

Safety Management Practices and Employee Safety Behavior in Construction Projects: A Review of the Mediating Role of Safety Motivation

Li Yinglin^{1,2}, Zunirah Mohd Talib^{2,3}, Khairil Rafik Musa^{2*,3*}, Fan Fangxiu⁴

¹Affiliated Hospital of North Sichuan Medical College, No. 1, Maoyuan South Road, Shunqing District, Nanchong, Sichuan, China. Email: 15884709079@163.com.

²Graduate School of Management, Postgraduate Centre, Management and Science University, University Drive, Off Persiaran Olahraga, Seksyen 13, 40100 Shah Alam, Selangor, Malaysia

³Faculty of Business Management and Professional Studies, Management and Science University, University Drive, Off Persiaran Olahraga, Seksyen 13, 40100 Shah Alam, Selangor, Malaysia

⁴Affiliated Hospital of North Sichuan Medical College, No. 1, Maoyuan South Road, Shunqing District, Nanchong, Sichuan, China.

Received: 11.06.2026 | Accepted: 01.07.2026 | Published: 08.07.2026

*Corresponding Author: Khairil Rafik Musa

DOI: [10.5281/zenodo.21255897](https://doi.org/10.5281/zenodo.21255897)

Abstract

Review Article

Occupational injuries remain prevalent in the construction industry despite advances in safety management practices. This review examines the relationship between Safety Management Practices (SMP) and Safety Behavior (SB), emphasizing the mediating role of Safety Motivation (SM). Drawing on recent empirical studies, it evaluates how organizational safety initiatives influence workers' behavioral compliance and identifies limitations of traditional enforcement-based approaches. The review highlights that external regulations alone cannot sustain safe behaviors without fostering intrinsic motivation. It also discusses the shortcomings of technology-based monitoring systems in addressing psychological determinants of safety. The study advocates integrating motivational strategies to promote proactive safety self-regulation and improve construction safety performance.

Keywords: Safety management practices, safety behavior, safety motivation, construction safety, occupational safety.

Copyright © 2026 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0).

1. Introduction

Despite significant investments in on-site safety hardware and regulatory updates, occupational injury rates in the construction industry remain stubbornly high (Iqbal et al., 2025). Site management often relies on rigid administrative measures to enforce compliance, but on-site data indicates that over 80% of accidents stem directly from frontline workers' operational errors, misjudgments of risk,

and habitual violations. The vast gap between policies on paper and behavioral reality indicates that traditional engineering measures and top-down penalties have reached a dead end, compelling researchers to delve deeper into behavioral psychology and employee motivation (Payne et al., 2025).

How exactly can Safety Management Practices (SMP) be truly translated into sustained Safety



Citation: Li, Y., Zunirah Mohd Talib, Z., Khairil Rafik Musa, K. R., & Fan, F. (2026). Safety management practices and employee safety behavior in construction projects: A review of the mediating role of safety motivation. *GAS Journal of Arts Humanities and Social Sciences (GASJAHSS)*, 4(7), 11-25.

Behaviors (SB) on-site? Existing literature often views this relationship as a direct, automatic pathway. However, this assumption is directly undermined by the realities of modern construction projects. Endless administrative pressure and the threat of fines often backfire, triggering chronic psychological fatigue and pushing workers toward shortcuts and selective compliance (Huang et al., 2023). Unless external rules can synergize with workers' intrinsic safety motivation (SM), they are fundamentally incapable of altering behavioral habits (Zhang et al., 2022).

Although recent research has heavily favored high-tech monitoring methods such as BIM and computer vision to capture violations (Wang et al., 2024), these technologies address symptoms rather than root causes, failing to resolve the psychological drivers of behavioral self-regulation. This review systematically examines existing empirical research on how organizational safety measures influence worker behavior, with a particular focus on unpacking the black box of safety motivation as a behavioral mediator. By highlighting the shortcomings of existing empirical models, this paper establishes a clearer research agenda for the transition of construction site safety management from passive supervision to behavioral self-regulation.

2. Methodology

This study adopts a systematic literature review method to ensure the rigor and comprehensiveness of literature retrieval and screening. The research data are mainly derived from the Web of Science (WoS) Core Collection database. The search strategy employs a combination of keywords of the core concepts, and the specific search formula is: ("Safety Management Practices" OR "SMP") AND ("Employee Safety Behavior" OR "SB") AND ("Construction Projects"). To ensure the timeliness of the research conclusions and grasp the latest advancements in safety science, the publication time of the literature is limited to between 2020 and 2025, and the document type is strictly restricted to peer-reviewed academic journal papers (Articles).

The literature underwent an initial search executed in the database, removing duplicate records and literature with missing key metadata. A preliminary evaluation was conducted on the filtered literature one by one, excluding academic articles that were not from the construction industry, non-empirical studies, and those without a direct correlation to employee safety behavior. An in-depth full-text reading was performed on the potentially relevant literature, focusing on reviewing the integrity of their theoretical frameworks, the rigor of their data analysis, and their applicability to complex project contexts. After undergoing the above strict hierarchical screening and compliance checks, 65 core articles were officially included in the end. These 65 high-quality studies constitute the empirical cornerstone for the subsequent analysis of findings, critical review, and derivation of research gaps in this paper.

3. Theoretical Framework

To clarify the cognitive and environmental friction involved in workers' behavioral decisions under intense project deadline pressures, this review integrates Social Cognitive Theory (SCT) (Bandura, 1986) and the Theory of Planned Behavior (TPB) (Ajzen, 1991). This framework moves beyond the traditional view of on-site safety as a static checklist, instead treating safety performance as the outcome of a dynamic interplay between organizational signals, the allocation of cognitive resources, and individual behavioral intentions.

SCT provides the overarching structural framework for this review through its triadic determinism, which posits that behavior, internal cognition, and the external environment continuously shape one another (Bandura, 1986). In the volatile construction environment, the quality of corporate safety training and the effectiveness of on-site management execution constitute core environmental inputs. However, SCT explicitly states that these managerial signals do not directly determine behavior; they must be filtered through the cognitive agency of workers (Arhim et al., 2024). This cognitive processing becomes evident when structural constraints, such as aggressive schedule pressures, intervene. Tight

deadlines introduce a competitive environmental force that continuously depletes workers' psychological resources, forcing them to trade off operational speed and safety compliance under conditions of bounded rationality (Seo, 2025).

