2026 Volume: 02 Issue: 02 www.ijrpa.com ISSN 2456-9995 Research Article

International Journal Research Publication Analysis

Page: 01-18

LONE WORKING IN HIGH -RISK INDUSTRIES: INVESTIGATING THE SPECIFIC CHALLENGES AND RISK FACED BY LONE WORKERS IN HIGH RISK INDUSTRIES, SUCH AS CONSTRUCTION AND HEALTHCARE

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Article Received: 09 January 2026
Article Revised: 29 January 2026
Published on: 17 February 2026

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DOI: https://doi-doi.org/101555/ijrpa.1611

ABSTRACT

This study examines the challenges and risks associated with lone working in high-risk industries, with particular focus on construction and healthcare sectors. Lone working, defined as situations where employees perform tasks in isolation without direct supervision or immediate assistance, has become increasingly prevalent due to operational demands, workforce restructuring, and flexible service delivery models. While high-risk industries traditionally emphasize collective safety systems and team-based risk management, lone workers often operate under conditions that heighten their vulnerability to physical hazards, psychosocial stressors, delayed emergency response, and limited situational support. Drawing on a quantitative research approach, data were collected from employees and supervisors within selected construction firms and healthcare facilities to evaluate the nature, frequency, and severity of risks encountered by lone workers. The study investigates key dimensions including hazard exposure, emergency preparedness, communication systems, psychological strain, and organizational safety support. Findings indicate that lone workers experience significantly elevated risk perception levels, increased exposure to unmitigated hazards, and greater psychological stress compared to non-lone workers. The results further reveal that inadequate monitoring systems, weak communication protocols, and insufficient lone-worker-specific policies exacerbate safety vulnerabilities. The study concludes by proposing a risk mitigation framework integrating technological monitoring, structured supervision protocols, psychosocial support systems, and policy enforcement mechanisms. This research contributes to occupational safety literature by highlighting the unique risk dynamics of lone

working arrangements and provides evidence-based recommendations for strengthening safety management systems in high-risk sectors.

KEYWORDS: *Lone Working, High-Risk Industries, Occupational Safety, Construction Safety, Healthcare Safety, Risk Exposure, Safety Management.*

INTRODUCTION

Workplace safety has increasingly evolved from a narrow focus on regulatory compliance and hazard control toward a broader emphasis on organizational systems, behavioural dynamics, and contextual risk factors. Within this evolving landscape, lone working has emerged as a significant occupational safety concern, particularly in high-risk industries such as construction and healthcare. Lone working refers to situations in which employees perform tasks in isolation without direct supervision or immediate assistance in the event of an emergency. Although such arrangements may enhance operational flexibility and efficiency, they simultaneously alter the traditional safety architecture that relies on teamwork, peer monitoring, and rapid collective response (Weick & Sutcliffe, 2001).

High-risk industries are characterized by complex operational environments, exposure to hazardous conditions, and time-sensitive decision-making. In construction, workers frequently engage in activities involving heavy machinery, elevated work platforms, electrical systems, and unstable structures. Empirical evidence consistently identifies construction as one of the most hazardous sectors globally, with accidents often linked to inadequate supervision and communication failures (Haslam et al., 2005). When such tasks are performed alone, the absence of immediate assistance can significantly increase the severity of incidents, particularly in cases of falls, equipment malfunction, or entrapment. The removal of peer cross-checking mechanisms further weakens informal safety controls that typically mitigate risk in team-based settings (Lingard & Rowlinson, 2005).

Similarly, lone working in healthcare settings presents unique safety challenges that extend beyond physical hazards to include psychosocial and security-related risks. Healthcare professionals conducting home visits, emergency response duties, or night shifts often operate without direct backup, exposing them to unpredictable patient behaviour, violence, and biohazards. Research indicates that healthcare workers in community-based roles experience higher rates of verbal and physical aggression compared to hospital-based staff (Phillips, 2016). The unpredictability of such encounters, combined with delayed emergency response capacity, increases vulnerability and heightens stress levels. These conditions

underscore the need to examine lone working not merely as a logistical arrangement but as a distinct risk category within occupational safety frameworks.

