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Feeling safe at work: Development and validation of the Psychological Safety Inventory

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Abstract

Psychological safety, defined as perceptions that an individual within a team is supported and feels safe to take interpersonal risks, voice opinions, and share ideas, is vital for organizational effectiveness. However, there is no consensus on how workplace psychological safety should be measured. We developed the Psychological Safety Inventory (PSI) in response to organizational needs to accurately assess psychological safety. A 70-item version of the PSI was administered to 497 employees from Canada, the United States, and the United Kingdom. Based on factor analytic findings, we reduced the preliminary PSI to a 30-item, five-factor scale. The PSI showed high reliability and correlated as anticipated with convergent measures. Overall, the PSI is a valid and reliable measure of workplace psychological safety.

KEYWORDS
psychological safety, psychometrics, scale validation, teams, workplace

Practitioner points

- Feeling psychologically safe, whether at an individual or organizational level, is vital for organizational effectiveness.
- However, there is no consensus on how psychological safety should be measured in an occupational setting.
- Given this lack of consensus and limited reliability and validity information for available measures, there is a need for the development of a comprehensive psychological safety scale.
- We developed a comprehensive self-report measure of psychological safety for use in workplace contexts titled the Psychological Safety Inventory (PSI).
- Based on exploratory and confirmatory factor analyses, we reduced the preliminary PSI to a 30-item, five-factor scale.

- The PSI subscales and total scale showed high reliability and correlated as anticipated with other measures of psychological safety, leadership, team climate, organizational perceptions, and organizational support.
- Our research can be used to inform organizational practices, such that leaders can assess their teams' levels of psychological safety to evaluate areas of need within the workplace context.

1 | INTRODUCTION

In an increasingly connected world, collaborative workplace efforts are becoming standard practice within organizations (Barker Scott & Manning, 2022; Edmondson & Lei, 2014). Effective teamwork is vital to solving complex problems across workplace disciplines and can be facilitated by productive communication (LePine et al., 2008; Salas et al., 2015), conflict resolution (Bradley et al., 2012; De Dreu & Weingart, 2003), cooperation (Mathieu et al., 2008; Salas et al., 2007), and leadership (Day et al., 2004; Morgeson et al., 2010). Psychological safety, broadly defined as the perception that a workplace team is safe to take interpersonal risks (Edmondson, 1999; Edmondson & Lei, 2014; Kahn, 1990), is also an important mechanism by which teams can enhance their performance and learning, reduce potential for critical errors, and create a positive collaborative experience (Edmondson et al., 2004). The purpose of this research was to develop and validate a new measure of workplace psychological safety.

1.1 | Psychological safety in the workplace

Psychological safety in the workplace is critical for employees to facilitate dissemination of knowledge, learn from mistakes, and experiment with new ideas (Edmondson, 1999). When a team member perceives their environment to be psychologically safe, they will feel confident to openly share suggestions for workplace improvements, accept feedback from others, and collaborate with others without fear of negative consequences, such as embarrassment or punishment (Edmondson, 1999; Edmondson & Lei, 2014; Newman et al., 2017).

Feeling psychologically safe is especially important for high-stakes workplace environments, such as within the military, where team members must work collaboratively to quickly adapt to fluctuating demands and deal with extreme conditions and dangerous environments (Veestraeten et al., 2013). Similarly, in healthcare settings, psychological safety is imperative to navigate the complex work environment and to maintain patient safety and quality of care (O'Donovan & McAuliffe, 2020). In past empirical research, psychological safety has been significantly positively associated with a number of relevant workplace constructs, including servant managerial leadership (Chughtai, 2016), positive team climate (Lee & Idris, 2017), and organizational support (Carmeli & Zisu, 2009).

Overall, psychological safety also contributes to enhanced team learning and performance across a variety of settings (Carmeli, 2007; Edmondson & Lei, 2014; Frazier et al., 2017; Newman et al., 2017; Obrenovic et al., 2020; Veestraeten et al., 2013).

Psychological safety comprises many key components. First, in a psychologically safe workplace environment, employees are confident that the team is safe in speaking up about mistakes, asking for help, seeking feedback, and experimentation. This confidence to share knowledge and request feedback without fear of negative consequences is known as interpersonal risk-taking (Edmondson, 1999). In addition to interpersonal risk-taking, an important component of psychological safety is mutual trust and respect between team members (Edmondson, 1999). When team members trust their colleagues and respect their competencies, they are more likely to share information and challenge ideas with the belief that their efforts will be recognized as potentially useful to the team, as opposed to penalized or criticized (Edmondson, 2003; Edmondson & Mogelof, 2006). Individuals may also exhibit different levels of psychological safety depending on the availability of organizational and structural supports (Wanless, 2016). Consistent with the Conservation of Resources Theory (Hobfoll, 1989), adequate access to workplace resources, information, and rewards renders them less vulnerable to resource depletion, insecurity, and defensiveness, and will instead foster an environment in which team members feel safe to share their ideas to achieve their goals (Edmondson, 1999; Newman et al., 2017; Obrenovic et al., 2020). Similarly, to feel psychologically safe, individuals in the team understand their identity, importance, and security within the team (Frazier et al., 2017). Specifically, individuals who believe that their decisions matter to the team and whose role within the team is made to explicitly feel safe to express their ideas. On the other hand, when team members perceive their status as low, such as when a leader does not acknowledge the importance of the team member's contributions, they will not engage in behaviors consistent with a psychologically safe environment (Wanless, 2016). For example, they may hesitate to share ideas, ask for help, or speak up about potential mistakes. Finally, an important tenet of psychological safety and well-being reflects support from leaders (Edmondson, 1999; Guberina & Min Wang, 2021; Kahn, 1990; Newman et al., 2017). Leung et al. (2015) emphasized the critical need for prosocial leader behavior to enhance team member perceptions of psychological safety, such that leaders should be inclusive, open, honest, and available to provide constructive or positive feedback to their subordinates.

