

# Healthy Workplaces: The Effects of Nature Contact at Work on Employee Stress and Health

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## ABSTRACT

**Objectives.** Cultivating healthy workplaces is a critical aspect of comprehensive worksite health promotion. The influence of healthy workplace exposures on employee health outcomes warrants research attention. To date, it is unknown if nature contact in the workplace is related to employee stress and health. This study was designed to examine the effects of nature contact experienced at work on employee stress and health.

**Methods.** Office staff at a southeastern university ( $n=503$ , 30% response rate) participated in the cross-sectional study. We used a 16-item workplace environment questionnaire, the Nature Contact Questionnaire, to comprehensively measure, for the first time, nature contact at work. The Perceived Stress Questionnaire and 13 established health and behavioral items assessed the dependent variables, general perceived stress, stress-related health behaviors, and stress-related health outcomes.

**Results.** There was a significant, negative association between nature contact and stress and nature contact and general health complaints. The results indicate that as workday nature contact increased, perceived stress and generalized health complaints decreased.

**Conclusions.** The findings suggest that nature contact is a healthy workplace exposure. Increasing nature contact at work may offer a simple population-based approach to enhance workplace health promotion efforts. Future researchers should test the efficacy of nature-contact workplace stress interventions.

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The work environment contributes to employee health. A sick environment can threaten health through biological and psychological pathways. Biologically, indoor air pollutants and toxins may cause illness, such as the Sick Building Syndrome.<sup>1</sup> Psychologically, office environments typified with crowding and noise contribute to chronic stress.<sup>2,3</sup> Conversely, office environments can be created to enhance employee health. Healthy exposures include the following: availability of healthy behavioral options (e.g., healthy food choices), enhanced and optimized safety, environmental sustainability and stewardship, and the opportunity for nature contact at work.<sup>4-8</sup> The healthy workplace consists of these healthful exposures and is free of the negative ones.

Effective, comprehensive worksite health promotion programs (WHPPs) aim to foster a healthy workplace. It is now widely believed that worksite health promotion should go beyond education and focus on individual behavior change and also include environmental modifications. Environmental modifications are physical changes or interventions to the workplace environment. Engbers et al. conducted a systematic review of 13 randomized controlled trials (RCTs) with environmental interventions at work entitled “Worksite Health Promotion Programs with Environmental Changes.”<sup>4</sup> The Working Healthy Project, for example, was a study of more than 2,000 employees that showed how environmental modifications, such as food labeling on vending machines and at restaurants and a red-line route to promote lunchtime walking, resulted in a significant increase in fruit and vegetable consumption and physical activity at 2.5 years follow-up.<sup>9</sup> Environmental modifications are especially important components of WHPPs because they support and enable health and behavioral outcomes.

One way that the workplace may be modified to promote health is through the purposeful use of nature contact.<sup>10</sup> Nature contact is a component of all healthy places and the focus of this workplace study. Everyday nature contact is exposure to the outdoors or outdoor-like elements in the places people live, work, and play.<sup>5</sup> At work, nature contact may be achieved by adding an indoor office plant or taking a work break outdoors. To date, a handful of workplace studies have suggested that nature contact experienced at work or in an office setting may be health promoting. For example, previous work or office findings suggest that relaxing outdoors,<sup>11</sup> indoor office plants,<sup>12</sup> and office window views<sup>7</sup> were related to less stress. Although these findings support the notion that nature contact is a component of a healthy workplace, studies are few and limited.