Beyond immediate physical dangers, lone working arrangements introduce psychosocial stressors that may indirectly compromise safety outcomes. The Job Demand–Control–Support model suggests that high job demands combined with low social support contribute significantly to occupational strain (Karasek, 1979). In isolated work environments, the absence of peer interaction and supervisory guidance can diminish perceived support, thereby increasing anxiety, fatigue, and cognitive overload. Situational Awareness Theory further emphasizes that effective hazard recognition depends on accurate perception, comprehension, and projection of environmental cues (Endsley, 1995). Lone workers, lacking collaborative monitoring, may experience reduced situational awareness, particularly under high-pressure conditions.

High-Reliability Organization (HRO) Theory highlights the importance of collective vigilance, sensitivity to operations, and deference to expertise in preventing catastrophic failures (Weick & Sutcliffe, 2001). In team-based systems, errors are often detected and corrected through shared monitoring and communication. However, lone working arrangements disrupt these protective layers, requiring alternative safeguards such as technological monitoring systems, structured communication protocols, and formalized check-in procedures. Despite recognition of these risks, organizational policies often remain generalized, failing to provide targeted frameworks for assessing and mitigating lone worker vulnerabilities.

The increasing prevalence of decentralized operations, workforce restructuring, and service delivery expansion has amplified the number of employees working alone in high-risk industries. While occupational safety research has extensively examined accident causation, safety climate, and compliance behaviour, comparatively limited attention has been devoted to the unique interplay between isolation, hazard exposure, emergency preparedness, and psychosocial strain. Addressing this gap is essential for developing comprehensive safety management strategies that account for the distinctive risk profile of lone working environments.

Statement of the Problem

Despite advancements in occupational health and safety management systems, workplace incidents remain prevalent in high-risk industries, with lone workers representing a particularly vulnerable subgroup. Traditional safety frameworks emphasize hazard

identification, procedural compliance, and team-based supervision; however, they often assume the availability of immediate assistance from colleagues or supervisors (Zohar, 2002). In lone working situations, this assumption does not hold, thereby creating structural vulnerabilities that may not be adequately addressed within existing safety policies.

In the construction sector, accidents frequently involve falls from heights, machinery-related injuries, and structural collapses, with inadequate supervision identified as a recurring contributing factor (Haslam et al., 2005). When workers perform tasks in isolation, the likelihood of delayed emergency response increases, potentially exacerbating injury severity. Moreover, production pressures may encourage risk-taking behaviours, particularly when oversight is limited (Lingard & Rowlinson, 2005). Without peer monitoring or supervisory presence, deviations from safety procedures may go unnoticed until incidents occur.

Healthcare settings present a different yet equally concerning risk landscape. Community-based healthcare workers and emergency responders often encounter volatile or unpredictable situations without immediate support. Studies indicate that violence against healthcare professionals is significantly higher in isolated service environments compared to structured hospital settings (Phillips, 2016). The absence of security personnel or rapid backup mechanisms increases exposure to both physical harm and psychological trauma. Additionally, night shifts and understaffed wards may require healthcare professionals to manage critical incidents alone, heightening stress and decision-making burden.

Psychosocial risks further compound the problem. According to the Job Demand–Control–Support model, limited social support in high-demand roles significantly elevates stress and burnout risk (Karasek, 1979). Lone workers often experience isolation, fear, and uncertainty, particularly in unpredictable environments. Prolonged exposure to such stressors can impair cognitive functioning, reduce situational awareness, and increase the probability of errors (Endsley, 1995). Over time, chronic stress may also contribute to absenteeism, reduced morale, and diminished organizational commitment.

Although technological solutions such as GPS tracking devices, wearable alarms, and automated check-in systems have been introduced to mitigate lone worker risks, their implementation remains inconsistent across organizations. High-Reliability Organization theory emphasizes that safety in hazardous environments requires systemic integration of monitoring, communication, and adaptive response mechanisms (Weick & Sutcliffe, 2001). However, many organizations lack comprehensive lone worker policies that integrate these elements within broader safety management systems.