1.2 | Measuring psychological safety: Areas for improvement

Psychological safety at the team level is primarily measured across studies using the seven-item Psychological Safety Scale (PSS), drawn from a larger battery of surveys developed by Edmondson (1999). In developing the PSS, Edmondson (1999) defined psychological safety as a the "shared belief held by members of a team that the team is safe for interpersonal risk taking" (p. 350). The PSS assesses psychological safety as a unidimensional construct characterized by interpersonal risk-taking, with items reflecting, for example, perceptions of safety associated with taking risks, team reactions to mistakes, and the team's understanding of the individual's talents and skills (Edmondson, 1999). Although the internal consistency, convergent validity, and discriminant validity of the PSS were evaluated by Edmondson (1999), factor analytic findings were not clear. Specifically, although the dimensionality of the PSS was evaluated in conjunction with the battery of scales, factor loadings and potential cross-loadings were not provided. In addition, the author implemented principal components analysis with varimax rotation, which is most appropriate for item reduction with orthogonal constructs. Given that the other scales measured constructs such as team efficacy and clear team goals, exploratory factor analysis (EFA) with an oblique rotation method would have been most appropriate. Although the PSS and its adaptations are the most frequently-used measures used to assess psychological safety, to our knowledge, following the development of the PSS, no further validation studies have been conducted.

In addition to the aforementioned areas for improvement, as mentioned, the PSS evaluates team-level psychological safety as a unidimensional construct reflecting interpersonal risk-taking. However, the seven-item measure reflecting a narrow definition of psychological safety may not capture the entire content domain and may not represent more recent developments in the psychological safety research literature (Liu et al., n.d.). Assessments of psychological safety as a unidimensional construct may also limit potential associations between the construct and other relevant workplace variables, such as workplace performance and team learning. We argue that components that were once viewed as antecedents of psychological safety, including mutual trust and respect, organizational and structural support, identity within the organization, and supportive leadership, are critical components required to perceive one's environment as psychologically safe. As such, these should be included in contemporary definitions of psychological safety in addition to interpersonal risk-taking.

More recently, new measures of psychological safety and closely-related constructs have been developed, including the Psychological Antecedents of Promotive and Prohibitive Voice scale (Liang et al., 2012), self and other psychological safety scales (Tynan, 2005), and scales reflecting psychological safety associated with colleagues and supervisors (Hetzner et al., 2010). Although useful, these measures again reflect a narrow content domain, and were largely developed based on the particular study context.

Therefore, their psychometric properties were not subjected to rigorous validation procedures or evaluated across samples, which may limit their interpretability or replicability of findings (Newman et al., 2017). Taken together, the limited reliability and validity information, as well as the narrow content domains evaluated using current measures, necessitates the development of a comprehensive psychological safety scale based on a thorough review of the literature and rigorous empirical evaluations of psychometric properties.

1.3 | Objective

To address the limitations associated with past studies, the purpose of this research was to develop and validate a comprehensive self-report measure of psychological safety for use in workplace contexts titled the Psychological Safety Inventory (PSI). First, we evaluated the dimensionality of a preliminary 70-item version of the PSI. Next, based on factor analytic findings, we reduced the PSI to its final 30-item version, and confirmed the factor structure using a second sample. Finally, we assessed the internal consistency reliability and convergent validity of the PSI. Based on past empirical literature (Carmeli & Zisu, 2009; Chughtai, 2016; Edmondson, 1999; Lee & Idris, 2017), we hypothesized that scores on the PSI would be positively correlated with psychological safety as measured using the PSS, as well as servant managerial leadership, team climate for innovation, and organizational support, and negatively correlated with negative perceptions of one's organizational culture.

2 | METHOD

2.1 | Participants

This study received approval from the Health Science Research Ethics Board at Western University and Lawson Health Research Institute. Participants included 500 full-time civilian employees. Three participants were removed from the dataset, as they failed attention checks administered. Thus, the final dataset comprised 497 full-time employees (238 men, 248 women, 4 other, 7 missing) from Canada ($n = 113$), the United States ($n = 104$), and the United Kingdom ($n = 277$). Three participants did not specify the country in which they reside. See Table 1 for additional demographic information.

2.2 | Convergent validity measures

2.2.1 | Team psychological safety

We used Edmondson's PSS (Edmondson, 1999) to examine team psychological safety, or climate for interpersonal risk-taking, as a measure of convergent validity. The scale measures responses to

TABLE 1 Descriptive statistics for demographic information (*n* = 497).

