RESEARCH ARTICLE

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A pilot study of changes in Total Worker Health® policies and programs and associated changes in safety and health climates in small business

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Abstract

Background: There is little longitudinal research on whether changes to Total Worker Health® (TWH) policies and programs are associated with changes in health climate and safety climate. We hypothesize that as TWH policies and programs change, employees will report changes in safety climate and health climate from baseline to 1 year.

Methods: Twenty-five diverse small businesses and their employees participated in assessments completed approximately 1 year apart. The exposures of interest, TWH policies and programs, were measured using the business-level Healthy Workplace Assessment™ which collects information on six benchmarks. The outcomes of interest, employee perceptions of safety climate and health climate, were measured via an employee survey. We employed paired t-tests and simple linear regression to assess change over a 1-year period.

Results: The mean Healthy Workplace Assessment overall score changed by 11.3 points (SD = 11.8) from baseline to Year 1. From baseline to Year 1, the mean scores of each benchmark changed in a positive direction within this sample. The mean safety climate score and health climate score changed by +0.1 points (SD = 0.2) and +0.1 points (SD = 6.4) from baseline to Year 1, respectively. The associations between changes in the overall Healthy Workplace Assessment score and health climate and safety climate scores were negligible [$\beta = 0.01$ (95% confidence interval [CI]: 0.002, 0.02), and $\beta = 0.01$ (95% CI: 0.002, 0.02), respectively].

Conclusion: Our study suggests that when small businesses improve upon their TWH policies and programs they experience marginal measurable improvements in employee perceptions of their workplace safety climate and health climate.

KEYWORDS
employee engagement, health climate, health leadership, longitudinal study, occupational safety and health, safety climate, safety leadership

1 | INTRODUCTION

Total Worker Health® (TWH) is a holistic approach to worker safety and health, where workers are protected from injury and illness and are also encouraged and enabled to improve their health and well-being at work.[1] To date, there has been little research into how changes in TWH policies and programs over time are associated with employees' perceptions of workplace health climate and safety climate. We posit that efforts to improve TWH policies and programs will be most effective at improving workforce health and safety if they also improve employees' perceptions of safety climate and health climate.[2,3] Safety climate and health climate are indicators of the experiences employees have about what kinds of practices are rewarded and supported at work.[4] Positive safety climate and health climate are associated with improved productivity, less back pain, less physical pain, better life satisfaction, and better self-reported health.[5]

Previously, we proposed that employee perceptions of safety climate and health climate play an important mediating role between TWH policies and programs and employee health outcomes.[6,7] In other words, businesses should develop the systems to manage workplace TWH, and they should also implement them in a consistent and supportive manner. In a cross-sectional study of 382 businesses, we demonstrated that employers report implementing the TWH approach in a variety of ways.[8] For example, employers commonly reported that they used the hierarchy of controls to prevent work-related injuries and offered physical activity-focused health promotion programs. They also reported that they are inclusive in their delivery of health and safety initiatives and established a company-wide system to communicate about these initiatives. In a separate cross-sectional study of 52 small businesses, we demonstrated that these TWH business practices were positively correlated with both safety climate and health climate.[9] In other words, we found evidence that businesses that have more TWH policies and programs employ workers who perceive their business is committed to their health and safety.

However, what we cannot glean from our prior research is whether there is a temporal relationship between changes in TWH policies and programs and changes in safety climate and health climate. In a recent review of the safety climate intervention literature, Lee et al.[10] noted that when businesses incorporate more safety policies and programs it may signal to employees that safety is rewarded and supported. For example, safety climate with respect to road safety improved after the implementation of a structured management standard of road safety in Israel.[11] While there has been some longitudinal research linking safety climate to employee health outcomes,[12] we are unaware of any longitudinal research that relates changes to TWH business practices with changes in climate perceptions.

The purpose of this pilot study with 25 small businesses is to evaluate whether changes to business TWH policies and programs are associated with changes in safety climate and health climate over a 1-year period. We hypothesize that when businesses make positive changes to their TWH policies and programs, their employees will report improved safety climate and health climate perceptions from baseline to 1 year later.