There are important nature-contact and health findings in other populations and other settings. These findings, although not directly related to work, may inform future worksite studies and practice. These findings help point to possible forms of nature contact that may represent healthy exposures at work and warrant future research. For example, a nature-contact intervention of gardening reduced stress in a study of breast cancer patients.<sup>13</sup> Other less active forms of outdoor exposure, such as spending passive time in an urban park, have also been associated with less stress among random samples of city dwellers.<sup>14</sup> Indoor exposure to plants, natural lighting, fish tanks, and a view from the window have been previously associated with less stress among many populations.<sup>15-19</sup> In addition, exposure to abstract representations of nature experienced indoors, such as recorded nature sounds or photographed images, has been associated with decreased stress and stress-related outcomes.<sup>20</sup> A study demonstrated that a “nature therapy” intervention consisting of two forms of nature contact—a nature mural printed on a hospital bedside curtain and a nature CD playing—resulted in significantly less perceived pain and stress during a bronchoscopy procedure.<sup>21</sup> In summary, these studies suggest that the following forms of nature contact were health-promoting among a variety of populations and settings: window view, natural light, fish tanks, live or artificial plants, listening to recorded nature sounds on a CD, nature photography or art, and outdoor breaks or lunch.<sup>5</sup> These nature-contact findings may inform future work studies by pointing to these forms of nature contact that may be healthful in the workplace as well.

The theoretical question “How does nature contact promote health?” has previously been explored. In a nutshell, nature contact reduces stress. Biological researchers point to an evolutionary explanation for this phenomenon. The biophilia hypothesis contends that natural elements are calming for people today because of the linkage to survival in the past (just as common fears—such as snakes, spiders, and heights—are rooted in the past and related to survival).<sup>22,23</sup> “Throughout human existence, human biology has been embedded in the natural environment. Those who could smell the water, find the plants, follow the animals, and recognize the safe havens must have enjoyed survival advantages.”<sup>23</sup> Psychological researchers have studied the brain and stress response after exposure to nature contact. This work has led to two potential mechanisms to explain how natural elements reduce stress in people today. Environments with natural elements either (1) restore stress-fatigued cognitive resources to enhance coping abilities<sup>24</sup> or (2)

stimulate underutilized portions of the “old” brain, which balance the concentrated stimulation and relieve exhausted portions of the brain<sup>25</sup> to reduce stress.

## PURPOSE

Stress-reducing work environments represent an important focus of research and practice. Stress not only influences mental health and quality of life, it also increases the likelihood of chronic diseases, such as heart disease and cancer.<sup>26–28</sup> Stress and related health consequences are more prevalent in the U.S. today than in the past, and work is attributed as a major cause.<sup>29</sup> According to the demand-control model and previous findings, occupational positions with low decision latitude and high psychological demands, such as office staff, suffer most from stress.<sup>30,31</sup> In addition to having high-stress jobs, office staff are a priority public health population because they represent 70% of the U.S. workforce.<sup>32</sup> In this study, we examine workplace environments and stress among office staff.

This study was designed to (1) describe the influence of nature contact at work on perceived stress and stress-related health and behavioral outcomes and (2) inform public health promotion. Although there is evidence that nature contact is health-promoting in many populations and varied settings, there are few findings on nature contact at work and health among office staff, a priority public health population.<sup>7</sup> To date, it is unknown if regular contact with nature in the workplace is associated with perceived stress levels of office staff. Understanding and designing healthy workplaces is important and offers a promising and population-based approach to reduce stress and related health outcomes among working Americans.<sup>5,7</sup>

## METHODS

### Participants

We invited a census of office staff at a southeastern university ( $n=1,622$ ) to participate in the study. The group included 13 job codes of full-time, mostly desk-bound office staff, such as secretaries and office clerks. Electronic informed consent was obtained from all participants; participation was anonymous and voluntary.

### Procedures

We used a cross-sectional, Web-based survey design to collect data. We sent an e-mail invitation along with the Web link to access the online survey to the census. The participants took approximately 10–15 minutes to complete the online survey. We utilized a Web-based survey because it was cost-efficient, environmentally

sound, practical, and had the potential to reach the study’s population.<sup>33</sup> Five previously identified strategies<sup>34</sup> were used to minimize potential disadvantages of Web-based surveys, such as non-response error and low response rate: (1) e-mails were personalized by addressing each participant by name; (2) informed consent to participate in the study was obtained by clicking “next” on the online survey; (3) personal questions about income, age, and marital status were located at the end of the survey; (4) two follow-up, reminder e-mails were sent three and five days after the initial e-mail invitation to office staff who had not yet participated; and (5) participants in the study were eligible for a nominal incentive.