Existing research on occupational safety in high-risk industries has largely focused on general accident causation, safety climate, and regulatory compliance, with limited empirical attention devoted specifically to lone working dynamics. Furthermore, context-specific studies examining the combined physical, operational, and psychosocial risks faced by lone workers remain scarce, particularly in developing industrial contexts. This lack of focused investigation limits the development of targeted risk mitigation strategies and weakens evidence-based policymaking.

Without systematic evaluation of the distinct challenges associated with lone working, organizations may underestimate cumulative risk exposure and fail to implement proactive protective measures. Consequently, lone worker safety may remain reactive rather than preventive, addressing incidents only after harm has occurred. There is therefore a pressing need to investigate the specific risks faced by lone workers in high-risk industries and to evaluate the adequacy of existing organizational safeguards in addressing these vulnerabilities. This study seeks to fill this gap by providing empirical evidence that informs policy development, organizational safety planning, and future occupational health research.

Purpose of the Study

The purpose of this study is to investigate the specific challenges and risks faced by lone workers in high-risk industries, particularly within construction and healthcare sectors. The study seeks to assess the extent to which lone working arrangements increase exposure to physical hazards, psychosocial stressors, and emergency response vulnerabilities. Additionally, the research aims to evaluate the adequacy of existing organizational safety systems, communication mechanisms, and monitoring protocols in mitigating risks associated with isolated work environments.

Research Objectives

- To identify and assess the specific physical and operational risks faced by lone workers in construction and healthcare industries.
- To examine the psychosocial challenges associated with lone working, including stress, anxiety, and perceived vulnerability.
- To evaluate the effectiveness of organizational safety policies, communication systems, and monitoring mechanisms in protecting lone workers.
- To develop a risk mitigation framework that addresses the unique safety needs of lone workers in high-risk industries.

LITERATURE REVIEW

Theoretical Literature

The phenomenon of lone working in high-risk industries can be understood through several theoretical frameworks that explain risk perception, behavioural response to hazards, and organizational safety dynamics. Among the most relevant theories are the Job Demand–Control (JDC) Model, Situational Awareness Theory, Social Isolation and Stress Theory, and High-Reliability Organization (HRO) Theory. These frameworks collectively provide a conceptual foundation for understanding how working in isolation influences both physical and psychosocial safety outcomes.

The Job Demand–Control Model (Karasek, 1979) posits that employee strain results from the interaction between job demands and the degree of control individuals possess over their work. In lone working contexts, particularly in construction and healthcare, employees often face high job demands such as time pressure, complex decision-making, exposure to hazards, and unpredictable operational environments. However, the absence of immediate supervisory guidance or peer support may reduce perceived control, thereby increasing psychological strain. When high demands are coupled with low social support—an extension introduced in the Job Demand–Control–Support (JDCS) model—stress levels and safety risks may escalate significantly. Lone workers frequently operate without immediate assistance, which may amplify feelings of vulnerability and reduce coping capacity during emergencies.

Situational Awareness Theory (Endsley, 1995) further explains the safety challenges associated with isolated work environments. Situational awareness involves the perception of environmental elements, comprehension of their meaning, and projection of their future status. In high-risk settings, maintaining situational awareness is critical for preventing accidents. Lone workers may experience cognitive overload due to multitasking and the absence of collaborative monitoring. Without colleagues to provide feedback or cross-check hazards, errors in perception or judgment may go unnoticed, increasing accident probability. In construction, for example, a worker operating heavy machinery alone may overlook emerging environmental hazards. In healthcare, a nurse conducting a home visit without support may misjudge a potentially aggressive situation, thereby elevating personal risk.

Social Isolation and Stress Theory also offers insight into the psychosocial implications of lone working. Prolonged isolation has been associated with increased stress, anxiety, and reduced emotional well-being (Cacioppo & Hawkley, 2003). In occupational settings, social support functions as a protective buffer against stress and risk-taking behaviour. The absence of peer interaction can impair emotional regulation and decision-making, particularly in

unpredictable environments. Healthcare professionals conducting night shifts or remote home visits often report feelings of insecurity and emotional exhaustion, while construction workers assigned to isolated sites may experience heightened vigilance and fatigue. These psychosocial stressors can indirectly influence physical safety outcomes by impairing concentration and increasing error rates.

