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PSYCHOLOGICAL MICROFOUNDATIONS OF ORGANIZATIONAL RELIABILITY IN SAFETY-CRITICAL INDUSTRIAL ENVIRONMENTS – EMOTIONAL INTELLIGENCE, SENSE OF COHERENCE, AND RESILIENCE AMONG EXPERIENCED INDUSTRIAL WORKERS

A SZERVEZETI MEGBÍZHATÓSÁG PSZICHOLÓGIAI MIKROALAPJAI BIZTONSÁGKRITIKUS IPARI KÖRNYEZETEKBEN – ÉRZELMI INTELLIGENCIA, KOHERENCIAÉRZÉS ÉS REZILIENCIA TAPASZTALT IPARI MUNKAVÁLLALÓK KÖRÉBEN

The current study explores the psychological microfactors underlying resilience within safety-sensitive industries, with emphasis on the interplay between emotional intelligence, sense of coherence, and adaptability. In this respect, a conceptual model for the analysis of emotional intelligence, sense of coherence, and resilience was applied to an industrial sample of 460 employees, with 294 listwise valid cases. The findings revealed that self-regulatory emotional intelligence emerged as the best predictor of resilience (ß = .450, p < .001), whereas sense of coherence exhibited a partial mediation effect (ß = .171, p = .002). The explanatory strength of the mediation model was rather high (R^2 = .507). Moreover, emotional intelligence significantly predicted sense of coherence, especially self-regulatory (ß = .489, p < .001). The comparison between managers and subordinates demonstrated structural invariance; nevertheless, the relative significance of intrapersonal self-regulation proved to be more pronounced for managers, whereas sense of coherence had greater significance for followers.

Keywords: **emotional intelligence, resilience, sense of coherence, organizational reliability, safety-critical industrial environment**

A tanulmány a reziliencia pszichológiai mikrotényezőit vizsgálja biztonságkritikus ipari környezetben, különös tekintettel az érzelmi intelligencia, a koherenciaérzés és az adaptív működés kapcsolatára. A kutatás 460 fős ipari mintán, 294 listwise érvényes eset elemzésével tesztelte az érzelmi intelligencia, a koherenciaérzés és a reziliencia integrált modelljét. Az eredmények szerint az önszabályozó érzelmi intelligencia bizonyult a reziliencia legerősebb prediktorának (ß = .450, p < .001), míg a koherenciaérzés szignifikáns, részleges mediáló szerepet töltött be (ß = .171, p = .002). A mediációs modell magyarázóereje magas volt (R^2 = .507). Az érzelmi intelligencia a koherenciaérzést is jelentősen előre jelezte, különösen az önszabályozó dimenzió (ß = .489, p < .001). A vezetői és beosztotti csoportok összehasonlítása strukturális invarianciát mutatott, ugyanakkor a vezetők esetében az intraperszonális önszabályozás, míg a követőknél a koherenciaérzés relatív szerepe bizonyult hangsúlyosabbnak. Az eredmények alátámasztják, hogy a szervezeti megbízhatóság és az operatív stabilitás részben az egyéni pszichológiai szabályozási folyamatokra épül.

Kulcsszavak: **érzelmi intelligencia, reziliencia, koherenciaérzés, szervezeti megbízhatóság, biztonságkritikus ipari környezet**

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Heavy industry, mechanical engineering, and automotive production systems represent complex sociotechnical environments in which safety and reliable operation cannot be explained solely by technological reliability. Analyses of accidents consistently show that failures rarely arise from isolated individual errors but from interactions between human decisions and organizational conditions. This perspective has led to the conceptualization of safety culture as the interplay between organizational structures and individual decision processes.

High Reliability Organization (HRO) research conceptualizes reliability as a collective capability based on continuous vigilance, sensitivity to failure, and decentralized expertise (Weick & Sutcliffe, 2007). Resilience engineering extends this perspective by framing performance as the capacity to anticipate, monitor, respond to, and learn from disturbances (Hollnagel et al., 2006; Hollnagel, 2015). Although these approaches emphasize organizational processes, they implicitly rely on individual psychological capacities that support stable performance under uncertainty.

At the individual level, resilience refers to adaptive functioning under stress and is increasingly conceptualized as a dynamic process emerging from interactions between psychological resources and environmental conditions (Connor & Davidson, 2003; Ungar, 2021). Within Antonovsky's (1987) salutogenic framework, sense of coherence–the perception of the environment as comprehensible, manageable, and meaningful–facilitates effective stress regulation. Empirical research confirms its association with psychological well-being, adaptive coping, and long-term health outcomes (Dziuba et al., 2021; Mittelmark et al., 2022).

In high-risk organizational environments, resilience therefore reflects both an individual psychological resource and a component of organizational adaptation. Previous research indicates that emotional intelligence can function as a protective factor against psychological strain and support resilient forms of organizational functioning (Balázs, 2020). Emotional intelligence may contribute to coherent situation appraisal, thereby increasing the likelihood of resilient functioning.

From this perspective, organizational stability does not imply error-free operation but the capacity to maintain core operational functions and decision quality under uncertainty. While resilience refers to adaptive capacity, organizational stability represents its functional outcome in the continuity of safety-critical performance (Hollnagel, 2014; Patriarca et al., 2018; Woods, 2015). However, existing resilience research primarily emphasizes structural and technological conditions and rarely operationalizes their psychological microfoundations (Hollnagel et al., 2006; Reason, 1997).

Theoretical background

Conceptual approaches to emotional intelligence and its organizational interpretation

Emotional intelligence (EI) is one of the most widely discussed psychological constructs in organizational behavior and leadership research because it links cognitive decision-making processes with emotional self-regulation. Classically, EI is defined as the ability to perceive, understand, and regulate emotions in ways that facilitate adaptive functioning and intellectual growth (Salovey & Mayer, 1990; Mayer, Salovey, & Caruso, 2008).

The literature distinguishes between ability-based and trait-based models of emotional intelligence. Ability models conceptualize EI as a form of emotional information processing comparable to cognitive intelligence, whereas trait models assess typical emotional self-perceptions and behavioral tendencies through self-report measures. In addition, mixed models integrate emotional competencies with broader personality characteristics and are frequently applied in organizational research (O'Boyle, Humphrey, Pollack, Hawver, & Story, 2011; Petrides, 2010).

The organizational relevance of emotional intelligence derives from the fact that emotions influence not only well-being but also decision-making and behavioral regulation. Meta-analytic evidence demonstrates a consistent relationship between emotional intelligence and job performance (Miao, Humphrey, & Qian, 2017). The cascade model proposed by Joseph and Newman (2010) further suggests that emotion perception and understanding influence performance primarily through emotion regulation processes.

