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The development and validation of a *Total Worker Health*® Climate scale

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Abstract

The purpose of this study is to develop a *Total Worker Health*® Climate (TWH-c) Scale, addressing workers' perceptions of the relative priority of safety, physical health, and mental well-being in their organizations. It aims to fill a notable gap in *Total Worker Health*® (TWH) literature: the absence of a validated scale assessing TWH perceptions in the workplace. Building upon the theory of organizational climate (Beus et al., 2023), two novel physical health and mental well-being sub-climate scales were developed and joined with a validated safety climate scale to create an overall TWH Climate (TWH-c) scale. This method includes four phases. First, items were generated based on literature review, cognitive interviews with job incumbents, and evaluations of subject matter experts. Second, factor analyses were conducted on three separate samples. Third, shared perceptions across units were tested to examine Physical Health Climate (PHC) and Mental Well-being Climate (MWC) as shared sub-climates. Finally, criterion-related validity was assessed through regression analyses. The resulting scale includes 40 items (16 SC items, 14 PHC items, 10 MWC items), and provides scores for each sub-climate and an overall TWH-c. Each sub-climate was significantly related to important outcomes within its domain at the individual, unit, and organization levels. The overall TWH-c score was also linked to these outcomes in addition to unique job-related outcomes at all levels. This study provides the first psychometrically validated tool for measuring organizational TWH-c, an efficient method

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We have no known conflict of interest to disclose. Findings from the development and validation of the Total Worker Health® (TWH) Climate Scale were disseminated at three major academic conferences. Early conceptualization and preliminary results were presented in 2023 at the 4th International Symposium to Advance Total Worker Health in Bethesda, Maryland. Final results were presented at the 2024 Society for Industrial and Organizational Psychology (SIOP) conference in Chicago, focusing on the scale's validation. A follow-up presentation at the 2025 Work, Stress, and Health (WSH) conference in Seattle highlighted the use of item response theory to refine and shorten the scale, emphasizing psychometric improvements and practical applications.

to assess TWH as a holistic climate. Further implications are discussed regarding its use and expansion.

Keywords

Total Worker Health®; occupational safety; worker health; worker well-being; organizational culture; organizational climate; scale development

In 2022, there were 5,190 fatal and 2.8 million non-fatal workplace injuries and illnesses in the U.S.—equivalent to 2.8 cases per 100 full-time employees (BLS, 2023). Beyond physical risks, workers face mental and physical health hazards shaped by financial, economic, and work-related factors (Forbes & Krueger, 2019). To address these challenges, the U.S. National Institute for Occupational Safety and Health (NIOSH) developed the *Total Worker Health®* (TWH) approach, defined as policies, programs, and practices that integrate protection from safety and health hazards with efforts to promote overall wellness (NIOSH, 2016). Within this framework, *Safety* is the state of being protected from acute physical harm or injury. *Physical Health* is the condition of the body over time, including physical fitness, maintained to perform daily physical functions and to avoid chronic physical injuries/illnesses. *Mental Well-being* refers to mental health and wellness, characterized by positive affect, low levels of stress, and sustained cognitive functioning both at work and at home. TWH extends traditional occupational safety and health by recognizing that safety, health behaviors, and organizational factors are interconnected and must be addressed holistically. Mental health concerns, for example, affect 1 in 5 U.S. adults and have worsened since COVID-19, contributing to nearly \$200 billion in lost earnings annually (NAMI, 2023). Compromised mental well-being reduces productivity, as seen with depression (Ekman et al., 2013; Thomas & Morris, 2003), and imposes greater financial burdens than heart disease, stroke, cancer, or obesity (Goetzel et al., 2018). A holistic framework that unites safety, physical health, and mental well-being is essential for improving employee experiences and supporting organizational performance. However, organizations still struggle to assess how well these domains are addressed collectively. Traditional measures often isolate them, offering little insight into the broader work environment. A validated climate measure that includes safety, physical health, and mental well-being would help organizations evaluate their current state, identify needs, track progress, and guide resource allocation and interventions. It would also advance research on the effectiveness of holistic approaches for improving worker outcomes.

The dual focus of protecting workers from safety and health hazards, while also promoting physical health and mental well-being, is key (Anger et al., 2019). The combined effects of each domain examined from multiple disciplines creates an overarching framework, as a high-level construct that highlights the unique benefit from the interaction of its discrete parts, known within this context as “integration” (Punnett et al., 2020). This underscores the significance of integrating safety, physical health, and mental well-being into the core of workplace policies and practices (Chari et al., 2018). This requires holistic examination of the workplace from each discrete domain in a way that allows for the observation, implementation, and evaluation of the combined effects of safety, physical

health, and mental well-being. Collaborative endeavors, involving *Total Worker Health*[®] (TWH) professionals and partners, support advancing research, implementing interventions, and translating findings in the pursuit of enhancing the design of healthy work environments and the wellness of workers through this integrated approach (Schill et al., 2019). This paves the way for assessing, monitoring, and improving the wellness of workforces.

Embracing the TWH approach involves leveraging scientific knowledge to effectively advance research and guide policy making across the multi-faceted aspects of work. This extends beyond organizational structure and employment practices to include supervisory methods and workplace culture. Through evidence-based programs, practices, and interventions that consider factors such as leadership, organizational support, engagement strategies, incentives, training, and evaluation (NIOSH, 2016), TWH initiatives aim to create sustainable work environments that effectively address a spectrum of challenges. As TWH theory and practice expand to meet evolving workforce dynamics and stakeholder needs, these holistic programs aim to enhance the well-being and experiences of employees across the organization (Howard et al., 2016). This approach has been shown to benefit employees at all levels and enhance their work experiences (Brossoit et al., 2023; Sorensen et al., 2013).

Holistic Evaluation as a Key Focus of Total Worker Health

TWH seeks to advance worker well-being through the holistic alignment of safety, physical health, and mental well-being, driving change at institutional, unit, and individual levels. This approach under the TWH framework entails the systemically integrated coordination of workplace policies, programs, and practices to address these domains simultaneously—both on and off the job (NIOSH, 2016; Schill & Chosewood, 2013). This concept emphasizes breaking down silos between traditional safety practices and broader health initiatives, fostering a holistic approach that acknowledges the interconnectedness of physical, mental, and social factors affecting workers. However, effectiveness of this approach hinges on one critical prerequisite: the ability to *measure* safety, physical health, and mental well-being in a way that is discrete, capturing each domain distinctly, while also being complete enough to be considered holistic. Currently, such measures remain underdeveloped, limiting TWH's potential.

Despite a clear goal, TWH efforts struggle due to a lack of adequate measurement as assessments are not currently capable of providing sufficient insight into each domain of safety, physical health, and mental well-being, both independently and in tandem. While TWH interventions have shown benefits, such as reducing injuries and managing chronic conditions (Anger et al., 2019; Feltner et al., 2016), many overlook organizational dynamics, group-level outcomes, and employee perceptions (Howard et al., 2016; Loeppke et al., 2015). Current tools also lack the capacity to holistically assess these domains across work and non-work contexts (Tamers et al., 2019). Existing scales (e.g., Schwatka et al., 2020; Sorensen et al., 2018) are constrained by limited dimensionality, psychometric rigor, and applicability to diverse organizational contexts. Without a validated, multidimensional tool to assess TWH perceptions, efforts to model outcomes beyond individual-level incidents remain constrained. A robust measurement framework is essential to enable data-driven

strategies that align safety, physical health, and mental well-being at all levels—laying the foundation for a holistic approach.

Tapping into the Organizational Climate Perspective

Organizational culture is shaped by underlying beliefs and core values that define what is essential to a company, whereas organizational climate refers to the employees' shared perceptions about their company's policies, procedures, and practices as they relate to those core values (Zohar, 1980; Zohar & Hofmann, 2012). For example, studies on safety climate (SC) have shown that employees' perceptions of their leadership's commitment to safety influence the employees' motivation and knowledge, which in turn affect hazardous exposures, safety incidents, and injury outcomes (Christian et al., 2009). SC is established as a robust leading indicator (i.e., predictor) of future occupational safety outcomes across many industries (Christian et al., 2009; Griffin & Neal, 2000; Nahrgang et al., 2011). Consistent with the SC literature, we define TWH Climate (TWH-c) as *employees' shared perceptions of their organization's policies, procedures, and practices as they relate to (or reflect) the value and importance of their safety, physical health, and mental well-being both within the organization and beyond*. We posit that a good TWH-c score will serve as an indicator of safety, physical health, and mental well-being outcomes. TWH-c scores can guide holistic and streamlined decision-making about TWH interventions and the evaluation of their effectiveness.

TWH adopts a comprehensive approach, examining how safety, physical health, and mental well-being, both in and outside the workplace, collectively influence worker outcomes. This perspective offers enhanced opportunities for meaningful support and systemic improvement in worker welfare (Punnett et al., 2020). Adopting an organizational culture and climate perspective, considering employees as the beneficiaries of TWH interventions, offers crucial insights. Their shared climate perceptions regarding safety, physical health, and mental well-being are vital for evaluating TWH programs that are guided by theoretical frameworks capturing research in each of these TWH domains.

The adoption of an organizational culture and climate framework naturally introduces a multilevel perspective to the proposed TWH framework. By emphasizing shared perceptions among employees, this approach acknowledges that individual experiences are shaped by organization-level factors. The organization serves as the referent for these perceptions, linking individual outcomes, such as safety, physical health, and mental well-being, to broader policies, procedures, and practices. This multilevel view highlights the need for TWH interventions to address both the worker as the end user and the organizational context, capturing the dynamic interplay between personal and environmental influences on worker well-being.

Organizational Theories Underscore the Potentials of Organizational Climate Perceptions

Organizational climate theory provides a foundation for understanding the development of a TWH-c, which holistically considers safety, physical health, and mental well-being

into workplace norms and practices. Climate forms through employees' shared perceptions of policies, leadership behaviors, and social cues that emphasize the value of these interconnected domains (Beus et al., 2023). This shared understanding emerges as leaders and organizational systems create consistent environments, practices, and messaging that prioritize TWH (James & Jones, 1974). These perceptions crystallize through repeated social interactions and collective interpretation, aligning individual behaviors with organizational goals. We propose that TWH-c comprises the three aforementioned interwoven sub-dimensions, which arise through collective sensemaking (Beus et al., 2023). Employees cognitively interpret their environment by observing how TWH-related initiatives are implemented, decoding top and local leadership messaging regarding TWH, and discussing experiences with peers (Griffin & Curcuruto, 2016; Mearns & Reader, 2008). This process aligns with the core motivational force of the theory, uncertainty reduction. Through these shared experiences, workers seek clarity on organizational expectations (Mearns & Reader, 2008). Perceptions are shaped by shared experiences and collective understanding among employees that consistently display what their leaders and organization find important (Schwatka et al., 2018). This process occurs at multiple levels, with top management policies and practices interacting with local leadership and peer dynamics to create shared understandings. These influences often operate in tandem, reinforcing or shaping one another to produce coherent climates within units (Beus et al., 2023; Klein & Kozlowski, 2000). Over time, shared perceptions stabilize, guiding behaviors such as safety compliance or participation in wellness programs (Pronk, 2013; Zohar & Polachek, 2014).

The three dimensions of workplace safety, physical health, and mental well-being, are deeply interconnected and reinforce each other over time, contributing to perception sharing and collective meaning-making (Nielsen & Miraglia, 2017). These components, while often investigated in isolation, have significant interplay. For example, robust physical health initiatives (e.g., ergonomic programs) reduce musculoskeletal pain, which indirectly improves mental well-being (Hammer & Perry, 2019). Supporting mental well-being, in turn, can lead to safer, more attentive employees in both professional and personal settings by ensuring enhanced situational awareness and safety compliance (Zweber et al., 2016). When workers feel secure physically and emotionally, they are more engaged, productive, and capable of managing health challenges from various aspects of life (Sorensen et al., 2016). The alignment between physical health and mental well-being has been linked to improved general health, higher life satisfaction, and reduced productivity loss (Katz et al., 2019). In summary, when one dimension is supported, it becomes easier to enrich the others, creating a reinforcing cycle of well-being. A commitment to these three dimensions fosters synergy, in which workers feel safer, more supported, and more invested in maintaining their own and their colleagues' well-being, both at work and in their personal lives. This interconnectedness underscores the need for holistic measurement, as segmented approaches (e.g., assessing safety separately) can miss critical interactions (Schwatka et al., 2018).

