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Associations Between the Breakroom Built Environment, Worker Health Habits, and Worker Health Outcomes: A Pilot Study Among Public Transit Rail Operators

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Abstract

Objective: To investigate the association between the breakroom built environment and worker health outcomes.

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Methods: We conducted this study in a mass transit organization (rail). We collected a user-reported breakroom quality score (worker survey), a worksite health promotion score (validated audit tool), and self-reported worker health outcomes (survey).

Results: Among the 12 breakrooms audited and 127 rail operators surveyed, the average worksite health promotion score was 9.1 (out of 15) and the average user-reported breakroom quality was 3.1 (out of 7). After multivariable regression, breakrooms with higher worksite health promotion scores and user-reported breakroom quality were associated with lower odds of depression and fewer medical disability days.

Conclusions: This cross-sectional study demonstrates an association between the quality of the breakroom built environment and worker health, specifically depression and medical disability days.

Keywords

absenteeism; breakroom; built environment; depression; disability days; indoor environmental quality; nutrition; physical activity; transit workers; worksite health promotion

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The impact of a worksite's built environment on worker health outcomes has been previously studied in various occupations and industries. Such studies often include the analysis of associations between specific indoor environmental quality (IEQ) subdomains such as indoor air quality,[1-3] ambient sound,[4] light, and temperature,[5,6] with healthy behaviors such as physical activity[7,8] and nutritional choices.[9-11] Associations between a worksite's health promotion resources and health outcomes including obesity,[12] metabolic syndrome,[13] mental health,[14] hypertension,[15] and cardiovascular outcomes[16] have also been investigated. Of additional interest is the research linking the quality of the indoor built environment with enterprise outcomes such as absenteeism and presenteeism.[17-19] Such studies have most often been performed in the location of primary work activity, as opposed to the breakroom.[20,24]

Overall, breakrooms are an understudied domain of the workplace in the context of employee health and health promotion. Some studies have examined specific environmental conditions of the breakroom, yet these most often have been related to "restorative outcomes" such as mood and sense of rejuvenation.[25] Other previous research has focused on the break experience (eg, duration, frequency, time of day) and its impact on worker health and occupational outcomes.[26-33] However, a notable gap exists in the currently available literature addressing the influence of the breakroom built environment on employee health.

We aimed to address this knowledge gap by pursuing the following objective: to investigate the relationship between the built environment of the breakroom and worker health outcomes in a public transit workforce.

The work described here focuses on the transportation industry for a number of reasons. Transportation workers are known to be at increased risk for a number of lifestyle-related diseases such as obesity,[34] hypertension,[35] tobacco and alcohol dependence,[36] cardiovascular disease,[37,38] and diabetes.[34,39] These associations are not unexpected, given the sedentary, stressful, and time-intensive nature of their work.[40,41] Indeed, a seminal study from the 1950s which demonstrated the impact of physical activity on heart disease was performed using bus drivers as the sedentary cohort.[42] In addition, transportation work often involves a split-shift schedule. Transit workers may spend hours waiting in between shifts, in exactly the kind of breakrooms analyzed in this study. Much attention has been given to the nature of the work required of transit operators and its resultant impact on worker health.[34,43] However, in keeping with general occupational literature, fewer studies have examined the associations between the built environment of the transit workplace and worker health outcomes.[44]

METHODS

Setting

Researchers from the Harvard T.H. Chan School of Public Health collaborated with the Massachusetts Bay Transportation Authority (MBTA) to perform this study. The MBTA serves as the public transportation system for the Greater Boston metropolitan region. An average of 1.2 million passengers use the MBTA on an average weekday, with 700,000 daily commuters utilizing the transit agency's network of four rail lines.[45] These lines (Red, Orange, Green, and Blue) are operated by a total of 766 active rail operators, and provide service to 133 stations, covering 78 miles of track.[45] The rail operators have access to 12 "rail operator breakrooms," located throughout the rail system. The Green Line is similar to light rail, running one to two trolly cars at a time that operate in both subways and on the streets with at-grade platforms. The Orange, Red, and Blue Lines are dedicated subway trains with no street crossing or sharing.

Data Sources

Independent variables describing the built environment were obtained from two sources: (1) a researcher-conducted analysis of the health-promoting resources in the breakroom (see worksite health promotion score, below), and (2) user-reported measures of breakroom environmental quality obtained by a survey distributed to and completed by MBTA rail operators.

