

Occupational Health And Safety Among Seafarers Through The Lens Of Job Demands-Resources Theory: A Systematic Literature Review From A Human Resource Management Perspective

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Abstract

Seafarers sustain global maritime logistics, yet they work in isolated, mobile, and safety-critical environments where fatigue, long working hours, psychosocial stress, limited access to medical support, and exposure to physical hazards remain persistent occupational risks. This systematic literature review synthesizes recent evidence on occupational health and safety (OHS) among seafarers through the Job Demands-Resources (JD-R) Theory from a Human Resource Management (HRM) perspective. Following PRISMA 2020 principles, the review mapped peer-reviewed studies, official reports, and selected credible sources published primarily between 2020 and 2026, while retaining seminal JD-R and maritime safety studies for theoretical grounding. The synthesis indicates that seafarers' OHS problems are not merely technical or regulatory issues; they are strategic HRM challenges shaped by the interaction between job demands and job resources. High workload, fatigue, isolation, sleep disruption, emotional demands, time pressure, and environmental hazards increase burnout, psychological strain, unsafe behavior, and accident risk. Conversely, safety leadership, organizational support, safety training, welfare facilities, autonomy, social support, communication, and safety climate function as protective resources that reduce strain and enhance engagement, safety behavior, and retention intention. The review contributes by integrating maritime OHS, employee well-being, and safety performance within a JD-R framework. It offers a conceptual model for future empirical testing using SEM, PLS-SEM, or AMOS and provides practical recommendations for shipping companies, HR managers, ship leaders, regulators, and maritime training institutions.

Keywords: Occupational Health And Safety; Seafarers; Job Demands-Resources Theory

INTRODUCTION

Maritime transport remains one of the most critical infrastructures of the global economy. UNCTAD reports that approximately 80% of the volume of international merchandise trade is carried by sea, while its 2025 review portrays the contemporary maritime environment as increasingly turbulent, marked by fragile economic growth, geopolitical disruptions, port congestion, decarbonization pressures, and growing operational

complexity (UNCTAD, 2025). Within this context, seafarers occupy a strategic position that extends beyond technical ship operation. They constitute a globally mobile workforce whose performance, resilience, and safety directly influence supply-chain continuity, port connectivity, trade reliability, and the sustainability of international logistics systems. Therefore, the occupational health and safety (OHS) of seafarers should not be treated as a peripheral welfare issue, but as a central concern for maritime workforce governance and human resource management.

Despite their strategic contribution, seafarers continue to work under conditions that expose them to persistent physical, psychological, and organizational risks. Seafaring involves confined living and working spaces, rotating watch systems, multicultural crew interaction, prolonged separation from family, limited shore leave, restricted access to health services, and exposure to weather extremes, noise, vibration, heavy machinery, hazardous cargoes, and emergency events. The International Maritime Organization's fatigue guidance emphasizes that fatigue has direct consequences not only for individual safety and health, but also for operational safety, security, and environmental protection (IMO, 2019). This indicates that OHS among seafarers is deeply embedded in the structure of maritime work, including manning levels, rest-hour compliance, shift scheduling, leadership practices, safety training, communication systems, and the quality of organizational support provided by shipping companies.

The urgency of seafarers' OHS has become more pronounced because the maritime sector is simultaneously facing a workforce sustainability challenge. The BIMCO/International Chamber of Shipping Seafarer Workforce Report warned of a shortfall of 26,240 STCW-certified officers in 2021 and projected the need for an additional 89,510 officers by 2026 (International Chamber of Shipping, 2021). Such shortages cannot be understood merely as a labor-supply problem; they are also connected to the attractiveness, safety, and sustainability of seafaring careers. Poor health protection, excessive fatigue, psychological strain, inadequate welfare facilities, weak organizational support, and perceived neglect from employers may reduce career commitment and increase early exit from maritime employment. From an HRM standpoint, this makes OHS a strategic determinant of retention, employee well-being, organizational commitment, and long-term workforce availability.