Unlike traditional TWH research (focused on individual outcomes), a climate lens captures how collective interpretations shape program success (Nielsen & Miraglia, 2017). For instance, well-designed wellness programs fail if employees perceive them as punitive (Lee et al., 2024). Climate also explains cross-organization variability: identical programs yield

different results in places where cultural norms discourage participation (He et al., 2019). The predictive utility of climate is well-documented in safety research, where strong safety climates reduce injuries (Huang et al., 2016; Lee et al., 2021). However, existing TWH tools (e.g., Sawhney et al., 2018) lack climate-specific metrics or are impractical for small firms, while modular scales (e.g., Tamers et al., 2019) risk content validity by neglecting overlaps between domains. A unified scale, modeled on validated safety climate instruments (Zohar, 1980), would enable leaders to assess interventions holistically, offering opportunities to truly engage with the multi-faceted aspects of the TWH framework.

Aims and Hypotheses

To address the existing gaps in TWH measurement, this study aimed to develop and validate a novel TWH-c scale that captures workers' shared perceptions about organizational priorities related to safety, physical health, and mental well-being. Benchmarking the method we employed in developing and adapting other established SC scales as a foundation (Zohar & Luria, 2005), we developed two additional sub-climate scales that focus on workers' shared perceptions about the value and importance of their health and well-being to their company. This innovative scale encompasses three core dimensions of TWH, yielding three sub-climate scores: safety climate (SC) based on an existing validated scale (Zohar & Luria, 2005), and the two new sub-climates, physical health climate (PHC) and mental well-being climate (MWC). As discussed earlier, the integrated theory of organizational climate suggests the mechanism for the emergence of the TWH-c via collective sense-making. Based on this, we *hypothesized* that each sub-climate scale would exhibit reliability and predict outcomes within its own domain (e.g., SC is associated with safety outcomes such as better safety compliance and participation). With TWH focusing on the holistic consideration of safety, physical health, and mental well-being as a key facilitator of positive outcomes for the individual, their unit, and their organization, we also *hypothesized* that the overarching TWH-c would explain the relationship between these sub-climates, and that a single TWH-c score would have utility in predicting outcomes across all three domains: 1. safety outcomes, 2. physical health (e.g., higher levels of healthy behaviors regarding diet, exercise, and sleep), 3. mental well-being outcomes including job-related well-being (e.g., job satisfaction) and general well-being (e.g., less job stress; better mental health, work-family balance, and life satisfaction), as well as 4. important job-related outcomes (e.g., turnover intentions; work engagement). Our study's goal was to produce the first psychometrically validated holistic measurement tool for TWH-c, providing an effective and reliable way for organizations to gauge TWH standing and progress.

Method

The process of scale development and validation was conducted in four phases, each with its own qualitative or quantitative techniques: 1. item generation and reduction, 2. testing of psychometric properties, 3. testing of shared perceptions, and 4. assessing criterion-related validity. The goal of Phase 1 was item generation and reduction, including literature review, semi-structured interviews and evaluations with experts, and cognitive interviews with job incumbents. Phase 2 aimed to test the psychometric properties of our developed items as a reliable scale, including factor structure as well as convergent and discriminant validity.

Phase 3 tested the unit-level agreement of the proposed scale in order to report scores as true shared climate perceptions. The aim of Phase 4 was to assess the predictive ability and criterion-related validity of the finalized scale.

Phase 1: Item Generation and Reduction

Phase 1 employed a mixed methods approach to develop items for the PHC and MWC components of the TWH-c scale. The process involved deductive reasoning based on a literature review, semi-structured interviews with TWH experts, cognitive interviews with job incumbents, and quantitative ratings from subject matter experts (SMEs) to arrive at a final draft of the items. The literature review and interviews with TWH experts guided the generation of an initial set of items which was then refined through a sequence of cognitive interviews with job incumbents. After this, an iterative process of item review by SMEs culminated into quantifiable ratings that were used to trim the scale into its final form.

Phase 1 Method: The literature review covered NIOSH TWH materials and published research on the TWH framework, including research about TWH intervention strategies and training materials such as the Hierarchy of Controls (Anger et al., 2015; NIOSH, 2015; Sawhney et al., 2018; Schwatka et al., 2020; Sorensen et al., 2018). Certain features integral to the TWH framework already align with the SC literature (Flin et al., 2000; Zohar, 1980). These include open communication about the associated domain (be it safety, physical health, or mental well-being), the provision of resources and training per domain (such as personal protective equipment [PPE] and training regarding its proper usage for long-term health, or employee assistance programs and communicating their usefulness for well-being), and the removal of obstacles related to the domain regardless of productivity (such as competing demands between work and the domain). These consistencies across frameworks aided the initial item generation in which TWH experts and SMEs were recruited to assess theoretical saturation and propose dimensions at bi-weekly meetings for three months (6 meetings total).

During these meetings, we collected feedback regarding content validity of the two proposed sub-climate scales from 15 SMEs with expertise in relevant fields, including occupational health and safety experts, industrial engineers, TWH practitioners, and educators in academia, government, and the private sector. They were given the list of newly generated items alongside the definition of each climate domain and asked for their feedback regarding construct correspondence using a 10-point Likert scale, and to provide their thoughts on each item's uniqueness, clarity, and construct distinctiveness in a written comment. This modified Hinkin and Tracey (1999) approach allowed us to gather their thoughts on our proposed multilevel climate while also giving SMEs an opportunity to assess potential deficiencies, which the traditional Hinkin and Tracey approach (Colquitt et al., 2019) does not require to evaluate content validity (e.g., the clarity and relevance of each item). Suggestions about the proposed dimensionality of the scale, specific definitions of safety, physical health, and mental well-being, and options for discrete items were solicited as well. Items were then altered or removed based on SMEs' suggestions through an iterative discussion process with SMEs, utilizing their ratings and comments. This feedback was used to refine the quality of the initial sets of 27 and 29 items for PHC and MWC, respectively.

These items were then presented to 10 frontline employees through a cognitive interview process to assess readability, clarity, and appropriateness. Participants read each item aloud, provided their rating, explained their reasoning for said rating, and shared their opinion on how easily the item could be understood by their peers. The interview results were used to improve the items before our original panel of SMEs provided a final review. At the end of their review, quantitative ratings of content validity were given in order to assess the assumed utility and contribution of each item to the validity of the entire scale. This process, drawn from the Delphi Method (Gordon, 1994), culminated in a final approval rating per item. This led to the removal of more items in each sub-climate, resulting in a revised scale of 20 items for PHC and 21 items for MWC.

Phase 1 Results: Consensus from our field and academic experts determined the scope of physical health and mental well-being under the TWH-c framework. The insights gathered through these interviews were instrumental in refining the definitions, providing clarity, and facilitating the development of a robust measurement tool for organizational culture and climate related to TWH. The implementation of the safety sub-climate, with a short introduction to interpret the associated prompt, was not altered due to precedent (Zohar & Luria, 2005; Zohar & Polachek, 2014). SMEs suggested that physical health should be considered as “how well your body is working” with examples including freedom from illness or injury. The PHC scale should inquire about how organizations support physical health through personal improvement and maintenance of physical health via exercise, diet, and sleep. Specific examples include providing healthy diet plans, discounted gym memberships, and information on proper sleep. Respondents were directed to focus on their company’s initiatives in supporting physical health with the prompt provided in Table 4. SMEs defined mental well-being as the representation of a person’s mental health and quality of life, with examples being the presence of positive emotions, high morale, and reduction of burnout and stress. Organizations can support this through various means, such as providing stress prevention programs, employee assistance, and designing work to avoid burnout. This feedback from SMEs helped guide our definition and survey prompt for MWC to focus on what organizations are doing to support employee mental well-being. The MWC prompt is also presented in Table 4. Our SMEs helped provide the scope for physical health and mental well-being under the TWH approach and advised how to clearly communicate this through prompts provided to survey respondents.

Phase 2: Testing of Psychometric Properties

The PHC and MWC sub-climate scales generated in Phase 1, along with Zohar and Luria’s original 16-item SC scale, were administered to three separate samples to obtain data from multiple sources. These included a general sample from a survey panel provider (Qualtrics; Sample 1) and the employees of two companies (Samples 2 and 3). Exploratory factor analysis (EFA) was conducted on the general sample to explore the underlying factor structure in a sample of workers from various industries. Subsequent confirmatory factor analyses (CFA) were conducted on the company samples to test whether the same factor structure of the scale held true. Whether scores should be computed for three sub-climates, one holistic climate score, or both were determined by the results of a second-order CFA. Tests of convergent and discriminant validity were also conducted to confirm that the novel

scales are effectively capturing their respective facets of TWH-c while remaining distinct from unrelated constructs. For this, the average variance extracted (AVE) statistic (Fornell & Larcker, 1981) was utilized, which reflects the proportion of variance in a latent construct captured by its indicators (manifest variables) relative to the measurement error. It measures how well the indicators converge to represent the underlying construct. An AVE greater than 0.50 indicates stronger convergent validity. When comparing the AVE of a target construct with its factor-correlation to a related but distinct construct, a higher AVE for the target construct suggests that it is well-defined and distinct. These procedures were completed so that each sub-climate scale was tested individually to display its suitability as a measure of its own domain before combining them to supply evidence for aggregation into a single TWH-c score.

Phase 2 Method: Sample 1 was recruited through a survey panel provider (Qualtrics) to obtain data from a population of workers from various industries. Participants from this panel were vetted in order to match the specifications of the project specifically as a general sample for EFA. Completion times below five minutes (one standard deviation below the mean response time), suspicious responses to open-ended items, failure on attention checks, and suspicious invariance (participants with rating variance < 0.20 were flagged for review; Lopez-Fernandez et al., 2018) were grounds for removal from the dataset. This level of fidelity was communicated with the panel provider during data collection to communicate the level of data quality necessary. The attention check followed the panel provider's recommendation to be present in the first half of the survey (Appendix A).

Sample 1 included 788 anonymous participants for our general sample who met the criteria quoted above. The panel provider ensured that participants were from a variety of industries, at least 18 years of age, employed full-time, and compensated appropriately based on survey length. Of these participants, more than half identified as women (56%) and as white (69.4%), with ages ranging from 18–65 years ($M = 44.80$, $SD = 15.06$).

The other two samples were from a manufacturing company (Sample 2) and a utility company (Sample 3) located in the U.S. Pacific Northwest; all participants completed an IRB-approved informed consent process. Sample 2 included 376 participants with 66.2% identifying as men and 32.2% with ages ranging from 25–34 years. Most of this sample identified as white (58.5%) and had tenure with the company ranging from 1–5 years (45.7%). Sample 3 included 165 participants with 49.7% identifying as men and 27.9% in their 50s. Most of this sample also identified as white (73.3%), with 24% of this sample's tenure ranging from 1–5 years with their company.

Datasets were cleaned by removing multivariate outliers and incomplete cases listwise. Mahalanobis distance cut-offs were 45.31 for PHC and 46.79 for MWC. Regarding assumption checking, Bartlett's test of sphericity was significant for both PHC and MWC, and there was adequate sampling accuracy via the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (0.967 and 0.956, respectively). There was passable linearity, normality and homoscedasticity, and nothing to suggest additivity (no overlap in variables implied by redundant agreement or being too highly correlated) for both PHC and MWC datasets, as

evidenced by the absence of significant departures from normal distribution and the presence of consistent variances across levels of the predictor variables within each climate domain.

Phase 2 Analyses: EFA were performed on Sample 1 to examine the factor structures of both the PHC and MWC sub-climate scales. Oblique rotation was used, retaining factors with eigenvalues above 1.0. Items with substantial cross-loadings across multiple factors (> 0.40) or low factor loadings (< 0.40) were removed. Confirmatory factor analyses were then conducted using Samples 2 and 3 on both the PHC and MWC sub-climate scales to confirm the factor structures obtained from the general sample. Model fit was assessed with the χ^2 statistic, comparative fit index (CFI), Tucker-Lewis index (TLI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA), utilizing cut-off recommendations by Hu and Bentler (1999) (i.e., CFI and TLI $> .90$, SRMR and RMSEA $< .08$). Models were examined using the larger company sample first (Sample 2), before reaffirming with the smaller sample (Sample 3). After the models were confirmed for each sub-climate, second-order CFA was conducted on a combined dataset of both companies to see if a meaningful TWH-c emerged from combining SC, PHC, and MWC. A grouping variable for the company was included to maximize power. The model specified that Total Worker Health Climate would explain the relationships among Zohar's full 16-item SC scale (Zohar & Luria, 2005) and the newly generated 14-item PHC and 10-item MWC sub-climate scales from the prior factor analyses.