The worker survey also included the dependent health variables, drawn from previously validated tools and questionnaires (see Measures, below). These included breakroom usage patterns, operator health behaviors (diet, exercise, smoking, alcohol), and operator health outcomes (eg, fatigue, depression, disability days) (see Survey, Supplemental Digital Content 1, http://links.lww.com/JOM/A759 for a copy of the survey as administered).

Study Population and Survey Protocol

The study population was a sample of all active rail operators employed by the MBTA at the time of the study. We performed all recruitment for survey participation in-person and onsite in the breakrooms. Rail operators who voluntarily agreed to participate upon invitation completed the self-administered survey. Each operator could participate only once.

We obtained access to the breakrooms from the MBTA Safety Department in coordination with the Operations Department. We approached operators in each of the 12 rail breakrooms over the course of 11 nonconsecutive days between March 20, 2019 and May 30, 2019. We selected dates and times at random, in accordance with the availability of researchers and accompanying MBTA staff. Site visit schedules included mornings, afternoons, and evenings of both weekends and weekdays. All operators who visited the breakroom during the administration time period were invited to participate in the study. Surveys were administered on iPads using Qualtrics software, (Provo, Utah, USA) with the option of a paper copy depending on the preference of the participant. Operator participation was incentivized with a $5 restaurant gift card purchased with funds from a Rose Service Learning Fellowship Award (an internal student grant from the Harvard T.H. Chan School of Public Health). No identifying information was collected as part of the survey. Operators were instructed to answer all questions in relation to the breakroom which they utilized most frequently.

MBTA rail operators and Safety Department staff pilot tested the survey prior to generalized administration. We accommodated the recommended changes prior to the initiation of formal data collection.

Approval

The Harvard T.H. Chan School of Public Health Institutional Review Board reviewed all protocols and procedures related to this study and declared it to be exempt. The MBTA Safety Department actively participated in the planning and execution stages to ensure that data collection was in compliance with internal policies.

Measures

Worksite Health Promotion Score—We used the Centers for Disease Control's (CDC) Tool for Observing the Work Environment (TOWE) to obtain the breakroom worksite health promotion score.[46] This audit-style checklist allows for the systematic enumeration of the health-promoting resources available in a workplace, and can be scaled based on the characteristics of interest. We determined the presence or absence of a total of 15 health-promoting items (Table 1) at all 12 rail operator breakrooms identified by the MBTA. We used this number as the worksite health promotion score. We selected these specific items for inclusion based on the priorities of the host organization in analyzing the impact of breakroom resources on healthy behaviors among their operators. We completed all site visits over the course of 2 working days (on November 12, 2018 and December 4, 2018). Note that the operator survey was administered several months after the collection of this audit data. This was done to allow for final approval of the survey content and protocol by MBTA leadership. To our knowledge, no significant changes to the breakroom environment or MBTA operational practices were enacted between these two periods of data collection.

General Demographics—We queried age (in years) and gender (male, female, other) on the survey.

User-Reported Breakroom Quality and Usage—On our survey, we included the questions related to IEQ found in the University of California Berkeley Center for the Built Environment Survey.[47] This tool is an accessible, efficient way to solicit user-reported ratings of the following IEQ subdomains: Temperature, Humidity, Air Quality, Lighting, Natural Light, Vibration, Noise, Cleanliness, Maintenance, and Overall Quality. Responses were a Likert scale between 1 (very unsatisfied) and 7 (very satisfied). Thus, higher scores indicate a greater user-reported quality of each specific characteristic. The survey instructed workers to answer these questions in reference only to the breakroom which they utilized most frequently (their "primary breakroom"). Average Overall Quality was used as the user-reported quality score.

In the survey, operators reported the number of days (in their last 7 workdays) in which they had visited their primary breakroom. Workers also reported the average length of time spent in that breakroom on a typical workday. We multiplied these numbers together to yield overall breakroom usage time (or time spent in the breakroom), in hours per week.

Operator Health Behaviors—We included the self-reported International Physical Activity Questionnaire (IPAQ) short form in our survey to assess operator exercise habits.[48] This validated scale is simple to understand and yields a classification of high, moderate, or low levels of self-reported exercise. It is also possible to extract a self-reported number of total metabolic-minutes per week (met-minutes per week), which we converted to met-hours per week for ease of subsequent calculations.