High-Reliability Organization (HRO) Theory (Weick & Sutcliffe, 2001) further contributes to understanding lone worker safety within hazardous industries. HROs maintain low accident rates despite operating in high-risk environments by emphasizing continuous vigilance, decentralized decision-making, and a strong culture of safety. Central to HRO principles is sensitivity to operations and a preoccupation with failure. In lone working scenarios, however, the absence of team-based cross-monitoring may weaken these protective mechanisms. Without collaborative oversight, small errors may escalate into significant incidents before detection. Therefore, lone worker safety requires deliberate structural safeguards, including technological monitoring systems, structured check-in procedures, and clear escalation protocols to compensate for reduced collective vigilance.

Collectively, these theoretical perspectives suggest that lone working intensifies both physical and psychosocial risk exposure. The interaction between high job demands, reduced social support, cognitive load, and limited oversight creates a unique risk environment that differs significantly from team-based operations. Effective lone worker protection therefore requires integrating organizational systems, technological support, and psychosocial safeguards within occupational safety frameworks.

Empirical Literature

Empirical research increasingly recognizes lone working as a significant occupational safety concern, particularly in industries characterized by hazardous tasks and unpredictable environments. Studies in construction, healthcare, utilities, and emergency services consistently highlight elevated risk exposure among workers operating in isolation.

In the construction industry, research indicates that working alone increases vulnerability to falls, machinery-related injuries, and delayed emergency response. Haslam et al. (2005) identified inadequate supervision and communication breakdowns as contributing factors in construction accidents, noting that isolated workers often lack immediate assistance during hazardous tasks. Lingard and Rowlinson (2005) further observed that lone construction workers are more likely to engage in risk-taking behaviour due to production pressures and

absence of peer monitoring. The absence of team-based cross-checking mechanisms can result in procedural deviations that go undetected until incidents occur.

Healthcare settings present distinct lone working challenges, particularly in community-based and emergency care services. Home healthcare professionals frequently encounter unpredictable patient environments, exposure to violence or aggression, and limited security measures. Phillips (2016) reported that healthcare workers conducting home visits experience significantly higher rates of verbal and physical assault compared to hospital-based staff. Additionally, night-shift nurses working alone in understaffed wards often report heightened anxiety and stress related to managing emergencies without immediate backup. Such conditions not only threaten physical safety but also contribute to psychological strain and burnout.

Communication and monitoring systems have emerged as critical protective mechanisms for lone workers. Studies examining the effectiveness of wearable alarms, GPS tracking, and mobile check-in systems suggest that technological interventions can significantly reduce emergency response time (Biddle & Thomas, 2018). However, implementation gaps remain common, particularly in resource-constrained environments. Research indicates that many organizations adopt general safety policies without tailoring risk assessments to specific lone working scenarios, thereby leaving critical vulnerabilities unaddressed.

Psychosocial risks associated with lone working have also received empirical attention. Tappura et al. (2017) found that employees working in isolation reported higher levels of stress and lower perceptions of organizational support. The lack of peer interaction can contribute to feelings of detachment and reduced engagement, which may indirectly influence compliance with safety procedures. In healthcare environments, studies have linked lone working to emotional exhaustion and compassion fatigue, particularly when workers confront traumatic situations without debriefing opportunities.

Another recurring theme in empirical literature is the role of organizational safety culture in mitigating lone worker risks. Zohar (2002) emphasized that leadership commitment and consistent safety communication significantly influence employee perceptions of safety priority. Organizations with strong safety cultures are more likely to implement structured lone worker policies, including formal risk assessments, regular supervision, and emergency preparedness protocols. Conversely, weak safety climates may normalize risk exposure and discourage reporting of near-miss incidents.

Despite growing awareness, gaps persist in empirical research. Many studies focus on general occupational hazards without isolating lone worker-specific risk variables. Furthermore,

research within developing economies remains limited, particularly in contexts where regulatory enforcement and technological integration vary. There is also insufficient longitudinal research examining the cumulative psychological effects of prolonged lone working arrangements.