Phase 2 Results: For PHC, EFA analysis using Sample 1 showed a three-factor structure retaining 16 of the 20 original items that fit the data best. The first factor (Communication and Resources; six items) encompassed educating workers and offering programs to improve health. The second (Hygiene and Recovery; three items) addressed policies, resources, and enforcement of hygiene and injury-related recovery. The last factor (Commitment and Action; seven items) focused on the promotion of worker health and taking action to ensure health. For MWC, EFA procedures on Sample 1 displayed a single-factor structure retaining all 21 items as the best explanation for the data, as they all loaded onto one general factor encompassing mental well-being in the workplace. Table 1 and Table 2 present the eigenvalues, variance explained, and final EFA loadings for both PHC and MWC, respectively.

When the viable 16-item PHC model was assessed with CFA using Sample 2's data, the model fit was reasonable (CFI = 0.94; TLI = 0.93; RMSEA = 0.09; SRMR = 0.05). However, improvements were suggested by modification indices and supported by theoretical considerations, including item redundancy and SME feedback. Using this information, items 6 and 16 were trimmed to enhance the model's overall fit (CFI = 0.96; TLI = 0.95; RMSEA = 0.07; SRMR = 0.05). All fit indices for tested CFA models are presented in Table 3. This new 14-item model (see Table 4) also fits Sample 3's data well (CFI = 0.97; TLI = 0.97; RMSEA = 0.07; SRMR = 0.03).

For MWC, all items were placed into a CFA model using Sample 2's data, which yielded inadequate fit (CFI = 0.90 TLI = 0.88; RMSEA = 0.12; SRMR = 0.04). Items were trimmed using a combination of initial EFA loadings, CFA loadings, and modification indices, as well as theoretical considerations (interview and SME feedback, TWH literature, etc.) This

helped remove additional redundancy and interrelation between items, yielding a 10-item scale with the following fit in Sample 2 (CFI = 0.99; TLI = 0.98; RMSEA = 0.07; SRMR = 0.02). All fit indices for tested CFA models are presented in Table 3. This 10-item scale (see Table 4) also fits well using the data from Sample 3 (CFI = 0.98; TLI = 0.98; RMSEA = 0.08; SRMR = 0.02).

Second-order CFA was conducted on a combined dataset of both companies (Samples 2 and 3) to see if a meaningful TWH-c would emerge. The model specified that TWH-c would explain the relationships among Zohar's full 16-item SC scale (Zohar & Luria, 2005) and the newly generated 14-item PHC and 10-item MWC scales from the prior factor analyses. This yielded adequate fit (CFI = 0.92; TLI = 0.91; RMSEA = 0.07; SRMR = 0.05), justifying the combination of sub-climate scores into one equally weighted TWH-c aggregate, formed by an average of each sub-climate. These findings support our hypotheses of establishing a reliable measure of a meaningful combined TWH-c comprising safety, physical health, and mental well-being sub-climates. Final scales and their reliabilities can be found in Table 4.

To assess convergent validity, AVEs were calculated. PHC showed AVE values of 0.56 in Sample 2 and 0.67 in Sample 3, while MWC had AVE values of 0.74 in Sample 2 and 0.76 in Sample 3. These values exceed the threshold of 0.50 suggested by Fornell and Larcker (1981), indicating that the constructs explain a significant proportion of variance in their indicators. For comparison, the AVE of the established SC scale was 0.60 in Sample 2 and 0.66 in Sample 3, further supporting acceptable convergent validity.

Discriminant validity was examined by comparing the AVE for each construct to the square of its correlation (r^2) with Diversity Climate (DC; McKay et al., 2007), a distinct construct focused on inclusivity and equity that was specifically collected to test its discrimination from our novel climate scales. For PHC (AVE = 0.56 in Sample 2 and 0.67 in Sample 3), r^2 values were 0.34 ($r = 0.58$) in Sample 2 and 0.41 ($r = 0.64$) in Sample 3, with AVE values exceeding r^2 , supporting discriminant validity. Discriminant validity was also supported for MWC (AVE = 0.74 in Sample 2 and 0.76 in Sample 3), with r^2 values of 0.48 ($r = 0.69$) in Sample 2 and 0.59 ($r = 0.77$) in Sample 3. Similarly, SC showed consistent results (AVE = 0.60 in Sample 2 and 0.66 in Sample 3), with r^2 values of 0.21 ($r = 0.46$) in Sample 2 and 0.29 ($r = 0.54$) in Sample 3. A second-order CFA model confirmed these findings, with fit indices (CFI = 0.92; TLI = 0.91; RMSEA = 0.07; SRMR = 0.05) and a significant chi-square difference test ($\chi^2(\Delta df = 1390) = 2860.2, p < .01$), further supporting the distinctiveness of these constructs.

Phase 3: Testing of Shared Perceptions

Phase 3 Method: Homogeneity tests and multilevel CFA using company data across units tested whether PHC and MWC as sub-climate scores could be examined at the team level as shared climate perceptions (Bliese, 2000). Individual-level climate scores capture each employee's individual perception of the work environment. The unit-level climate, then, emerges through the aggregation of these individual scores. This aggregation reflects a more collective and shared understanding of the climate within the unit. To assess the unit level, two additional samples were collected from a working population, with data from two

timepoints (Times 1 and 2, with a 4-month lag) to examine the time-lag prediction of TWH-c on outcome variables at the collective-level. These additional samples were collected to both provide time after climate assessments and to increase the number of collective units per sample, which enhances our ability to assess collective outcomes of climate and provides a more robust assessment of collective-level perceptions. Sample 4 comprises 339 participants from 69 smaller organizations in China at Time 1, where we assessed organization-level climates. These organizations are from a variety of industries, such as manufacturing, construction, healthcare, agriculture, mining, transportation, and finance. At Time 2, data were collected from 50 of these organizations, focusing on organization-level outcomes and obtaining objective outcomes reported by top management teams. Across both time points, 56% of participants identified as men, and were 33.90 years old on average ($SD = 6.03$) with 7.15 years of industry tenure ($SD = 1.92$). The Cronbach's α for SC, PHC, and MWC are 0.90, 0.95, and 0.96, respectively.

Sample 5 consisted of 104 work units from two organizations in the healthcare and logistic industries located in Taiwan. In this study, we operationalized units based on shared leadership or supervision, common location or environment, and regular social/collaborative interaction, rather than the traditional workgroup definition tied to formal organizational structures. This approach better captured functional relationships and communication patterns shaping daily work experiences in these organizations, regardless of formal hierarchy. At Time 1, we assessed both organization-level climates and outcomes, while Time 2 focused on collecting objective outcomes. However, only one of the two organizations provided objective outcome data, which was reported by their human resources management team. Across both time points, 51% of participants identified as men and 55% of participants were under 40 years old. Average employee tenure was 2.45 years ($SD = 1.34$). The Cronbach's α for SC, PHC, and MWC are 0.99, 0.97, and 0.98, respectively.

Phase 3 Analyses: To justify aggregation of individual responses into unit-level constructs, reliability and within-group agreement indices ($rwg(j)$) and intra-class correlations ($ICC(1)$ and $ICC(2)$) were calculated. These indices assess the extent to which employee perceptions within a work unit are shared and distinguishable from those of other units. A multilevel CFA was then conducted to evaluate the fit of the TWH-c construct at the unit level. Analyses were performed on Samples 4 (organization level) and 5 (unit level). Our choice to include unit-level assessment despite the referent addressing overall organizational climate is based on the collective sensemaking mentioned prior, as this can also exist within local contexts (Beus et al., 2023). Even when item referents are framed at the organization level, meaningful and reliable unit-level climates can still emerge when shared interpretations are shaped by local leadership and social dynamics (Klein & Kozlowski, 2000). All climate variables were subjected to homogeneity tests, with SC serving as a comparative benchmark given its established role as a shared unit-level construct (Murphy et al., 2018).

Phase 3 Results: In Sample 4, agreement and between-organization differentiation were strong across all variables. SC showed $rwg(j) = 0.96$, $ICC(1) = 0.29$, and $ICC(2) = 0.67$;

PHC had $\text{rwg}(j) = 0.97$, $\text{ICC}(1) = 0.34$, and $\text{ICC}(2) = 0.72$; and MWC had $\text{rwg}(j) = 0.90$, $\text{ICC}(1) = 0.17$, and $\text{ICC}(2) = 0.50$. The $\text{ICC}(1)$ values signify meaningful between-unit variance while sharing the same organization, which is a necessary condition for establishing unit-level constructs. The $\text{ICC}(2)$ values indicate between-unit distinction, and the $\text{rwg}(j)$ values indicate consensus within units regarding climate perceptions, which can be expected from groups within the same organization. The $\text{ICC}(2)$ values further suggest acceptable reliability of the aggregated unit-level means, supporting their stability as indicators of shared unit climate. Overall, Sample 4 demonstrates a well-differentiated climate structure appropriate for multilevel analysis.

Sample 5 showed similar within-unit agreement and between-unit differentiation. SC yielded $\text{rwg}(j) = 0.96$, $\text{ICC}(1) = 0.25$, and $\text{ICC}(2) = 0.72$; PHC had $\text{rwg}(j) = 0.94$, $\text{ICC}(1) = 0.15$, and $\text{ICC}(2) = 0.56$; and MWC showed $\text{rwg}(j) = 0.90$, $\text{ICC}(1) = 0.23$, and $\text{ICC}(2) = 0.70$. Collectively, the agreement and reliability indices across both samples provide strong support for aggregation and confirm the appropriateness of Samples 4 (organization level) and 5 (unit level) for multilevel analysis of TWH-c and its outcomes.

Multilevel CFA involved specifying the measurement model of an overarching TWH-c construct based on the composite scores of the SC, three factors for the PHC, and the MWC of Sample 4 (Figure 1). Sample 4 was used specifically to maintain alignment between the structure of the data and the referent of the scale, which is held at the organization level. Satisfactory fit was detected with $\chi^2 = 16.80$ ($df = 10$, $p = 0.08$), $\text{CFI} = 0.99$, $\text{TLI} = 0.99$, $\text{RMSEA} = 0.04$, $\text{SRMR}_{(individual\ level)} = 0.02$, and $\text{SRMR}_{(organization\ level)} = 0.03$. The findings offer further evidence of the robustness and validity of the TWH-c construct operationalized at the group level.

Phase 4: Assessing Criterion-related Validity

Phase 4 Method: Criterion-related validity was assessed using separate regression analyses for each climate, predicting outcomes within that climate's domain, in Samples 2, 4, and 5. Specifically, the data from Samples 2, 4, and 5 were used to assess criterion-related validity using individual-, organization-, and unit-level outcomes, respectively. This allows for testing the robustness of the sub-climate–outcome relationships across multiple levels of analysis. The aggregate TWH-c was also assessed, as it is presumed to be associated with outcomes across domains and serves as a single metric of overall TWH perceptions in a workplace. Correlations with outcomes at the individual level for Samples 2 and 3, and at the collective level for Samples 4 and 5, were conducted for each sub-climate as well as the TWH-c aggregate score. Reliability statistics and correlations among all climates and outcomes from each source of data are presented below. Criteria in the study include: 1. safety outcomes, 2. physical health outcomes, 3. mental well-being outcomes, and 4. job-related outcomes. For the aggregated collective outcome, $\text{ICC}(1)$ and $\text{rwg}(j)$ are presented to justify the aggregation of individual perceptions into collective-level variables. $\text{ICC}(2)$ values are also presented, although Bliese et al. (2019) suggest that high $\text{ICC}(2)$ values, while beneficial, are not essential for detecting emergent collective effects. See Tables 5–8 for correlations among all climates and outcomes for each sample. See Appendix B for all the following measures used at the individual and collective levels.