While SCT explains why the environment triggers cognitive friction, TPB fills the gap at the micro-decision level by explaining how this friction alters immediate psychological drivers prior to action. Within the TPB framework, safety motivation (SM) is viewed as a direct empirical manifestation of behavioral intention (Ajzen, 2025). High-quality safety training alters individuals' attitudes toward the efficacy of preventive measures, while explicit management commitment establishes subjective norms (Chae & Kang, 2025).

In high-intensity projects, breaking points typically occur at the level of perceived behavioral control (PBC). As project deadlines intensify, workers' local control over their immediate work environment declines significantly. At this point, even if workers hold positive safety attitudes, a sense of scarcity in time resources erodes their behavioral intentions, leading to a management disconnect. Consequently, safety motivation collapses, and opportunistic rule-breaking begins to dominate (Pechteep et al., 2025).

By integrating the feedback loop of SCT with the intention component of TPB, this review constructs a closed-loop framework. The model suggests that safety management practices can only be truly effective when they successfully penetrate workers' internal cognitive filters and transform external administrative pressures into intrinsic self-regulatory motivation.

4. Findings and Critical Review

In the high-risk, low-tolerance environment of construction, safety management practices (SMP) do not directly determine on-site operational outcomes; rather, they are transformed into organizational environmental signals through the interplay of four core dimensions: the quality of safety training, project schedule pressures, risk perception, and management implementation. These four dimensions do not exist in isolation; together, they reshape the

psychological reference points of frontline teams. Through the mediating influence of safety motivation, they ultimately determine whether employees will engage in opportunistic rule-breaking or demonstrate proactive defensive behaviors.

4.1 Safety Management Practices (SMP) and Safety Behavior (SB)

Safety Training Quality and Employee Safety Behavior

In high-risk construction environments, safety training has evolved from a static, one-way imposition of rules into a complex cognitive intervention that transforms occupational attitudes and risk-response capabilities (Priolo et al., 2025). High-quality safety training (STQ), serving as a signal from the organizational environment, bridges the gap between a company's overarching policies and specific defensive practices on-site (Kanesan et al., 2025). The direct translation of STQ into employee safety behavior (SB) is primarily achieved through the reinforcement of cognitive skills and the reshaping of individual risk perceptions.

From a cognitive perspective, when training is personalized and incorporates structured behavioral feedback, it significantly improves workers' situational reasoning and clinical critical reflection, enabling them to accurately execute standard operating procedures in highly mobile, multi-trade work environments (Kim & Shin, 2024). Furthermore, when training incorporates operant conditioning and continuous managerial feedback, it generates lasting learning effects, thereby sustaining compliance habits throughout extended project cycles (Grill, 2025).

At the same time, STQ fundamentally reshapes workers' psychological contracts and subjective norms. When organizations invest tangible, substantial resources into targeted safety education, workers perceive this as a genuine institutional commitment to their well-being rather than mere formalism. This perception fosters organizational citizenship behavior, driving workers to shift from passive compliance to active safety engagement,

such as voluntarily reporting hazards and providing safety reminders to peers (Bayram, 2022). According to an expanded Theory of Planned Behavior, organizational investments in robust safety induction and ongoing onboarding training constitute key mechanisms for cognitive self-regulation (Rantsatsi, 2025). By tailoring training content to the occupational risks specific to particular departments and job roles, organizations can enhance workers' sense of behavioral control, enabling them to resist taking speculative shortcuts that violate safety protocols even in resource-constrained or high-pressure project environments (Wasana et al., 2025).

Schedule Pressure and Employee Safety Behavior

In large-scale infrastructure and complex public building projects, aggressive milestones and delivery deadlines create a severe operational conflict between production speed and regulatory compliance (Meyerhoff et al., 2025). Pressing schedule pressures are not merely logistical or scheduling issues, but rather a systemic source of stress that depletes workers' cognitive bandwidth and psychological safety (Liu et al., 2025).

The pathways through which schedule pressures undermine safety behaviors can be effectively mapped using the Job Demands-Resources (JD-R) model. When time demands surge significantly while organizational support resources fail to expand accordingly, workers experience severe cognitive resource depletion (Seo et al., 2025). Faced with top-down threats of punishment resulting from schedule delays, frontline teams operating under bounded rationality frequently engage in calculated risk-benefit trade-offs (Kyambade et al., 2024). Supervisors driven entirely by production targets often inadvertently signal that regulations take a backseat to progress; this administrative pressure permeates multi-tiered subcontracting chains, ultimately manifesting as habitual on-site violations, reduced inspection procedures, and localized operational errors (Emuze, 2023).

Furthermore, the exposure of this pressure throughout the workplace triggers a cascading negative psychological cycle. Sustained high-

intensity work leads to chronic physical fatigue and acute emotional strain, thereby severely impairing workers' situational awareness and concentration (Simon, 2023). Log-tracking studies indicate that safety violations forced by extreme time constraints rapidly translate into heightened workplace anxiety and a sharp decline in psychological safety (Cho et al., 2023). This anxiety ultimately leads to cognitive-level passive resistance and withdrawal, where workers selectively ignore critical safety protocols simply to meet daily deadlines, fundamentally undermining the integrity of the project's safety defense systems.

Safety Management Implementation (SMI) and Employee Safety Behavior

Safety Management Implementation is not a passive, static set of rules, but rather a dynamic organizational signal that redefines the psychological contract and behavioral boundaries of frontline employees (Liu & Xu, 2024). In complex, multi-trade ecosystems such as large-scale infrastructure and healthcare construction projects, the rigor of SMI enforcement directly determines the fidelity with which structured safety systems are translated into individual operational awareness (Pham et al., 2025).