In high-risk industrial environments, emotional intelligence becomes particularly relevant because stress, cognitive overload, and affective states can influence safety behavior and rule compliance (Clarke, 2010). Emotional self-regulation therefore plays a critical role in contexts characterized by technological complexity and high responsibility. From an organizational perspective, emotional intelligence can thus be interpreted as a psychological resource that supports cognitive control, stable decision-making, and adaptive responses to operational disturbances.

From the perspective of high-reliability organizational theory, emotional intelligence constitutes a psychological precondition for the individual-level enactment of reliability-enhancing behaviors. Weick and Sutcliffe (2007) identify mindful organizing – characterized by sensitivity to anomalies, reluctance to simplify, and deference to expertise – as the behavioral hallmark of high-reliability performance. Each of these behaviors requires the kind of attentional stability and regulatory control that emotional intelligence supports: without effective management of affective states, perceptual sensitivity degrades, cognitive simplification increases, and

interpersonal deference breaks down. Emotional intelligence in safety-critical industrial contexts can therefore be understood not merely as a performance resource but as a functional prerequisite for the psychological processes underlying organizational reliability.

Definition of resilience and its relationship with emotional intelligence

Resilience is commonly defined as adaptive functioning under conditions of stress or adversity (Masten, 2001). Contemporary perspectives conceptualize resilience as a dynamic regulatory process involving situation appraisal, self-regulation, and the mobilization of psychological resources (Bonanno, 2004; Kalisch et al., 2015; Luthar, Cicchetti, & Becker, 2000; Ungar, 2021).

In organizational contexts, resilience has both an individual and a collective dimension. At the individual level it refers to the capacity for flexible adaptation to stress, while at the collective level it forms a microfoundation of team and organizational resilience (Lengnick-Hall, Beck, & Lengnick-Hall, 2011; Williams, Gruber, Sutcliffe, Shepherd, & Zhao, 2017). From this perspective, organizational resilience emerges from aggregated patterns of individual adaptive functioning, which is particularly relevant in high-risk industrial environments where operational stability depends heavily on the quality of individual decisions and responses (Vogus & Sutcliffe, 2007).

Recent research emphasizes that resilient adaptation is grounded in psychological regulatory processes, particularly emotion regulation and cognitive control (Bonanno & Burton, 2013). Flexible regulation of negative affect and cognitive reappraisal of stressful situations reduce dysfunctional stress responses and facilitate adaptive coping (Southwick & Charney, 2012).

Empirical studies demonstrate that intrapersonal EI components–such as self-awareness and self-control–are significant predictors of psychological resilience in the context of stress and adversity (Armstrong, Galligan, & Critchley, 2011). Further research indicates that emotional intelligence contributes to the flexible use of emotion regulation strategies, which represent a core mechanism of resilient adaptation (Double, Pinkus, & MacCann, 2022; Schneider, Lyons, & Khazon, 2013).

The organizational interpretation of resilience is also consistent with resilience engineering, which conceptualizes system stability through the capacities to anticipate, monitor, respond, and learn from disturbances (Hollnagel, 2014). Although formulated primarily at the system level, these capacities rely on individual psychological resources such as emotional self-regulation and cognitive control. In technologically complex and safety-critical work environments, these psychological resources play a crucial role in maintaining operational stability and enabling recovery from unexpected disruptions (Beus, Payne, Bergman, & Arthur, 2010; Clarke, 2010). This connection between individual psychological resilience and system-level reliability is particularly consequential in safety-critical industrial environments. Hollnagel's (2014) four resilience capacities – the ability to anticipate potential disruptions, monitor developing situations, respond to disturbances, and learn from experience – each presuppose individual psychological resources that enable stable cognitive and regulatory functioning under pressure. Anticipation requires the cognitive capacity to hold multiple scenarios simultaneously without affective overload; monitoring requires sustained attentional control; response requires rapid and flexible behavioral regulation; and learning requires the capacity to reflect on experience without defensive distortion. Individual resilience, operationalized as adaptive functioning under stress, can therefore be understood as the psychological substrate that makes these system-level capacities individually enactable. The present study's focus on safety-critical industrial workers thus moves beyond the general organizational literature by testing this model in a population where the relationship between individual psychological resources and system reliability carries direct operational and safety implications.

Sense of coherence and salutogenesis: organizational applications and mediating mechanisms

Antonovsky's salutogenic theory introduced the concept of sense of coherence (SOC), defined as the extent to which individuals perceive their environment as comprehensible, manageable, and meaningful (Antonovsky, 1987). SOC reflects a generalized orientation through which individuals interpret situations as structured and controllable, facilitating effective coping with environmental demands.

Empirical research provides strong support for the protective role of SOC in stressful contexts. A systematic review by Eriksson and Lindström (2006), synthesizing several hundred studies, demonstrated consistent positive associations between SOC and both mental and physical health outcomes. Subsequent meta-analytical findings further confirmed this protective function; for example, Schäfer et al. (2019) reported a substantial negative correlation between SOC and posttraumatic stress symptoms ($r \approx -0.41$).

In organizational research, SOC has increasingly been examined as a mechanism linking workplace conditions and employee well-being. Studies show that SOC can mediate the relationship between psychosocial job demands and psychological outcomes (Feldt, Kinnunen, & Mauno, 2000). Building on this perspective, the concept of work-specific sense of coherence (Work-SOC) was developed to capture comprehensibility, manageability, and meaningfulness within the work environment. Vogt et al. (2013) validated the Work-SOC scale, and subsequent longitudinal research demonstrated that workplace resources can predict increases in SOC and thereby enhance work engagement (Vogt et al., 2016). In safety-critical industrial contexts, the three components of SOC acquire specific operational meaning that extends their general psychological function. Comprehensibility – the sense that one's environment is structured and predictable – maps onto the operator's capacity to maintain an accurate situational model of complex technical

systems; its degradation under stress is a recognized precursor to accidents and near-misses (Reason, 1997). Manageability – the perception that one possesses sufficient resources to meet demands – corresponds to the operator's sense of task efficacy under time pressure and high responsibility. Meaningfulness – the experience of work as worthy of engagement and effort – supports sustained motivational commitment to safe performance even in routine, repetitive operational conditions. In this context, sense of coherence functions not merely as a general well-being resource but as a psychological stabilizer of the interpretive processes that underlie reliable human performance in safety-critical systems. This reframing positions SOC as a theoretically novel construct within the resilience engineering literature, where equivalent concepts have been articulated at the system level – such as Hollnagel's (2014) notion of functional readiness – but never operationalized at the level of individual psychological experience.