Phase 4 Outcome Measures

Safety Outcome Measures. At the individual level in Sample 2, safety measures addressed safety compliance and participation. *Safety Compliance* was measured using a 4-item scale from Griffin and Neal (2000) and a 5-point agreement scale; e.g., “I carry out my work in a safe manner.” Cronbach’s α was 0.91 for Sample 2 and 0.93 for Sample 3. *Safety Participation* was similarly measured using a 4-item scale from Griffin and Neal (2000) and a 5-point agreement scale; e.g., “I promote the safety program within the organization.” Cronbach’s α was 0.84 for Sample 2 and 0.87 for Sample 3.

At the collective-level in Sample 4, *Organization Safety Compliance* ($\alpha = 0.71$; ICC(1) = 0.25; ICC(2) = 0.61; rwg(j) = 0.94) and *Safety Participation* ($\alpha = 0.78$; ICC(1) = 0.29; ICC(2) = 0.67; rwg(j) = 0.96) were collected at Time 2, utilizing the reference shift model to adapt items from the individual level to the organization level. Reported *Incident Rate*, *Injury Rate*, and *Injury Expenses* for the organization were assessed in Sample 4 by three items rated objectively such as “Within the past 6 months, while on the job, how often have organization members been involved in recordable incidents?” In Sample 5, *Unit Safety Compliance* ($\alpha = 0.97$; ICC(1) = 0.18; ICC(2) = 0.63; rwg(j) = 0.90) was collected at Time 1, utilizing the reference shift model to adapt items from the individual level to the unit level, as well as a single item to report *Unit Injury Rate* at Time 2, “How often have unit members been injured at work since the beginning of this year?” While our interpretation aligns with theoretical models positioning climate as a driver of safety outcomes (e.g., Christian et al., 2009), and precedent displaying that climate perceptions exhibit temporal stability (Ehrhart et al., 2013; Zohar, 2000), the use of a six-month referent for injuries with a four-month lag between assessments limits our ability to draw firm conclusions about causal direction in this sample. Although temporally lagged data mitigate concerns about common method bias and enhance the plausibility of causal interpretations (Podsakoff et al., 2003), the partial overlap in timing also allows for the possibility that recent safety incidents may have shaped employee perceptions of climate. As such, we interpret these associations cautiously, emphasizing that they offer support for both predictive and postdictive validity, rather than serving as definitive evidence of causality. We further discuss this limitation and recommend that future studies use prospective longitudinal designs to clarify the directionality of the climate–injury relationship.

Physical Health Outcome Measures. Physical health measures addressed general health, sleep quality, and health behavior maintenance at the individual level. *General Health* was measured using a single-item measure from Hays et al. (2017) and a 5-point Likert scale (1 = Poor; 5 = Excellent): “In general, how would you rate your physical health?” *Subjective Sleep Quality* was measured using a single-item measure from the Pittsburgh Sleep Quality Index (Buysse et al., 1989) and a 5-point Likert scale (1 = Poor; 5 = Excellent): “During the last month, how would you rate your sleep quality?” *Sleep, Diet, and Bodily Maintenance* were captured with items taken from the Health Behavior Checklist (Vickers Jr et al., 1990), using a 5-point agreement scale. Two items represented sleep behaviors (e.g., “I do my best to get enough sleep”); two measured diet habits (e.g., “I eat a balanced diet”); and three involved the bodily maintenance practices of exercise, substance abuse, and monitoring for

illness. Cronbach's α was 0.51 for both Sample 2 and Sample 3, which is expected from a formative scale like a checklist (Hanafiah, 2020).

At the collective level, health measures addressed collective health behaviors, absence due to illness, and lost time in hours. For Sample 4, *Organization Health Behaviors* (from Hays et al., 2017, $\alpha = 0.71$; ICC(1) = 0.22; ICC(2) = 0.58; rwg(j) = 0.94) were adapted to assess collected health outcomes using the reference shift model similar to safety outcomes at Time 2. *Organization Absenteeism* was also collected using Nicholson and Payne's (1987) scale with an item addressing average sick days taken and total *Healthcare Expenses* incurred by the organization, both at Time 2. Sample 5 also used the adapted Hays et al. (2017) scale ($\alpha = 0.90$) to assess *Unit Health Behaviors* at Time 1, with the addition of *Unit Absenteeism* as average sick hours lost due to sickness using a similar protocol to Nicholson and Payne (1987), collected at Time 2.

Mental Well-being Outcome Measures. Mental well-being measures addressed life satisfaction, job satisfaction, depression, anxiety, stress, and work-life balance at the individual level. *Life Satisfaction* was measured using a 5-item scale from Diener et al. (1985) and a 5-point agreement scale; e.g., "I am satisfied with my life." Cronbach's α was 0.90 for Sample 2 and 0.91 for Sample 3. *Job Satisfaction* was measured using a single item from Fisher et al. (2016), rated on a 5-point agreement scale: "Overall, I am satisfied with my job." *Depression* was measured with five items from the Depression Anxiety Stress Scale short form (DASS; Szabó, 2010), using a 5-point agreement scale (e.g., "In the past month, I couldn't seem to experience any positive feeling at all"). Cronbach's α was 0.92 for Sample 2 and 0.90 for Sample 3. *Anxiety* was measured using the 2-item General Anxiety Disorder scale short form (GAD-2; Spitzer et al., 2006) and a 5-point Likert scale (1 = Never; 5 = Always); e.g., "I experience feeling nervous, anxious, or on edge." Cronbach's α was not calculated, given the two-item scale. *Stress* was measured with the 4-item Perceived Stress Scale (Cohen et al., 1983), using a 5-point Likert scale (1 = Never; 5 = Very Often); e.g., "In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?" Cronbach's α was 0.77 for Sample 2 and 0.70 for Sample 3. *Work-life Balance* was measured with a single item from Fisher et al. (2016), rated on a 5-point agreement scale: "In general, I feel that I have an adequate balance between my work and personal/family life."

At the collective level, mental well-being outcomes measured collective satisfaction and stress. For Sample 4, *Organization Satisfaction* was measured at Time 2 using a three-item scale from Rafferty and Griffin (2006), rated on a 5-point agreement scale (Cronbach's $\alpha = 0.70$; ICC(1) = 0.19; ICC(2) = 0.53; rwg(j) = 0.93). Example items include, "Overall, I am satisfied with the kind of work I do" and "Overall, I am satisfied with my job." *Organization Stress* was measured in Sample 4 by an adapted Perceived Stress Scale (Cohen et al., 1983) using the reference shift model (Cronbach's $\alpha = 0.87$; ICC(1) = 0.35; ICC(2) = 0.72; rwg(j) = 0.92), also at Time 2. For Sample 5, *Unit Satisfaction* was measured at Time 1 using the single-item version of the same job satisfaction scale (ICC(1) = 0.13; ICC(2) = 0.54; rwg(j) = 0.90), rated on a 5-point agreement scale (Rafferty & Griffin, 2006; "Overall, I am satisfied with my job.").

Job-related Outcome Measures. Job-related outcomes addressed turnover intentions and work engagement at the individual level. *Turnover Intention* was measured using the 2-item scale from Cammann et al. (1983), rated on a 5-point agreement scale; e.g., “I often think about quitting this job.” *Work Engagement* was measured with six items from Schaufeli et al. (2002), using a 5-point agreement scale; e.g., “I am immersed in my work.” Cronbach’s α was 0.87 for both Sample 2 and Sample 3.

At the collective level, job-related outcomes addressed collective commitment and objective turnover rate. For Sample 4, *Organization Collective Commitment* was measured at Time 2 with a 4-item scale from Klein et al. (2014), rated on a 5-point scale ranging from 1 (Not at all) to 5 (Completely); Cronbach’s $\alpha = 0.78$; ICC(1) = 0.33; ICC(2) = 0.71; rwg(j) = 0.94. Example items include, “How committed are you to your organization?” and “To what extent do you care about your organization?” Objective *Turnover* at Time 2 was measured by the rate of employees leaving the organization in the last six months. For Sample 5, *Unit Collective Commitment* was measured using the same scale from Klein et al. (2014; Cronbach’s $\alpha = 0.87$; ICC(1) = 0.14; ICC(2) = 0.55; rwg(j) = 0.90) at Time 1. *Unit Turnover* was operationalized as the rate of employees leaving the unit since the beginning of the year in Sample 5, collected at Time 2.

Phase 4 Results

The criterion-related validity on individual-level outcomes: Combined regression results using Sample 2 are presented in Table 9. Individual perceptions of SC were significantly and positively associated with Safety Compliance and Safety Participation. Individual perceptions of PHC were also significantly and positively related to General Health, Sleep Quality, Diet Behaviors, Sleep Behaviors, and Bodily Maintenance. MWC demonstrated significant associations with improved Life Satisfaction, Job Satisfaction, and Work-Life Balance, and lower levels of Depression, Anxiety, and Stress at the individual level. Finally, the combined TWH-c was significantly associated with all outcomes across safety, physical health, and mental well-being domains. TWH-c was positively related to Safety Compliance, Safety Participation, General Health, Sleep Quality, Sleep Behaviors, Diet Behaviors, Bodily Maintenance, Life Satisfaction, Job Satisfaction, Work Engagement, and Work-Life Balance, and negatively related to Depression, Anxiety, Stress, and Turnover Intentions at the individual level. Although somewhat less specific than discrete sub-climates, TWH-c showed meaningful relationships with outcomes across all domains, supporting its broader relevance.

The criterion-related validity on collective-level outcomes: Using data from Sample 4, Table 10 shows that organization-level perceptions of SC were significantly and positively related to Organization Safety Compliance and Safety Participation. SC was also significantly negatively related to Organization Incidents and Injuries Reported, consistent with prior research indicating that stronger safety climates promote safety behaviors while reducing incidents at the collective level. PHC was significantly and positively associated with Organization Health Behaviors at Time 2 and negatively associated with Objective Absenteeism. MWC was significantly related to greater Organization Satisfaction and lower Organization Stress. TWH-c was significantly associated with a broad range of organization

outcomes. Positive associations were found with Safety Compliance, Safety Participation, Health Behaviors, Satisfaction, and Commitment. TWH-c also showed significant negative relationships with Reported Incidents, Reported Injuries, Organization Stress, Absenteeism, and Turnover, reinforcing the value of TWH-c as a multidimensional predictor of workplace functioning.

Using Sample 5, Table 11 shows that unit-level SC was positively associated with Unit Safety Compliance at Time 1, and negatively associated with Injuries Reported at Time 2. PHC was significantly positively related to Unit Health Behaviors, and negatively to Absenteeism. MWC was significantly and positively associated with Unit Satisfaction at Time 1. TWH-c was significantly related to multiple positive unit-level outcomes, including Safety Compliance, Health Behaviors, Satisfaction, and Commitment. It was also negatively associated with Injuries Reported, though not significantly related to Absenteeism or Turnover Rate. These findings reinforce the criterion-related validity of TWH-c across diverse organizational contexts, underscoring its value as a comprehensive measure of climate impacting physical health, safety, and mental well-being outcomes.

Discussion

This study aimed to develop and validate measurement scales to assess TWH-c. This included two new sub-climates, PHC and MWC, designed to complement an established SC scale to align with the TWH framework. These measures were combined to create a holistic conceptual model and quantifiable score of organizational TWH-c. After item generation and trimming, factor analyses revealed final models for PHC and MWC that fit data from samples for three datasets. Second-order CFA also showed that SC, PHC, and MWC are explained by an overarching TWH-c, justifying their aggregation into a TWH-c construct. Evidence generated from within-organization and unit agreement and intraclass correlations displays that both PHC and MWC exist at the organization and unit levels. Regression models display that individual-level perceptions of SC, PHC, and MWC are linked to individual-level outcomes. Their combined score for TWH-c is also linked to outcomes including job-related outcomes such as turnover and engagement. At the collective level, aggregated SC, PHC, and MWC scores were associated with outcomes within their respective domains. The combined TWH-c score is also linked to collective-level outcomes at both levels.

Theoretical Contributions

The study makes a significant theoretical contribution by developing an innovative framework that combines SC, PHC, and MWC into a holistic TWH-c construct. This approach advances traditional organizational climate research by moving beyond single-dimensional assessments, which tend to examine workplace factors in isolation, to offer a more holistic understanding of how organizational climates collectively influence worker safety, physical health and mental well-being. This extends traditional SC theory (Zohar, 1980) by illustrating how shared employee perceptions can reflect multiple converging priorities within a single climate framework. While SC research has established the importance of shared perceptions for predicting safety outcomes (Christian et al., 2009;

Nahrgang et al., 2011), the TWH-c framework broadens this perspective to account for the combined relevance of these three domains.