Based on Social Exchange Theory (SET), the behavioral pathways of SMI are strongly moderated by the perceived fairness and structural integrity of its enforcement process. A fair and transparent enforcement matrix that consistently recognizes proactive compliance while uniformly penalizing violations fosters institutional trust (Rabiul et al., 2025). This institutional trust enhances psychological reciprocity between employees and management, driving workers to transition from baseline safety compliance to active safety participation, such as voluntarily reporting hazards and providing peer safety coaching (Su, 2021).

Furthermore, modern construction ecosystems increasingly rely on technology-assisted and culturally sensitive enforcement strategies to minimize human error and information decay. While aided by technological precision, the quality of management-led interactions remains critical. On

highly collaborative and multicultural construction sites, top-down administrative directives often suffer from significant information loss during transmission (Rehan et al., 2024). To address this challenge, forward-thinking management must establish highly responsive two-way communication feedback loops and foster a mutually beneficial safety culture (Jamil et al., 2025). By reducing communication noise and ensuring that safety expectations are clearly understood within the cultural context, rigorous enforcement directly optimizes workers' ability to identify hazards, thereby building a resilient behavioral defense system capable of resisting the temptation to prioritize production efficiency.

Risk Perception and Employee Safety Behavior

Risk perception is defined as workers' subjective assessment of the probability and severity of potential occupational hazards; it determines whether objectively present environmental threats translate into internal motivations for self-protection (Brewster et al., 2024). In inherently hazardous and dynamic work environments, a high level of risk perception maintains a baseline of psychological alertness, compelling workers to strictly adhere to procedural safety protocols, correctly use personal protective equipment (PPE), and maintain a high level of situational awareness (Fonseca & Ferreira, 2025).

The functional relationship between risk perception and behavioral outcomes can be fully explained by Protection Motivation Theory (PMT). Within this framework, workers' safety behaviors are direct products of individual threat assessment and response evaluation processes (Kuran et al., 2023). A solid awareness of construction safety and internalized risk vigilance serve as powerful psychological drivers that significantly enhance safety motivation, thereby counteracting the passive complacency induced by routine, repetitive tasks (Al-Bayati, 2021; Ali et al., 2021). Risk perception often comes into direct conflict with competing production demands (Djunaidi et al., 2024). When faced with complex environmental interactions, risk perception, as a core individual driver within a multi-

factor risk coupling system, helps workers resist the temptation to take shortcuts, even under severe time constraints (Chen, 2025).

4.2 Safety Management Practices (SMP) and Safety Motivation (SM)

Safety Training Quality and Safety Motivation

Safety training quality (STQ) is a core organizational catalyst for activating and sustaining employee safety motivation (SM). Safety training is not a passive, administratively enforced measure, but rather a dynamic psychological intervention mechanism capable of eliminating employees' deeply ingrained cognitive biases and achieving a deep alignment between individual values and the organization's safety objectives (Rehman et al., 2025). Based on Self-Determination Theory (SDT), the profound transformation of individual safety motivation through safety training relies heavily on the instructional design of the training itself, its situational relevance, and the structured support provided by the organization (Casey et al., 2021).

From the perspective of cognitive processing, the motivational effects of safety training are closely related to the degree of alignment between the content structure and the learner's mental model. The application of Cognitive Load Theory (CLT) indicates that when training courses precisely correspond to real-world workflows and operational sequences on-site, the cognitive resources expended by the brain to retrieve and process information are significantly reduced, thereby helping workers seamlessly transform acquired knowledge into an intrinsic drive for proactive safety (Kim et al., 2025). At the same time, moving away from traditional, rigid, one-way instruction toward interactive teaching that incorporates decentralized discussions, gamified elements, and highly immersive augmented reality (AR) and virtual reality (VR) technologies can significantly enhance trainees' professional self-efficacy and willingness to engage in self-directed learning (Bęś & Strzałkowski, 2024). This shift in teaching paradigms empowers workers with greater autonomy over their own learning pace, thereby directly stimulating their intrinsic motivation and

sense of safety responsibility (Rehman et al., 2025).

Crucially, the long-term transformation and behavioral retention resulting from safety training cannot be achieved in a psychological vacuum. In highly complex and technology-intensive operational environments, structured feedback from management serves as a concrete embodiment of the organization's commitment to safety and accounts for a significant proportion of variations in employee compliance behavior (He et al., 2024). When safety training is rolled out comprehensively as a collective team intervention, it transcends mere guidance on individual behavior and instead establishes shared psychological contracts and collaborative norms within the organization, propelling the entire team from passive rule compliance to a higher-order motivational state in which all members actively build safety resilience (Linhardt et al., 2024).

Schedule Pressure and Safety Motivation

High-quality training fosters an internal drive for safety, but schedule pressure (SP), as a powerful institutional stressor, is highly likely to systematically undermine individuals' safety motivation. In large-scale, high-risk infrastructure projects, there exists an inherent structural conflict between the objective reality of meeting tight deadlines and the regulatory requirements for ensuring on-site safety (Rowen et al., 2022). When the urgency of the schedule exceeds an individual's psychological coping threshold, the previously balanced dynamic between a worker's achievement motivation to complete tasks and their safety motivation to comply with regulations is completely disrupted, forcing them into a calculated high-risk trade-off (Neale & Gurmu, 2022).

This destructive dynamic can be thoroughly deconstructed by defining schedule pressure as a "hindrance stressor" within the Job Demands-Resources (JD-R) model. Under intense production pressure caused by blind rushes, chaotic logistics, or repeated rework, senior managers often unintentionally send utilitarian signals that "schedule takes precedence over compliance" (Neale & Gurmu, 2022). This administrative pressure cascades

down the subcontracting chain, causing frontline workers' safety motivation to plummet, as they clearly recognize that strict adherence to safety procedures will result in organizational penalties due to schedule delays (Peddie et al., 2025).

Furthermore, prolonged exposure to extreme schedule pressures severely undermines an organization's long-term learning capacity and adaptive defenses. The physical fatigue and emotional strain caused by rushed work schedules undermine situational awareness, while the deprivation of individual safety autonomy erodes the collective safety culture (Rowen et al., 2022). Ultimately, the project's defense systems lose the human-centered redundancies designed to mitigate human error, trapping workers in a vicious cycle of speculative compliance where they routinely compromise core safety values in favor of meeting calendar deadlines.