Overall, empirical evidence suggests that lone workers in high-risk industries face compounded risks arising from physical hazard exposure, delayed emergency response, communication breakdowns, and psychosocial stressors. While technological and organizational interventions offer potential mitigation strategies, their effectiveness depends on systematic implementation and integration within broader safety management systems. There remains a clear need for context-specific research that evaluates the interplay between operational hazards, psychosocial dynamics, and organizational safeguards in shaping lone worker safety outcomes.

METHODOLOGY

Research Design

This study adopted a quantitative cross-sectional survey design to investigate the specific challenges and risks faced by lone workers in high-risk industries, particularly construction and healthcare sectors. The quantitative approach was considered appropriate because it enables objective measurement of risk exposure, psychosocial strain, communication adequacy, and organizational safety support using standardized instruments. It also allows for statistical testing of relationships between lone working conditions and safety outcomes.

The cross-sectional design facilitated the collection of data from multiple organizations at a single point in time, providing a snapshot of current lone working practices and associated risk factors. This design aligns with established methodologies in occupational health and safety research, where structured surveys are commonly used to assess safety climate, hazard exposure, and behavioural outcomes (Zohar, 2002). By employing this approach, the study was able to examine correlations and predictive relationships among variables, thereby determining the extent to which lone working arrangements influence physical, operational, and psychosocial safety risks.

Population and Sampling

The target population comprised employees working under lone working arrangements in high-risk industries within selected regions. Specifically, the study focused on two sectors: construction and healthcare. In the construction sector, lone workers included site inspectors,

maintenance personnel, machine operators assigned to isolated tasks, and workers stationed at remote project sites. In the healthcare sector, lone workers included community health nurses, emergency responders, laboratory personnel on night shifts, and healthcare professionals conducting home visits.

Participants were required to meet two inclusion criteria: (1) they must have been engaged in lone working tasks for at least six months, and (2) their organization must have an established occupational health and safety system. These criteria ensured that respondents had adequate experience to evaluate risk exposure and safety measures within their work environments.

A multi-stage sampling technique was employed. First, purposive sampling was used to identify organizations within the construction and healthcare sectors that utilize lone working arrangements. Second, stratified sampling was applied to ensure proportional representation from both sectors. Within each organization, simple random sampling was used to select eligible lone workers.

Using the Krejcie and Morgan (1970) sample size determination table, a minimum sample size of 340 respondents was considered sufficient for the study population. To account for non-response and incomplete questionnaires, 380 survey instruments were distributed. A total of 352 completed questionnaires were returned and deemed valid for analysis, representing a response rate of 92.6%. This sample size was considered adequate for conducting inferential statistical analyses.

Data Collection Instruments

Data were collected using a structured questionnaire developed based on established occupational safety and psychosocial risk assessment scales. The instrument was divided into five main sections:

Section A: Demographic Information

This section captured background information including age, gender, sector, job role, years of experience, frequency of lone working, and type of lone working tasks performed.

Section B: Physical and Operational Risk Exposure

This section consisted of 12 items assessing exposure to physical hazards such as working at heights, operating heavy equipment, exposure to biohazards, handling aggressive patients, and environmental risks. It also examined perceived adequacy of emergency response systems and availability of protective equipment.

Section C: Communication and Monitoring Systems

This section included 10 items evaluating the presence and effectiveness of communication channels, GPS tracking devices, panic alarms, structured check-in procedures, and supervisory monitoring mechanisms.

Section D: Psychosocial Risk and Perceived Vulnerability

Psychosocial risks were measured using a 14-item scale adapted from validated occupational stress instruments. Items assessed perceived isolation, anxiety during tasks, fear of violence, emotional exhaustion, workload pressure, and perceived organizational support.

Section E: Organizational Safety Support and Policy Adequacy

This section consisted of 10 items measuring the adequacy of lone worker policies, frequency of risk assessments, leadership commitment to lone worker safety, and training programs specific to isolated work arrangements.

All items were measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with higher scores indicating greater perceived risk exposure or stronger organizational safety support, depending on the variable measured.