Variable	n	%	M (SD)
Age	497	–	35.7 (10.5)
Gender			
Men	238	48.6	–
Women	248	50.6	–
Do not have an option that applies to me	4	0.8	–
Ethnicity			
Black/African/Caribbean	29	5.8	
East and Southeast Asian	44	8.9	–
Indigenous peoples	3	0.6	–
Latin American/Hispanic	18	3.6	–
South Asian	19	3.8	–
West Asian	2	0.4	–
White	397	79.9	–
Other	1	0.2	–
Martial status			
Married/common law	162	32.8	–
In a long-term relationship	44	29.1	–
Single	165	33.4	–
Divorced	13	2.6	–
Separated	7	1.4	–
Widowed	3	0.6	–
Education			
Less than high school diploma or equivalent	5	1.0	–
High school diploma or equivalency certificate	51	10.3	–
Some college/CEGEP	41	8.3	–
Completed college/CEGEP	63	12.7	–
Some university (undergraduate)	33	6.7	–
Completed university (undergraduate)	186	37.5	–
Graduate or professional degree	117	23.6	–
Income			
Less than $40,000	124	25.1	–
$40,000–$59,999	107	21.6	–
$60,000–$79,999	102	20.6	–
$80,000–$99,999	58	11.7	–
100,000–$119,999	35	7.1	–
$120,000 or more	69	13.9	–

TABLE 1 (Continued)

Variable	n	%	M (SD)
Country			
Canada	113	22.9	–
United States	104	21.1	–
United Kingdom	277	56.1	–
Occupation			
Agriculture, forestry, fishing, and hunting	7	1.4	–
Arts, entertainment, and recreation	15	3.0	–
College, university, and adult education	32	6.5	–
Computer and electronics manufacturing	14	2.8	–
Construction	21	4.3	–
Finance and insurance	36	7.3	–
Government and public administration	36	7.3	–
Health care and social assistance	78	15.8	–
Hotel and food services	17	3.4	–
Information services and data processing	30	6.1	–
Legal services	10	2.0	–
Military	1	0.2	–
Mining	1	0.2	–
Primary/secondary (K–12) education	31	6.3	–
Publishing	2	0.4	–
Real estate, rental, and leasing	6	1.2	–
Retail	52	10.5	–
Scientific or technical services	23	4.7	–
Software	13	2.6	–
Telecommunications	4	0.8	–
Transportation and warehousing	23	4.7	–
Utilities	3	0.6	–
Wholesale	3	0.6	–
Other industry	36	7.3	–
Job Role			
Upper management	19	3.8	–
Middle management	84	16.9	–
Junior management	66	13.3	–
Administrative staff	57	11.5	–
Support staff	57	11.5	–
Student	3	0.6	–
Trained professional	100	20.2	–
Skilled laborer	42	8.5	–
Consultant	7	1.4	–

TABLE 1 (Continued)

Variable	n	%	M (SD)
Temporary EMPLOYEE	5	1.0	–
Researcher	20	4.0	–
Self-employed/partner	25	5.0	–
Other	11	2.2	–

Note: Occupation = which of the following categories best describes the industry you primarily work in (regardless of your actual position); job role = which of the following best describes your role in industry. % represents valid percentage. Missing *n*s range for demographic information range from 0 to 7.

seven items on a 7-point Likert scale ranging from 1 (*very inaccurate*) to 7 (*very accurate*). Mean scores were calculated, such that higher scores represented higher levels of psychological safety. Past research indicates that the internal consistency of the PSS is high (e.g., α = .82; Edmondson, 1999).

2.2.2 | Servant leadership

The 28-item Servant Leadership Questionnaire (SLQ; Liden et al., 2008) evaluates facets of managerial leadership at one's workplace, including emotional healing, creating value for the community, conceptual skills, empowering, helping subordinates grow and succeed, putting subordinates first, and behaving ethically. Each item is rated on a 7-point scale where 1 (*strongly disagree*) and 7 (*strongly agree*). Mean scores were calculated, with higher scores reflecting increased servant leadership. Internal consistency of the SLQ has been reported as high in past research (e.g., α = .85; Gocen & Sen, 2021).

2.2.3 | Team climate for innovation

The 38-item Team Climate Inventory (TCI; Anderson & West, 1998) measures attributes contributing to innovation in groups. The TCI comprises four subscales: Participation in the Team (e.g., sharing information in the team), Support for New Ideas (e.g., team works together to develop new ideas), Team Objectives (e.g., clarity of team's objectives), and Task Orientation (e.g., team monitors and appraises the work together). Participation in the Team and Support for New Ideas were measured on 5-point scales ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Team Objectives was measured on a 7-point scale ranging 1 (*not at all*) to 7 (*completely*), and Task Orientation was measured on a 7-point scale ranging from 1 (*to a very little extent*) to 7 (*to a very great extent*). Mean scores were derived for each subscale, such that higher scores indicated higher levels of each team climate-related construct. Past research supports the reliability and validity of the TCI (e.g., α = .84–.94; Anderson & West, 1998).