Safety Management implementation and Safety Motivation

Safety management enforcement is not a passive set of compliance directives; it is characterized by fair supervision, transparent communication, and precise risk control, fundamentally transforming external regulatory pressure into employees' internal psychological baseline (Joshi et al., 2021). In highly collaborative engineering projects with extremely low fault tolerance, the consistency of management's enforcement of safety systems explicitly shapes frontline workers' perceptions of institutional authority and legitimacy, thereby directly determining the activation state and transformation direction of their safety motivation (SM).

Based on Self-Determination Theory (SDT), the operational mechanism of safety management enforcement determines whether employees' motivation remains at the surface level of external coercion or can be successfully internalized into an autonomous safety drive. Empirical evidence from large-scale organizational interventions indicates that, compared with mandatory means focusing on passive compliance, proactive prevention strategies aimed at enhancing overall safety culture and

systematic management exhibit significantly higher subjective efficacy in stimulating employees' internal safety motivation (Van Kampen et al., 2023). If institutional enforcement becomes a mere formality, or merely pursues superficial administrative compliance and legitimacy while lacking substantive reverence for life, management enforcement will lose its moral appeal, thereby severely weakening employees' willingness to cross the compliance threshold and pursue proactive participation (Rincon-Ballesteros et al., 2021).

In high-risk institutional environments, transactional or transformational leadership behaviors are deeply intertwined with safety culture enforcement, jointly determining employees' work enthusiasm and regulatory compliance (Padalung & Sidin, 2020). When management introduces advanced interactive safety modules, it conveys to employees the organization's substantive resource investment in individual well-being (Joshi et al., 2021). This active deployment of management resources releases genuine institutional safety commitments, helping to foster an open communication environment and a shared sense of professional efficacy within the team (Mbong & Bygvraa, 2021). Therefore, in resource-constrained or high-pressure construction environments, consistent and technologically supported management enforcement can effectively prevent motivation decay, ensuring that workers internalize safety regulations into an uncompromising professional responsibility.

Risk Perception and Safety Motivation

Risk perception is defined as an individual's subjective assessment of the severity and probability of environmental threats, functioning as a critical psychological filter that determines whether objectively existing on-site hazards can be transformed into an active drive to avoid risk (Saedi et al., 2023). In inherently variable and dynamic workspaces, workers' psychological calibration of risk constitutes the cornerstone of safety motivation, directly determining their willingness to invest in safety compliance and spontaneous safety participation (Aghighi & Souri, 2021).

The functional link between risk perception and motivation can be thoroughly explained through the multi-stage model of situation awareness (SA). In highly dynamic construction environments, continuous fluctuations in spatial morphology greatly increase the difficulty for workers to perceive, comprehend, and predict potential hazards in real time (Zhang et al., 2023). Cognitive biases such as habituation or overconfidence can lead to a systematic underestimation of routine hazards, thereby triggering the collapse of the protective drive and a surge in speculative non-compliance behaviors (Duarte & Mouro, 2020). Safety motivation plays an indispensable mediating role in the impact of risk perception on final behavioral outcomes, emphasizing that risk identification at the cognitive level must successfully activate the individual's motivational system, otherwise it cannot be transformed into actual compliance behavior on-site (Aghighi & Souri, 2021).

4.3 Safety Motivation (SM) and Safety Behavior (SB)

Safety motivation (SM) serves as a core cognitive-emotional engine linking psychological antecedents to actual performance; it explains why, under identical institutional conditions, different individuals exhibit significant variations in their actual safety behaviors (SB) (Berglund et al., 2025). Based on Self-Determination Theory (SDT), the intrinsic nature of this motivation directly determines the structural quality of behavioral outcomes. Superficial administrative directives often elicit only passive, externally regulated compliance with regulations; only when safety values are successfully internalized as an individual's self-determined motivation do employees move beyond passive risk avoidance toward spontaneous safety-conscious behavior (Kabiesz, 2024).

Safety motivation serves as the core channel through which macro-level organizational structures and leadership processes are translated into micro-level individual behavioral commitment (Yeboah et al., 2025). Employees' intrinsic drive for safety does not arise spontaneously; rather, this motivation is systematically cultivated when organizational

processes provide clear behavioral guidance and reinforce individuals' autonomous commitment to the organization and their professional identity (Berglund et al., 2025). When workers demonstrate strong safety motivation rooted in deep, positive safety attitudes, they develop a profound psychological identification with on-site management practices (Makhbul et al., 2024). This identification shifts their cognitive frame of reference, causing them to view safety not as an operational burden imposed by external supervisors, but as an uncompromising professional responsibility.

Furthermore, in highly dynamic and fragmented project environments, safety motivation is constructed as team-level safety behavior deeply rooted in collective communication and collaborative interactions. Individual motivational drivers are amplified through Team Voice, collective learning, and reflective information exchange, leading to a significant improvement in overall safety performance (Wang et al., 2023). This open-ended interaction effectively breaks down information silos between units, allowing individual safety motivations to coalesce and evolve into collective defense mechanisms.

4.4 The Mediating Role of Safety Motivation

The transmission pathway linking institutional-level safety management practices (SMP) with empirical-level safety behaviors (SB) is a complex behavioral transformation process driven by individual psychology and cognitive processing (Zhang et al., 2021). Within this theoretical framework, safety motivation (SM) functions as a core cognitive mediator and psychological filter. It internalizes macro-level inputs at the organizational level and transforms them into stable, high-fidelity micro-level behavioral compliance and spontaneous civic actions (Zhao & Yan, 2023).

From a structural perspective, management practices driven by companies and owners must pass through an interwoven hierarchy of implementation before they can alter frontline "sharp-end" behaviors. Top-level organizational goals and institutionalized safety

systems exert indirect influence by shaping specific, functional grassroots practices (Zhang et al., 2023). In high-risk environments, substantial corporate investment in safety management acts as a psychological buffer, providing institutional reassurance and reducing job insecurity, thereby sustaining employees' organizational citizenship behavior during severe socioeconomic crises.