### Instruments

We measured nature contact at work using a 16-item scale, the Nature Contact Questionnaire (NCQ). We measured total score and three subscales—outdoor, indoor, and indirect nature contact. The outdoor-nature-contact subscale measured the employees’ outdoor exposure at work—for example, “the weekly frequency of work breaks outdoors.” The indoor-nature-contact subscale measured employees’ exposure to natural elements within the office space, such as view from a window, natural light, and live plants. An example was “the number of live plants in the office.” The indirect-nature-contact subscale measured employees’ exposure to abstract representations of natural elements in the office, such as photographs of natural landscapes and recorded nature sounds. An example was “percentage of time per week listening to recorded nature sounds on CD.” The range of possible total scores was 16 to 96. We used a continuous Likert scale to quantify the response options and included percentage of time exposed to the item (0%, 1%–20%, 21%–40%, 41%–60%, 61%–80%, and 81%–100%), frequency of contact with the item (N/A, 0, 1, 2, 3, 4, and 5 or more), and number of contact items (0, 1, 2, 3, 4, and 5 or more). We established content validity (expert panel), construct validity (Kaiser-Meyer-Olkin = 0.68), internal consistency (alpha = 0.63), and test-retest reliability ( $r=0.84$ ). The NCQ and psychometric properties were reported in detail elsewhere.<sup>35</sup>

We measured stress using the Perceived Stress Questionnaire (PSQ). The PSQ consists of 30 items, such as “you have too many things to do,” “you feel lonely or isolated,” and “you find yourself in situations of conflict.” The range of possible total scores was 30 to 120. The reported test-retest reliability of the PSQ was  $r=0.82$  and the internal reliability was alpha = 0.92. The PSQ psychometric properties also were reported in detail elsewhere.<sup>36</sup>

We measured health and health behaviors using 13 items drawn from the Behavioral Risk Factor Surveillance System (BRFSS),<sup>37</sup> National Quality Institute,<sup>38</sup> Centers for Disease Control and Prevention,<sup>39</sup> and previous studies.<sup>40,41</sup> We measured self-reported health, the number of days in the past month influenced by poor health, and behavioral items—including cigarette smoking and preventive behaviors—using BRFSS historical questions.<sup>37</sup> Alcohol and coffee consumption were measured with items similar to the BRFSS historical questions but modified based on previous research.<sup>40</sup> We measured frequency of moderate and vigorous physical activity using items from a national healthy workplace questionnaire.<sup>38</sup> Lastly, we measured diet with two items related to fruit and vegetable consumption based on previous research<sup>41</sup> and defined a serving using governmental guidelines from the 5 A Day for Better Health Program.<sup>39</sup>

### Data analysis

We used SPSS<sup>®</sup> version 16<sup>42</sup> to analyze the data. All survey responses were numerically coded, and totals and subtotals were calculated for both survey instruments (PSQ and NCQ). We used multiple regression analysis to determine which of the health and behavioral items were stress related. To explore the relationship between nature contact and health and the relationships among forms of nature contact, we conducted bivariate correlation analyses and independent t-test analyses.

## RESULTS

### Demographics

The majority of the participants were women (92.9%) and white (82.5%). The mean age of the participants was 42 years, with a standard deviation of 12 years. Approximately half of the participants attended some college or technical school (47.5%), reported earning \$25,001–\$35,000 per year (49.5%), and reported being married (54.4%). The response rate was about 30% ( $n=503$ ).

### Nature contact at work and employee health

First, we determined which of the health and behavioral survey items were stress related. To determine the stress-related variables, we employed a multiple regression analysis with the PSQ stress total as the dependent variable and the 13 health and behavior survey items as independent variables. Data analysis revealed that “general health” self-rating (poor to excellent) and “number of days in the past 30 days that health prevented from doing usual activities” were significant predictors of stress and, thus, represented

**Table 1. Relationships between nature contact at work and stress, general health, and number of days health prevented activities among office staff**