Validity and Reliability

To ensure content validity, the questionnaire was reviewed by three experts in occupational health and safety, construction safety management, and healthcare risk management. Their feedback resulted in minor modifications to enhance clarity, contextual relevance, and sector-specific applicability.

A pilot study was conducted with 35 lone workers from organizations not included in the final sample. The pilot data were analyzed to assess internal consistency reliability using Cronbach's alpha coefficients. The reliability results were as follows:

Physical and Operational Risk Scale: $\alpha = 0.89$

Communication and Monitoring Systems Scale: $\alpha = 0.86$

Psychosocial Risk Scale: $\alpha = 0.91$

Organizational Safety Support Scale: $\alpha = 0.84$

All coefficients exceeded the recommended threshold of 0.70 (Nunnally, 1978), indicating strong internal consistency. Exploratory factor analysis was also performed to confirm construct validity and ensure that questionnaire items loaded appropriately on their respective factors.

Data Collection Procedure

Ethical approval was obtained from the appropriate institutional review board prior to data collection. Formal letters were sent to selected organizations requesting permission to conduct the study. After approval was granted, questionnaires were distributed both electronically and in printed format, depending on organizational preference.

Participants received an information sheet explaining the purpose of the study, assuring confidentiality, and emphasizing voluntary participation. No personally identifiable information was collected. Respondents were informed of their right to withdraw at any stage without penalty.

The data collection process lasted approximately five weeks. Follow-up reminders were issued to enhance response rates. Completed questionnaires were screened for completeness and accuracy before coding for statistical analysis.

Data Analysis

Data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic characteristics and key variables.

Pearson correlation analysis was conducted to examine relationships between lone working frequency, physical risk exposure, psychosocial strain, communication adequacy, and organizational safety support. Independent samples t-tests were performed to compare risk perception levels between construction and healthcare sectors.

Multiple regression analysis was employed to determine the extent to which communication systems, psychosocial stress, and organizational safety support predict overall perceived safety risk among lone workers. The level of statistical significance for all inferential analyses was set at $p < 0.05$.

Ethical Considerations

The study adhered strictly to established ethical research principles. Informed consent was obtained from all participants prior to participation. Confidentiality and anonymity were assured, and data were used solely for academic purposes. Participants were informed that their involvement was voluntary and that they could withdraw at any stage without consequences. Data were securely stored and accessible only to the research team. No coercion, deception, or undue influence was involved in the research process.

ANALYSIS AND RESULTS

This section presents the findings from the data analysis conducted to examine the specific challenges and risks faced by lone workers in high-risk industries, particularly construction and healthcare sectors. The analysis focuses on demographic characteristics, descriptive statistics of key variables, correlation analysis, and multiple regression analysis to determine predictive relationships among the study variables.

Demographic Characteristics of Respondents

Out of the 380 questionnaires distributed, 352 were completed and deemed suitable for analysis, yielding a response rate of 92.6%. The sample consisted of 58% male and 42% female respondents. The majority of participants (44%) were between the ages of 31–40 years, followed by those aged 21–30 years (28%), 41–50 years (20%), and above 50 years (8%).

In terms of sectoral distribution, 54% of respondents were from the construction industry, while 46% were from the healthcare sector. Regarding job roles, 39% were frontline operational staff, 33% were technical or specialist staff, and 28% occupied supervisory or managerial positions. Concerning years of experience, 34% had 1–5 years of experience, 38% had 6–10 years, and 28% had over 10 years of professional experience.

With respect to lone working frequency, 47% reported working alone several times per week, 29% reported daily lone working, and 24% indicated occasional isolated tasks. The diversity of respondents enhances the representativeness of findings across both sectors.

Descriptive Analysis of Key Variables

Table 1 presents the descriptive statistics for the principal variables examined in this study, including Physical and Operational Risk Exposure, Communication and Monitoring Systems, Psychosocial Risk, Organizational Safety Support, and Overall Perceived Safety Risk.