2.2.4 | Organizational perceptions

Negative perceptions of organizational culture were assessed with the Organizational Bullshit Perception Scale (OBPS; Ferreira et al., 2022). The OBPS contains 15 items measured on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), reflecting perceptions about the organization's regard for truth, the supervisor, and organizational language. Higher mean scores on the OBPS reflect more negative perceptions of one's organizational culture. Research employing the OBPS has reported strong reliability and validity (e.g., α = .90; Ferreira et al., 2022).

Finally, we evaluated levels of perceived organizational support using the Survey of Perceived Organizational Support (POS) Scale (Shanock et al., 2019). The POS is a 10-item scale derived from the original 36-item Survey of POS (Eisenberger et al., 1986). The POS uses a 7-point scale of 1 (*strongly disagree*) to 7 (*strongly agree*), with higher mean scores reflecting greater satisfaction with the respective organization. In past research, reliability and validity of the POS were strong (e.g., α = .88; Hellman et al., 2006).

2.3 | Procedure

Participants signed up to complete the study online via the recruitment platform, Prolific.co, and were requested to complete the preliminary 70-item PSI, as well as the PSS (Edmondson, 1999), the SLQ (Liden et al., 2008), TCI (Anderson & West, 1998), the OBPS (Ferreira et al., 2022), and the POS (Shanock et al., 2019) via Research Electronic Data Capture (REDCap). Individuals received £3.75 for their participation.

2.4 | PSI scale development

The first step in the PSI development process involved generating item content using a deductive approach based on definitions derived from past psychological safety research. Specifically, a large pool of items was derived to reflect the domains of psychological safety. We defined psychological safety as: *Perceptions that the individual within a team and organization is supported and feels safe in tackling emerging challenges. These include taking risks without fear of consequence, mutual trust amongst team members, navigating resources within the organization, and feeling secure in their individual roles*. We sought to assess psychological safety at the individual level, as it is important to capture self-reported individual differences in perceptions of one's workplace environment.

Based on our review of the literature (e.g., Edmondson, 1999; Frazier et al., 2017; Nembhard & Edmondson, 2006; Newman et al., 2017), we developed item content based on the following domains of psychological safety: (1) Interpersonal Risk-Taking; (2) Mutual Trust/Respect; (3) Organizational/Structural Support; (4) Identity and Clarity in Context of Team; and (5) Supportive Leadership. *Interpersonal Risk-Taking* is defined as a sense of

confidence that the team is safe for interpersonal risk-taking (i.e., speaking up about mistakes, asking for help, seeking feedback, experimentation). *Mutual Trust Respect* refers to perceptions of the team environment whereby individuals exhibit trust and mutual respect. Team members care about and are interested in each other as individuals. Members also share positive intentions to be helpful and respect each other's contributions. *Organizational/ Structural Support* is characterized by the presence of structural features such as adequate access to resources, information, and rewards to promote a sense of support. *Identity and Clarity in the Context of the Team* refers to perceptions of positive individual identity, importance, and security within the team. Finally, *Supportive Leadership* reflects one's perceptions of positive leadership defined through effective guidance and support, encouraging personal growth, and prioritizing the open and efficient resolution of issues.

Items were written to be clear (e.g., appropriate reading level), concise (e.g., no double-barreled items), neutral in social desirability, and consistent with theory (Kline, 2015) reflecting psychological safety. At the item writing stage, we ensured adequate content validity; that is, items were written to target all five domains of psychological safety.

Psychometrics experts generally recommend that researchers develop three-to-four times the desired number of items for their initial item pool, as many items will be discarded following item analysis procedures (DeVellis, 2003; Morgado et al., 2017). Thus, the first draft of the PSI contained 102 items (*Interpersonal Risk-Taking*: 23 items; *Mutual Trust/Respect*: 20 items; *Organizational/ Structural Support*: 19 items; *Identity and Clarity in the Context of the Team*: 16 items; *Supportive Leadership*: 24 items). We engaged a total of nine psychology research experts (i.e., staff including post-doctoral associates, research associates, and faculty members at MacDonald Franklin Operational Stress Injury Research Centre, St. Joseph's Health Care London) and seven psychometrics experts (i.e., graduate students and faculty members in the psychology department at a Canadian university) to evaluate items to ensure that they accurately reflected the construct of psychological safety. Specifically, experts were provided with items and domain definitions. They were then instructed to indicate the degree to which they agreed that each item represented each of the five domains on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Experts were also provided with comment boxes to note any items with problematic phrasing or any items that strayed too far from the intended construct and were permitted to indicate whether any items should be added, modified, or whether any items were more suited to another domain. Expert ratings and comments were then collated and incorporated to refine items. In total, based on expert ratings and feedback, we modified items and reduced the preliminary pool to 70 items (*Interpersonal Risk-Taking*: 14 items; *Mutual Trust/Respect*: 14 items; *Organizational/Structural Support*: 14 items; *Identity and Clarity in the Context of the Team*: 13 items; *Supportive Leadership*: 15 items), eliminating and modifying items with the lowest representation ratings.