<i>Independent variables</i>	<i>Dependent variables</i>	<i>r</i>
Nature contact total	Stress total	−0.14 <sup>a</sup>
	General health	−0.14 <sup>a</sup>
	Days health poor	0.01
Outdoor nature contact subtotal	Stress total	−0.17 <sup>b</sup>
	General health	−0.17 <sup>b</sup>
	Days health poor	0.04
Indoor nature contact subtotal	Stress total	0.04
	General health	−0.10 <sup>c</sup>
	Days health poor	−0.03
Indirect nature contact subtotal	Stress total	−0.08
	General health	0.00
	Days health poor	−0.01

<sup>a</sup> $p<0.01$

<sup>b</sup> $p<0.001$  (two-tailed)

<sup>c</sup> $p<0.05$

the stress-related variables in this study. None of the health behavior items, such as smoking and physical activity, was a statistically significant predictor of stress. As a result, we included the PSQ stress total and the two stress-related health variables as dependent variables in remaining analyses.

We used Pearson product bivariate correlations to examine the relationship between nature contact at work and the three study variables (stress, general health, and number of days health prevented activities). Higher nature-contact scores represented more nature contact at work, and lower perceived stress and health scores represented less stress and fewer health concerns (Table 1). The correlations were interpreted based on the strength of the association.

We conducted t-test analyses to further examine the patterns of association between nature contact and health. High and low nature-contact scores were dummy-coded as 1 and 2, respectively. The high-nature-contact group was one standard deviation above the mean and the low-nature-contact group was one standard deviation below the mean. We ran analyses to compare the highest and lowest nature-contact groups. The high-total-nature-contact group and the high-outdoor-nature-contact group had significantly less stress and better general health than the related low groups. There was no statistically significant difference between high and low nature contact for the number of days one missed normal activities over the last month for any measure of nature contact. Table 2

provides a summary of the influence of high vs. low nature contact on total stress score.

## DISCUSSION

The purpose of this study was to examine the influence of nature contact at work on stress and health among office staff, a priority public health population that has not been well studied.<sup>11</sup> The findings from this study were consistent with previous findings in other settings and the primary theoretical explanations.<sup>5,24–25</sup> Employees with more nature contact at work reported significantly less perceived stress and stress-related health complaints. These findings suggest that nature contact at work may constitute a healthy workplace exposure.

It is important to understand healthy workplace exposures. It is now widely believed that cultivating healthy workplaces is an important component of comprehensive WHPPs.<sup>4</sup> This study's main findings suggest that nature contact at work, as in other settings, is associated with stress reduction among employees. These findings, in the context of the larger body of literature, suggest that the purposeful use of nature contact at work may reduce employee stress.<sup>5</sup> Creating, enhancing, or promoting the use of outdoor break areas, for example, may be one way for health promotion practitioners to cultivate a healthy workplace with nature-contact exposures.<sup>10</sup> Future research should build off of these cross-sectional findings and assess if environmental (nature-contact) interventions at work result in stress reduction among employees.

Although the effect size was small to moderate, the findings were statistically significant and important. The findings are particularly important because increasing nature-contact exposure at work may be an inexpensive and practical way to enhance worksite health promo-

tion efforts. In contrast to other factors that influence perceived stress, such as social support, job demands, and relaxation skills,<sup>28</sup> enhancing nature contact at work is a relatively simple approach. Adding indoor plants, opening blinds, or going outside for a work break instead of to the break room, for example, are straightforward ways to increase healthy exposures at work to combat stress and promote health. Enhancing coping or social support, on the other hand, likely involves more time, effort, and resources. Maller et al. and others recognized that “contact with nature may provide an effective population-wide strategy.”<sup>43</sup>

These findings are also important because this was the first known study to measure nature contact comprehensively at work or in any setting. Other studies have examined the influence of one form of nature contact (e.g., the number of indoor plants) on stress or health. Researchers have previously pointed to three forms of nature contact important for child development that were similar to the forms measured and analyzed in this study,<sup>44</sup> but this is the first known study to measure all known health-promoting forms of nature contact. The findings from this study also allowed the first-ever quantitative comparisons between forms of nature contact. Kuo emphasized the need to study nature contact comprehensively to determine “which forms or doses of nature enhance effectiveness and which do not.”<sup>45</sup>