The relationship between emotional intelligence and sense of coherence can be explicated through a three-stage cognitive–affective regulatory process. In the first stage, emotional self-regulation – particularly impulse control and stress tolerance – functions as an affective filter: by preventing the cognitive system from being overwhelmed by negative emotional states, it preserves cognitive resources by modulating the affective response before it disrupts structured information processing – consistent with Gross's (2002) process model of emotion regulation (Côté, 2014). In the second stage, this reduction in affective load creates the cognitive conditions under which work situations can be appraised as comprehensible, manageable, and meaningful – the three defining components of sense of coherence (Antonovsky, 1987). Importantly, emotional intelligence does not directly produce coherence; rather, it removes the affective obstacles that would otherwise distort coherent situational appraisal. In the third stage, this coherent interpretive orientation stabilizes the individual's representation of the work environment, reduces subjective uncertainty – itself a primary stressor in operationally demanding contexts – and thereby preserves the cognitive resources required for flexible, adaptive responding. In high-risk industrial environments, this freed cognitive capacity constitutes a foundational condition for resilient functioning: it supports anticipation of disturbances, stable decision-making under time pressure, and recovery from unexpected operational disruptions (Hollnagel, 2014; Kalisch, Müller, & Tüscher, 2015).

Research objectives and hypotheses

The present study examines how individual psychological resources contribute to operational stability and organizational reliability in high-risk industrial environments. It builds on the assumption that organizational resilience is not solely a structural or procedural characteristic but is partly realized through individual regulatory and interpretive mechanisms.

Specifically, the study investigates the relationships among emotional intelligence, sense of coherence, and resilience. Emotional intelligence is assumed to support resilient functioning, while sense of coherence may function as a mediating mechanism linking emotional competencies to adaptive responses. Within this framework, sense of coherence is conceptualized as an interpretative orientation that structures how individuals perceive and manage complex work environments.

The present study is primarily confirmatory in nature: its hypotheses build on theoretically well-established and empirically supported relationships, and the study's central aim is to test whether these relationships replicate within a specific and underrepresented population – namely, experienced employees in heavy industry, mechanical engineering, and the automotive sector. At the same time, the study extends prior work in three respects: it integrates emotional intelligence, sense of coherence, and resilience within a single structural model that has not been tested in this combination; it applies this model in a Central European industrial context where cross-cultural generalizability cannot be assumed; and it examines whether the relative weighting of psychological resources varies across hierarchical roles – a comparison that retains an exploratory dimension.

The theoretical argument also draws on Conservation of Resources (COR) theory, which posits that stress emerges when individuals experience resource loss or perceive a threat to valued resources (Hobfoll, 1989). Within this perspective, emotional intelligence and sense of coherence can be interpreted as personal resources that help maintain stable functioning under demanding conditions. Emotional intelligence, particularly through emotion regulation processes, supports cognitive control and consistent decision-making. Meta-analytic evidence indicates that emotion regulation plays a central role in the relationship between emotional intelligence and performance outcomes (Joseph & Newman, 2010), and empirical findings demonstrate significant associations between intrapersonal EI components and psychological resilience (Armstrong et al., 2011). Accordingly, the following hypothesis is proposed:

H1. Emotional intelligence is positively related to resilience.

A distinctive feature of sense of coherence is that it represents not only a coping resource, but also an interpretive framework: it structures the perception of the work environment and shapes the representation of stressors. Research on Work-SOC has demonstrated that the perceived comprehensibility and manageability of the work environment are associated with employee well-being and work engagement (Vogt et al., 2016). From a theoretical perspective, emotional self-regulation may contribute to more coherent situation perception by reducing affective "noise" and stabilizing the sense of control (Côté, 2014). Based on this logic:

H2. Emotional intelligence is positively related to individual sense of coherence.

The mediation logic underlying the proposed model is based on the assumption that personal resources build upon one another. According to the JD–R model, personal resources may function as mediators between environmental factors and outcomes (Xanthopoulou et al., 2007). Sense of coherence is supported by a substantial evidence base linking it to favorable mental health outcomes (Eriksson & Lindström, 2006), and it has also been identified as a mediating mechanism in workplace studies (Feldt et al., 2000). On this basis, it can be assumed that the effect of emotional intelligence is partially transmitted through the coherent experience of the work environment.

H3. Sense of coherence partially mediates the relationship between emotional intelligence and resilience.

With regard to the dimensionality of emotional intelligence, prior empirical findings suggest that intrapersonal, self-regulatory components are more strongly associated with resilience than interpersonal dimensions (Armstrong et al., 2011). In the context of organizational performance outcomes, emotion regulation has also been identified as the strongest link within the cascade model (Joseph & Newman, 2010). In high-risk industrial environments–where attentional stability and control under stress are particularly critical–the examination of the dominant role of self-regulatory components is therefore especially warranted.

H4. The self-regulatory component of emotional intelligence predicts resilience more strongly than social–adaptive components.

Finally, the potential moderating role of organizational position can be theoretically derived from role theory and the logic of the JD–R model (Bakker & Demerouti, 2017). Leadership roles may simultaneously entail greater resources (e.g., autonomy, decision authority) and greater demands (e.g., responsibility, emotional labor). Meta-analytic findings indicate that the relationship between emotional intelligence and workplace outcomes is context-dependent and tends to be particularly strong in leadership roles and in positions characterized by high emotional demands (Harms & Credé, 2010; Miao, Humphrey, & Qian, 2017). This justifies examining whether the proposed pattern of relationships is structurally generalizable and whether the relative importance of psychological resources differs across hierarchical levels within the organization.

H5. Leader and follower roles do not alter the psychological core mechanisms underlying resilience; however, the relative importance of associated psychological resources differs across hierarchical levels within the organization.

Figure 1 summarizes the hypothesized relationships among the study variables.

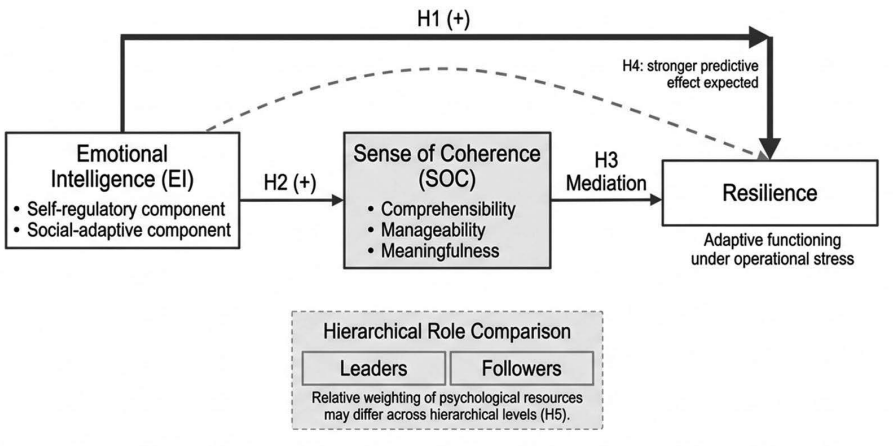
Methodology

Sample

The empirical data collection was conducted in collaboration with four Hungarian trade union organizations whose membership is predominantly employed in operationally demanding and safety-critical industrial sectors: the Vasutasok Szakszervezete (Railway Workers' Union), the Mozdonyvezetők Szakszervezete (Train Drivers' Union), the Vasúti Dolgozók Szabad Szakszervezete Szolidaritás (Free Union of Railway Employees – Solidarity), and the Munkástanácsok Országos Szövetsége (National Federation of Workers' Councils), the latter representing

Figure 1

Conceptual model of the hypothesized relationships among emotional intelligence, sense of coherence, and resilience in safety-critical industrial environments



Source: own compilation

employees across heavy industry, mechanical engineering, and the automotive sector. Railway operations in particular constitute a paradigmatic high-reliability organizational context, characterized by technological complexity, real-time decision-making under time pressure, and consequential safety demands (Weick & Sutcliffe, 2007). The study therefore targeted an active industrial workforce population embedded in organizational environments where operational reliability and individual regulatory capacity carry direct functional significance.