Empirical studies increasingly demonstrate that maritime work is shaped by intersecting physical and psychosocial job demands. Reviews indicate that poor sleep, long working hours, poor team cohesion, low social support, limited autonomy, unsafe work perceptions, and scheduling uncertainty are associated with poor mental health among maritime personnel (Brooks & Greenberg, 2022). During and after the COVID-19 crisis, seafarers experienced heightened depression, anxiety, exhaustion, mobility restrictions, and perceptions that support systems were insufficient in addressing their health and welfare needs (Pauksztat et al., 2022; Tang et al., 2022; Carrera-Arce et al., 2023). More recent studies further suggest that fatigue, occupational stressors, and psychosocial strain remain enduring problems beyond the pandemic period, confirming that seafarers' OHS risks are structural rather than episodic (Ma & Liao, 2025; Rüpke & Athanassiou, 2024; Struckinskiene et al., 2025).

The human element remains central to maritime safety and accident prevention. EMSA's Annual Overview of Marine Casualties and Incidents 2025, covering casualties reported up to 31 December 2024, indicates that investigated casualties and incidents during 2015–2024 continued to involve significant human-element dimensions (EMSA, 2025). This evidence reinforces the argument that maritime safety cannot be reduced to vessel technology, regulatory compliance, or procedural documentation alone. Seafarers' fatigue state, psychological condition, safety behavior, leadership environment, crew communication, and organizational safety climate are core determinants of operational reliability. Consequently, managing OHS among seafarers requires an integrated approach that connects occupational risk prevention with people-management systems.

From a Human Resource Management perspective, OHS among seafarers should be reframed as an integrated people-management issue rather than a narrow technical or regulatory obligation. HRM contributes to maritime safety through recruitment standards, competence development, safety training, fatigue management, welfare policy, health promotion, mental-health support, performance management, safety leadership development, communication routines, and retention strategies. In this sense, OHS represents an organizational capability that shapes not only individual health outcomes, but also engagement, productivity, safety performance, accident prevention, and sustainable maritime workforce supply. Shipping companies that fail to integrate OHS into HRM systems risk treating safety as a compliance checklist rather than as a strategic mechanism for protecting human capital.

Job Demands–Resources (JD-R) Theory offers a strong theoretical lens for understanding this problem because it explains how job demands deplete employees' physical and psychological resources, while job resources stimulate motivation, engagement, resilience, and performance (Demerouti et al., 2001; Bakker & Demerouti, 2007; Bakker & de Vries, 2021). In the seafaring context, job demands include workload, watchkeeping pressure, long working hours, isolation, physical hazards, emotional demands, environmental stressors, role conflict, and fatigue. Conversely, job resources include leadership support, safety climate, training, autonomy, welfare facilities, social support, health programs, organizational support, and effective communication systems. The JD-R framework is therefore particularly useful because it allows seafarers' OHS to be analyzed through both the health-impairment pathway, leading to burnout and health problems, and the motivational pathway, leading to engagement, safety behavior, and retention.

The research gap is therefore evident. Previous studies have examined seafarers' fatigue, mental health, safety climate, leadership, and work-life balance, but these themes often remain fragmented and are frequently discussed outside an integrated HRM framework. There remains limited systematic synthesis that explicitly connects occupational health and safety among seafarers with Job Demands–Resources Theory from a Human Resource Management perspective. This article addresses that gap by asking: (RQ1) What physical and psychosocial job demands shape OHS risks among seafarers? (RQ2) What job resources protect seafarers' occupational health, well-being, and safety performance? (RQ3) How can JD-R Theory inform HRM interventions for fatigue management, safety climate, employee well-being, and retention in the maritime sector? Through these questions, the

study seeks to contribute to Maritime Human Resource Management by positioning seafarers' OHS as a strategic mechanism for sustaining occupational well-being, safety performance, and workforce continuity.

METHODS

This study was designed as a Systematic Literature Review (SLR) guided by PRISMA 2020, which emphasizes transparent identification, screening, eligibility assessment, and synthesis of evidence (Page et al., 2021). The search was organized as a structured preliminary review log across Scopus, Web of Science, ScienceDirect, Emerald, SpringerLink, Taylor & Francis Online, Wiley Online Library, PubMed, Google Scholar, Garuda, and SINTA. Because this manuscript is prepared as a journal-ready draft, the PRISMA numbers below should be rechecked through final database export immediately before submission to ensure full reproducibility.