Based on Social Exchange Theory (SET) and Uncertainty Management Theory, the mediating capacity of safety motivation is strongly reinforced by leadership behavior and the surrounding organizational climate. Empowering and inclusive leadership styles foster a climate of deep psychological safety, thereby stimulating strong safety motivation and deep task engagement (Wang et al., 2025). When managers exhibit inclusive and supportive behaviors, they reduce communication costs within the team, thereby empowering employees to overcome individual self-efficacy deficits, enabling them to voice critical concerns and proactively share safety-related information (Tian et al., 2025).

When robust management commitment is combined with advanced digital tools, behavioral outcomes shift from superficial, short-term compliance toward deep, sustainable safety commitment. As explained by the Technology Acceptance Model (TAM), this transformation occurs because consistent management commitment directly enhances workers' perceptions of the "usefulness" and "ease of use" of safety processes, thereby improving the quality structure of their underlying safety motivation (Zhao & Yan, 2023).

The mediating role of safety motivation is crucial for maintaining operational discipline under tight deadlines and environmental pressures. Under adverse or high-intensity schedules and work arrangements, a robust safety culture and consistent management enforcement play a key moderating and mediating role, effectively curbing behavioral degradation and stabilizing overall safety performance (Al-mekhlafi et al., 2022). By optimizing structured work arrangements, fostering a climate of error management, and conveying genuine institutional commitment (Ali Arhim et al.,

2024), high-quality safety management practices can prevent individual safety motivation from diminishing under production pressures. Ultimately, safety motivation, as a cognitive hub, perfectly explains why identical structural inputs produce starkly different behavioral outcomes among different workers.

5. Discussion & Research Gaps

In the evolution of classical theories in organizational behavior and occupational health and safety, the mechanisms by which safety management practices, project deadlines, risk perception, and safety motivation drive employee safety behavior have established a relatively solid empirical foundation. Previous scholars have generally confirmed that institutional inputs at the macro level must undergo cognitive filtering and emotional internalization at the micro-individual level before they can be translated into defensive actions on-site.

However, when this classic behavioral transmission pathway is applied to contemporary high-reliability public infrastructure, the disconnection between the theoretical boundaries of existing research and real-world contexts becomes fully apparent. This mismatch is first evident in the situational blind spots of prior literature regarding the configuration of safety management practices. Most existing safety research treats the quality of safety training and management implementation as homogeneous, binary, linear administrative directives, systematically overlooking the multidimensional technical risk systems unique to high-risk medical construction projects. Current classical management models are fundamentally incapable of rationally explaining how, within a low-tolerance environment, safety management practices across different dimensions should be dynamically configured and prioritized to precisely mitigate the high-order systemic risks arising from multi-trade cross-operations. This results in a clear lack of explanatory power in existing theories when applied to high-reliability public engineering projects.

Intertwined with these blind spots in safety practice configuration, the second academic bottleneck that

urgently needs to be overcome lies in the existing literature's linear simplification of schedule pressure as a core institutional stressor. In past empirical derivations based on the classical work-demand-resource model, the academic community has almost without exception defined rushed work and time pressure as purely obstructive stresses that erode psychological safety and drain workers' cognitive bandwidth, positing that they share only a simple negative linear relationship with safety motivation and compliance behavior. However, this one-size-fits-all theoretical assumption completely obscures the time paradox and social attributes unique to public welfare mega-projects. Within the dynamic range of gradually escalating time pressure, the decline or maintenance of employees' safety motivation does not follow a smooth downward straight line; rather, it is highly likely to exhibit a nonlinear, threshold-driven inverted U-shaped or stair-step trajectory, that is, it stimulates safety agency during a reasonable "pressure dividend" period, but encounters a catastrophic defensive collapse after crossing a certain institutional tipping point. Current research on construction safety clearly lacks an empirical analytical framework capable of capturing and quantifying this nonlinear transition mechanism.

Discussions regarding the intention-behavior gap also exhibit a severe tendency toward fragmentation, as existing psychological frameworks all presuppose an ideal workforce that is internally homogeneous, information-symmetric, and characterized by smooth communication. However, the reality of a hospital construction site is essentially an asymmetric multi-team system comprising traditional construction craftsmen, technical experts from high-precision medical equipment manufacturers, and multi-party supervisory and auditing personnel. These teams are inherently characterized by distinct professional barriers and mutually isolated information silos. Previous literature lacks an integrated theoretical model capable of cross-integrating individual multidimensional risk perception with macro-level multi-team uncertainty environments, resulting in the dynamic boundary conditions governing the transformation of safety motivation into safe citizen behavior remaining unclear.

6. Future Research Directions & Conclusion

Given the theoretical gaps in existing research, future scholars should move beyond the limitations of traditional cross-sectional surveys and adopt multi-time-point micro-log tracking methods and stepwise interrupted time series designs to quantitatively capture the nonlinear threshold trajectories through which project schedule pressures transform from challenges into obstacles. Simultaneously, for work sites with multidimensional risk coupling future research should integrate high-reliability organization theory into construction safety management, exploring how to achieve optimal configuration of safety practices through digital twins and intelligent networked physical monitoring. Furthermore, future research should transcend a single psychological perspective and attempt to cross-integrate self-determination theory, social exchange theory, and team resilience engineering. This will allow for a deeper exploration of how error management climate, team advice, and inclusive leadership, across subcontractor boundaries, dynamically regulate the transformation of motivation into safety behavior, thereby breaking down information silos across trades.

In summary, this study systematically unravels the complex mechanisms linking safety management practices, project schedule pressures, risk perception, safety motivation, and employee safety behavior, firmly establishing the mediating role of safety motivation as a bridge between these factors. The findings indicate that relying solely on rigid administrative constraints and pressure to meet deadlines tends to induce opportunistic rule-breaking. Only by activating individual risk calibration through high-quality situational interventions, and by transforming regulations into a sense of personal responsibility through an inclusive and fair climate, can the gap between intention and action be completely bridged. This approach guides the science of construction safety toward a new paradigm that focuses on human-centered redundancy, collective psychological homeostasis, and nonlinear resilience engineering.