Data were collected with the assistance of trained interviewers who personally contacted participants, informed them about the purpose of the study, and ensured standardized administration of the questionnaire. Their role was limited to providing information and technical assistance; they did not influence the content of the responses.

The data analysed in the present study were collected within the framework of the GINOP-5.3.5-18 European Social Fund project (project identifiers: GINOP-5.3.5-18-2018-00052 and GINOP-5.3.5-18-2018-00053), implemented in cooperation with the participating trade union organizations. The author contributed to the project as a co-investigator, and the subsequent use of the collected data for independent scientific purposes was authorized by the project leader and a representative of the participating trade union federation. Throughout data collection, participants' rights were fully protected: participation was voluntary, respondents were informed about the purpose of the research prior to completing the questionnaire, anonymity and confidentiality were guaranteed, and no personally identifiable information was recorded or retained. All data were handled in accordance with applicable data protection regulations.

The total sample size was N = 460, while the number of listwise valid cases used in the regression and mediation analyses was 294. The sample included both leaders and non-leaders, enabling comparative analyses across organizational roles.

The mean age of participants was 44.78 years (SD = 11.84), with ages ranging from 19 to 77 years. The gender composition of the sample was 70.2% male (n = 320) and 29.8% female (n = 136), reflecting the male-dominated character of the heavy industrial and railway sectors from which the sample was drawn. Average total work experience was 23.90 years (SD = 12.83), and mean tenure in the current position was 11.88 years (SD = 10.24). The survey did not include a systematic assessment of occupational roles or educational background; this represents a limitation of the present study and is acknowledged as such in the Limitations section. Overall, the sample consisted predominantly of experienced industrial employees with long-term organizational embeddedness, providing a suitable context for examining operational stability and resilience.

Emotional intelligence – Bar-On model

Emotional intelligence was measured using a Hungarian-language translation of the Bar-On Emotional Quotient Inventory (EQ-i; Bar-On, 1997, 2006). While a formally published and independently standardized Hungarian validation of the full adult EQ-i has not been established in the peer-reviewed literature, the instrument has been applied in Hungarian academic and organizational research contexts, including doctoral dissertations (Balázs, 2014; Kun, 2011; Majoros, 2008), providing a precedent for its use with Hungarian-speaking samples. In the present study, psychometric adequacy was evaluated within the sample: internal consistency of the full scale proved satisfactory (Cronbach's $\alpha > .80$), corrected item–total correlations exceeded accepted thresholds for all items, and the factor structure was examined empirically rather than assumed on the basis of the original normative model. The model conceptualizes emotional intelligence as a multidimensional "mixed" construct integrating intrapersonal and interpersonal competencies, adaptability, stress management, and general mood. This framework is widely used in organizational research because it captures functional emotional competencies–such as emotion regulation, problem solving, impulse control, and optimism–that are directly related to workplace adaptation (Bar-On, 2006).

The selection of the Bar-On mixed model over alternative conceptualizations of emotional intelligence was guided by three considerations specific to the present research context. Ability-based models (Mayer, Salovey, & Caruso, 2008) conceptualize EI as a form of emotional information processing and require performance-based administration conditions that are difficult to standardize in large-scale field settings with heterogeneous workforce samples. Trait-based models (Petrides, 2010), while suitable for self-report administration, primarily capture stable emotional dispositions rather than the functional competencies most relevant to workplace adaptation. The Bar-On mixed model, by contrast, operationalizes EI through competencies with direct organizational relevance – including impulse control, stress tolerance, and problem-solving under pressure – that have particular face validity in safety-critical industrial environments where regulatory and adaptive demands are high (Clarke, 2010). Additionally, the Bar-On framework has been extensively applied in organizational research, providing a broad comparative base for contextualizing the present findings (O'Boyle et al., 2011). These considerations do not preclude the value of ability-based assessments, and future research comparing model types in industrial samples would constitute a meaningful extension of the present work.

Previous research indicates that the dimensional structure of mixed emotional intelligence models may vary across samples (Joseph & Newman, 2010). Accordingly, the factor structure of the scale was empirically examined in the present industrial sample rather than assuming the original five-factor structure a priori.

Psychometric foundations of the emotional intelligence measurement model

The internal consistency of the full EI scale proved to be satisfactory (Cronbach's $\alpha > .80$). To examine the dimensional structure of emotional intelligence, Principal Axis Factoring with Varimax rotation was applied. The sample

proved suitable for factor analysis, as indicated by an excellent Kaiser–Meyer–Olkin value (KMO > .90) and a significant Bartlett's test of sphericity ($p < .001$). Based on the eigenvalue > 1 criterion and inspection of the scree plot, two stable factors were identified. The first factor reflected adaptive–social functioning, whereas the second represented self-regulation, stress management, and impulse control. The correlation between the factors was moderate ($r \approx .55$), and both showed satisfactory internal consistency (Cronbach's $\alpha > .75$).

The full scale showed high internal consistency (Cronbach's $\alpha > .80$), corrected item–total correlations exceeded the accepted threshold for all items ($r > .30$), and removal of individual items did not improve reliability. For subsequent analyses, standardized factor scores calculated using the regression method were applied. Regression results indicated that the self-regulatory factor showed stronger associations with sense of coherence ($\beta = .489$, $p < .001$) and resilience ($\beta = .450$, $p < .001$) than the adaptive–social factor, supporting the predictive validity of the empirically derived two-factor structure. Accordingly, subsequent structural analyses were based on this sample-specific two-factor EI model (Table 1).