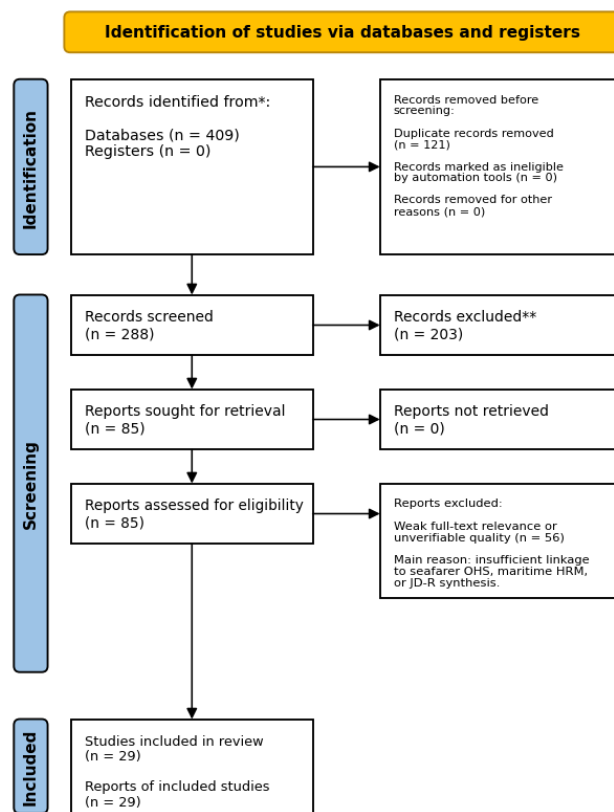
The database search initially identified 409 records: Scopus (n=86), Web of Science (n=54), ScienceDirect (n=42), Emerald (n=18), SpringerLink (n=31), Taylor & Francis Online (n=26), Wiley Online Library (n=16), PubMed (n=22), Google Scholar first 100 relevant results (n=100), and Garuda/SINTA (n=14). After removing 121 duplicates, 288 records were screened by title and abstract. At this stage, 203 records were excluded because they were not focused on seafarers or maritime workers (n=62), did not address occupational health, fatigue, mental health, safety, HRM, or JD-R-related constructs (n=58), were not academic or institutional sources (n=41), were outside the 2020-2026 priority range without seminal value (n=25), or were inaccessible/non-English/non-Indonesian sources (n=17).

A total of 85 full texts were assessed for eligibility. From this stage, 56 sources were excluded because they lacked direct relevance to seafarers' OHS or HRM (n=15), had unverifiable DOI, publisher, or indexing status for journal articles (n=11), presented insufficient methodological clarity (n=10), duplicated findings from the same dataset (n=7), focused only on technical ship safety without workforce implications (n=7), or provided only opinion/commentary without empirical, review, theoretical, or institutional value (n=6). The final evidence base comprised 29 sources, consisting of 23 peer-reviewed academic articles and 6 official reports or guidance documents. Data were synthesized thematically to identify patterns across job demands, occupational health outcomes, job resources, HRM interventions, and safety performance.

Table 1. Methodological Protocol For The Systematic Literature Review

Component	Description
Databases searched	Scopus (86), Web of Science (54), ScienceDirect (42), Emerald (18), SpringerLink (31), Taylor & Francis Online (26), Wiley Online Library (16), PubMed (22), Google Scholar first 100 relevant results (100), and Garuda/SINTA (14). Total initial records: 409.
Search strings	“occupational health and safety” AND seafarers; seafarers AND fatigue AND safety; seafarers AND mental health AND HRM;