We incorporated the previously validated Starting the Conversation (STC) tool in our survey to analyze worker dietary behaviors.[49] This self-reported measure contains eight questions which request food-frequency style responses for various areas of food consumption. These subdomains are individually scored between 0 and 2. A total possible score ranges from 0 to 16, with a higher score indicating a less healthful diet.

We utilized the Fatigue Assessment Score (FAS) to assess fatigue symptoms, as this tool has been previously validated among transportation workers.[50] The FAS is a self-reported tool with 10 questions regarding fatigue symptoms, each of which is answered using a 1 to 5 Likert scale. Therefore, a total score can range from 10 to 50, with a higher score indicating greater fatigue.

The CAGE questionnaire assesses for potentially problematic alcohol use among respondents.[51] This tool has four yes/no questions that strive to identify the compulsive nature of a respondent's alcohol use. Each "yes" response receives a score of 1, otherwise the subdomain receives a score of 0. The total CAGE score can therefore be between 0 and 4, and a score of more than or equal to 2 is considered a positive screen for potentially problematic alcohol use.

The survey asked operators to self-report their current and/or previous cigarette use on the survey by answering a single question with dropdown answer choices of never smoker, previous smoker, or current smoker.

Operator Health Outcomes—We assessed medical disability using the CDC's Health-Related Quality of Life short form, which was included on the survey.[52] This self-reported tool measures medical disability days by asking how many days per month the individual is unable to perform his/her usual activities (including work) due to physical and/or mental health concerns.

The self-reported Patient Health Questionnaire (PHQ-2) is a commonly-used screening tool for depression.[53] There are two questions in this tool, each of which is scored from 0 to 3. The total score can therefore range from 0 to 6, and a score of more than or equal to 3 is considered a positive screen for depression.

Operators reported their height (in feet and inches) and weight (in pounds) on the survey. We used this information to calculate self-reported BMI (kg/m^2).

Statistical Analyses

We performed simple descriptive statistics using Stata (StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC.). We applied analysis of variance or chi-square tests where appropriate. Pearson correlation coefficients described the associations between the worksite health promotion score and user-reported quality ratings, as well as individual IEQ subdomains and overall user-reported quality scores.

We performed regression analyses using SAS (SAS Institute Inc., SAS 9.1.3, Cary, NC: SAS Institute Inc.). We built linear (fatigue, exercise, and diet quality as continuous outcomes), logistic (positive depression screen as a dichotomous outcome), or Poisson (disability days as counts) regression models to analyze the outcomes of interest. Predictive variables were (1) breakroom worksite health promotion score, (2) user-reported breakroom quality, (3) breakroom usage time, or (4) each of the 10 subdomains of IEQ. Primary outcomes were: operator-reported physical activity, operator-reported diet quality, and operator-reported fatigue levels. We controlled for the following covariates: age, sex, smoking status, and potentially problematic alcohol use. Secondary outcomes were depression and medical disability days.

RESULTS

Survey Collection and Demographics

We approached 179 transit operators to participate, which represents 23% of the total active operator population at the time of our study. We had an overall participation rate of 71% among those operators invited to participate (127 participated out of 179 approached, or 17% of the total operator population). The average age among participants was 44 years old, and our surveyed population was 60% men (Table 2 and TableS1, Supplemental Digital Content 2, http://links.lww.com/JOM/A760).

Worksite Health Promotion Score and User-Reported Breakroom Quality

Our study yielded worksite health promotion scores ranging from 3 to 13, with an average score of 9.08 (out of a possible 15). The breakroom with the highest worksite health promotion score (Orange 2) had 13 out of the 15 evaluated health-promoting resources

(Table 1) available to operators, including onsite exercise equipment, educational posters promoting both healthy nutrition and physical activity, relatively healthy vending machine options, food storage/preparation resources, onsite showers and lockers, and easily accessible drinking water. In contrast, the breakroom with the lowest worksite health promotion score (Green 1) had only three out of 15 health-promoting resources (food storage options, food preparation resources, and seating available for food consumption). User-reported breakroom quality scores ranged from 1.0 up to 5.0 with an average of 3.1 (out of a possible 7, Table 3). The Pearson correlation coefficient between worksite health promotion scores and user-reported quality scores was 0.12, indicating a very weak correlation (*P*-value=0.20, see Table S2, Supplemental Digital Content 3, http://links.lww.com/JOM/A761 for this and other Pearson correlation coefficients).