Following reduction of the item pool, we assessed the reading level of the scale using the Gunning Fog Index (Gunning, 1952). This index reflects the number of years of formal education required by a person to understand the text provided. The Gunning Fog Index for the preliminary PSI was 7.95, which represents an eighth-grade reading level. This reading level is desirable for self-report measures of personal characteristics. Finally, we considered best practices for implementation of specific scale anchors. For example, researchers have recommended Likert-type scales with 5- or 7-point anchors, ensuring a "neutral" midpoint option (e.g., Dawes, 2008) to enhance the reliability of the measure. Thus, we selected a 5-point Likert scale for administration of scale items, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

2.5 | Item reduction and scale validation analytic strategy

First, we conducted an EFA on half of the sample (*n* = 250) using SPSS Version 27 (IBM Corp., 2020) to examine the dimensionality of the PSI and to reduce items to a parsimonious set. We implemented principal axis factoring with promax rotation. Items were retained based on theory, consideration for item redundancy, and a factor loading cut-off value of 0.30 (Boateng et al., 2018). We also considered Scree plots, Horn's parallel analysis (Horn, 1965), and theoretical underpinnings reflecting psychological safety to determine the number of factors to extract.

Following item reduction, we conducted a confirmatory factor analysis (CFA) on the second half of the civilian sample (*n* = 247) using MPlus Version 8 (Muthén & Muthén, 2017) to confirm the factor structure of the reduced item set. To ensure adequate sample size, we conducted a Monte Carlo simulation for a CFA with five factors representing each psychological safety domain and respective items as indicator variables. Effect sizes were generated based on our EFA. With 150 observations across 1000 repetitions, significant effects were detected between 93.0% and 96.0% of the time. Thus, our sample size of 247 was adequate in terms of statistical power. We used the mean- and variance-adjusted weighted least squares estimator (WLSMV) for ordinal data, and missing data were estimated using the default full-information maximum likelihood. To assess model fit, we used root mean square error of approximation (RMSEA), comparative fit index (CFI), and the Tucker–Lewis index (TLI). For RMSEA, values below 0.05 represent strong fit, values between 0.05 and 0.08 represent fair fit, and values above 0.10 reflect poor fit (Browne & Cudeck, 1993; Hu & Bentler, 1999) CFI and TLI values close to 0.95 reflect excellent model fit (Hu & Bentler, 1999).

Finally, we assessed the convergent validity of the final PSI by correlating the scale with psychological safety as measured using the PSS, as well as servant managerial leadership, team climate for innovation, organizational support, and negative perceptions of one's organizational culture among the whole sample (*n* = 497). We calculated Pearson correlations using SPSS

Version 27 (IBM Corp., 2020). Effect sizes were interpreted as small, $r = .10$, medium, $r = .30$, and large, $r = .50$ (Cohen, 1992).

3 | RESULTS

3.1 | Item reduction findings

First, we conducted an EFA using the preliminary 70-item PSI. Initial eigenvalues and the parallel analysis suggested that 10 factors should be extracted. However, the Scree plot indicated that only four factors should be extracted, and based on our literature review, our goal was to extract five factors from the data. Thus, we retained five factors for the initial EFA based on our theoretical understanding of the psychological safety construct. The EFA using the 70 items indicated that the five factors accounted for 40.93% (*Supportive Leadership*), 7.59% (*Mutual Trust/Respect*), 4.48% (*Identity and Clarity in Context of Team*), 2.61% (*Organizational/Structural Support*), and 2.02% (*Interpersonal Risk-Taking*) of the variance in items, respectively. Factor correlations ranged between .41 (*Interpersonal Risk-Taking* and *Supportive Leadership*) and .64 (*Interpersonal Risk-Taking* and *Mutual Trust/Respect*).

To reduce the number of scale items while preserving content validity of the PSI, we removed items sequentially based on a number of criteria. First, we maintained items with loadings above .30, removed items with cross-loadings above .30, and eliminated items that were redundant. At the same time, we sought to maintain adequate content coverage of the five psychological safety domains. Overall, we removed a total of 40 items, including 9 from *Interpersonal Risk-Taking*, 7 from *Mutual Trust/Respect*, 8 from *Organizational/Structural Support*, 7 from *Identity and Clarity in Context of Team*, and 9 from *Supportive Leadership*. The final measure comprised 30 items, with final subscales ranging from five to seven items each.

Next, we conducted an EFA on the final 30-item PSI. Five factors emerged with eigenvalues greater than 1.00. Factor 1 (*Mutual Trust/Respect*) accounted for 40.21% of variance among items, whereas Factor 2 (*Supportive Leadership*) accounted for 8.33%, Factor 3 (*Identity and Clarity in Context of Team*) accounted for 5.28%, Factor 4 (*Organizational/Structural Support*) accounted for 4.36%, and Factor 5 (*Interpersonal Risk-Taking*) accounted for 2.95% of variance among items. Factor correlations ranged from .41 to .64. See Table 2 for factor loadings associated with the 30-item EFA.[1]

We used CFA to confirm that the five-factor structure was suitable for the 30-item PSI. When all fit indices were examined, the model fit the data well overall: $\chi^2(395) = 968.81$, $p < .001$, CFI = 0.949, TLI = 0.944, RMSEA = 0.077 (90% confidence interval = 0.071, 0.083). Factors were significantly correlated, ranging in magnitude from .51 (*Organizational/Structural Support* and *Interpersonal Risk-Taking*) to .72 (*Organizational/Structural Support* and *Supportive Leadership*). Factor loadings are provided in Table 2. A copy of the PSS with its instructions is available in Supporting Information Materials.