7. Acknowledgements

This research was funded by the 2026 Annual Project of Nanchong Social Science Research “15th Five-Year Plan”— *The Impact of Safety Management Practices in Hospital Construction Projects on Employee Safety Behavior: The Mediating Role of Safety Motivation* (Grant No.: NC26B316). The authors gratefully acknowledge the support provided by this project, which made the completion of this study possible.

Reference

- Aghighi, A., & Souri, M. (2021). The Role of Risk Perception on Safety Behavior: Mediated by Safety Motivation and the Moderating Role of co-workers' and Supervisor Safety Climate. *Journal of Safety Promotion and Injury Prevention*, 8(4).
- Aghighi, A., & Souri, M. (2021). The Role of Risk Perception on Safety Behavior: Mediated by Safety Motivation and the Moderating Role of co-workers' and Supervisor Safety Climate. *Journal of Safety Promotion and Injury Prevention*, 8(4).
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.
- Ajzen, I. (2025). *Theory of planned behavior*. In *Wikipedia*. https://en.wikipedia.org/wiki/Theory_of_planned_behavior
- Al-Bayati, A. J. (2021). Impact of construction safety culture and construction safety climate on safety behavior and safety motivation. *Safety*, 7(2), 41.
- Al-Bayati, A. J., Renner, A. T., Listello, M. P., & Mohamed, M. (2023). PPE non-compliance among construction workers: An assessment of contributing factors utilizing fuzzy theory. *Journal of Safety Research*, 85, 146–156. <https://doi.org/10.1016/j.jsr.2023.02.008>
- Ali Arhim, A., Alzubi, A., Iyiola, K., & Banje, F. U. (2024). Unpacking the relationship between

- empowerment leadership and electricity worker's unsafe behavior: A multi-moderated mediation approach. *Sustainability*, 16(23), 10732. <https://doi.org/10.3390/su162310732>
- Ali, R. F., Dominic, P. D. D., Ali, S. E. A., Rehman, M., & Sohail, A. (2021). Information security behavior and information security policy compliance: A systematic literature review for identifying the transformation process from noncompliance to compliance. *Applied Sciences*, 11(8), 3383.
- Al-Mekhlafi, A. B. A., Isha, A. S. N., Abdulrab, M., Ajmal, M., & Kanwal, N. (2022). Moderating effect of safety culture on the association inter work schedule and driving performance using the theory of situation awareness. *Heliyon*, 8(11). [https://www.cell.com/heliyon/fulltext/S2405-8440\(22\)02577-4](https://www.cell.com/heliyon/fulltext/S2405-8440(22)02577-4)
- Bandura, A. (1986). Social foundations of thought and action. *Englewood Cliffs, NJ, 1986*(23-28), 2.
- Bayram, M. (2022). Factors affecting employee safety productivity: an empirical study in an OHSAS 18001-certified organization. *International journal of occupational safety and ergonomics*, 28(1), 139-152.
- Berglund, L., Johansson, J., Johansson, M., Nygren, M., & Stenberg, M. (2025). Structures and processes for safety culture? Perspectives from safety leaders in the Swedish construction industry. *Safety*, 11(2), 47. <https://doi.org/10.3390/safety11020047>
- Berglund, L., Johansson, J., Johansson, M., Nygren, M., & Stenberg, M. (2025). Structures and processes for safety culture? Perspectives from safety leaders in the Swedish construction industry. *Safety*, 11(2), 47. <https://doi.org/10.3390/safety11020047>
- Beś, P., & Strzałkowski, P. (2024). Analysis of the effectiveness of safety training methods. *Sustainability*, 16(7), 2732. <https://doi.org/10.3390/su16072732>
- Brewster, L., Rae, J., Maria, S., & Jones, D. (2024). Beyond the sirens: A scoping review on paramedic safety during response and transportation. *Journal of Transport & Health*, 39, 101922. <https://doi.org/10.1016/j.jth.2024.101922>
- Casey, T., Turner, N., Hu, X., & Bancroft, K. (2021). Making safety training stickier: A richer model of safety training engagement and transfer. *Journal of safety research*, 78, 303-313. <https://www.sciencedirect.com/science/article/abs/pii/S0022437521000815>
- Chae, J., & Kang, Y. (2025). *The mechanism of construction workers' intentional unsafe behavior: In perspective of Theory of Planned Behavior*. In *Lecture Notes in Civil Engineering*. Springer. https://doi.org/10.1007/978-3-031-84208-5_60
- Chen, X. (2025). Integrated multimethod analysis of miners' safety behavior and risk interaction for practical applications. *Scientific Reports*, 15, 34722. <https://doi.org/10.1038/s41598-025-18454-4>
- Cho, S., Kim, S., Lee, H. W., & Li, Z. A. (2023). You make me anxious! Witnessing safety violations during the daily commute and at work leads to employee work withdrawal. *Human Resource Management*, 63(2), 241-258. <https://doi.org/10.1002/hrm.22197>
- Djunaidi, Z., Khaliwa, A. M., Hafia, A., & Putri, N. (2024). Daily income targets and passenger pressure on safety risky riding behavior among online motorcycle taxi riders in Jakarta, Indonesia. *Kesmas: Jurnal Kesehatan Masyarakat Nasional*, 19(1), 8-17. <https://doi.org/10.21109/kesmas.v19i1.7796>
- Duarte, A. P., & Mouro, C. (2020). I Feel Safe Doing It! Prevalence, risk perception, and motives for risky driving in Portugal. *Portuguese Journal of Public Health*, 37(2-3), 82-90. <https://karger.com/pjp/article/37/2-3/82/275037/I-Feel-Safe-Doing-It-Prevalence-Risk-Perception>