Breakroom Usage Patterns

The highest breakroom usage time was 22.9 hours per 7 working days, while the lowest value was 3.7 hours per 7 working days. For all respondents the average breakroom usage time was 7.3 hours per 7 working days (Table 2).

Specific Breakroom IEQ Characteristics

Among all participants, the three subdomains of IEQ that received the overall lowest scores were cleanliness (average 2.9 out of 7), air quality (2.9), and furnishings (2.7). The three subdomains for which the breakrooms received the highest ratings were sound (3.9), temperature (4.1), and overall lighting (4.1). The results of these user-reported measures are summarized in Table S3, Supplemental Digital Content 4, http://links.lww.com/JOM/A762.

Pearson correlation coefficients revealed that all of the individual IEQ characteristics were either moderately (temperature [ρ=0.58], vibration [0.597], humidity [0.47]), strongly (air quality [0.65], overall lighting [0.69], natural light [0.61], sound [0.63], cleanliness [0.74], furnishings [0.76]) or very strongly (maintenance [0.81]) correlated with overall user-reported quality. These associations were all statistically significant at the $P<0.05$ alpha level (see TableS2, Supplemental Digital Content 3, http://links.lww.com/JOM/A761).

Operator Health Behaviors and Health Outcomes

The average metabolic-minutes per week among all participants was 2947.0. The average STC diet score among all participating operators was 6.7 (out of 16), and the average FAS score was 20.2 (out of 50). There were 8 respondents (6.2%) who screened positive for potentially problematic alcohol use, and 11% of participants (*n*=14) reported that they were current smokers. A total of 11% of participating operators (*n*=14) met the depression screening criteria. Workers reported an average of 2.1 medical disability d/ mo, and had an average BMI of 30.8. (Table 2).

Associations with Health Habits and Health Outcomes

Factors that Influence Physical Activity—Covariate-adjusted regression analyses revealed that user-reported quality score and worksite health promotion score, as well as overall usage rates, were not associated with self-reported physical activity. Among the IEQ subdomains, greater satisfaction with overall lighting was associated with a small decrease in the number of reported met-minutes, while higher satisfaction with breakroom temperature was associated with an increase in reported exercise. The other IEQ subdomains were not predictive of self-reported physical activity levels (Table 4).

Factors that Influence Diet—In adjusted regression analyses, user-reported breakroom quality, breakroom worksite health promotion score, and breakroom usage time were not associated with the healthfulness of an operator's diet as assessed by self-reported questionnaire. Satisfaction with natural light was the only IEQ subdomain which showed some association with the diet score (β=−0.48, P=0.05, Table 4).

Factors that Influence Fatigue—In covariate-adjusted regression analyses, we found that a higher worksite health promotion score was associated with lower fatigue (β=−0.44, P=0.06). However, user-reported break room quality and the breakroom usage time did not predict operator-reported fatigue. Among the IEQ subdomains, only greater satisfaction with the breakroom maintenance was associated with less fatigue among operators (β=−1.11, P=0.03, Table 4).

Factors that Influence Depression—In covariate-adjusted regression analyses, both higher worksite health promotion scores (OR 0.70, 95% CI 0.57, 0.89) and higher user-reported quality scores (OR 0.68, 95% CI 0.46, 1.01) were associated with lower odds of depression. Breakrooms with more highly-rated air quality were also associated with lower odds of depression (OR 0.49, 95% CI 0.24, 1.01; Table 4).

Factors that Influence Medical Disability Days—In adjusted models, higher worksite health promotion scores (β=−0.08, P<0.01) and user-reported breakroom quality scores (β= −0.07, P=0.07) were associated with fewer self-reported medical disability days. In addition, more breakroom usage time was likewise associated with fewer medical disability days (β= −0.02, P=0.03). Less vibration (β=−0.15, P=0.02) and better maintenance in the breakrooms (β=−0.18, P=0.01) were also associated with fewer disability days, but the other IEQ subdomains were not predictive in any meaningful way (Table 4).