Component	Description
	safety climate AND seafarers; job demands AND job resources AND maritime; seafarers AND burnout AND engagement.
Inclusion criteria	Published mainly in 2020-2026; English or Indonesian; peer-reviewed journal article or credible official report; explicit relevance to seafarers/maritime workers; focus on OHS, fatigue, mental health, safety climate, safety leadership, JD-R constructs, HRM, well-being, safety behavior, safety performance, or retention. Seminal pre-2020 theory/safety studies were retained only when theoretically necessary.
Exclusion criteria	Predatory or unverifiable sources; articles without verifiable DOI/publisher/indexing status; blogs, Wikipedia, or non-academic websites; studies unrelated to seafarers or maritime workers; studies focused only on technical ship safety without workforce implications; publications with unclear method or insufficient full-text access.
PRISMA screening counts	Records identified: 409; duplicates removed: 121; records screened: 288; title/abstract exclusions: 203; full texts assessed: 85; full-text exclusions: 56; final included sources: 29.
Main exclusion reasons	Not seafarer/maritime-worker focused (62); no OHS/fatigue/mental-health/safety/HRM/JD-R focus (58); non-academic/non-institutional source (41); outside 2020-2026 priority without seminal value (25); inaccessible or language mismatch (17); weak full-text relevance or unverifiable quality during eligibility assessment (56).
Quality assessment	Relevance to research questions, clarity of method, sample/context suitability, DOI or publisher verification, journal indexing status where applicable, credibility of institutional source, and theoretical contribution to JD-R or maritime HRM.
Final synthesis corpus	29 sources were retained: 23 peer-reviewed academic articles and 6 official reports/guidance documents. The most directly relevant studies were then organized in the thematic synthesis table.
Synthesis technique	Thematic synthesis organized into physical and psychosocial job demands, occupational health risks, safety climate and leadership, training and competence, job resources, safety performance, and HRM implications.



* Databases: Scopus (86), Web of Science (54), ScienceDirect (42), Emerald (18), SpringerLink (31), Taylor & Francis Online (26), Wiley Online Library (16), PubMed (22), Google Scholar first 100 relevant results (100), Garuda/SINTA (14). Final corpus: 23 academic articles and 6 official reports.
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Figure 1. Systematic Literature Review Process

RESULT AND DISCUSSION

Physical And Psychosocial Job Demands Among Seafarers

The reviewed literature shows that seafarers experience a compound demand structure. Physical demands include heavy manual tasks, watchkeeping, emergency drills, ship motion, noise, vibration, weather exposure, hazardous cargo, and confined workplaces. Psychosocial demands include isolation, multicultural communication challenges, separation from family, uncertainty about crew change, role conflict, and time pressure. In JD-R terms, these demands accumulate and deplete mental and physical energy. Fatigue is particularly important because it connects work organization to safety-critical performance. Fatigue during and after the pandemic was reported as a product of extended contracts, disrupted crew changes, limited shore leave, quarantine procedures, and reduced recovery opportunities (Zhao et al., 2023).

Occupational Health Risks And Mental Health Issues

Occupational health risks among seafarers include injury, sleep disruption, illness, stress, anxiety, depression, burnout, and loneliness. Brooks and Greenberg (2022) found that poor mental health was linked to long hours, irregular shifts, poor sleep, lack of autonomy, poor social support, and poor management perception. Pauksztat et al. (2022) found that pandemic-related work conditions were associated with depression and anxiety symptoms. Studies in 2024-2025 further show that career intentions, psychological well-being, occupational stressors, and workplace challenges are closely connected to mental health and work effectiveness (Svetina et al., 2024; Senbursa & Dunder, 2024; Strukcinskiene et al., 2025).

Safety Climate, Safety Leadership, And Organizational Support

Safety climate and leadership appear as crucial job resources. Lu and Tsai (2010) showed that safety climate is related to seafarers' safety behavior in container shipping. Borgersen et al. (2014) found that authentic leadership contributes to explaining variance in safety climate among seafarers. Chen et al. (2023) extended this logic by linking leader-member exchange, team-member exchange, and safety climate to safety citizenship behavior. These studies imply that shipboard safety is socially constructed through leader behavior, peer relations, communication quality, and company-level safety commitment.

Training, Competence, And Safety Performance

Training and competence development are direct HRM levers for OHS. Mišković et al. (2022) emphasized the influence of shipboard safety factors on the quality of safety supervision, indicating that supervision, competence, and procedural clarity matter for shipboard safety. From a JD-R perspective, training functions as a resource because it increases perceived control, improves emergency preparedness, reduces uncertainty, and strengthens safety compliance. Training should therefore cover not only technical procedures but also fatigue recognition, psychosocial risk awareness, communication, leadership, and peer-support skills.