Rather than treating SC, PHC, and MWC as separate domains, this model demonstrates their coherence as dimensions of a broader TWH-c. The ability to model these domains as a single, holistic construct affirms this core proposition, showing that employee perceptions reflect a holistic experience, where top and local leadership's priorities, policy implementation, and peer norms operate in tandem. This model moves beyond traditional single-domain tools and supports a broader understanding of how employees collectively experience work.

The TWH-c construct aligns with precedent in the climate literature by framing it as a product of shared sensemaking. This helps bridge organizational climate theory (Beus et al., 2023; James & Jones, 1974) to the TWH framework, demonstrating that collective sensemaking at the unit and organization levels can culminate in distinct TWH-related climate perceptions. Our results underscore the importance of encouraging and monitoring ongoing interactions among workers, leaders, and organizational systems, as they can contribute to important shared perceptions. By utilizing both unit- and organization-level aggregation, we also show support that both top and local leaders can set expectations about the organization. This supports the perspective that macro-level policies and local leader behavior jointly influence climate perceptions.

Practical Implications

The implementation of TWH programs is a strategic avenue for advancing the widespread objective of protecting and advancing worker well-being (Sauter, 2013; Schill et al., 2019; Schulte et al., 2012). The validated TWH-c scale offers a practical tool for guiding intervention designs and evaluation, grounded in climate theory spanning safety, physical health, and mental well-being. Specifically, the explicit dimensionality of this scale can help guide holistic efforts, as there are three sub-climates that must be assessed to achieve the overall TWH-c score, allowing for discrete measurement of its pieces as well as a total score. Regarding intervention assessment, having a total score as well as discrete sub-climate scores allows for a targeted assessment per organization based on their focus and needs. This scale can provide utility for those in high-risk industries or professions that often come with frequent safety and health issues, while also remaining generalizable for most industries. Entire companies, from the frontline to the office, can participate in order to observe differences across settings, environments, and job tasks. The TWH-c scale can be used both as a holistic examination or as a means of targeting areas that require focused attention.

Being that the TWH-c scale is predicated on prior SC research, some best practices for improving SC provide initial strategic paths for improvement of TWH-c. Specifically, buy-in from top management and communication from direct supervisors (Zohar & Polachek, 2014) would be clear starting points for organizations aiming to improve TWH-c. Established SC strategies such as top-down commitment and supervisor messaging can serve as initial methods for climate improvement.

Because TWH-c is composed of specific climate domains, it can inform both organizational practice and broader public health efforts. The ability to quantify discrete sub-climates (i.e., work environment, health policies, and supervisory support) alongside a unified total score provides flexibility for stakeholders at various levels. Policymakers can use this data to promote regulations or guidelines that support worker well-being across industries, particularly in sectors prone to high risk. At the organization level, data-driven strategies can be developed to target specific areas in need of improvement, making efforts both context-sensitive and scalable. Thus, the TWH-c scale offers a robust framework for initiating and evaluating both localized and systemic efforts to enhance TWH-c.

Limitations and Future Directions

Although this study has some limitations, it provides clear benefits and future directions. While data were collected from five distinct sources (Samples 1–5), there still may be issues of generalizability. The goal was to simultaneously include a diverse sample, while also assessing TWH in specific industries that employ frontline employees. Future replication and extension are needed, especially regarding the application of this iteration of TWH-c to jobs other than frontline employees working in physically rigorous working conditions. As the literature matures, different aspects of TWH might be more pertinent given industry, organizational hierarchy, and nature of the work itself.

Another limitation concerns the temporal design of Sample 4. Specifically, accidents and injuries were reported for the six months preceding the climate assessment. While this design was intended to capture enough low base-rate events to conduct meaningful analyses, it complicates our ability to make strong causal claims. Although the climate measure was conceptually positioned as a predictor (Christian et al., 2009), the outcome window includes events that may have preceded or shaped perceptions of climate, rather than resulted from them. This raises important concerns about directionality. While we interpreted these findings with appropriate caution, future work should employ prospective longitudinal designs to more rigorously assess the temporal dynamics between climate and subsequent related incidents. Such designs will help clarify the theoretical positioning of climate as either an antecedent, consequence, or both in relation to workplace outcomes.

Although our study demonstrated construct- and criterion-related validity of the TWH-c scale, it may not capture the entirety of TWH. TWH spans a broad range of health facets (e.g., social health) and well-being dimensions (e.g., eudaimonic well-being), and new facets may be emphasized as the TWH literature grows. Also, PHC was distinct regarding within-group agreement metrics and criterion-related validity. Physical health may be less strongly or directly influenced by the workplace environment, as it is also impacted strongly by personal/family environments. Safety policies and PPE can take effect immediately. Procedures and practices like employee assistance programs can quickly improve well-being. This highlights that a longitudinal study may be more robust in detecting potential relationships between PHC and health outcomes. A greater span of outcome variables would also be helpful, including objective health outcomes.

A notable limitation of this study lies in the incongruence between the organization-level referent of our items (“my organization”) and the unit-level aggregation in Sample 5. This

mismatch represents a meaningful theoretical and methodological challenge, as referent-shift consensus models typically recommend aligning item wording with the target level of analysis to ensure construct clarity (Klein & Kozlowski, 2000). However, our empirical results, including strong within-unit agreement ($rwg(j) = 0.90\text{--}0.96$) and significant between-unit variance ($ICC(1) = 0.15\text{--}0.25$), demonstrate that shared unit-level climates can robustly emerge even when measuring at the organization level. The convergence of high consensus and meaningful between-unit differences suggests that employees' shared interpretations of organizational policies can coalesce distinctly at the unit level, consistent with Beus et al.'s (2023) framework of climate emergence through localized sensemaking.

Since these results support unit-level climate emergence, future research should focus on establishing a local workgroup-level TWH-c. In the SC literature, a local climate focusing on the supervisor as referent manifests in workgroups as a similarly impactful assessment of the organization and is also capable of predicting important individual and job-related outcomes (Huang et al., 2016; Zohar & Polachek, 2014). A logical progression is to explore how local climates contribute uniquely or interactively with organization-level climate. Comparative studies can test whether referent-shift items presented as a local climate with a supervisor referent yield stronger unit-level effects or incremental predictive validity. This can yield a greater understanding of cross-level interactions, the uniqueness of climate manifesting at each level, and the combined effects of strong local and organization climates. This knowledge can optimally improve policies, procedures, and practices within organizations and work units, including interventions and training programs catered to each level.

As organizations strive to implement TWH programs, future research should focus on exploring patterns within the distinct components of TWH-c. In its present form, the TWH-c scale can observe interactions across each facet of TWH, highlighting potential interplay between safety, physical health, and mental well-being. A first step to a greater understanding of how TWH is perceived is to observe moderation and mediation effects under the TWH framework; however, there may be even more useful patterns within these facets. By employing advanced statistical techniques such as Latent Profile Analysis (LPA), researchers can identify unique employee health and climate profiles which can guide the development of more nuanced and targeted interventions. Furthermore, the ability to both analyze individual TWH-c facets and derive an overall score empowers organizations to create evidence-based solutions that are aligned with the unique needs of their workforce. Such specific and targeted information encourages companies to improve individual employee outcomes and also bolster organizational effectiveness and resilience, as TWH-c assessments directly reflect the concerns and priorities of the workforce (Feltner et al., 2016; Punnett et al., 2020).

Conclusion

This study represents a significant contribution to the field of TWH by developing and validating a comprehensive organizational assessment using SC as a well-established foundation. By drawing from SC literature and theory, we created and validated a multidimensional climate scale that captures safety, physical health, and mental well-being

perceptions under the unified TWH framework. A key outcome was the creation and validation of two sub-climate scales, PHC and MWC, which combine with SC to form a higher order TWH-c construct predictive of relevant outcomes across domains. Validation analyses confirmed that each sub-climate, as well as TWH-c, predicts important individual-, unit-, and organization-level outcomes.

This validated climate measure enables holistic assessment of TWH, offering a practical tool for research, intervention, and organizational improvement. Its flexibility and theoretical grounding make it useful for organizations seeking to promote TWH, as well as researchers aiming to advance its measurement and application.

Appendix A: Attention check for online sample through the panel provider (Qualtrics)

“We care about the quality of our survey data and hope to receive the most accurate measures of your opinions, so it is important to us that you thoughtfully provide your best answer to each question in the survey. If you are committed to providing your thoughtful and honest answers to the questions in this survey, please select option 2.”

Appendix B

Table B1.
Scales and Measures Used in the Outcome Battery at the Individual Level

Variable	Citation	Items	Example	Cronbach's Alpha		
				Sample 2	Sample 3	Sample 2 subset
Safety Behavior: Compliance	Griffin & Neal (2000)	4	“I carry out my work in a safe manner.”	0.91	0.93	0.91
Safety Behavior: Participation	Griffin & Neal (2000)	4	“I promote the safety program within the organization.”	0.84	0.87	0.83
General Health	Hays et al. (2017)	1	“In general, how would you rate your physical health?”	-	-	-
Subjective Sleep Quality	Buysse et al. (1989)	1	“During the last month, how would you rate your sleep quality?”	-	-	-
Behavioral Health Checklist: Sleep	Vickers et al. (1990)	2	“I do my best to get enough sleep.”	-	-	-
Behavioral Health Checklist: Diet	Vickers et al. (1990)	2	“I eat a balanced diet.”	-	-	-
Behavioral Health Checklist: Bodily Maintenance	Vickers et al. (1990)	3	“I do my best to get some exercise.”	0.51	0.51	0.46
Life Satisfaction	Diener et al. (1985)	5	“I am satisfied with my life.”	0.90	0.91	0.89
Depression	Szabó (2010)	5	“In the past month, I couldn't seem to experience any positive feeling at all.”	0.92	0.90	0.92

Variable	Citation	Items	Example	Cronbach's Alpha		
				Sample 2	Sample 3	Sample 2 subset
Anxiety	Spitzer et al. (2006)	2	"I experience feeling nervous, anxious, or on edge."	-	-	-
Stress	Cohen et al. (1983)	4	"In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?"	0.77	0.70	0.78
Job Satisfaction	Fisher et al. (2016)	1	"Overall, I am satisfied with my job."	-	-	-
Turnover Intention	Cammann et al. (1983)	2	"I often think about quitting this job."	-	-	-
Work Engagement	Schaufeli et al. (2002)	6	"I am immersed in my work."	0.87	0.87	0.85
Work-life Balance	Fisher et al. (2016)	1	"In general, I feel that I have an adequate balance between my work and personal/family life."	-	-	-

Note. Sample 2, N = 376. Sample 3, N = 165. Sample 2 subset (unit level) N = 200. The health checklist is a formative scale of behaviors and, thus, is expected to yield lower internal agreement. Cronbach's Alpha information is provided for a scale with at least three items.

Table B2.
Scales and Measures Used in the Outcome Battery at the Collective Level

Variable	Citation	Items	Example	Cronbach's Alpha	
				Sample 4	Sample 5
Organization/Unit Safety Compliance	Griffin and Neal (2000)	4	We carry out work in a safe manner.	0.71	0.97
Organization/Unit Safety Participation	Griffin and Neal (2000)	4	We promote the safety program within the organization/unit .	0.78	NA
Incident Rate	-	1	Within the past 6 months, while on the job, how often have organization members been involved in recordable incidents?	-	NA
Injury Rate	-	1	Within the past 6 months, how often have organization members been injured at work? How often have unit members been injured* at work since the beginning of this year?	-	-
Injury Expense	-	1	Within the past 6 months, what are the overall expenses associated with workers' compensation (e.g., medical expenses, lost wages)?	-	NA
Organization/Unit Health Behaviors	Hays et al. (2017)	3	We engage in healthy behaviors (e.g., exercise, healthy eating, sleep enough)	0.71	0.90
Absenteeism	Nicholson & Payne (1987)	1	In the past six months, on average, how many days/hours* were organization/unit members absent from work due to physical health issues?	-	-
Health Expense	Nicholson & Payne (1987)	1	In the last six months, what is the total amount of healthcare expenses incurred by the organization?	-	NA
Organization/Unit Satisfaction	Rafferty and Griffin (2006)	3	Overall, I am satisfied with my job.	0.70	-

Variable	Citation	Items	Example	Cronbach's Alpha	
				Sample 4	Sample 5
Organization/Unit Stress	Cohen et al. (1983)	4	In the last month, we felt we were unable to control the important things in our work.	0.87	-
Organization/Unit Collective Commitment	Klein et al. (2014)	4	How committed are you to your organization?	0.78	0.87
Turnover Rate	-	1	How many organization/unit members left in the past 6 months/since the beginning of the year ?	-	-

Note. Sample 4, N = 50 organizations. Sample 5, N = 104 units. Cronbach's Alpha information is provided for a scale with at least three items. The presence of an asterisk

* indicates differences due to the referent across items from Samples 4 and 5, indicated in the example item.