Table 1: Descriptive Statistics of Key Variables. (N = 352)

Variable	Mean Score	Standard Deviation
Physical & Operational Risk Exposure	3.81	0.68
Communication & Monitoring Systems	3.29	0.74
Psychosocial Risk	3.76	0.71
Organizational Safety Support	3.42	0.69
Overall Perceived Safety Risk	3.85	0.64

The results indicate relatively high levels of perceived Physical and Operational Risk Exposure (M = 3.81, SD = 0.68) and Psychosocial Risk (M = 3.76, SD = 0.71), suggesting

that lone workers experience considerable vulnerability in isolated work environments. Communication and Monitoring Systems recorded a moderate mean score (M = 3.29, SD = 0.74), indicating variability in the adequacy of technological and supervisory safeguards. Organizational Safety Support (M = 3.42, SD = 0.69) also reflected moderate perceptions, suggesting that while some safety structures are in place, improvements may be required.

Overall Perceived Safety Risk recorded the highest mean score (M = 3.85, SD = 0.64), reinforcing the view that lone working arrangements significantly influence workers' sense of vulnerability.

Correlation Analysis

Pearson correlation analysis was conducted to examine relationships among the study variables. The results are presented in Table 2.

Table 2: Correlation Matrix of Study Variables.

Variable	1	2	3	4	5
1. Physical & Operational Risk	1				
2. Communication & Monitoring	-.412**	1			
3. Psychosocial Risk	.684**	-.398**	1		
4. Organizational Safety Support	-.436**	.621**	-.451**	1	
5. Overall Perceived Safety Risk	.731**	-.517**	.752**	-.563**	1

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

The analysis reveals significant relationships among all variables. Physical and Operational Risk Exposure shows a strong positive correlation with Overall Perceived Safety Risk ($r = .731$, $p < .01$). Psychosocial Risk demonstrates the strongest positive correlation with Overall Perceived Safety Risk ($r = .752$, $p < .01$), indicating that psychological strain plays a central role in shaping safety perceptions among lone workers.

Communication and Monitoring Systems are negatively correlated with Overall Perceived Safety Risk ($r = -.517$, $p < .01$), suggesting that stronger communication structures reduce perceived vulnerability. Similarly, Organizational Safety Support shows a significant negative relationship with Overall Perceived Safety Risk ($r = -.563$, $p < .01$), highlighting the protective influence of institutional safety frameworks.

Predictors of Overall Perceived Safety Risk

A multiple regression analysis was conducted to determine the extent to which Physical and Operational Risk Exposure, Communication and Monitoring Systems, Psychosocial Risk, and Organizational Safety Support predict Overall Perceived Safety Risk among lone workers.

The regression model was statistically significant, $F(4, 347) = 128.36$, $p < .001$, and accounted for 59.6% of the variance in Overall Perceived Safety Risk ($R^2 = .596$). This indicates strong explanatory power of the model.

Table 3: Multiple Regression Analysis for Predictors of Overall Perceived Safety Risk.

Predictor Variable	B	Std. Error	Beta	t-value	p-value
(Constant)	0.412	0.109	—	3.780	<0.001
Physical & Operational Risk	0.294	0.048	0.321	6.125	<0.001
Communication & Monitoring Systems	-0.187	0.041	-0.214	-4.561	<0.001
Psychosocial Risk	0.336	0.052	0.359	6.462	<0.001
Organizational Safety Support	-0.221	0.046	-0.247	-4.804	<0.001

The results indicate that all four independent variables significantly predict Overall Perceived Safety Risk.

Psychosocial Risk emerged as the strongest positive predictor ($\beta = 0.359$, $p < .001$), followed by Physical and Operational Risk Exposure ($\beta = 0.321$, $p < .001$). This suggests that both psychological strain and direct hazard exposure substantially increase perceived vulnerability among lone workers.

Conversely, Organizational Safety Support ($\beta = -0.247$, $p < .001$) and Communication and Monitoring Systems ($\beta = -0.214$, $p < .001$) significantly reduce perceived safety risk. These findings demonstrate that structured policies, leadership commitment, and effective monitoring systems act as protective mechanisms against lone working vulnerabilities.

