh et al. 2009. "Canadian Network for Mood and Anxiety Treatments (CANMAT) Clinical Guidelines for the Management of Major Depressive Disorder in Adults. V. Complementary and Alternative Medicine Treatments." *Journal of Affective Disorders* 117(Suppl. 1).

Schweizer, C., R.D. Edwards, L. Bayer-Oglesby, W.J. Gauderman, V. Ilacqua, M. Juhani Jantunen et al. 2007. "Indoor Time-Microenvironment-Activity Patterns in Seven Regions of Europe." *Journal of Exposure Science and Environmental Epidemiology* 17(2): 170–81.

Sherrod, D.R. 1974. "Crowding, Perceived Control, and Behavioral Aftereffects." *Journal of Applied Social Psychology* 4(2): 171–86. DOI: 10.1111/j.1559-1816.1974.tb00667.x.

Stokols, D. 1972. "On the Distinction between Density and Crowding: Some Implications for Future Research." *Psychological Review* 79(3): 275–277. DOI: 10.1037/h0032706.

Sundstrom, E. 1987. "Work Environments: Offices and Factories." In D. Stokols and I. Altman, eds., *Handbook of Environmental Psychology* (Vol. 1). New York: Wiley.

Sundstrom, E., P.A. Bell, P.L. Busby and C. Asmus. 1996. "Environmental Psychology 1989–1994." *Annual Review of Psychology* 47: 485–512.

Taylor, A.F., F.E. Kuo and C.W. Sullivan. 2001. "Coping with ADD: The Surprising Connection to Green Play Settings." *Environment and Behavior* 33(1): 54–77. DOI: 10.1177/00139160121972864.

Taylor, A.F., F.E. Kuo and W.C. Sullivan. 2002. "Views of Nature and Self-Discipline: Evidence from Inner City Children." *Journal of Environmental Psychology* 22(1–2): 49–63. DOI: 10.1006/jevp.2001.0241.

Ulrich, R.S. 1984. "View through a Window May Influence Recovery from Surgery." *Science* 224(4647): 420–421.

Veitch, J.A., K.E. Charles, G.R. Newsham, C.J.G. Marquardt and J. Geerts. 2003. *Environmental Satisfaction in Open-Plan Environments: 5. Workstation and Physical Condition Effects.* (IRC-RR-154) Ottawa, ON: National Research Council Institute for Research in Construction.

Wirz-Justice, A., P. Graw, K. Krauchi, A. Sarrafzadeh, J. English, J. Arendt et al. 1996. "'Natural' Light Treatment of Seasonal Affective Disorder." *Journal of Affective Disorders* 37(2–3): 109–20.

Woo, J.-M. and T.T. Postolache. 2008. "The Impact of Work Environment on Mood Disorders and Suicide: Evidence and Implications." *International Journal on Disability and Human Development* 7(2): 185–200.