DISCUSSION

This study shows that the breakroom built environment can have significant associations with self-reported worker health outcomes, with less-pronounced effects on worker health behaviors. Specifically, the presence of more health-promoting resources in the breakroom was associated with fewer medical disability days, lower odds of depression, and lower fatigue ratings. A higher worker-reported breakroom quality score was associated with fewer medical disability days and lower odds of depression. Several IEQ subdomains were significantly associated with the outcomes of interest. Specifically, greater satisfaction with maintenance was correlated with reduced fatigue, greater satisfaction with temperature control was associated with more self-reported exercise, and greater satisfaction with natural light demonstrated a positive relationship with a more healthful diet.

Breakroom Quality and Usage

We found differences between both the worksite health promotion scores and the user-reported breakroom quality scores across the various lines of the MBTA (Table 3). This suggests that even within the same organization, differences in quality between specific facilities may exist. Thus, organizations may find it beneficial to perform a comprehensive analysis of their facilities (rather than sampling), in order to fully capture such differences.

The overall correlation between the operator-reported quality scores and the worksite health promotions scores was very weak. This could indicate that health-promoting resources do not factor into a worker's perception of "overall satisfaction" with their breakroom. Organizations should consider collecting metrics through both user report and a formal audit in order to capture potential discrepancies between what the organization considers to be most important and what the end-user most values.

Indoor Environmental Quality Subdomains

Two subdomains of IEQ which scored among the lowest overall were cleanliness (average 2.9 out of 7) and furnishings (2.7, TableS3, Supplemental Digital Content 4, http://links.lww.com/JOM/A762). It is interesting that these same two subdomains (furnishings and cleanliness) were also among the most strongly correlated with overall operator perception of breakroom quality (see TableS2, Supplemental Digital Content 3, http://links.lww.com/JOM/A761). Organizations interested in generating the greatest change in breakroom quality as perceived by the user may consider concentrating initial efforts on the IEQ subdomains of cleanliness and furnishings. Alternatively, it may be helpful to first survey the facility users themselves, to see which subdomains are most highly valued and/or require the most urgent correction according to the specific population of interest.

Associations with Healthy Behaviors

Factors that Influence Fatigue—There was a small improvement in operators' self-reported fatigue levels in those breakrooms with a higher worksite health promotion score. This association could reflect the importance of breakroom resources on outcomes associated with rest.

Among the IEQ subdomains, a higher maintenance score was significantly associated with an improved fatigue score. This could suggest an understandably greater comfort with resting in a well-maintained breakroom. Organizations interested in exploring structural changes to influence their workers' fatigue symptoms could consider first addressing these two areas of facility quality.

Factors that Influence Physical Activity—Based on our data, neither the worksite health promotion score nor the user-reported quality score was predictive of operators' self-reported physical activity. The observed lack of association between the worksite health promotion score and physical activity could be explained in part by the fact that the breakrooms were almost universally devoid of any available exercise equipment (there was little variability between the break rooms).

Among the IEQ subdomains, only overall lighting exhibited a significant correlation with physical activity level. Surprisingly, as satisfaction with the lighting increased, operators reported lower levels of exercise. This could be a spurious finding as there is no clearly evident mechanistic pathway between breakroom lighting and physical activity. However, it is possible to imagine a scenario wherein workers who are sufficiently satisfied with the lighting inside the breakroom feel less incentive to leave the facility and walk (or otherwise exercise) during their break time. Further research is needed to more fully investigate this issue.

Factors that Influence Diet—Based on our data, neither the worksite health promotion score nor the user-reported quality score was predictive of operators' self-reported diet score. This could potentially be explained by the fact that the available diet-related resources included on the TOWE may have had little influence on the specific questions included in the Starting the Conversation questionnaire, and were present in almost every break room.

The only IEQ subdomain which was associated in a significant way with the diet score was natural light. Greater satisfaction with natural light was associated with a less healthful diet. This could potentially be explained by the fact that if an operator is more content to sit in the breakroom, he/she is more likely to purchase food from the vending machines (a generally less healthy option), as opposed to leaving the facility to acquire food from another venue. Although our study included no formal datapoint on this topic, it was noted that many of the breakrooms with natural lighting were in locations more removed from easily accessible commercial centers, thus limiting food options. Breakrooms with less natural light were often underground, in busy city center areas surrounded by many food choices. This phenomenon could partially explain the relationship between natural light and diet.