Sectoral Comparison: Construction and Healthcare

An independent samples t-test was conducted to examine differences in Overall Perceived Safety Risk between construction and healthcare lone workers. The results indicated that construction workers reported slightly higher mean safety risk ($M = 3.92$, $SD = 0.61$) compared to healthcare workers ($M = 3.77$, $SD = 0.66$). The difference was statistically significant, $t(350) = 2.84$, $p < .01$.

This suggests that while both sectors face substantial lone working challenges, construction environments may present more immediate physical hazards, whereas healthcare settings may experience relatively higher psychosocial strain.

CONCLUSION

This study examined the specific challenges and risks faced by lone workers in high-risk industries, with particular emphasis on the construction and healthcare sectors. The findings provide strong empirical evidence that lone working arrangements significantly influence

both physical and psychosocial dimensions of occupational risk. Workers operating in isolation reported high levels of exposure to operational hazards, including environmental dangers, equipment-related risks, and unpredictable task conditions. At the same time, psychosocial strain emerged as a critical concern, with feelings of vulnerability, anxiety, and emotional exhaustion strongly shaping overall perceptions of safety risk.

The regression analysis demonstrated that psychosocial risk is the strongest predictor of overall perceived safety vulnerability, followed closely by physical and operational hazard exposure. These findings highlight that lone working risks are not limited to visible physical dangers but also encompass psychological stressors that can impair concentration, decision-making, and situational awareness. The absence of immediate supervision or peer support intensifies these vulnerabilities, increasing the likelihood of delayed emergency response and escalation of minor incidents into severe outcomes.

Importantly, the results also revealed that effective communication and monitoring systems, as well as strong organizational safety support, significantly reduce perceived risk among lone workers. Structured check-in procedures, technological tracking mechanisms, leadership engagement, and clear lone worker policies act as protective buffers against isolation-related hazards. The study therefore concludes that lone working safety is multidimensional and requires integrated organizational strategies that combine hazard control, psychosocial support, and systemic monitoring.

Overall, lone working in high-risk industries represents a distinct risk category that demands targeted safety management approaches. When properly managed through comprehensive policies and support systems, the risks associated with isolated work can be significantly mitigated. However, failure to address these unique vulnerabilities may compromise worker safety, organizational performance, and long-term operational sustainability.

Recommendations

Organizations in high-risk industries should develop comprehensive lone worker safety policies that explicitly address risk assessment, supervision protocols, emergency response procedures, and communication requirements. These policies must go beyond general safety guidelines and provide structured frameworks tailored specifically to isolated work arrangements.

There is a need to strengthen technological monitoring systems, including GPS-enabled tracking devices, wearable panic alarms, and automated check-in platforms. Such systems should be integrated into daily operations to ensure rapid response during emergencies and

continuous oversight of high-risk tasks performed in isolation. Employers should implement structured communication protocols requiring periodic check-ins between lone workers and supervisors. Clear escalation procedures must be established to ensure immediate intervention when communication lapses occur. Supervisory accountability should be reinforced through routine monitoring and documentation of lone working activities.

Psychosocial risk management strategies should be incorporated into occupational safety programs. Organizations should provide stress management training, access to counselling services, and regular debriefing sessions, particularly for healthcare workers exposed to aggressive or traumatic situations. Promoting a culture of psychological safety can significantly reduce isolation-related anxiety and improve decision-making under pressure.

Leadership commitment to lone worker safety must be visibly demonstrated through consistent engagement, regular site visits, and enforcement of compliance standards. Managers and supervisors should receive specialized training on identifying and mitigating risks associated with isolated work. Regulatory bodies should consider developing sector-specific guidelines for lone working arrangements, particularly in construction and healthcare industries where hazard exposure is elevated. Standardized frameworks can enhance compliance, clarify employer responsibilities, and strengthen enforcement mechanisms.

Future research should adopt longitudinal designs to assess the long-term psychological and operational effects of lone working. Comparative studies between organizations with advanced lone worker protection systems and those with minimal safeguards would provide deeper insight into best practices and intervention effectiveness. By integrating technological safeguards, structured communication systems, psychosocial support mechanisms, and strong leadership commitment, organizations can create safer environments for lone workers and significantly reduce the multidimensional risks associated with isolated work arrangements.

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