Table 1

Two-factor measurement model of emotional intelligence
(Principal Axis Factoring, Varimax rotation)

Item	Adaptive–Social EI	Self-Regulatory EI	h^2
Social responsibility	.844	–	.741
Interpersonal relations	.766	–	.687
Empathy	.607	–	.401
Problem solving	.662	–	.591
Reality testing	.632	–	.585
Flexibility	.413	–	.250
Optimism	.548	.484	.535
Happiness	.663	.413	.610
Self-confidence	–	.756	.605
Independence	–	.735	.564
Stress tolerance	–	.688	.530
Impulse control	–	.527	.280
Self-esteem	.470	.659	.656
Self-awareness	.589	.581	.684
Self-actualization	.725	.420	.701

Note. Only factor loadings with $|\lambda| \geq .40$ are reported.
Source: own compilation

Sense of coherence – Antonovsky's SOC Scale (Hungarian validation)

Sense of coherence was assessed using the shortened Sense of Coherence Scale (SOC-13), based on Antonovsky's (1987) salutogenic theory. The construct comprises three components: comprehensibility, manageability, and meaningfulness. The questionnaire consists of 13 items, which respondents rate on a 7-point Likert scale; total scores range from 13 to 91, with higher scores indicating a stronger sense of coherence.

In the present study, the Hungarian-language validated version of the scale was used. The psychometric properties of the Hungarian adaptation were examined by Balajti and colleagues (2007) in a heterogeneous societal sample ($N = 128$). The internal consistency of the scale proved to be satisfactory (Cronbach's $\alpha = .82$). Principal component analysis identified a three-factor structure, accounting for 56% of the total variance. Convergent and criterion validity of the construct were supported by significant associations in theoretically expected directions with measures of mental health, including the GHQ-12, the Beck Depression Inventory, and indicators of perceived health status. Test–retest reliability over a five-month interval demonstrated adequate temporal stability. Based on these validation results, the Hungarian version of the SOC-13 can be considered a reliable and valid measurement instrument suitable for empirical research conducted in organizational and workplace samples.

Resilience – 10-Item Connor–Davidson Resilience Scale (CD-RISC-10)

Resilience was assessed using the Hungarian adaptation of the 10-item short version of the Connor–Davidson Resilience Scale (CD-RISC-10). The original CD-RISC was developed by Connor and Davidson (2003) as a 25-item instrument with a multidimensional structure. Subsequent studies, however, were unable to consistently replicate the original factor structure; therefore, Campbell-Sills and Stein (2007) developed a shortened, unidimensional 10-item version of the scale.

The Hungarian adaptation was carried out by Járai and colleagues (2015), who confirmed a stable, unidimensional structure using confirmatory factor analysis. Model fit indices indicated an acceptable fit: $\chi^2(35) = 40.047$; $\chi^2/df = 1.144$; CFI = .952; TLI = .926; RMSEA = .047.

The Cronbach's alpha coefficient of the scale was .85, corresponding to the reliability reported for the original short version. The Hungarian CD-RISC-10 validated by Járai et al. (2015) demonstrates adequate convergent and discriminant validity and is suitable for distinguishing between clinical and non-clinical populations. In the present study, resilience was treated as a unidimensional construct and operationalized using the total score.

Analytical strategy

The analytical strategy consisted of several steps. First, descriptive statistics and bivariate correlations were calculated to examine associations among the study variables. Next, the dimensional structure of emotional intelligence was explored using exploratory factor analysis (Principal Axis Factoring with Varimax rotation). Sampling adequacy was assessed using the Kaiser–Meyer–Olkin measure and Bartlett's test of sphericity. Standardized factor scores were computed and used in subsequent analyses. Hypotheses were tested using multivariate linear regression models. Mediation effects were examined with a bootstrap-based procedure (PROCESS macro, Model 4), which allows robust estimation of indirect effects without assuming normality. Role differences (leader vs. follower)

were assessed using group-specific regression models and interaction-based moderation analyses.

Results

Correlation analysis

Correlation analyses indicated significant positive associations among the main variables. Both adaptive ($r \approx .56$, $p < .001$) and self-regulatory emotional intelligence ($r \approx .63$, $p < .001$) were moderately related to resilience. Emotional intelligence was also positively associated with sense of coherence (adaptive: $r \approx .56$; self-regulatory: $r \approx .65$; $p < .001$), while sense of coherence correlated with resilience ($r \approx .55$, $p < .001$), satisfying the statistical prerequisites for mediation analysis (Table 2).

Table 2

Descriptive statistics and correlations of the main variables

Variable	*N*	*Min*	*Max*	*M*	*SD*	*1*	*2*	*3*	*4*
1. Resilience	440	0	4	2.88	0.69	–			
2. Sense of coherence	426	2	7	4.90	0.89	.548**	–		
3. EI Adaptive	334	−2.51	2.15	0.00	0.97	.564**	.565**	–	
4. EI Self-regulatory	334	−2.61	2.77	0.00	0.93	.627**	.649**	.629**	–

*Note. Pearson correlations. **p < .01. Sample sizes vary by variable due to pairwise handling of missing data. Emotional intelligence dimensions are standardized factor scores (M = 0, SD ≈ 1).*

Source: own compilation

The observed pattern of associations confirmed that emotional intelligence was related both to the hypothesized mediator (sense of coherence) and to the outcome variable (resilience), and that the mediator was also significantly associated with resilience.

The effect of emotional intelligence on resilience

The direct relationship between emotional intelligence and resilience was examined using multivariate regression analysis. When resilience was entered as the dependent variable and the two emotional intelligence factors were included as predictors, both dimensions showed significant positive effects. The adaptive dimension predicted resilience ($B = 0.197$; $\beta = 0.279$; $p < .001$), while the self-regulatory dimension emerged as a stronger predictor ($B = 0.333$; $\beta = 0.450$; $p < .001$). In the mediation model including sense of coherence, SOC was a significant predictor of resilience ($B = 0.132$; $\beta = 0.171$; $p = .002$). The effects of emotional intelligence remained significant but decreased (adaptive: $\beta = 0.265$; $p < .001$; self-regulatory: $\beta = 0.377$; $p < .001$), indicating partial mediation (Table 3).

Bootstrap mediation analysis (PROCESS Model 4, 5,000 resamples) further confirmed the mediating role of sense of coherence. For the self-regulatory emotional intelligence dimension, the indirect effect was significant ($B = 0.110$; 95% CI [.048, .175]), while the direct effect remained significant ($B = 0.367$; $\beta = 0.510$; $p < .001$). For the adaptive dimension, the direct effect was also significant ($B = 0.299$; $\beta = 0.425$; $p < .001$), and the indirect effect through sense of coherence was significant ($B = 0.129$; 95% CI [.084, .181]).

The effect of emotional intelligence on sense of coherence

Correlation analyses indicated significant positive associations between emotional intelligence and sense of coherence (adaptive: $r \approx .56$; $p < .001$; self-regulatory: $r \approx .65$; $p < .001$).

A multivariate regression model was estimated with sense of coherence as the dependent variable and the two emotional intelligence dimensions as predictors. Both factors showed significant positive effects. The adaptive dimension predicted sense of coherence ($B = 0.223$; $\beta = 0.245$; $p < .001$), while the self-regulatory dimension emerged as a stronger predictor ($B = 0.456$; $\beta = 0.489$; $p < .001$) (Table 4).