- Emuze, F. (2023). Impact of Work Pressure on Construction Safety. *Journal of Engineering, Project & Production Management*, 13(1).
- Fonseca, T., & Ferreira, S. (2025). *Truck driver safety: Factors influencing risky behaviors on the road—A systematic review*. **Applied Sciences**, 15(17), Article 9662. <https://doi.org/10.3390/app15179662>
- Grill, M. (2025). Recognizing employees' contribution to effectiveness and values: A randomized waitlist-controlled trial of operant-based leadership training. *PLOS ONE*, 20(4), e0320131. <https://doi.org/10.1371/journal.pone.0320131>
- He, S., Li, Z. L., Wu, Y., Chen, X., Chen, Y. J., Chen, W. F., Chen, Q. Z., & Xiong, F. F. (2024). Association of hospital safety climate and compliance with occupational safety practices among nurse interns: A cross-sectional study using canonical correlation analysis. *Health Science Reports*, 7(10), e70104. <https://doi.org/10.1002/hsr2.70104>
- Huang, H. T., Tsai, C. H., Wang, C. F., Chien, T. C., & Chang, S. H. (2023). Exploration of COVID-19 pandemic prevention behaviors among healthcare workers. *Healthcare*, 11(2), 153. <https://doi.org/10.3390/healthcare11020153>
- Iqbal, M. S., Mushtaq, M., Popescu, V., Birau, R., Popescu, J., & Margaritescu, S. (2025). Impact of management practices on employees' safety performance: Highlighting safety as a sustainable development goal in the textile industry. *Industria Textila*, 76(3). <https://doi.org/10.35530/IT.076.03.20253>
- Jamil, Z., Nordin, S., Miraj, M., (2025). Sustainable safety practices and hazard management in the oil and gas industry: An HSE perspective. *Frontiers in Public Health*, 13, 1611106. <https://doi.org/10.3389/fpubh.2025.1611106>
- Joshi, S., Hamilton, M., Warren, R., Faucett, D., Tian, W., Wang, Y., & Ma, J. (2021). Implementing Virtual Reality technology for safety training in the precast/prestressed concrete industry. *Applied ergonomics*, 90, 103286. <https://www.sciencedirect.com/science/article/abs/pii/S0003687020302349>
- Joshi, S., Hamilton, M., Warren, R., Faucett, D., Tian, W., Wang, Y., & Ma, J. (2021). Implementing Virtual Reality technology for safety training in the precast/prestressed concrete industry. *Applied ergonomics*, 90, 103286. <https://www.sciencedirect.com/science/article/abs/pii/S0003687020302349>
- Kabiesz, P. (2024). Safety culture in SMEs of the food industry: A case study and best practices. *Sustainability*, 16(24), 11185. <https://doi.org/10.3390/su162411185>
- Kanesan, P. A/L., Omar, S., & Fadzil, S. M. (2025). The influence of safety management practices on safety participation and awareness level of standard operating procedure (SOP) among construction employees in Johor. *Jurnal Kejuruteraan*, 37(5), 2341–2350. [https://doi.org/10.17576/jkukm-2025-37\(5\)-25](https://doi.org/10.17576/jkukm-2025-37(5)-25)
- Kim, G. Y., Kwon, Y. B., Ban, H., Kim, H. K., & Park, J. Y. (2025). *The impact of work sequence-based safety training on workers' cognitive effectiveness at construction sites*. *Buildings*, 15(9), 1409. <https://doi.org/10.3390/buildings15091409>
- Kim, K. H., & Shin, S. (2024). Factors influencing preceptor nurses' clinical teaching behavior: A cross-sectional study. *Nurse Education Today*, 133, 106555. <https://doi.org/10.1016/j.nedt.2024.106555>
- Kuran, C. H. A., Njå, O., & Braut, G. S. (2023). Conceptualizing the bending and breaking of rules in the heavy goods transport sector. *Safety Science*, 167, 106235. <https://doi.org/10.1016/j.ssci.2023.106235>
- Kyambade, M., Nkurunziza, G., Sewante, L., Namatovu, A., & Tushabe, M. (2024). Servant leadership and healthy work relationships in university context: A moderated mediation analysis of psychological safety and socially responsible leadership. *Cogent Psychology*,

- 11(1), 2418802.
<https://doi.org/10.1080/2331186X.2024.2418802>
- Linhardt, R. M., Bisbey, T. M., & Salas, E. (2024). The science and practice of team training: Historical progress and a research agenda. *Consulting Psychology Journal*, 76(1), 70–92. <https://doi.org/10.1037/cpb0000263>
- Liu, S., Li, N., Liu, N., Fu, T., Mao, Y., Du, J., & Zhu, Y. (2025). Prevalence and factors influencing overweight/obesity and poor vision in children and adolescents before and after the COVID-19 pandemic in a city in Sichuan Province. *Frontiers in Public Health*, 13, 1582864.
- Makhbul, Z. K. M., Kaliannan, M., & Ibrahim, N. H. (2024). Work value as a mediator between safety culture and safety attitude. *Geografia: Malaysian Journal of Society and Space*, 20(4), 211–224. <https://ejournal.ukm.my/gmjss/article/view/75075>
- Mbong, T. S. S., & Bygvraa, D. A. (2021). Analysis of the implementation of the International Safety Management Code using motivation theory: the seafarer's views. *International maritime health*, 72(3), 172–178. https://journals.viamedica.pl/international_maritime_health/article/view/72325
- Meyerhoff, J., Popowski, S., Lakhtakia, T., Tack, E., Kornfield, R., Kruzan, K., Krause, C., Nguyen, T., Rushton, K., Pisani, A., Reddy, M., Van Orden, K., & Mohr, D. (2025). Automated digital safety planning interventions for young adults: Qualitative study using online co-design methods. *JMIR Formative Research*, 9
- Neale, J., & Gurmu, A. (2022). Production pressures in the building sector of the construction industry: A systematic review of literature. *Journal of Engineering, Design and Technology*, 20(6), 1412–1429.
- Padauleng, A. W., & Sidin, A. I. (2020). The relationship between leadership style and nurse's work motivation with the implementation of patient safety culture in hospital, Bone regency. *Enfermeria clinica*, 30, 161–164. <https://www.sciencedirect.com/science/article/abs/pii/S1130862120303818>
- Payne, M., Roache, D., Subero, J., & Zhang, G. T. (2025). How safety leadership styles impact safety performance: A case study. *Journal of Safety Research*. <https://doi.org/10.1016/j.jsr.2025.02.006>
- Pechteep, P., Luathep, P., & Jaensirisak, S. (2025). Factors influencing the violation intentions of pedestrians, motorcycle riders, and car drivers at midblock crosswalks. *Journal of Information Systems Engineering and Management*, 10(23s). <https://doi.org/10.3126/jisem.2025.106235>
- Peddie, N., Hoegh, J., Rice, G., Shetty, S., Ure, A., & Cogan, N. (2025). Health and social care professionals' experience of psychological safety within their occupational setting: A thematic synthesis review. *Nursing Reports*, 15(4), 131–148. <https://doi.org/10.3390/nursrep15040131>
- Pham, V. H. S., Dau, T. D., & Nguyen, V. L. (2025). Evaluating criteria influencing safety performance in metro construction. *Cogent Engineering*, 12(1), 2574529. <https://doi.org/10.1080/23311916.2025.2574529>
- Priolo, G., Vignoli, M., & Nielsen, K. (2025). Risk perception and safety behaviors in high-risk workers: A systematic literature review. *Safety Science*, 186, 106811. <https://doi.org/10.1016/j.ssci.2025.106811>
- Rabiul, M. K., Mohamed, A. E., Patwary, A. K., Yean, T. F., & Osman, S. Z. (2023). Linking human resources practices to employee engagement in the hospitality industry: The mediating influences of psychological safety, availability and meaningfulness. *European Journal of Management and Business Economics*, 32.