2 | METHODS

2.1 | Study population

We recruited small Colorado businesses (<500 employees) to participate in the Small + Safe + Well (SSWell) Study from April 2017 through August 2019. We recruited businesses through a variety of methods including email and phone calls, hosting exhibit booths at local conferences, presentations at local professional businesses meetings (e.g., chambers of commerce, professional society groups), and a paid media campaign.

2.2 | Study design and theoretical framework

The study design and the theoretical framework have been previously detailed.[7] Briefly, the SSWell TWH intervention consists of businesses participating in Health Links™, which provides businesses with TWH assessment, advising, and certification as well as a TWH Leadership Training Program that includes a 6-h in-person training and a virtual follow-up period of 3 months. Businesses also administer the Employee Health and Safety Culture Survey each year.[7] All participating businesses and their employees completed the study assessments approximately 1 year apart as part of the SSWell study.

For the purposes of this study, we were interested in the association of TWH adoption and implementation of policies and programs and changes in health and safety climates over a 1-year period before participating business representatives completed the TWH Leadership Training. Thus, we included businesses that were randomized to the lagged treatment group and had not yet participated in the TWH Leadership Program as of April 2020 and that had at least two, consecutive years of data from both the Health Links Healthy Workplace Assessment™[8] and the Employee Health and Safety Culture Survey between April 2017 and April 2020. Among the 134 businesses in the initial cohort, 56 businesses met the criteria of completing two Assessments plus the Employee Health and Culture Survey. Of these, 25 had not received the TWH Leadership Training resulting in 25 businesses in this pilot analysis. Our study included informed consent for all participants and was approved by the Colorado Multiple Institutional Review Board.

2.3 | Measures

2.3.1 | TWH business policies, programs, and practices

We measured TWH business policies and programs via the Health Links Healthy Workplace Assessment™.[8] One representative from

each business, typically an employee familiar with the business's TWH program, completed this assessment. Our prior research demonstrates that there are no differences in assessment responses by the position of the respondent.[8]

This assessment includes measures across six benchmarks: Organizational Supports, Workplace Assessment, Health Policies and Programs, Safety Policies and Programs, Engagement, and Evaluation. Each benchmark is detailed below.

- The Organizational Supports benchmark measures leadership commitment, benefits, resources and teams dedicated to safety and health (max points = 30).
- The Workplace Assessment benchmark asks about the frequency of employee surveys that are used to develop policies and programs for the business (max points = 12).
- The Health Policies and Programs benchmark measures the number and comprehensiveness of programs and policies that align with the health needs and interests of employees like tobacco cessation, nutrition, mental health, stress management, disease prevention, and so forth. (max points = 16).
- The Safety Policies and Programs benchmark assesses how the business prioritizes safety and their commitment to reducing occupational injury and illness (max points = 16). Examples of this commitment include having a written policy, hazard control, ergonomics, violence prevention and emergency preparedness.
- The Engagement benchmark evaluates the business's communication, inclusion, incentives, and sense of community (max points = 14).
- The Evaluation benchmark assesses whether businesses track and measure the effectiveness of their specific policies and programs aimed at improving employee health and safety and what data they use to track and measure their policies and programs (max points = 9).

In this study, we used the composite overall score (out of 97 points) as well as each of the six benchmark scores independently as the primary predictors. The composite overall score is calculated by summing the six benchmark scores.

2.3.2 | Safety climate and health climate

We measured safety climate and health climate via the Employee Health and Safety Culture Survey. Safety climate is a measure of employee perception of their business's commitment to safety. This construct is made of six individual items each scored on a 5-point Likert scale.[2] An example item is "My organization tries to continually improve safety levels in each department.[2]" Health climate is a measure of employee perception of their business's commitment to employee health and well-being. This construct is made of four individual items each scored on a 5-point Likert scale.[3] An example item is "My organization encourages me to speak up about issues and priorities regarding employee health and well-being.[3]" These measures have been found to be reliable and valid.[13]