Table 3

Effects of emotional intelligence dimensions and sense of coherence on resilience
(Multivariate linear regression – mediation control model)

Predictor	B	SE	β	t	p	Tolerance	VIF
EI – Adaptive dimension	0.187	0.039	0.265	4.848	< .001	0.537	1.861
EI – Self-regulatory dimension	0.271	0.043	0.377	6.330	< .001	0.454	2.201
Sense of coherence (SOC)	0.132	0.042	0.171	3.139	.002	0.544	1.839

Note. Dependent variable: resilience. $R = .712$; $R^2 = .507$; Adjusted $R^2 = .503$; $F(3, 306) = 105.07$, $p < .001$. Both emotional intelligence dimensions remained significant after inclusion of sense of coherence, while their standardized coefficients decreased relative to the baseline model. Sense of coherence emerged as an independent, significant predictor, indicating partial mediation in regression terms. Multicollinearity diagnostics (Tolerance > .45; VIF < 2.3) suggest adequate model stability.

Source: own compilation

Table 4

Effects of emotional intelligence dimensions on sense of coherence
(Multivariate linear regression)

Predictor	B	SE	β	t	p	Tolerance	VIF
EI – Adaptive dimension	0.223	0.051	0.245	4.407	< .001	0.571	1.752
EI – Self-regulatory dimension	0.456	0.052	0.489	8.804	< .001	0.571	1.752

Note. Dependent variable: sense of coherence. $R = .675$; $R^2 = .456$; Adjusted $R^2 = .452$; $F(2, 309) = 129.47$, $p < .001$. Both emotional intelligence dimensions are positively and significantly associated with sense of coherence. Based on standardized coefficients, the effect of the self-regulatory dimension is nearly twice that of the adaptive dimension. Multicollinearity diagnostics (Tolerance > .57; VIF < 1.8) indicate adequate model stability.
Source: own compilation

Differences by leadership and follower roles

To examine whether the structural relationships among emotional intelligence, sense of coherence, and resilience differ across hierarchical levels, the sample was divided into leaders (N = 84) and followers (N = 376).

Group-specific regression models were first estimated using split-file analyses. Subsequently, a formal moderation test was conducted using an interaction-based regression model to assess whether organizational role significantly altered the relationships among the examined variables.

Group-Specific Regression Models

Separate regression models were estimated to predict resilience in the leader and follower subsamples. In the leader group, self-regulatory emotional intelligence emerged as the only significant and strong predictor of resilience (B = 0.304; β = 0.652; p < .001), whereas the effect of sense of coherence was not significant (B = −0.011; β = −0.023; p = .865). In contrast, within the follower subsample both self-regulatory emotional intelligence (B = 0.371; β = 0.488; p < .001) and sense of coherence (B = 0.211; β = 0.262; p < .001) emerged as significant and positive predictors (Table 5).

The group-specific models therefore delineate different emphases at a descriptive level: leader resilience appears to be predominantly intrapersonal in nature, whereas follower resilience is partly embedded in the organisational context.

Interaction (Moderation) Model

To examine whether the psychological core mechanisms of resilience differ structurally between leader and follower groups, an interaction-based regression model was applied. Resilience was specified as the dependent variable, emotional intelligence dimensions and sense of coherence were entered as main effects, and organizational role (leader vs. follower) was included as a moderator. The interaction terms used were adaptive EI × role, self-regulatory EI × role, and sense of coherence × role.

None of these coefficients reached statistical significance, suggesting that organizational role does not have a major moderating effect on emotional intelligence or sense of coherence in their contribution to resilience: adaptive EI × role: p = .443; self-regulatory EI × role: p = .259; sense of coherence × role: p = .194. It can therefore be argued that the core elements of this model are statistically invariant across hierarchical levels. Multicollinearity

Table 5

Effects of self-regulatory emotional intelligence and sense of coherence on resilience
(Leader and follower subsamples; control regression analyses)

Panel A. Follower subsample (Role = 0)

Predictor	B	SE	β	t	p	Tolerance	VIF
EI – Self-regulatory dimension	0.371	0.046	0.488	8.079	< .001	0.600	1.668
Sense of coherence (SOC)	0.211	0.049	0.262	4.334	< .001	0.600	1.668

Note (Panel A). Dependent variable: resilience. $R = .684$; $R^2 = .468$; Adjusted $R^2 = .464$; $F(2, 243) = 107.03$, $p < .001$. In the follower subsample, both self-regulatory emotional intelligence and sense of coherence emerged as significant, positive predictors.

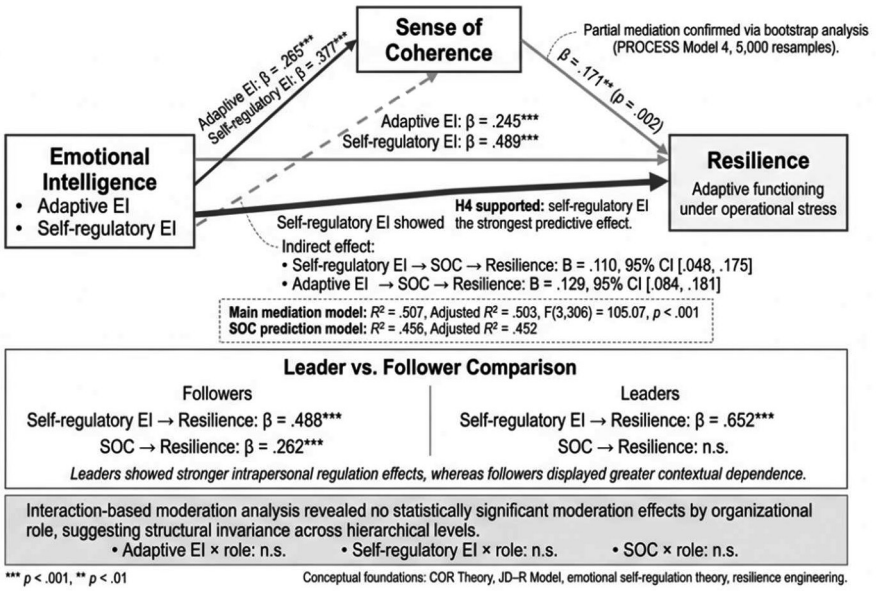
Panel B. Leader subsample (Role = 1)

Predictor	B	SE	β	t	p	Tolerance	VIF
EI – Self-regulatory dimension	0.304	0.061	0.652	4.944	< .001	0.559	1.790
Sense of coherence (SOC)	−0.011	0.065	−0.023	−0.171	.865	0.559	1.790

Note (Panel B). Dependent variable: resilience. $R = .638$; $R^2 = .407$; Adjusted $R^2 = .387$; $F(2, 61) = 20.90$, $p < .001$. In the leader subsample, only self-regulatory emotional intelligence emerged as a significant predictor, whereas the effect of sense of coherence was not significant.
Source: own compilation

Figure 2

Empirical mediation and role-comparison model of emotional intelligence, sense of coherence, and resilience. Integrated Interpretation of Role Differences



Source: own compilation

diagnostics were also within acceptable limits (VIF = 1.6 to 2.5). Figure 2 presents the empirically supported path coefficients of the tested model.