Associations with Health Outcomes

Depression: Higher worksite health promotion scores and user-reported quality scores were both independently and significantly associated with a lower likelihood of depression. While the IEQ subdomains did not reveal any meaningful correlations with depression, the following subdomains trended towards being protective against depression: better temperature control, higher air quality, better lighting, less vibration, and better maintenance. Organizations may consider including improvements to these structural factors when they are seeking strategies to address workforce depression.

In addition to the significant impact on the individual operators and their families, depressed workers can have a large economic impact on their companies. A report published by the American Psychiatric Association's Center for Workplace Mental Health estimates that each depressed transit worker may cost their employer up to $10,000 per year in medical care, missed work days, and decreased productivity.[54] Such numbers could be used by organizations to justify capital investment in facility improvement projects.

Our results indicate that a 33% improvement in the breakroom worksite health promotion score could yield a 75% lower odds of a positive screen for depression. While these numbers are difficult to transcribe into "potential dollars saved," even a superficial inspection of this relationship would suggest an area ripe for potential cost-effective investments.

Medical Disability Days: User-reported breakroom quality, the worksite health promotion score, and breakroom usage time were negatively associated with the number of self-reported medical disability days per month. That is, those operators who frequented higher quality breakrooms and those with relatively more health-promoting resources reported, on average, fewer medical disability days. This observed association was greater in both magnitude and significance using the worksite health promotion score (compared with the user-reported quality score) as the predictive variable. While these data should not be misunderstood to represent absenteeism or sick days, they do represent days in which physical or mental health issues prevented the individual from performing his/her usual activities (including work).

Among the IEQ subdomains, less vibration and better maintenance were both significantly associated with fewer medical disability days. Less vibration in the breakroom could contribute to a more restful and rejuvenating break experience, thus reducing the impact of cumulative work-related fatigue. Improved breakroom maintenance could also affect medical disability days through the mechanistic pathway of first reducing fatigue. Indeed, our results also supported a negative relationship between user-reported breakroom quality, the worksite health promotion score, and fatigue levels. Qualitatively, the operators frequently cited the poor state of their breakrooms as proof of a low level of employer interest in their wellbeing. Thus, inadequate maintenance of breakrooms could contribute to a low level of organizational loyalty, and an increased willingness to “call in” even when that action may not be medically necessary.

The following characteristics also trended towards fewer disability days: better temperature control, higher air quality, less unwanted occupational sound, better lighting, and improved cleanliness.

According to the MBTA Rail Operations Department, each operator who calls in sick costs the MBTA an estimated $450 per day. Our study identified an average of 2.1 medical disability days per month, per operator. We performed a crude calculation to estimate the potential cost of medical disability days among MBTA rail operators. We first assumed that each disability day results in a sick day, and also assumed that our identified average of 2.1 medical disability days per month is representative of the entire MBTA rail operator population (n=766). By multiplying the number of operators (766) by this average (2.1) and the provided cost estimate ($450), our data suggest that sick days cost the MBTA over $720,000 per month. It is likely that our assumptions (particularly our assumption that every medical disability reflects a sick day) result in this value being an over estimation of the true cost.

Our analysis showed that a 33% improvement in the breakroom worksite health promotion score (eg, a score of 9 moving to 12 on the 15-point scale) would be expected to yield a 12% decrease in the average number of medical disability days per month. This would equate to a drop from the average identified in our study (2.1 days per operator per month) to 1.8 days per month.

By multiplying this lower average (1.8) by the same number of operators and cost estimate as described above, a 33% increase in the average breakroom worksite health promotion score across the MBTA could be expected to lower the average monthly cost of rail operator sick days by nearly $100,000 per month.

LIMITATIONS

As this study was cross-sectional in design, associations cannot be interpreted as causative, especially since directionality is not established and reserve causation is a concern. Outside of the worksite health promotion score, all other values were obtained through worker self-report. It is important to note that our results were likely influenced by the phenomenon of social desirability, which is commonly observed in survey-based studies. For example, many respondents may have underreported their smoking/alcohol habits, while overreporting the healthfulness of their diet, amount of exercise, etc. The anonymous survey will not allow us to perform any longitudinal studies to track individual changes from the results presented in this paper.