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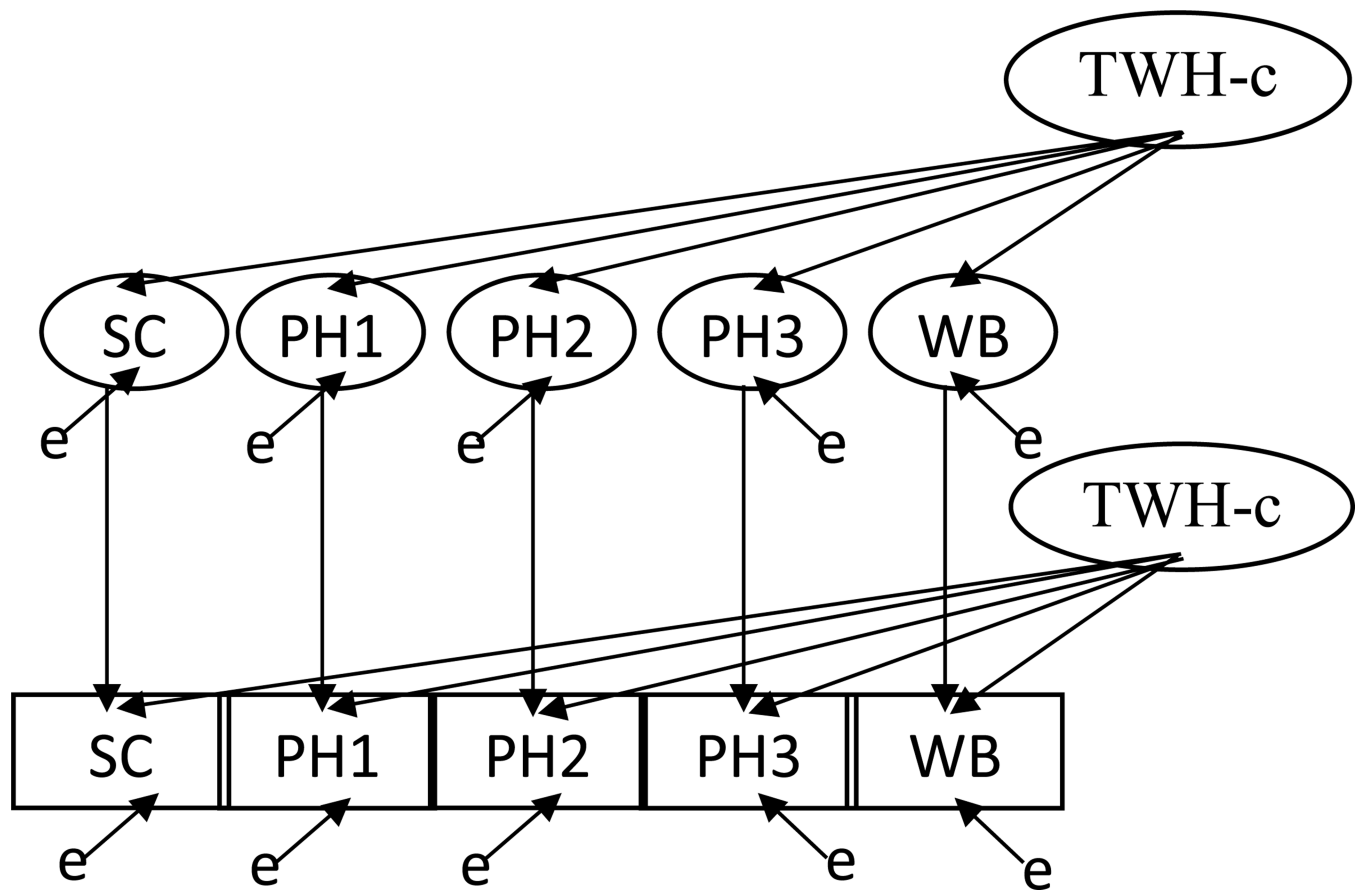


Figure 1.

Specification of the Multilevel Confirmatory Factor Analysis for the Total Worker Health Climate Construct at the Organization Level

Note. Fit for Sample 4. SC = safety climate; PH1 = physical health climate factor 1 “Communication and Resources”; PH2 = physical health climate factor 2 “Hygiene and Recovery”; PH3 = physical health climate factor 3 “Commitment and Action”; WB = mental well-being climate; TWH-c = Total Worker Health climate; L1 = individual-level; L2 = organization-level; estimation method = maximum likelihood estimation with robust standard errors (MLR)

Table 1.
Exploratory Factor Analysis Results for Physical Health Climate Scale (proposed 16 items)

		Factor		
		1	2	3
Items: My Company...				
Factor 1: Communication and Resources				
Item 1	...educates workers on how to be physically healthy (e.g., regular physical activity, healthy eating).	0.78	>.01	0.10
Item 2	...provides workers with information on how to have a healthy lifestyle (e.g., exercise, healthy eating, quality sleep).	0.79	0.08	0.01
Item 3	...provides training on how to be physically healthy at work.	0.74	0.02	0.09
Item 4	...offers workers programs and services to encourage physical activity (e.g., on-site gym, wellness programs, membership discount for partnered gym).	0.86	>.01	−0.06
Item 5	...offers useful programs to improve workers' physical health (e.g., diet plans, exercise opportunities, help to stop smoking).	0.85	−0.03	0.01
Item 6	...encourages workers to participate in physically healthy behaviors (e.g., physical activity, eating healthy foods).	0.63	0.18	0.11
Factor 2: Hygiene and Recovery				
Item 7	...provides workers with what they need to have good hygiene (e.g., a place to wash their hands, trash and recycling containers, working bathrooms).	0.01	0.57	0.10
Item 8	...has policies that allow workers to take time off when ill, injured, or recovering (e.g., sick leave, workers' compensation, maternal/paternal leave).	0.13	0.72	−0.03
Item 9	...encourages workers to have good hygiene habits (e.g., hand washing, cleaning your workspace, removing trash).	0.04	0.76	0.02
Factor 3: Commitment and Action				
Item 10	...is committed to workers' physical health.	0.07	0.02	0.77
Item 11	...views workers' physical health as a priority.	0.10	−0.02	0.77
Item 12	...promotes employee physical health even when work falls behind schedule.	0.18	−0.14	0.72
Item 13	...puts resources such as time, space, and money into supporting healthy lifestyles.	0.18	−0.06	0.71
Item 14	...has resources for avoiding and preventing the flu, colds, COVID, and other infectious diseases.	−0.04	0.19	0.56
Item 15	...takes action when there is concern about physical health in the workplace.	−0.13	0.11	0.80
Item 16	...provides a good environment for workers' physical health at work (e.g., heating, lighting, ventilation, good air quality).	−0.21	0.03	0.65
Eigenvalues		10.75	1.70	1.17
Percentage variance		53.72	8.49	5.85

Note. Bolded items represent strong factor loadings, placing the item into its respective factor.

Table 2.
Exploratory Factor Analysis Results for Mental Well-Being Climate Scale (proposed 21 items)

Items: My Company...		Factor 1
Item 1	...sees the well-being of workers as a priority.	0.81
Item 2	...considers workers' well-being to be more important than production schedules.	0.80
Item 3	...puts effort into reducing extreme job stress.	0.84
Item 4	...has resources that can help workers when they struggle with mental health issues (e.g., burnout, depression, thoughts of suicide).	0.75
Item 5	...commits resources such as time, space, and money to supporting employee well-being.	0.84
Item 6	...notices poor morale and responds to improve our well-being.	0.81
Item 7	...makes effective changes when there are issues about well-being in the workplace.	0.79
Item 8	...provides a good workplace that helps workers maintain their well-being (e.g., a calm environment, ways for reporting issues, supportive management).	0.78
Item 9	...encourages workers to join in on being supportive of each other's well-being (e.g., anti-bullying campaigns, being supportive of co-workers).	0.75
Item 10	...provides information to educate workers about the benefits of maintaining good mental health and well-being.	0.82
Item 11	...provides training for workers on how to ensure their well-being at work.	0.8
Item 12	...offers workers programs and services that improve work-life balance (e.g., childcare programs, flexible scheduling).	0.79
Item 13	...has policies, programs, and procedures in place to help handle stress for everyone.	0.86
Item 14	...has policies or procedures to promote workers' well-being (e.g., flexible work hours, no meetings during lunch time).	0.77
Item 15	...listens to workers about their well-being concerns.	0.83
Item 16	...asks all workers (e.g., union members, health and safety representatives, supervisors, frontline workers) about mental health issues.	0.83
Item 17	...encourages workers to speak up about their mental health and well-being issues.	0.85
Item 18	...makes workers feel safe enough to mention their well-being concerns.	0.85
Item 19	...values workers' opinions when making decisions about well-being policies, procedures, and programs.	0.85
Item 20	...provides good communication about mental health and well-being issues that affect workers.	0.87
Item 21	...offers mental health and well-being services (e.g., counseling, peer support groups, employee assistance programs).	0.77
Eigenvalues		14.21
Percentage variance		67.65

Table 3.
Confirmatory Factor Analyses Results for Models Assessing the Total Worker Health Climate Scale

Models	χ^2	df	χ^2 diff	CFI	TLI	RMSEA	[90%CI]	SRMR
PHC Model 1: 16 items, Sample 2	357.56	101.00	3.54	0.94	0.93	0.09	0.08	0.10
PHC Model 2: 14 items, Sample 2	211.14	74.00	2.85	0.96	0.95	0.07	0.06	0.09
PHC Model 2: 14 items, Sample 3	123.77	74.00	1.67	0.97	0.97	0.07	0.05	0.09
MWC Model 1: 21 items, Sample 2	1073.24	189.00	5.68	0.90	0.88	0.12	0.11	0.11
MWC Model 2: 10 items, Sample 2	88.59	35.00	2.53	0.99	0.98	0.07	0.05	0.09
MWC Model 2: 10 items, Sample 3	64.36	35.00	1.84	0.98	0.98	0.08	0.05	0.10
TWH-c Model: 2nd Order	2860.26	1390.00	2.06	0.92	0.91	0.07	0.06	0.07

Note. PHC = physical health climate; MWC = mental well-being climate; TWH-c = Total Worker Health Climate; CFI = Comparative fit index; TLI = Tucker-Lewis index; RMSEA = Root Mean Square Error of Approximation; CI = Confidence interval; SRMR = Standardized Root Mean Square Residual. All χ^2 values are significant. For Sample 2, N = 375. For Sample 3, N = 153.

Table 4.