2.3.3 | Survey method

Employees of each business completed the Employee Health and Safety Culture Survey. This survey was administered to employees shortly after one representative completed the Health Links Healthy Workplace Assessment™, as described above. The Employee Health and Safety Culture Survey was ideally completed within 6 weeks of completion of the Health Links Healthy Workplace Assessment™ to ensure we were capturing the current safety climate and health climate at the time of the Health Links Healthy Workplace Assessment and did not reflect any organizational changes made as a result of the business-level assessment. The survey was administered via REDCap, an online survey distribution platform.[14,15] We emailed a link to this survey to our main contact within each business who distributed the link to their employees in a variety of ways, including sending a mass email, to including the link in a newsletter, to announcing it in a meeting then directing employees to the link. Our goal was to have as many employees as possible complete the survey, so we left it to individual businesses to determine the best way to distribute the survey. Overall, the participation rate in the Employee Health and Safety Culture Survey across all businesses was 26% at baseline and 25% at Year 1 (679 of 2607 participating employees across all businesses at baseline and 645 of 2602 participating employees across all businesses at Year 1). The average employee survey response rate within each business was 43% (range: 16%–100%) at baseline and 45% (range: 8%–100%) at Year 1. In general, smaller businesses had higher response rates compared with larger organizations.

2.3.4 | Business demographics

We measured business-level demographics through the Health Links Healthy Workplace Assessment™. These demographics included number of employees, geographic location, industry, employee gender, and employment type (part time, full time, etc.).

2.4 | Statistical analysis

While both safety climate and health climate variables were administered at the employee level via the survey, we chose to aggregate and average these measures at the business level as is commonly done in the organizational climate literature.[4] Safety climate was calculated by averaging all six items for each employee and then averaging the scores for all employees within a business, resulting in a score from 1 to 5. Health climate was calculated by averaging all four items for each employee and then averaging the scores for all employees within a business, resulting in a score from 1 to 5. The intraclass correlation coefficient [ICC(1)] for safety climate (0.19, 95% confidence interval [CI] = 0.12, 0.29) and health climate (0.11, 95% CI = 0.06, 0.18) were sufficiently high so we were able to aggregate responses at the business level. Additionally, the $r*wg_j$

estimate for safety climate (0.88) and health climate (0.85) indicated sufficient agreement in responses (interchangeability) to aggregate responses at the business level.[16]

We generated descriptive statistics, including counts (percent) and means (standard deviation) for business demographics collected in the Health Links Healthy Workplace Assessment™. We assessed the independent variables by calculating the mean and standard deviation for the overall Health Links Healthy Workplace Assessment™ score and for each benchmark at baseline and after 1 year. We performed an ANOVA test to determine if the change in overall Health Links Healthy Workplace Assessment score were associated with size of business. The dependent variables were assessed as the mean and standard deviation for health climate and safety climate at baseline and 1 year into the study. We performed paired samples *t* tests to assess change in all variables from baseline to Year 1. We calculated and presented differences in scores from baseline to Year 1.

To test our hypothesis, we used simple linear regression at the business level (N = 25). We assessed a total of 14 models: 7 with perception of safety climate as the dependent variable and 7 with perception of health climate as the dependent variable. For both sets of models the independent variables assessed were the change in score from baseline to Year 1 for each of the six benchmark scores and the composite total score. All models were unadjusted due to the limited number of businesses. Significance level was set at 0.01 for all models to adjust for multiple comparisons. All analyses were performed using SAS Version 9.4.

3 | RESULTS

The size of small businesses participating in the study ranged from micro (2–10 employees, n = 5, 20%) to large (251–500 employees, n = 4, 16%), with the average number of employees being 104 (SD = 128) (see Table 1). About one-third of businesses (36%) were in the services industry (n = 9), 28% in health care and social assistance (n = 7), and 12% each in construction (n = 3) and public administration (n = 3). The majority (80%) of businesses were in urban areas in Colorado. Among our participant businesses, 13 (52%) had existing designated health and safety committees at study outset.