Joint interpretation of the split-file analyses and the moderation model indicates that the structural relationships among emotional intelligence, sense of coherence, and resilience are largely similar across leader and follower groups. The interaction tests did not reveal significant moderation effects, suggesting that the underlying mechanisms operate according to the same structural logic in both groups.

At a descriptive level, however, differences emerged in the relative weighting of resources. In the leader subsample, resilience was more strongly associated with self-regulatory emotional intelligence, whereas in the follower subsample sense of coherence showed a more pronounced independent contribution. It should be emphasized that these are descriptive patterns observed in group-specific regression models and do not reflect statistically significant moderation effects; they should therefore be interpreted with caution and not generalized as structural differences between hierarchical roles.

Conclusion

Based on the empirical findings, an integrated organizational–psychological model emerges in which resilience is not conceptualized as an isolated individual disposition, but rather as an operational capacity shaped through the interaction of personal and organizational resources.

Emotional intelligence was empirically differentiated in the sample into two distinct dimensions: adaptive-social and self-regulatory factors. The former and the latter factors functioned as important predictors of resilience, though the latter was revealed to be the most important predictor of the construct in the study, with the highest beta weight (.450, $p < .001$). This result suggests that the microfoundation of organizational stability can be found in the internal regulation of emotions, tolerance to stress, and control of impulses. Sense of coherence was found to have an independent and significant association with the construct of resilience, with beta weight equal to .171, $p = .002$, and was also revealed to have a partial mediation effect in the EI-resilience association. In the mediation model, the direct effect of EI on the construct of resilience was found to be diminished, though still statistically significant, from self-regulatory $\beta = .450$ to $\beta = .377$.

With respect to organizational role, the moderation analyses confirmed structural invariance across leader and follower groups: none of the interaction effects reached statistical significance. At a descriptive level, group-specific regression models suggested a pattern in which leader resilience showed stronger association with self-regulatory emotional intelligence ($\beta = .652$, $p < .001$), while follower resilience showed a more pronounced independent contribution of sense of coherence ($\beta = .262$, $p < .001$). These patterns should be interpreted cautiously as exploratory, non-significant trends rather than established structural differences, and their replication in larger, role-balanced samples would be necessary before drawing firm conclusions. To the extent that these descriptive patterns prove replicable, they would provide a preliminary basis for considering role-sensitive approaches to resilience development in safety-critical organizations.

Discussion and theoretical implications

Most of the study's hypotheses received empirical support. Emotional intelligence was positively associated

with resilience (H1) and sense of coherence (H2), while mediation analyses confirmed a partial mediating role of sense of coherence (H3). Self-regulatory emotional intelligence emerged as the strongest predictor of resilience (H4). The moderating role of organizational position (H5) was not statistically supported; however, group-specific patterns suggest differences in the relative importance of psychological resources across hierarchical levels.

The theoretical contribution of the study can be summarized in three points. First, it refines the micro-mechanisms linking emotional intelligence and resilience. Second, it positions sense of coherence (SOC) as an interpretive stabilizer mediating between emotional resources and resilient functioning. Third, it conceptualizes resilience in safety-critical industrial environments as a psychological microfoundation of organizational reliability.

Mechanistic refinement of the EI–resilience relationship

Although meta-analytic evidence consistently links emotional intelligence with workplace outcomes, the mechanisms underlying this relationship remain only partially understood (Joseph & Newman, 2010; Miao et al., 2017; O'Boyle et al., 2011). The present findings contribute to clarifying this relationship by identifying two empirically derived EI dimensions and demonstrating that the self-regulatory component is a substantially stronger predictor of both sense of coherence (β = .489) and resilience (β = .450) than the adaptive–social dimension.

This pattern supports a mechanistic interpretation of resilience grounded in emotion regulation and attentional control under stress (Bonanno & Burton, 2013; Double et al., 2022). Rather than reflecting general social competence, resilience appears to depend primarily on internal regulatory capacities–particularly impulse control, stress tolerance, and emotional stability (Armstrong et al., 2011; Schneider et al., 2013). These findings therefore clarify the functional pathway through which emotional intelligence contributes to adaptive functioning in demanding organizational environments.

The effect sizes observed in the present study warrant contextual evaluation. The standardized coefficient for self-regulatory emotional intelligence as a predictor of resilience (β = .450) is consistent with the correlation reported by Armstrong et al. (2011) between intrapersonal EI components and psychological resilience (r = .47), and exceeds the mean effect observed in broader meta-analyses of EI and job performance outcomes (r = .28; Miao et al., 2017). The overall explained variance in resilience (R^2 = .507) is notably high for a self-report study of this kind, which warrants some caution in interpretation. One plausible alternative explanation is that the strong associations partly reflect construct overlap rather than independent predictive pathways: the self-regulatory EI dimension – comprising stress tolerance, impulse control, and emotional stability – shares conceptual content with the CD-RISC-10 resilience items, which also assess the capacity to cope under stress and recover from adversity. This overlap does not invalidate the findings, but it suggests that the observed β-values may overestimate the degree to which EI and resilience represent functionally distinct constructs. Future research employing ability-based EI measures alongside trait-based resilience assessments would allow a more conservative test of this relationship. A further alternative explanation concerns the potential confounding role of broad personality dimensions, particularly emotional stability, which is known to correlate with EI, SOC, and resilience simultaneously (Petrides, 2010). The absence of a personality control variable represents a boundary condition of the present findings.

Sense of coherence as an interpretive stabilizer

Sense of coherence has long been identified as a protective psychological resource (Eriksson & Lindström, 2006). The present study extends this perspective by conceptualizing SOC as a mediating interpretive mechanism linking emotional intelligence and resilience. Sense of coherence emerged as an independent predictor of resilience (β = .171) and partially mediated the relationship between emotional intelligence and resilience (self-regulatory pathway: β = .450 → .377).

This pattern is theoretically consistent with two major frameworks. Within the Job Demands–Resources (JD–R) model, personal resources influence outcomes partly through interpretive processes that structure the perception of job demands (Bakker & Demerouti, 2007; Vogt et al., 2016). Similarly, Conservation of Resources (COR) theory conceptualizes resilience as the capacity to mobilize resources and prevent resource loss under stress (Hobfoll, 1989). In this context, sense of coherence functions as a resource integrator that supports structured interpretation of complex work environments.