The sample size of our study was relatively small. Several of the outcomes (eg, positive screen for depression) and predictive variables (potentially problematic alcohol use) had very few representative subjects in our population. A larger sample size would make the observed associations clearer and would also add power to the statistical analyses.

This study was conducted within a public transportation system in the greater Boston, Massachusetts area, a relatively large urban area, with a high-volume transit system. This may limit the generalizability of our results to a similar geographic and demographic environment. Finally, there is a risk of bi-directionality between depression and a user-reported rating of one’s surroundings (eg, a more depressed individual may report lower satisfaction with their environment, as compared with a non-depressed person evaluating the same facility). Thus, reverse causation cannot be ruled out in this particular relationship.

STRENGTHS

This study was performed in a comprehensive manner, including an analysis of both worksite health promotion resources and user-reported metrics of breakroom quality. All 12 of the identified breakrooms were visited, as opposed to the development of sampling protocols. We also observed a large amount of variability among the quality scores of different breakrooms, this allows for a more sensitive analysis of associations. The detailed analysis of specific facility characteristics allowed for a granular examination of the impact of specific elements of the built environment on worker health outcomes. The tools used in the measurement of user-reported breakroom quality, the breakroom worksite health promotion score, and operator health outcomes, were all previously validated in the scientific literature.

FUTURE RESEARCH

Future investigative efforts into this area should include additional objective, quantifiable measures. Such research could include sound exposure measurements, indoor air quality analyses, and formal light evaluations. Additional information on health outcomes could be measured by collecting physical activity data through motion-tracking devices, researcher-collected BMI, etc. Prospective studies could also make the directionality of the observed associations much clearer, and would allow for the initiation of discussions regarding causality. Larger sample size could further clarify some of the relationships identified in this study, and the inclusion of additional industries and geographic regions would increase the generalizability of our results.

CONCLUSIONS

This study demonstrates the important associations between the built environment of the workplace breakroom and worker health habits/outcomes. In particular, higher scores on both the worksite health promotion score and user-reported breakroom quality measurements were associated with fewer medical disability days and a lower odds of depression. Both of these outcomes have the potential to be hugely expensive for any organization. Resources invested in improving the quality of worker breakrooms could represent a cost-effective investment to reduce some of the negative impacts of worker disability days and depression. The IEQ subdomains most strongly correlated with overall user-reported quality ratings were cleanliness, furnishings, and maintenance. These subdomains represent logical areas of focus for initial improvement efforts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Clinical Significance:

This article is not focused on the daily practice of clinical occupational medicine. However, readers involved in administrative medicine may see clinical results from initiatives related to the topics discussed herein.

TABLE 1.

Health-Promoting Items Included in the Breakroom Worksite Health Promotion Score*

Exercise-Promoting Resources	Available Food Options	Food Storage or Preparation Resources
Exercise equipment present in the break facility	Vending machine present Diet soda in vending machine	Refrigerator available to store food Microwave available to prepare food
Showers available	Low-fat/sugar snacks in vending machine	Toaster and/or toaster oven available to prepare food
Lockers present	Drinking water available in the break room	Kitchen sink accessible for food preparation Seating available in a dining area
Exercise educational materials posted in the break room	Fruits and/or vegetables in vending machine	Dietary educational materials posted in the break room

* From the Centers for Disease Control's (CDC) Tool for Observing the Worksite Environment (TOWE) audit tool. The number of health-promoting resources present in each breakroom=the worksite health promotion score.

TABLE 2.

Study Population Characteristics and Self-Reported Worker Outcomes* Among All Participants

Domain	Result	Units
n	127	–
Survey participation rate	127/179 (71%)	Participants/those invited to participate (%)
Gender		
76 (60%) male		
50 (39%) female		–
1 (0.8%) other		
Age	44 (9.4)	Mean (SD), in yrs
BMI	30.8 (5.6)	Mean (SD), kg/m^2
Time spent in break facility	7.3 (8.2)	Mean (SD), hrs per week
Fatigue score	20.2 (5.8)	Mean, possible score 10–50, higher score=greater fatigue symptoms
Exercise	2947.0 (3230.8)	Mean (SD), met-mins/wk
Diet score	6.7 (3.5)	Mean, possible score 0–16, higher score=less healthy diet
Medical disability days	2.1 (4.8)	Mean, per operator per month
Smoking status	14 (11%)	Prevalence of active smokers
Potentially problematic alcohol use	8 (6.30%)	Prevalence of positive CAGE screen
Depression	14 (11%)	Prevalence of positive PHQ-2 screen

CAGE, validated alcoholism screening tool; CDC, Centers for Disease Control; PHQ-2, patient health questionnaire short form.