We observed a positive change in the overall Health Links Healthy Workplace Assessment™ score and individual benchmark scores from baseline to Year 1 (Table 2). At baseline, the distribution of overall Health Links Healthy Workplace Assessment™ score was normally distributed. On average, businesses' overall score increased by 11.3 points out of a possible 97 points (SD = 11.8). Of the 25 participating businesses, 12 experienced an overall score increase by at least 10 points. We also observed that four businesses had either no change (n = 1) or their score decreased (n = 3). There does not appear to be a difference in change in overall Health Links Healthy Workplace Assessment™ score based on size of business (p = 0.36). Most of the benchmark scores also increased from baseline to Year 1. We observed the largest score increase for the organizational supports

TABLE 1 Business demographics and health and safety culture response rates (N = 25)

	N (%)	Health and safety culture survey response rate (%)	
		Baseline	Year 1
Size of business			
Micro (2–10 employees)	5 (20.0)	71.2	81.6
Small (11–50 employees)	9 (36.0)	41.9	51.0
Medium (51–200 employees)	7 (28.0)	36.7	29.9
Large (>200 employees)	4 (16.0)	18.5	15.0
Industry			
Construction	3 (12.0)	35.0	38.7
Health care and social assistance	7 (28.0)	54.4	38.0
Public administration	3 (12.0)	41.0	53.0
Real estate and rental and leasing	1 (4.0)	35.0	45.0
Services	9 (36.0)	42.8	41.4
Transportation, warehousing and utilities	2 (8.0)	17.5	43.5

benchmark (3.4 points [SD = 5.3]) and the smallest score increase for the evaluation benchmark (1.0 point [SD = 2.1]). On average, over the same period health climate increased by 0.1 points (SD = 0.3) and safety climate increased by 0.1 points (SD = 0.2).

Table 3 (health climate) and Table 4 (safety climate) show all results of the simple linear regression analysis. Changes in the evaluation benchmark were most strongly associated with changes in health climate (see Table 3). A one-point increase in the evaluation benchmark score (out of 9 points) was associated with a 0.08 point change (95% CI: 0.03 to 0.12) in health climate (out of 5 points) (Table 3). Similarly, changes in the evaluation benchmark were most strongly associated with a change in safety climate score (out of 5 points). A one-point increase in the evaluation benchmark score was associated with a 0.06 point change (0.02 to 0.10) in the safety climate score (Table 4).

4 | DISCUSSION

Our pilot study demonstrates that small businesses can improve upon their TWH policies and programs over a 1-year period as demonstrated by the change in overall Health Links Healthy Workplace Assessment™ score. However, the observed changes in TWH policies and programs were associated with negligible change in safety climate and health climate in this sample. The estimates were indeed quite small and thus might not be meaningful in practice. Below we describe potential reasons for why the anticipated relationship between improvements in TWH policies and practices and improvements in safety

TABLE 2 Scores and differences between baseline and Year 1 for the Healthy Workplace Assessment and the Employee Health and Safety Culture Survey (N = 25)

	Baseline Mean (SD)	Year 1 Mean (SD)	Score difference Mean (SD)	Range of score difference
Healthy Workplace Assessment				
Overall score (0–97)	43.4 (17.1)	54.7 (15.2)	11.3 (11.8)[a]	−10.5 to 40.9
Organizational supports (0–30)	16.6 (6.9)	20.1 (4.9)	3.4 (5.3)[a]	−4.0 to 13.0
Workplace assessments (0-12)	2.5 (2.4)	4.1 (2.3)	1.6 (2.2)[a]	−5.5 to 5.5
Health programs and policies (0–16)	4.1 (3.3)	5.9 (3.7)	1.8 (2.2)[a]	−0.9 to 8.8
Safety programs and policies (0–16)	9.6 (3.7)	10.9 (2.9)	1.4 (2.3)[a]	−4.0 to 6.8
Engagement (0–14)	7.0 (2.6)	8.9 (2.0)	1.8 (2.2)[a]	−3.2 to 5.5
Evaluation (0–9)	3.4 (2.1)	4.4 (2.1)	1.0 (2.1)	−3.3 to 5.8
Employee Health and Safety Culture Survey				
Health climate (1–5)	3.9 (0.4)	4.0 (0.3)	0.1 (0.3)[a]	−0.3 to 0.7
Safety climate (1–5)	3.7 (0.3)	3.8 (0.3)	0.1 (0.2)	−0.6 to 0.6

[a]p value < .01 for a paired samples t test.