- Rantsatsi, N. P. (2025). Health and safety induction training in the construction industry: a review. *Journal of Facilities Management*, 23(4), 561–575. <https://doi.org/10.1108/JFM-10-2023-0109>
- Rehan, A., Thorpe, D., & Heravi, A. (2024). Leadership practices and communication framework for project success – The construction sector. *Organization, Technology and Management in Construction: An International Journal*, 16(1), 204–223. <https://doi.org/10.2478/otmcj-2024-0016>
- Rehman, A., Hassan, M. U., Zubair, M. U., Aziz, T., & Ahmed, K. (2025). A framework for effective construction workers safety training using flipped learning. *Journal of Civil Engineering and Management*, 31(7). <https://doi.org/10.3846/jcem.2025.23083>
- Rowen, A., Grabowski, M., & Russell, D. W. (2022). The impact of work demands and operational tempo on safety Culture, motivation and perceived performance in safety critical systems. *Safety science*, 155, 105861. <https://www.sciencedirect.com/science/article/abs/pii/S0925753522002004>
- Seo, H. J. (2025). *Enhancing worker safety behaviors through the job demands–resources perspective: An analysis of job demands, resources, and safety outcomes*. **Buildings**, 15(3), 486. <https://doi.org/10.3390/buildings15030486>
- Simon, A. (2023). Organizational citizenship behavior for integrated management systems performance. *Environmental Engineering and Management Journal*, 22(12), 2117–2126. <https://doi.org/10.30638/eemj.2023.182>
- Su, W. J. (2021). The effects of safety management systems, attitude and commitment on safety behaviors and performance. *International journal for applied information management*, 1(4), 187-200.
- Tian, X., Chae, H., Song, D., & Zhang, Y. (2025). Leader prohibitive voice shapes employee voice through psychological safety moderated by self-efficacy and generational differences. *Scientific Reports*, 15, 31469. <https://doi.org/10.1038/s41598-025-17500-5>
- Van Kampen, J., Lammers, M., Steijn, W., Guldenmund, F., & Groeneweg, J. (2023). What works in safety: The use and perceived effectiveness of 48 safety interventions. *Safety Science*, 162, 106072. <https://doi.org/10.1016/j.ssci.2023.106072>
- Wang, D., Jia, J., Jiang, S., Liu, T., & Ma, G. (2023). How team voice contributes to construction project performance: The mediating role of project learning and project reflexivity. *Buildings*, 13(7), 1599. <https://doi.org/10.3390/buildings13071599>
- Wang, K., Zhao, C., Wang, F., & Hu, Y. (2024). Digital twin-driven safety management for port operations. *Frontiers in Marine Science*. <https://doi.org/10.3389/fmars.2024.1455522>
- Wang, L., Liu, J., & Lu, L. (2025). Speak up in a safe space: The role of inclusive leadership and collectivism in fostering upward voice. *Zhongshan Polytechnic & Peking University Collaboration*, July 2025. <https://doi.org/10.32604/jpa.2025.068580>
- Wasana, P. L. S., Weerasinghe, S. D. N. A. M. A. M., & Hong, S. C. (2025). Exploring the dynamics of safety culture: Analyzing attitudes, practices, and perceptions among chemical laboratory employees in Sri Lanka. *Industrial Health*. <https://doi.org/10.2486/indhealth.2024-0187>
- Yeboah, M. A., Kalvei, M., Ansong, L. O., & Ansong, A. (2025). Responsible leadership and workplace safety: do safety culture and safety motivation matter?. *Asia-Pacific Journal of Business Administration*, 17(2), 285-302.
- Zhang, C., Jia, C., Gao, H., & Shen, S. (2022). Ecological security pattern construction in hilly areas based on SPCA and MCR: A case study of Nanchong City, China. *Sustainability*, 14(18), 11368.
- Zhang, J., Xie, C., & Morrison, A. M. (2021). The effect of corporate social responsibility on hotel employee safety behavior during COVID-19:

The moderation of belief restoration and negative emotions. *Journal of Hospitality and Tourism Management*, 46, 233-243.

Zhang, Z., Guo, B. H. W., Chang-Richards, A., Feng, Z., Jin, R., Zou, Y., & Goh, Y. M. (2023). Digital technology enhanced situation awareness for construction safety: Systematic review and future research directions. *Safety Science*, 167, 106280. <https://doi.org/10.1016/j.ssci.2023.106280>

Zhang, Z., Guo, B. H. W., Chang-Richards, A., Feng, Z., Jin, R., Zou, Y., & Goh, Y. M. (2023).

Digital technology enhanced situation awareness for construction safety: Systematic review and future research directions. *Safety Science*, 167, 106280. <https://doi.org/10.1016/j.ssci.2023.106280>

Zhao, X., & Yan, D. (2023). Incorporating technological acceptance model into safety compliance of construction workers in Australia. *Safety Science*, 162, 106127. <https://doi.org/10.1016/j.ssci.2023.106127>