Final Total Worker Health Climate Scale: Safety Climate (SC), Physical Health Climate (PHC), and Mental Well-Being Climate (MWC), and Reliabilities

		Sample 2	Sample 3	Sample 2 subset
SC	Cronbach's Alpha	0.96	0.97	0.95
1	My Company ... reacts quickly to solve the problem when told about safety hazards.			
2	... insists on thorough and regular safety audits and inspections.			
3	... tries to continually improve safety levels in each department.			
4	... provides all the equipment needed to do the job safely.			
5	... is strict about working safely when work falls behind schedule.			
6	... quickly corrects any safety hazard (even if it's costly).			
7	... provides detailed safety reports to workers (e.g., injuries, near accidents).			
8	... considers a person's safety behavior when moving–promoting people.			
8	... requires each manager to help improve safety in their department.			
10	... invests a lot of time and money in safety training for workers.			
11	... uses any available information to improve existing safety rules.			
12	... listens carefully to workers' ideas about improving safety.			
13	... considers safety when setting production speed and schedules.			
14	... provides workers with a lot of information on safety issues.			
15	... regularly holds safety-awareness events (e.g., presentations, ceremonies).			
16	... gives safety personnel the power they need to do their job.			
PHC	Cronbach's Alpha	0.95	0.97	0.93
	My Company			
	<i>Factor 1: Communication and Resources</i>			
1	...educates workers on how to be physically healthy (e.g., regular physical activity, healthy eating).			
2	...provides workers with information on how to have a healthy lifestyle (e.g., exercise, healthy eating, quality sleep).			
3	...provides training on how to be physically healthy at work.			
4	...offers workers programs and services to encourage physical activity (e.g., on-site gym, wellness programs, membership discount for partnered gym).			
5	...offers useful programs to improve workers' physical health (e.g., diet plans, exercise opportunities, help to stop smoking).			
	<i>Factor 2: Hygiene and Recovery</i>			
6	...provides workers with what they need to have good hygiene (e.g., a place to wash their hands, trash and recycling containers, working bathrooms).			
7	...has policies that allow workers to take time off when ill, injured, or recovering (e.g., sick leave, workers' compensation, maternal/paternal leave).			
8	...encourages workers to have good hygiene habits (e.g., hand washing, cleaning your workspace, removing trash).			
	<i>Factor 3: Commitment and Action</i>			
9	...is committed to workers' physical health.			
10	...views workers' physical health as a priority.			
11	...promotes employee physical health even when work falls behind schedule.			
12	...puts resources such as time, space, and money into supporting healthy lifestyles.			

		Sample 2	Sample 3	Sample 2 subset
SC	Cronbach's Alpha	0.96	0.97	0.95
13	...has resources for avoiding and preventing the flu, colds, COVID, and other infectious diseases.			
14	...takes action when there is concern about physical health in the workplace.			
MWC	Cronbach's Alpha	0.97	0.97	0.96
	My Company			
1	...sees the well-being of workers as a priority.			
2	...commits resources such as time, space, and money to supporting employee well-being.			
3	...notices poor morale and responds to improve our well-being.			
4	...has policies or procedures to promote workers' well-being (e.g., flexible work hours, no meetings during lunch time).			
5	...listens to workers about their well-being concerns.			
6	...makes effective changes when there are issues about well-being in the workplace.			
7	...provides a good workplace that helps workers maintain their well-being (e.g., a calm environment, ways for reporting issues, supportive management).			
8	...encourages workers to join in on being supportive of each other's well-being (e.g., anti-bullying campaigns, being supportive of co-workers).			
9	...encourages workers to speak up about their mental health and well-being issues.			
10	...values workers' opinions when making decisions about well-being policies, procedures, and programs.			

Note. All items rated on a 5-point Likert Scale as follows: 1 – Strongly Disagree, 2 – Somewhat Disagree, 3 – Neutral, 4 – Somewhat Agree, 5 – Strongly Agree.

SC items are from Zohar and Luria, 2005.

PHC items were prompted with the following instructions: "Physical Health represents how well your body is working. A person with good physical health would be free from illness or injury. A healthy diet, exercise, and sleep help you take care of your body. This section asks about how your organization shows support for improving and maintaining your physical health. Organizations can do this by providing healthy diet plans, offering discounted gym memberships, providing information on proper sleep, etc. For this section, please focus on what your company is doing for your physical health.

MWC items were prompted with the following instructions: "Well-being represents your mental health and quality of life. People have good well-being when emotions and moods are more often positive than negative. Feeling more happiness and high morale, and less burnout and stress, are also related to well-being. Organizations can be supportive and reduce stress to help workers' mental health. This section asks about how your organization shows support for your well-being. Organizations can do this by providing stress prevention programs, offering employee assistance, designing work to avoid burnout, etc. For this section, please focus on what your organization is doing for your well-being."

Sample 2: N = 376. Sample 3: N = 165. Sample 2 subset: Sample 2's unit-level N = 200.

Table 5.
Correlations Between All Climate Scales and Outcomes for Sample 2 (Individual Level)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. SC	--																		
2. PHC	.67**	--																	
3. MWC	.63**	.81**	--																
4. TWH-c	.84**	.92**	.92**	--															
5. SBComp	.42**	.47**	.39**	.47**	--														
6. SBPart	.38**	.42**	.41**	.46**	.72**	--													
7. GenHealth	.16**	.24**	.29**	.26**	.20**	0.1	--												
8. SleepQual	.20**	.27**	.35**	.31**	.18**	.17**	.58**	--											
9. HDiet	.12*	.12*	.13*	.15**	.18**	.13*	.54**	.33**	--										
10. HMaint	.20**	.20**	.23**	.24**	.27**	.24**	.50**	.34**	.62**	--									
11. HSleep	.13*	.19**	.14*	.17**	.14*	.12*	.30**	.42**	.38**	.40**	--								
12. LifeSat	.30**	.37**	.45**	.43**	.26**	.28**	.40**	.44**	.35**	.40**	.28**	--							
13. Dep	-.36**	-.37**	-.44**	-.44**	-.35**	-.37**	-.35**	-.41**	-.28**	-.45**	-.26**	-.64**	--						
14. Anx	-.22**	-.28**	-.33**	-.32**	-.11*	-.15**	-.34**	-.39**	-.21**	-.31**	-.24**	-.42**	.58**	--					
15. Stress	-.33**	-.38**	-.43**	-.43**	-.27**	-.30**	-.41**	-.45**	-.27**	-.35**	-.25**	-.63**	.66**	.66**	--				
16. TurnInt	-.28**	-.35**	-.48**	-.42**	-.21**	-.29**	-.16**	-.23**	-.04	-.15**	-.05	-.27**	.30**	.24**	.33**	--			
17. JobSat	.30**	.40**	.47**	.45**	.22**	.30**	.17**	.27**	.08	.16**	.10	.43**	-.37**	-.27**	-.40**	-.62**	--		
18. WLBal	.29**	.34**	.40**	.39**	.18**	.14*	.37**	.43**	.22**	.25**	.16**	.41**	-.34**	-.29**	-.40**	-.34**	.48**	--	
19. WEngage	.30**	.41**	.53**	.47**	.31**	.37**	.43**	.44**	.26**	.38**	.24**	.56**	-.53**	-.32**	-.48**	-.46**	.57**	.42**	--
Mean	4.07	3.96	3.57	3.86	4.71	4.43	2.98	2.26	3.49	3.88	3.86	3.26	2.13	2.74	2.52	2.36	3.81	3.51	3.51
SD	0.87	0.85	1.09	0.85	0.58	0.69	1.02	1.13	1.03	0.78	0.93	1.04	1.13	1.10	0.81	1.22	1.09	1.23	0.78

Note. SC = safety climate; PHC = physical health climate; MWC = mental well-being climate; TWH-c = Total Worker Health climate; SBComp = safety behavior – compliance; SBPart = safety behavior – participation; GenHealth = general health; SleepQual = sleep quality; HDiet = diet; HMaint = bodily maintenance; HSleep = sleep; LifeSat = life satisfaction; Dep = depression; Anx = anxiety; TurnInt = turnover intention; JobSat = job satisfaction; WLBal = work-life balance; WEngage = work engagement.

** Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed)

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Table 6.
Correlations Between All Climate Scales and Outcomes for Sample 3 (Individual Level)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. SC	--																		
2. PHC	.78**	--																	
3. MWC	.62**	.74**	--																
4. TWH-c	.87**	.93**	.90**	--															
5. SBComp	.33**	.32**	.20*	.30**	--														
6. SBPart	.47**	.33**	.36**	.42**	.68**	--													
7. GenHealth	.25**	.24**	.35**	.32**	.22*	.16	--												
8. SleepQual	.26**	.24**	.39**	.33**	.11	.24**	.49**	--											
9. HDiet	.20*	.15	.20*	.20*	.23**	.16	.61**	.33**	--										
10. HMaint	.38**	.29**	.30**	.35**	.32**	.35**	.49**	.31**	.60**	--									
11. HSleep	.20*	.13	.22**	.20*	.14	.29**	.22**	.46**	.40**	.55**	--								
12. LifeSat	.39**	.33**	.40**	.41**	.10	.31**	.37**	.55**	.33**	.37**	.31**	--							
13. Dep	-.21*	-.21*	-.24**	-.24**	.03	-.31**	-.24**	-.48**	-.23**	-.27**	-.24**	-.62**	--						
14. Anx	-.22**	-.20*	-.38**	-.31**	.05	-.16	-.31**	-.49**	-.25**	-.25**	-.27**	-.52**	.80**	--					
15. Stress	-.25**	-.27**	-.34**	-.32**	-.02	-.23**	-.34**	-.46**	-.23**	-.29**	-.31**	-.55**	.61**	.55**	--				
16. TurnInt	-.32**	-.35**	-.57**	-.47**	-.03	-.17	-.29**	-.37**	-.08	-.21*	-.07	-.31**	.22**	.29**	.29**	--			
17. JobSat	.45**	.42**	.61**	.55**	.04	.24**	.24**	.37**	.09	.25**	.14	.42**	-.35**	-.34**	-.41**	-.81**	--		
18. WLBal	.34**	.45**	.55**	.50**	.16	.12	.29**	.35**	.22**	.34**	.20*	.37**	-.30**	-.33**	-.36**	-.50**	.56**	--	
19. WEngage	.50**	.43**	.55**	.55**	.16	.42**	.41**	.57**	.36**	.37**	.31**	.58**	-.46**	-.49**	-.51**	-.49**	.57**	.35**	--
Mean	4.04	4.11	3.48	3.90	4.76	4.42	3.28	2.69	3.95	4.28	4.12	3.82	1.59	2.39	2.23	2.07	3.83	3.72	3.61
SD	0.89	0.91	1.11	0.85	0.59	0.77	0.98	1.04	0.78	0.64	0.86	0.88	0.85	1.00	0.72	1.22	1.15	1.16	0.69

Note. SC = safety climate; PHC = physical health climate; MWC = mental well-being climate; TWH-c = Total Worker Health climate; SBComp = safety behavior-compliance; SBPart = safety behavior-participation; GenHealth = general health; SleepQual = sleep quality; HDiet = diet; HMaint = bodily maintenance; HSleep = sleep; LifeSat = life satisfaction; Dep = depression; Anx = anxiety; TurnInt = turnover intention; JobSat = job satisfaction; WLBal = work-life balance; WEngage = work engagement.

** Correlation is significant at the 0.01 level (2-tailed).

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* Correlation is significant at the 0.05 level (2-tailed).

Table 7.
Correlations Between All Climate Scales and Outcomes for Sample 4 (Organization Level)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 SC	--															
2 PHC	0.83**	--														
3 MWC	0.77**	0.83**	--													
4 TWH-c	0.91**	0.95**	0.94**	--												
5 OrgSComp	0.33*	0.36**	0.42**	0.40**	--											
6 OrgSPart	0.50**	0.52**	0.55**	0.56**	0.78**	--										
7 OrgIncRate	-0.34*	-0.38**	-0.25*	-0.34*	0.13	0.05	--									
8 OrgInjRate	-0.33*	-0.31*	-0.22	-0.31*	0.03	-0.09	0.54**	--								
9 OrgInjExp	-0.23	-0.32*	-0.16	-0.25	0.09	0.13	0.92**	0.52**	--							
10 OrgHB	0.43*	0.51**	0.52**	0.52**	0.76**	0.79**	-0.13	-0.10	-0.13	--						
11 OrgAbsent	-0.46**	-0.50**	-0.37**	-0.47**	-0.07	-0.31	0.25	0.37**	0.30*	-0.08	--					
12 OrgHealthExp	-0.04	-0.18	0.09	-0.05	0.02	0.25	0.60**	0.32*	0.68**	0.06	0.32*	--				
13 OrgSat	0.43**	0.45**	0.58**	0.53**	0.81**	0.76**	0.07	-0.16	0.06	0.78**	-0.15	0.18	--			
14 OrgCCom	0.61**	0.62**	0.74**	0.70**	0.68**	0.78**	-0.13	-0.27	-0.06	0.76**	-0.34*	0.13	0.81**	--		
15 OrgStress	-0.36**	-0.48**	-0.37**	-0.43**	-0.16	-0.29*	0.26	0.25	0.26	-0.25	0.38*	0.00	-0.17	-0.31*	--	
16 Turnover	-0.29*	-0.48**	-0.39**	-0.43**	-0.09	0.00	0.33*	0.26	0.32*	0.03	0.28*	0.39**	-0.27	-0.19	0.23	--
Mean	3.82	3.89	3.67	3.79	4.26	4.23	0.40	0.10	2.09	4.21	0.40	4.13	4.18	4.15	2.62	0.10
SD	0.39	0.49	0.55	0.45	0.32	0.36	0.88	0.30	4.04	0.34	0.73	5.35	0.33	0.40	0.64	0.05

Note. SC = safety climate; PHC = physical health climate; MWC = mental well-being climate; TWH-c = Total Worker Health climate; OrgSComp = organization safety compliance; OrgSPart = organization safety participation; OrgIncRate = organization incident rate; OrgInjRate = organization injury rate; OrgInjExp = organization injury expense; OrgHB = organization health behaviors; OrgAbsent = organization absenteeism; OrgHealthExp = organization healthcare expenses; OrgSat = organization satisfaction; OrgCCom = organization collective commitment; OrgStress = organization stress; log transformation was applied to injury and healthcare expense variables due to their skewed nature before analysis.