TABLE 3 Results of simple linear regressions for associations between score difference in the Healthy Workplace Assessment and score difference in health climate score among participating businesses participating in the Small + Safe + Well study (N = 25)

Model	β Estimate	95% CI	p Value
Score difference in overall score	0.01	0.002 to 0.02	0.0211
Score difference in organizational supports	0.02	−0.003 to 0.04	0.0964
Score difference in workplace assessment	0.02	−0.03 to 0.08	0.3692
Score difference in health policies and programs	0.05	−0.001 to 0.09	0.0542
Score difference in safety policies and programs	0.02	−0.03 to 0.07	0.3540
Score difference in engagement	0.03	−0.02 to 0.08	0.2447
Score difference in evaluation	0.08	0.03 to 0.12	0.0010

Abbreviation: CI, confidence interval.

TABLE 4 Results of simple linear regressions for associations between score difference in the healthy workplace assessment and for score difference in safety climate score among participating businesses in the Small + Safe + Well study (N = 25)

Model	β Estimate	95% CI	p Value
Score difference in overall score	0.01	0.002 to 0.02	0.0174
Score difference in organizational supports	0.02	0.005 to 0.04	0.0160
Score difference in workplace assessment	0.04	−0.01 to 0.08	0.1439
Score difference in health policies and programs	0.02	−0.02 to 0.07	0.3272
Score difference in safety policies and programs	0.01	−0.04 to 0.06	0.6776
Score difference in engagement	0.04	−0.008 to 0.08	0.0996
Score difference in evaluation	0.06	0.02 to 0.10	0.0112

Abbreviation: CI, confidence interval.

climate and health climate were not observed as well as the implications for future safety climate and health climate intervention research.

First, the improvement of TWH policies and programs from baseline to Year 1 among this cohort of small businesses is promising. Of note, the positive changes in organizational supports, workplace assessment, and engagement are indicative of stated leadership support, communication with employees, and using multiple data sources to assess the needs and interests of employees.[10,17] Over time, as employees observe these practices, they may perceive positive changes to their businesses safety climate and health climate.[10] Future research is needed to determine the optimal amount of time needed between implementation of TWH policies and programs and observable changes in safety climate and health climate, should a relationship exist.

Second, previous intervention research suggests that changes in safety climate perceptions may be greater when there are changes in safety leadership practices.[11,18] In their review of organizational climate and culture, Schneider et al. argue that there is ample evidence to demonstrate that leadership is a clear antecedent of climate.[4,19] Changes in safety and health leadership may be an important implementation factor when making changes to TWH policies and programs.[9] Without adequate leadership support, changes to TWH policies and programs may not be effectively implemented. This could be contributing to the lack of association seen between the changes in the Health Policies and Programs benchmark and the Safety Policies and Programs benchmarks with health climate and safety climate.

We also observed that a few participating businesses had either no change (n = 1) in their Health Links Healthy Workplace Assessment™ or their score decreased (n = 3). There could be a variety of reasons why a few businesses saw no change or a decreased score. For example, a business could have experienced budget cuts between baseline and Year 1, which could have impacted the number of programs and policies they offered, reducing their score. Businesses may have been advised to focus on executing one program or policy well rather than offering several that are not executed well, which could reduce their score from baseline to Year 1. Businesses may have been satisfied with their baseline score and thus did not feel the need to change anything in their program.

Finally, the businesses that participated in this study had above average baseline safety climate and health climate scores (greater than 3.5 out of 5.0 on a 1.0–5.0 Likert scale). Therefore, it is possible that if we had recruited businesses with lower health climate and safety climate scores, they might have shown greater improvements in climate. Ideally, future research should target businesses with a range of safety climate and health climate scores to understand the effect of changes in TWH policies and programs on business with varying baseline scores.