3.2 | Convergent validity

Descriptive statistics and Cronbach's alphas for the PSI and all convergent validity measures are reported in Table 3. To assess the convergent validity of the PSI, we calculated Pearson correlations between the PSI subscales, total scale, and the relevant measures. Correlations between the PSI subscales were strong, ranging from .45 (*Organizational/Structural Support* and *Interpersonal Risk-Taking*) to .61 (*Supportive Leadership* and *Organizational/Structural Support*). The total PSI scale also correlated strongly with the subscales, ranging from .71 (*Interpersonal Risk-Taking*) to .80 (*Mutual Trust/Respect*). See Table 4 for subscale and total scale correlations.

When we examined PSI subscale and total scale correlations with convergent validity measures, all correlations were significant (see Table 5). Specifically, all PSI subscales and the PSI total scale correlated positively with the PSS measure of psychological safety, leadership, TCI subscales (Participation in the Team, Support for New Ideas, Team Objectives, and Task Orientation), and perceived organizational support. The PSI subscales and total scale also correlated negatively with poor perceptions of one's organization (Ferreira et al., 2022). Overall, correlations were medium-to-large in magnitude, ranging from −.53 (negative organizational perceptions and PSI *Supportive Leadership*) to .80 (Servant Leadership and PSI *Supportive Leadership*).

4 | DISCUSSION

There is a strong universal need to promote collaborative team efforts and to solve complex problems in the workplace. As such, it is imperative that organizations establish benchmarks for understanding factors that contribute to team members' performance and learning. Measuring self-reported psychological safety is an important and effective way to understand team members' perceptions of workplace support and ability to take on emerging challenges. Given its importance, the purpose of this research was to develop and validate a comprehensive measure of psychological safety for use in workplace contexts.

Beginning with a pool of 102 items, we followed best practices for test construction (Carpenter, 2018) to reduce the scale to 30 items, including retaining items with loadings above .30, removing items with cross-loadings above .30, and eliminating redundant items. In accordance with Holden et al. (1985) and Streiner et al. (2015), items were also developed to be content-saturated, homogeneous, positively worded, and clearly written.

We subsequently assessed the 30-item PSI for its dimensionality, reliability, and convergent validity. Across samples, the 30 items loaded strongly onto their respective factors, and the five-factor CFA model fit the data well. Specifically, the five-factor structure represented components of psychological safety, including Interpersonal Risk-Taking, Mutual Trust/Respect, Organizational/Structural Support, Identity and Clarity in Context of Team, and Supportive Leadership. Specifically, one crucial component of psychological

TABLE 2 Exploratory and confirmatory factor analysis for Psychological Safety Inventory.

	Factor				
	1	2	3	4	5
My team cares about my well-being.	.71 (.76)				
I trust my team members.	.78 (84)				
My team makes me feel included.	.86 (.94)				
I feel respected by my team.	.89 (.92)				
I have a good relationship with my team members.	.95 (.90)				
I feel a sense of belonging on my team.	.86 (.88)				
People in the team embrace members' diverse perspectives.	.58 (.76)				
My leader(s) encourage a culture of inclusion.		.51 (.87)			
I trust my leader(s) to be honest with me.		.79 (.85)			
My leader(s) provide effective guidance.		.93 (.90)			
I receive constructive feedback from my leader(s).		.86 (.87)			
My leader(s) coach me to be better.		.80 (.88)			
My leader(s) act quickly to correct problems.		.74 (.80)			
My position is secure.			.88 (.75)		
My future with the team is clear.			.61 (.89)		
I identify myself as an important member of my team.			.53 (.79)		
I do not worry about being let go from the team.			.83 (.63)		
I am stable in my position.			.88 (.88)		
I feel confident in my position.			.53 (.80)		
There are services in the organization to help those in need.				.89 (.66)	
There are policies in place to protect me.				.68 (.83)	
Supportive resources are accessible.				.94 (.83)	
I know where to seek help in my organization when I need it.				.68 (.82)	
Resources are available to enhance my performance.				.43 (.79)	
If something goes wrong, I know where to find information to solve the issue.				.31 (.83)	
I am not afraid to ask for honest feedback from my team.					.63 (.75)
I do not worry about repercussions when I seek help from my team.					.68 (.66)
When I disagree with the team, I feel comfortable voicing my opinion.					.61 (.77)
I am not afraid to speak up to my team about my concerns.					.89 (.87)
I am not afraid to advocate for others within my team.					.39 (.77)

Note: Exploratory factor analysis (confirmatory factor analysis). Factor 1 = Mutual Trust/Respect. Factor 2 = Supportive Leadership. Factor 3 = Identity and Clarity in Context of Team. Factor 4 = Organizational/Structural Support. Factor 5 = Interpersonal Risk-Taking. EFA loadings reflect pattern matrix. Loadings <0.30 are suppressed. Cross-loadings for EFA can be found in Table S1.

TABLE 3 Descriptive statistics for Psychological Safety Inventory and convergent measures (n = 497).