In this study, findings suggest that the forms of nature contact may matter. The most direct nature contact—outdoor nature contact—had the strongest association with stress reduction and health. The frequency of employees' outdoor exposure at work had the strongest negative correlation to stress and health complaints, whereas the least direct form of nature contact—indirect nature contact—resulted in the least health benefits. Employees' exposure to

**Table 2. Relationships between perceived stress and high vs. low nature contact at work among office staff**

<i>Independent variables</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>t-score</i>
Low nature contact—total	41	67.3	16.2	2.1 <sup>a</sup>
High nature contact—total	60	60.5	16.2	
Low nature contact—outdoor subscale	85	68.0	17.8	3.1 <sup>b</sup>
High nature contact—outdoor subscale	58	59.2	15.7	
Low nature contact—indoor subscale	131	65.4	16.1	0.8
High nature contact—indoor subscale	52	63.1	17.1	
Low nature contact—indirect subscale	84	66.1	16.5	2.1 <sup>a</sup>
High nature contact—indirect subscale	46	60.1	16.6	

M = mean

SD = standard deviation

<sup>a</sup> $p < 0.05$

<sup>b</sup> $p < 0.01$  (two-tailed)

nature photography or nature sounds in the office, for example, had the weakest negative correlation to stress and health complaints. These novel findings will help health promotion practitioners begin to prioritize efforts. These findings are important for shaping workplace stress interventions and may suggest that taking an outdoor “booster break,”<sup>46</sup> for example, would be more important than displaying nature photography or a live plant in the office. Future research should build off of these cross-sectional findings and compare environmental (nature-contact) interventions at work to best inform practice.

### Limitations

Although the findings from our study and other studies suggest that nature contact may be helpful to reduce employee stress, future research should be conducted. An important limitation of our study was that participants consisted of office staff from one university. This limits generalizability to larger populations. Future research should examine other working populations.

Another limitation of our study was the lack of causal relationships. Like all cross-sectional studies, the findings from this study cannot infer causation. Nature contact did not cause stress reduction in this study. Future studies should examine the efficacy of workplace nature-contact interventions, such as the outdoor booster break, on employee stress among varying populations of employees. Intervention research could also be employed to better compare the forms (outdoor, indoor, and indirect) of nature contact on stress. Ideally, future intervention research should employ a RCT design in an applied workplace setting with several follow-ups to best inform recommendations for practice.

### CONCLUSIONS

Creating environments with natural elements to reduce stress is both intuitive and scientific. Office windows, vacation destinations, and real-estate costs worldwide suggest that people everywhere value nature contact (and will pay more for it).<sup>5,17,47–50</sup> This phenomenon has also been well studied. The main theoretical perspectives suggest that natural elements are calming for people today because of the linkage to survival in the past.<sup>5,24,25</sup>

A recent review entitled “Cultivating Healthy Places and Communities: Evidenced-Based Nature Contact Recommendations”<sup>10</sup> summarized the nature-contact literature as it related to human health. The article points to 12 research-based health promotion recommendations, with the assumption that “environments

can be protected, created, reconfigured, or regulated to prevent, eliminate, or mitigate [stress].”<sup>51</sup> The recommendations include the following: advocate for the preservation of pristine wilderness; incorporate wooded parks/green space in community design; maintain healing gardens; cultivate and landscape grounds for outdoor viewing; welcome animals inside; provide a plethora of indoor potted plants within view; light rooms with bright, natural sunlight; provide a clear view of nature outside; allow outside air and sounds in; display nature photography and realistic nature art; watch nature on TV or videos; and listen to recorded nature sounds.<sup>10</sup>

Our study’s findings support the notion that many of these recommendations may also apply to the workplace environment. These findings, together with the previous studies and the evidenced-based recommendations, suggest that nature contact may be fostered through environmental modifications to reduce employee stress. The concept of “wellness by design”<sup>15</sup> in the workplace may be achieved, in part, through the purposeful use of nature contact.

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