*Collected from worker survey.

TABLE 3.

Descriptive Results of Individual Breakrooms and Sample Size

Station	Worksite Health Promotion Score*	User-Reported Quality Score†	Sample Size (n)	Station Location	Station Location on Line
Red 1	11	1.9	10	Below ground	End of the line
Red 2	6	3.6	10	Below ground	Line junction
Red 3	11	3.2	5	Above ground	End of the line
Red 4	11	4.3	3	Above ground	Line junction
Red 5	8	1	4	Above ground	End of the line
Red line average	9.4	2.7	4.4 per breakroom	–	–
Green 1	7	2.6	16	Above ground	End of the line
Green 2	3	3	5	Above ground	End of the line
Green 3	11	3.1	20	Above ground	End of the line
Green 4	10	3.5	11	Above ground	End of the line
Green line average	7.2	3	13 per breakroom	–	–
Orange 1	11	2.5	13	Below ground	End of the line
Orange 2	13	3.3	9	Above ground	Middle of the line
Orange line average	12	3	11 per breakroom	–	–
Blue 1	5.0	11	21	Above ground	Middle of the line
Overall average	9.1	3.1	127	–	–

There are no Blue Average values because there was only one breakroom on this line.

* Worksite health promotion score defined by the Tool for the Observing the Worksite Environment (TOWE) audit score (possible values 0 to 15).

† Average score reported by all participants surveyed in each break facility (available score 1 to 7).

TABLE 4.

Results from Adjusted, Multivariate Regression Models of Breakroom Worksite Health Promotion Score, User-Reported Breakroom Quality, Breakroom Usage Time, and Significant Results of Indoor Environmental Quality (IEQ) Subdomains by Outcome

Health Outcomes				Health Habits			
Outcome	Predictive Variable	Result*	Statistical Significance†	Outcome	Predictive Variable	Result*	Statistical Significance†
Depression (positive screen on PHQ-2, yes/no)	Worksite health promotion score	OR 0.70	0.56, 0.89	Diet score (by STC tool, score 0–16, higher score=less healthy diet)	Worksite health promotion score	−0.07	0.60
	User-reported quality	OR 0.68	0.46, 1.01		User-reported quality	0.21	0.26
	Breakroom usage time	OR 0.94	0.85, 1.04		Breakroom usage time	0.02	0.53
	Air quality	OR 0.49	0.24, 1.01		Natural light	−0.48	0.05
	Vibration	OR 0.59	0.30, 1.17	Exercise (by met-hours/wk)	Worksite health promotion score	−0.26	0.68
	Maintenance	OR 0.52	0.22, 1.22		User-reported quality	−0.69	0.62
Medical disability days (by self-report, days per operator per month)	Worksite health promotion score	−0.08	< 0.01		Breakroom usage time	−0.08	0.66
	User-reported quality	−0.07	0.07		Temperature	2.63	0.05
	Breakroom usage time	−0.02	0.03		Overall lighting	−3.48	0.01
	Vibration	−0.15	0.02	Fatigue score (by FAS tool, score 10–50, higher score=greater fatigue)	Worksite health promotion score	−0.44	0.06
	Maintenance	−0.18	0.01		User-reported quality	−0.01	0.97
	Furnishings	0.14	0.04		Breakroom usage time	−0.07	0.27
	Natural light	0.25	<0.0001		Maintenance	−1.11	0.03

All regression results controlled for: sex, age, BMI, smoking status, alcohol use, and other predictive variables.

FAS, fatigue assessment scale; met, metabolic equivalent; PHQ-2, patient health questionnaire short form; STC, start the conversation tool.

* OR (odds ratio) for depression and safety events, β coefficient for all other outcomes.

† P-value for linear (fatigue, exercise, diet) and Poisson regression (medical disability days), 95% confidence interval for logistic regression (depression and safety events).