	M	SD	α
PSI Total	3.80	0.60	.95
PSI Risk Taking	3.98	0.67	.82
PSI Trust	3.93	0.76	.93
PSI Support	3.65	0.77	.88
PSI Identity	3.82	0.77	.88
PSI Leadership	3.62	0.89	.91
Edmondson	5.17	0.99	.81
Servant Leadership	4.58	1.13	.96
TCI Participation	3.93	0.70	.94
TCI Ideas	3.64	0.83	.94
TCI Objectives	5.27	1.10	.94
TCI Orientation	4.77	1.20	.90
OBPS	3.33	0.85	.82
POS	4.68	1.45	.96

Abbreviations: Edmondson, Edmondson's Psychological Safety Scale; Ideas, support for ideas; Identity, identity and clarity in context of team; Leadership, leadership support; M, mean; Objectives, team objectives; OBPS, Organizational Bullshit Perception Scale; Orientation, task orientation; Participation, team participation; POS, Perceived Organizational Support Scale; PSI, Psychological Safety Inventory; Risk Taking, Interpersonal Risk Taking; SD, standard deviation; Servant Leadership, Servant Leadership Scale; Support, organizational/structural support; TCI, Team Climate Inventory; Total, Psychological Safety Inventory total score; Trust, mutual trust/respect.

TABLE 4 Correlations between Psychological Safety Inventory subscales (n = 497).

	Total	Risk-Taking	Trust	Support	Identity	Leadership
Total	–					
Risk Taking	.71	–				
Trust	.80	.55	–			
Support	.79	.45	.48	–		
Identity	.79	.52	.57	.51	–	
Leadership	.78	.38	.46	.61	.48	–

Note: All correlations significant at p < .001.

Abbreviations: α, Cronbach's alpha; Identity, identity and clarity in context of team; Leadership, leadership support; Risk-Taking, Interpersonal Risk Taking; Support, organizational/structural support; Total, Psychological Safety Inventory total score; Trust, mutual trust/respect.

safety involves a belief that team members will not place blame on or punish an individual for engaging in well-intentioned interpersonal risk, such as requesting feedback or help, providing information to others, and discussing errors with colleagues (Edmondson, 1999). Each of these interpersonal risk-taking behaviors contributes to enhanced learning within teams (Edmondson, 1999). To cultivate an environment of psychological safety and engage in interpersonal risk-taking behaviors, team members must exhibit mutual trust and respect for one another. Building a workplace on the foundation of mutual trust and respect will help to establish an environment in which individuals feel comfortable being themselves, sharing diverse perspectives with colleagues, and disclosing their own or others' mistakes (Edmondson, 1999; Liu et al., 2015). Furthermore, providing employees with adequate supports, such as instructional and training supports, protective policies against workplace discrimination and harassment, or professional development resources can foster psychological safety by allowing team members to feel comfortable seeking help and guidance when needed (Edmondson, 1999; Newman et al., 2017). Also of importance to the construct of psychological safety is a strong sense of one's workplace identity and security, such that individuals should feel confident about their current role and future within the team to feel safe to freely express

themselves. Consistent with this notion, Plomp et al. (2019) found that temporary agency employees, whose positions were not secure long-term, scored significantly lower than permanent employees on workplace psychological safety. Finally, supportive and open leaders who are committed to coaching team members are critical to promoting a psychologically safe workplace environment (Edmondson, 1999; Frazier et al., 2017; Kahn, 1990).

When the reliability of the PSI was examined, results showed strong internal consistency for both the total score and subscales, indicating a homogeneous item pool. Each of the PSI subscales were strongly and positively correlated with one another, with the largest correlations emerging between Organizational/Structural Support and Supportive Leadership. It is evident that various workplace supports, such as availability of resources and effective communication from leaders, are closely connected and necessary to facilitate a positive and psychologically-safe workplace environment (Newman et al., 2017).

In addition to the dimensionality and internal consistency of the PSI, we assessed the convergent validity of the PSI in the full sample. Results showed that the PSI total score and its subscales correlated strongly with Edmondson's team-level PSS, with the strongest correlations between PSS and PSI Mutual Trust/Respect. This is consistent with PSS item content, which largely reflects relationships between team members (e.g., "No one on this team would deliberately act in a way that undermines my efforts"; "Working with members of this team, my unique skills and talents are valued and utilized"). Associations between the PSI total scores and its subscales were strongly and positively correlated with servant managerial leadership, and the strongest correlation emerged between servant leadership and PSI Supportive Leadership. These positive associations are in accordance with past empirical literature that has found a positive relation between team psychological safety and servant leadership, as well as an indirect association through affect-based trust in one's leader (Schaubroeck et al., 2011). Servant managerial leadership is characterized by focusing on assisting and

TABLE 5 Correlations between Psychological Safety Inventory and convergent measures ($n = 497$).

	Edmondson	Servant Leadership	TCI Participation	TCI Ideas	TCI Objectives	TCI Orientation	OBP	POS
PSI Total	.72	.74	.72	.68	.66	.64	−.46	.73
PSI Risk-Taking	.55	.37	.47	.39	.40	.39	−.27	.39
PSI Trust	.73	.49	.75	.61	.53	.57	−.29	.52
PSI Support	.46	.62	.51	.56	.53	.53	−.34	.62
PSI Identity	.53	.51	.52	.43	.48	.43	−.32	.57
PSI Leadership	.53	.80	.49	.59	.59	.53	−.53	.69

Note: All correlations significant at $p < .001$.