The three-stage mechanism outlined in the theoretical section finds support in the present empirical pattern. The substantially stronger predictive weight of the self-regulatory EI dimension – relative to the adaptive–social dimension – for both sense of coherence (β = .489 vs. β = .245) and resilience (β = .450 vs. β = .279) is consistent with the proposed affective filtering function: it is specifically the regulatory capacities of impulse control, stress tolerance, and emotional stability that reduce affective load and thereby enable coherent situational appraisal. The partial rather than full mediation of sense of coherence further suggests that emotional self-regulation also contributes to resilience through a parallel pathway – most plausibly through direct behavioral regulation under stress – while the interpretive stabilization function of SOC constitutes a distinct and independent mechanism. This dual-pathway architecture is theoretically coherent with the cascade model proposed by Joseph and Newman (2010), in which emotion regulation influences outcomes both directly and through downstream cognitive processes.

While this dual-pathway architecture is theoretically coherent, the independent contribution of sense of coherence to resilience was relatively modest (β = .171) compared to the direct effects of the EI dimensions, and warrants closer examination. This pattern of partial

rather than full mediation suggests that sense of coherence captures a real but limited portion of the pathway between emotional intelligence and resilience – consistent with Feldt et al.'s (2000) finding that SOC functions as a mediator in workplace stress models, though not as a dominant pathway. One interpretation is that the three SOC components – comprehensibility, manageability, and meaningfulness – operate at a higher level of cognitive abstraction than the moment-to-moment regulatory processes captured by EI, and therefore contribute to resilience through a slower, more dispositional channel. An alternative interpretation, however, is that the partial mediation partly reflects the measurement properties of the instruments: the SOC-13 and the CD-RISC-10 both contain items assessing perceived control and coping efficacy, which may produce residual overlap inflating their shared variance. This possibility cannot be ruled out in the present cross-sectional, single-source design, and represents a relevant limitation when interpreting the mediation effect.

Resilience as a microfoundation of organizational reliability

Organizational resilience research increasingly conceptualizes resilience as a capability enabling anticipation, response, and learning (Duchek, 2020; Vogus & Sutcliffe, 2007; Williams et al., 2017). The present findings complement this perspective by highlighting the psychological processes underlying resilient functioning. In safety-critical environments, emotional self-regulation appears to function as a primary mechanism supporting stable decision-making and operational reliability (Clarke, 2010).

This study therefore reconnects system-level resilience perspectives with their psychological microfoundations. Organizational stability emerges not only from structural arrangements but also from individual processes of emotional regulation and coherent situation appraisal (Lengnick-Hall et al., 2011; Duchek, 2020).

Consistency with and divergence from prior research

Taken together, the present findings are largely consistent with the existing literature on emotional intelligence, sense of coherence, and resilience, while offering a degree of specificity that extends prior work in meaningful ways. The primacy of self-regulatory over adaptive–social EI in predicting resilience replicates and extends the findings of Armstrong et al. (2011) and aligns with the cascade model of Joseph and Newman (2010), in which emotion regulation constitutes the most proximal link to performance outcomes. The present study adds to this picture by demonstrating that this primacy holds not only in general or clinical populations but also in an experienced industrial workforce population embedded in operationally demanding organizational environments. The partial mediating role of SOC extends Feldt et al.'s (2000) workplace mediation findings to a new nomological context, situating SOC within a broader personal resource chain rather than treating it as a standalone protective factor.

Role invariance and differentiated resource weighting

Although moderation analyses indicated that the structural relationships among variables were invariant across leader and follower groups, descriptive analyses revealed differences in the relative weighting of resources. For leaders, resilience was primarily associated with self-regulatory emotional intelligence, whereas for followers sense of coherence played a more substantial role. It should be noted, however, that these are descriptive patterns not supported by significant moderation effects.

This pattern suggests that resilience mechanisms are structurally stable but contextually weighted. While the basic psychological architecture–emotional self-regulation combined with coherent interpretation–remains consistent, organizational roles may influence how these resources are mobilized. Such differentiated resource activation aligns with both JD–R and COR frameworks, which emphasize the role of contextual demands in shaping resource utilization (Bakker & Demerouti, 2007; Hobfoll, 1989).

Practical Implications

The findings carry several concrete implications for resilience development in safety-critical organizations. The primacy of self-regulatory emotional intelligence – encompassing impulse control, stress tolerance, and emotional stability – as the strongest predictor of resilience suggests that effective intervention programs should prioritize these specific capacities over broader social or interpersonal competencies. In practical terms, this implies that training programs for employees in operationally demanding environments should include components targeting: (1) stress inoculation and controlled exposure to high-demand scenarios to build stress tolerance; (2) cognitive defusion and impulse regulation techniques drawn from acceptance-based behavioral approaches; and (3) reflective practice exercises that develop awareness of one's own emotional reactivity patterns under operational pressure. These components are distinct from generic communication or teamwork training and address the specific regulatory capacities that the present findings identify as most critical.

The independent contribution of sense of coherence to resilience further suggests that organizational design factors play a role alongside individual competencies. Specifically, the comprehensibility, manageability, and meaningfulness of the work environment can be actively supported through organizational measures such as clearly defined role responsibilities, transparent decision-making processes, structured communication about organizational goals, and meaningful feedback on individual contributions. These structural conditions do not replace individual psychological development but create the interpretive context within which self-regulatory capacities can be most effectively deployed.

Limitations and Future Research Directions

Several limitations should be considered when interpreting the findings of this study. First, the research relies on cross-sectional data, which does not allow for definitive causal inference. Although the mediation model is theoretically grounded and statistical assumptions were met, examining the temporal dynamics among emotional intelligence, sense of coherence, and resilience would require longitudinal designs or confirmatory structural equation modeling (SEM).

Second, the data were collected using self-report questionnaires, which may introduce the risk of common method bias. While the differentiated pattern of relationships and the non-significant interaction effects reduce this concern, future research could strengthen the robustness of the model by incorporating objective indicators or multi-source data.

Third, although the participating organizations operate in sectors that are widely recognized as safety-critical – particularly railway transport, heavy industry, and automotive manufacturing – the study did not include a direct measure of individual-level occupational risk exposure. The sample encompasses a range of job roles varying in their proximity to safety-critical operations, from operational positions such as train drivers, maintenance technicians, and crane operators to administrative and support functions. Accordingly, the extent to which the theoretical framing of high-risk organizational environments applies uniformly across all participants should be interpreted with appropriate caution. Future research would benefit from incorporating explicit occupational risk criteria or role-level safety exposure indicators as contextual variables, which would allow more precise testing of the model's boundary conditions within safety-critical populations.

Regarding role differences, moderation analyses did not provide statistical support for structural differences between leaders and followers. However, the observed variation in the relative weighting of psychological resources suggests that further research using larger samples and measurement invariance testing could provide a more precise understanding of role-related dynamics.

Future research could extend the present findings by applying longitudinal or multilevel designs, testing the model using structural equation modeling, and linking resilience to objective organizational outcomes such as safety incidents, error rates, or performance indicators.

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