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 8.
Correlations Between All Climate Scales and Outcomes for Sample 5 (Unit Level)

	1	2	3	4	5	6	7	8	9	10	11
1 SC	--										
2 PHC	0.94**	--									
3 MWC	0.91**	0.95**	--								
4 TWH-c	0.97**	0.96**	0.98**	--							
5 UnitSComp	0.85**	0.85**	0.83**	0.87**	--						
6 UnitInjRate	-0.33*	-0.24	-0.46**	-0.36*	-0.32	--					
7 UnitHB	0.73**	0.83**	0.79**	0.80**	0.79**	-0.13	--				
8 UnitAbsent	-0.55**	-0.58**	-0.46**	-0.54**	-0.38*	0.04	-0.32	--			
9 UnitSat	0.78**	0.82**	0.82**	0.83**	0.73**	-0.22	0.76**	-0.28	--		
10 UnitCCom	0.77**	0.80**	0.78**	0.80**	0.86**	-0.35*	0.73**	-0.48**	0.75**	--	
11 Turnover	-0.37*	-0.37*	-0.23	-0.33*	-0.21	-0.11	-0.19	0.71**	-0.06	-0.22	--
Mean	3.71	3.46	3.31	3.50	3.85	0.04	3.35	11.93	3.37	3.81	0.04
SD	0.62	0.56	0.73	0.62	0.53	0.14	0.58	10.26	0.59	0.44	0.03

Note. SC = safety climate; PHC = physical health climate; MWC = mental well-being climate; TWH-c = Total Worker Health climate; UnitSComp = unit safety compliance; UnitInjRate = unit injury rate; UnitHB = unit health behaviors; UnitAbsent = unit absenteeism; UnitSat = unit satisfaction; UnitCCom = unit collective commitment.

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 9. Regression Analyses Demonstrating Criterion-Related Validity with Individual Outcomes (Sample 2)

	SB Comp	SB Part	Gen Health	Sleep Qual	HDiet	HMAint	HSleep	LifeSat	JobSat	Dep	Anx	Stress	WL Balance	TurnInt	WEngage
Age	-0.04 (0.03)	< .01 (0.03)	0.05 (0.05)	0.15 (0.05) **	0.09 (0.05) *	0.06 (0.04)	0.10 (0.04) *	0.02 (0.05)	0.07 (0.05)	-0.09 (0.05)	-0.15 (0.05) **	-0.02 (0.04)	0.01 (0.06)	-0.08 (0.05)	0.04 (0.03)
Gender	< .01 ($< .01$)	< .01 ($< .01$)	< .01 ($< .01$)	< .01 ($< .01$)	< .01 ($< .01$)	< .01 ($< .01$)	< .01 ($< .01$)	< .01 ($< .01$)	< .01 ($< .01$)	< .01 ($< .01$)	-0.01 ($< .01$)	< .01 ($< .01$)	< .01 ($< .01$)	< .01 ($< .01$)	< .01 ($< .01$)
Tenure	0.08 (0.04) *	0.09 (0.04) *	-0.11 (0.07)	-0.02 (0.07)	0.01 (0.07)	0.08 (0.05)	0.01 (0.06)	0.15 (0.06) *	0.05 (0.06)	-0.10 (0.07)	0.04 (0.07)	-0.10 (0.05) *	-0.05 (0.08)	-0.05 (0.08)	< .01 (0.05)
SC	0.30 (0.03) **	0.32 (0.04) **	-	-	-	-	-	-	-	-	-	-	-	-	-
PHC	-	-	0.31 (0.07) **	0.38 (0.07) **	0.15 (0.07) *	0.17 (0.05) **	0.21 (0.06) **	-	-	-	-	-	-	-	-
MWC	-	-	-	-	-	-	-	0.42 (0.05) **	0.47 (0.05) **	-0.43 (0.05) **	-0.32 (0.05) **	-0.33 (0.04) **	0.45 (0.06) **	-	-
TWH-c	0.35 (0.03) **	0.40 (0.04) **	0.33 (0.07) **	0.42 (0.07) **	0.16 (0.07) *	0.20 (0.05) **	0.18 (0.06) *	0.54 (0.06) **	0.57 (0.07) **	-0.59 (0.07) **	-0.39 (0.07) **	-0.43 (0.05) **	0.57 (0.08) **	-0.61 (0.08) **	0.43 (0.05) **
SC R ² (Adj R ²)	0.21 (0.20)	0.17 (0.16)	-	-	-	-	-	-	-	-	-	-	-	-	-
PHC R ² (Adj R ²)	-	-	0.07 (0.06)	0.11 (0.10)	0.03 (0.02)	0.07 (0.06)	0.06 (0.05)	-	-	-	-	-	-	-	-
MWC R ² (Adj R ²)	-	-	-	-	-	-	-	0.22 (0.21)	0.25 (0.24)	0.21 (0.20)	0.15 (0.14)	0.21 (0.20)	0.17 (0.16)	-	-
TWH-c R ² (Adj R ²)	0.25 (0.25)	0.24 (0.23)	0.08 (0.07)	0.12 (0.11)	0.04 (0.02)	0.08 (0.07)	0.05 (0.04)	0.21 (0.20)	0.22 (0.21)	0.22 (0.21)	0.13 (0.12)	0.21 (0.20)	0.16 (0.15)	0.19 (0.18)	0.22 (0.21)

Note. SC = Safety Climate, PHC = Physical Health Climate, MWC = Mental Well-being Climate, TWH-c = Total Worker Health Climate, SBComp = safety behavior-compliance; SBPart = safety behavior-participation; GenHealth = general health; SleepQual = sleep quality; HDiet = diet behaviors; HMAint = bodily maintenance behaviors; HSleep = sleep behaviors; LifeSat = life satisfaction; Dep = depression; Anx = anxiety; TurnInt = turnover intention; WEngage = work engagement; JobSat = job satisfaction; WLBalance = work-life balance.

Standard error is presented in parentheses below the regression coefficient: β (S.E.). Adjusted R² is presented in the parentheses below R².

p < 0.01,

*
p < 0.05

Table 10.
Regression Analyses Demonstrating Criterion-Related Validity with Organizational Outcomes (Sample 4)

	Org SComp	Org SPart	Org IncRate	Org InjRate	Org InjExp	Org HB	Org Absent	Org HealthExp	Org Stress	Org Sat	Org CCom	Turnover
Age	0.09 (0.23)	-0.01 (0.21)	-0.39 (0.25)	-0.68 (0.24)**	-0.38 (0.26)	0.14 (0.21)	-0.09 (0.24)	-0.34 (0.26)	0.49 (0.22)*	-0.01 (0.20)	0.35 (0.16)*	-0.08 (0.25)
Tenure	-0.09 (0.24)	-0.05 (0.22)	0.40 (0.24)	0.56 (0.23)*	0.36 (0.25)	-0.09 (0.21)	0.03 (0.23)	0.29 (0.26)	-0.41 (0.22)	-0.13 (0.20)	-0.39 (0.17)*	0.09 (0.24)
SC	0.30 (0.13)*	0.45 (0.12)**	-0.36 (0.14)*	-0.35 (0.13)*	-0.24 (0.14)	-	-	-	-	-	-	-
PHC	-	-	-	-	-	0.48 (0.12)**	-0.48 (0.13)**	-0.17 (0.14)	-	-	-	-
MWC	-	-	-	-	-	-	-	-	-0.35 (0.12)**	0.52 (0.11)**	-	-
TWH-c	0.36 (0.12)**	0.51 (0.11)**	-0.35 (0.14)*	-0.31 (0.13)*	-0.26 (0.14)	0.47 (0.11)**	-0.48 (0.13)**	-0.04 (0.15)	-0.39 (0.12)**	0.49 (0.11)**	0.65 (0.09)**	-0.43 (0.14)**
SC R ² (Adj R ²)	0.11 (0.06)	0.25 (0.20)	0.17 (0.11)	0.25 (0.20)	0.10 (0.04)	-	-	-	-	-	-	-
PHC R ² (Adj R ²)	-	-	-	-	-	0.27 (0.23)	0.25 (0.20)	0.07 (0.01)	-	-	-	-
MWC R ² (Adj R ²)	-	-	-	-	-	-	-	-	0.22 (0.17)	0.35 (0.31)	-	-
TWH-c R ² (Adj R ²)	0.16 (0.11)	0.31 (0.27)	0.16 (0.11)	0.22 (0.17)	0.10 (0.05)	0.29 (0.24)	0.23 (0.18)	0.04 (-0.02)	0.26 (0.22)	0.31 (0.27)	0.55 (0.52)	0.18 (0.13)

Note. SC = Safety Climate; PHC = Physical Health Climate; MWC = Mental Well-being Climate; TWH-c = Total Worker Health Climate; OrgSComp = organization safety compliance; OrgSPart = organization safety participation; OrgIncRate = organization incident rate; OrgInjRate = organization injury rate; OrgInjExp = organization injury expense; OrgHB = organization health behaviors; OrgAbsent = organization absenteeism; OrgHealthExp = organization healthcare expenses; OrgSat = organization satisfaction; OrgCCom = organization collective commitment; OrgStress = organization stress. N = 50. Standard error is presented in parentheses after the regression coefficient. β (S.E.). Adjusted R² is presented in the parentheses below R².

**
 $p < 0.01$,

*
 $p < 0.05$

Table 11.
Regression Analyses Demonstrating Criterion-Related Validity with Organizational Outcomes (Sample 5)

	Unit SComp	Unit InjRate	Unit HB	Unit Absent	Unit Sat	Unit CCom	Unit Turnover
Age	-0.10 (0.08)	-1.61 (1.15)	0.18 (0.08) *	0.36 (0.95)	0.01 (0.09)	-0.08 (0.09)	-1.11 (1.12)
Tenure	0.05 (0.08)	-0.13 (0.48)	0.07 (0.07)	0.95 (0.39) *	0.10 (0.08)	0.05 (0.09)	0.95 (0.46) *
SC	0.83 (0.06) **	-0.78 (0.36) *	-	-	-	-	-
PHC	-	-	0.91 (0.05) **	-0.62 (0.29) *	-	-	-
MWC	-	-	-	-	0.86 (0.06) **	-	-
TWH-c	0.83 (0.05) **	-0.90 (0.36) *	0.94 (0.06) **	-0.58 (0.30)	0.86 (0.06) **	0.78 (0.07) **	-0.30 (0.36)
SC R ² (Adj R ²)	0.73 (0.73)	0.17 (0.09)	-	-	-	-	-
PHC R ² (Adj R ²)	-	-	0.74 (0.74)	0.45 (0.40)	-	-	-
MWC R ² (Adj R ²)	-	-	-	-	0.68 (0.67)	-	-
TWH-c R ² (Adj R ²)	0.76 (0.75)	0.20 (0.13)	0.73 (0.72)	0.43 (0.38)	0.69 (0.68)	0.65 (0.63)	0.21 (0.14)

Note. SC = Safety Climate, PHC = Physical Health Climate, MWC = Mental Well-being Climate, TWH-c = Total Worker Health Climate; UnitSComp = unit safety compliance; UnitInjRate = unit injury rate; UnitHB = unit health behaviors; UnitAbsent = unit absenteeism; UnitSat = unit satisfaction; UnitCCom = unit collective commitment. N = 104. Standard error is presented in parentheses after the regression coefficient: β (S.E.). Adjusted R² is presented in the parentheses below R².

 $p < 0.01$,

*
 $p < 0.05$