Abbreviations: Edmondson, Edmondson's Psychological Safety Team Scale; Ideas, support for ideas; Identity, identity and clarity in context of team; Leadership, leadership support; Objectives, team objectives; OBS, Organizational Bullshit Perception Scale; Orientation, task orientation; Participation, team participation; POS, Perceived Organizational Support Scale; PSI, Psychological Safety Inventory; Risk-Taking, Interpersonal Risk Taking; Servant Leadership, Servant Leadership Scale; Support, organizational/structural support; TCI, Team Climate Inventory; Total, Psychological Safety Inventory total score; Trust, mutual trust/respect.

motivating others to reach their full potential, treating the workplace as a community, and equally distributing power between team members (Greenleaf, 1977; Liden et al., 2008; van Dierendonck, 2011). When team members believe that their leaders exhibit these qualities, they are likely to develop positive dyadic relationships with team members and leaders (Liden et al., 2008; van Dierendonck, 2011), thus plausibly contributing to high levels of psychological safety. Similarly, all facets of team climate for innovation, including Participation in the Team, Support for New Ideas, Team Objectives, and Task Orientation, were strongly and positively related to all PSI subscales. Total PSI scores were most strongly correlated with Participation in the Team. These findings are consistent with research that has demonstrated psychological safety as a critical antecedent to team innovation (Gu et al., 2013; Newman et al., 2017; Post, 2012). Specifically, if individuals feel comfortable taking risks and suggesting novel ideas without fear of embarrassment or punishment, this will enhance their potential for creativity and innovation at work (Edmondson et al., 2004). Also as expected, PSI scores were strongly and positively correlated with perceived organizational support, indicating that the extent to which an organization places value on one's well-being and contributions in the workplace is related to one's tendency to ask questions, experiment with novel ideas, seek feedback from teammates, or disclose potential mistakes (Carmeli & Zisu, 2009; Gundersen, 2020).

Finally, PSI total and subscale scores were significantly and negatively correlated with poor perceptions of organizational culture, with small-to-large effect sizes. These negative perceptions included, for example, communication without regard for factual information, leaders striving only to advance their own agendas, and implementing excessive use of acronyms and verbiage (Ferreira et al., 2022). Unsurprisingly, negative perceptions of organizational culture were most strongly and negatively correlated with PSI Supportive Leadership, which contains items reflecting inclusive leadership culture, leaders as effective coaches, and leaders as trustworthy and honest.

4.1 | Limitations, future directions, and concluding remarks

Despite the strengths of our study, some limitations should be addressed. First, our samples comprised only individuals residing in Canada, the United Kingdom, or the United States, and sample sizes were relatively modest ($n = 250$ for EFA, $n = 247$ for CFA). Past research has suggested that cultural differences exist regarding the influence of perceptions of one's organizational environment on workplace attitudes and performance (Rockstuhl et al., 2020). Thus, it is possible that differences in how perceptions of psychological safety are defined or related to relevant constructs exist across nations. Future research should investigate cross-national invariance of the PSI with larger sample sizes, as well as differences in the magnitude of correlations between the PSI and other organizational variables across Eastern and Western nations, for example. Next, although we established the convergent validity of the PSI, future research should evaluate whether the measure demonstrates predictive validity for key workplace behaviors and outcomes, such as workplace creativity, performance, and innovation. Future research should also assess the discriminant validity of the PSI through correlations with variables that would likely not influence the workplace context. In addition, the PSI is a self-report measure, and thus, there is potential for participants to engage in socially desirable responding, characterized by a tendency to present oneself favorably to prevent negative perceptions from others (e.g., Paulhus, 1984). Therefore, future research should compare self- and other reports of psychological safety to demonstrate accuracy of responses. The internal consistency reliability of the overall PSI was also high at .95, so it is plausible that some items may be redundant. Future research should re-evaluate the internal consistency of the PSI to assess whether this finding emerges across samples. Participants were also not instructed to imagine a specific leader or team when responding to items due to the potentially distinct characteristics across jobs in our sample. Future research may consider instructing participants to respond to items based on specific supervisors, leaders, or teams

depending on the workplace context. Finally, because the Interpersonal Risk-Taking items were mostly negatively worded, future research should evaluate whether this factor represents a true content-related domain, or whether method bias has been introduced.

Our research can be used to inform organizational practices, such that leaders can assess their employees' levels of psychological safety at either the factor or facet level to evaluate areas of need within the workplace context. In turn, leaders can implement tailored interventions and supports to optimize distinct domains of psychological safety and, subsequently, use the PSI to supplement outcome monitoring and evaluate effectiveness of their intiatives. Overall, the present study empirically demonstrated the dimensionality, internal consistency reliability, and convergent validity of the PSI, and provided support for the use of the five-factor PSI as a comprehensive measure of psychological safety for use in a variety of workplace contexts.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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ENDNOTE

[1] The same substantive results emerged when direct oblimin rotation was used.

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