Our study demonstrated only a marginal association between changes in the evaluation benchmark and changes in the health climate and safety climate. This suggests that businesses which seek and use input from employees for their health and safety programs and policies may see changes in health climate and safety climate, as perceived by their employees. Recall that evaluation was measured by asking the business which sources of data they use to evaluate their programs as well as how effective businesses perceive their evaluation efforts are. Safety climate and health climate measures are driven by employee perceptions, so it makes sense that seeking feedback from employees and working to ensure that programs are successful might elicit a better climate score. Leaders or middle management often develop safety and health policies and programs with little employee input.[10,20] As Lee et al. noted in their review, the workers themselves are the key stakeholders of safety climate interventions but are often not part of the safety climate intervention design process. They suggest that a participatory approach to safety climate interventions could yield better results.[10]

4.1 | Strengths and limitations

A unique feature of our study was the ability to link business policies and programs data to employee climate survey data across two time points. Relatedly, our measures have been tested and validated in other samples.[2,3] Of note, the study included a variety of small business sizes and industries with a range of scores on all assessments that allowed us to examine the relationships hypothesized. The small sample size did not allow us to utilize multiple regression to control for factors like industry, region, or size of business, which could be associated with safety climate and health climate. It is possible that it may take more than 1 year for changes in TWH policies and practices to have a measurable impact on climate. Ideally, we would have liked to continue to monitor these companies longer. However, due to the COVID-19 pandemic, which led to state-wide stay at home orders in Colorado in March 2020, we were unable to extend the study follow-up period. Another limitation is that we did not examine which specific TWH policies or programs were implemented to determine which practices were specifically associated with changes in climate.

4.2 | Future directions

The results of this study suggest new directions for future research. Unfortunately, the needed research will be costly and time consuming. First, it would be important to increase the measurement timeframe to allow more than 1 year to observe changes in climate. Second, it would be important to account for what TWH policies and programs are implemented and when they are made in relation to the measurement of climate. Relatedly, a wide range businesses should be studied, representing the full range of baseline TWH policy and practices. Third, given the importance of leadership in the creation and maintenance of climate perceptions,[4] it would be important to evaluate how leadership, in addition to TWH policies, programs and practices, impacts the change in safety climate and health climate. Finally, it would also be informative to test the effect of TWH policies and programs on additional outcomes, such as in individual employee health risks and occupational injuries, especially in high hazard industries.

5 | CONCLUSION

This study shows that small businesses can advance their TWH policies and programs over a 1-year period. However, these changes were associated with marginal change in their employees' perceptions of safety climate and health climate. Future research should evaluate how changes to leadership, along with changes in TWH policies and programs, contribute to potential changes in safety climate and health climate over a longer time period amongst small businesses with varying levels of safety climate and health climate at baseline. We suggest that this should be done in a way that accounts for what TWH policies, programs and practices are implemented and when they are made in relation to the measurement of climate.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

DISCLOSURE BY AJIM EDITOR OF RECORD

John Meyer declares that he has no conflict of interest in the review and publication decision regarding this article.

AUTHOR CONTRIBUTIONS

Conceptualization: Erin Shore, Liliana Tenney, Natalie V. Schwatka, Miranda Dally, Lynn Dexter, Carol E. Brown, and Lee S. Newman. *Methodology*: Erin Shore, Natalie V. Schwatka, Miranda Dally, and Lynn Dexter. *Software*: Erin Shore. *Formal analysis*: Erin Shore. *Data curation*: Erin Shore, Miranda Dally, and Lynn Dexter. *Writing—original draft preparation*: Erin Shore. *Writing—review and editing*: Natalie V. Schwatka, Liliana Tenney, Miranda Dally, Lynn Dexter, Carol E. Brown, and Lee S. Newman. *Supervision*: Natalie V. Schwatka, Miranda Dally, Carol E. Brown, Liliana Tenney, and Lee S. Newman. *Project administration*: Natalie V. Schwatka and Lee S. Newman. All authors have read and agreed to the published version of the manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS APPROVAL AND INFORMED CONSENT

Our study included informed consent for all participants and was approved by the Colorado Multiple Institutional Review Board (COMIRB).

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