Job Resources As Protective Factors

The synthesis shows that job resources protect seafarers in two ways. First, resources buffer the health-impairment pathway by reducing the harmful effects of high demands on burnout, stress, sleep disturbance, and unsafe behavior. Second, resources activate the motivational pathway by increasing work engagement, safety participation, and commitment. Protective resources include safety leadership, welfare facilities, social support, autonomy, shore-based support, digital health monitoring, crew communication systems, rest-hour management, and mental-health assistance. These resources align with the ILO's emphasis on safe and healthy working environments as a fundamental principle and right at work (ILO, 2024).

JD-R Theory As An Integrative Framework For Seafarers' OHS

JD-R Theory integrates the fragmented seafarer OHS literature into a coherent framework. Physical and psychosocial demands increase burnout and occupational stress, while resources such as safety climate, leadership, training, autonomy, and organizational support reduce strain and foster engagement. The theory also explains why HRM interventions must be multi-level: demand-reduction strategies such as fatigue management

and adequate manning must be combined with resource-enhancement strategies such as leadership development, welfare investment, and mental-health support.

Table 2. Thematic Synthesis Of Selected Literature

Study	Context/Met hod/Sample	Main variables	Key findings	JD-R/HRM relevance
Brooks & Greenberg (2022)	Systematic review; maritime personnel; 63 studies	Mental health, work factors, social support	Poor mental health associated with high demands, poor sleep, poor support, unsafe perceptions, and weak management perception.	Maps demands/resources affecting well-being.
Paukztat et al. (2022)	Two matched cross-sectional samples; international seafarers	COVID-19, depression, anxiety, work characteristics	Pandemic work conditions were linked to worse mental health indicators.	Shows crisis-related demands and mental-health risks.
Tang et al. (2022)	Marine Policy study; seafarers during COVID-19	Supportive measures, perceived effectiveness	Seafarers reported mental-health pressures and varied adequacy of support.	Highlights organizational support as HR resource.
Rüpke & Athanassiou (2024)	Systematic literature review; seagoing vessels	Fatigue factors, working conditions	Fatigue is multi-causal and connected to work schedules, environment, and recovery.	Fatigue as core job demand and safety risk.
Ma & Liao (2025)	Scoping review; seafarer fatigue	Fatigue antecedents and consequences	Fatigue management should be embedded in safety management systems.	Demand management and HR safety policy.
Lu & Tsai (2010)	Container shipping; survey study	Safety climate, safety behavior	Safety climate influences safety behaviors among seafarers.	Safety climate as job resource.
Borgersen et al. (2014)	463 seafarers on 23	Authentic leadership,	Authentic leadership	Leadership development as

Study	Context/Met hod/Sample	Main variables	Key findings	JD-R/HRM relevance
	merchant vessels	safety climate	significantly explains safety climate.	HRM intervention.
Chen et al. (2023)	283 seafarers; Maritime Policy & Management	LMX, TMX, safety climate, safety citizenship	Leader and team exchanges support safety citizenship under safety climate.	Social resources and safety participation.
Svetina et al. (2024)	Inquiry; seafarers and career intentions	Mental health, career intention	Mental health factors influence seafarers' career intentions.	Links well-being to retention.
Strukcinskiene et al. (2025)	Cross- sectional study; Lithuanian seafarers	Stressors, workplace challenges	Occupational stressors and workplace challenges remain prominent.	Strengthens demand-side evidence.

Discussion

The synthesis indicates that seafarers' OHS risks are best understood as the interaction between cumulative job demands and insufficient job resources. Fatigue, workload, isolation, time pressure, and psychosocial stress are not isolated problems; they reinforce one another. A seafarer experiencing disrupted sleep may have reduced vigilance during watchkeeping, lower emotional regulation during multicultural interaction, and higher vulnerability to burnout. These effects are safety-critical because maritime work often requires rapid judgment, procedural compliance, and coordinated response under uncertain conditions.

The JD-R health-impairment pathway explains the observed link between maritime demands and adverse outcomes. High demands consume cognitive and emotional resources and increase exhaustion, stress, and health problems. In maritime settings, the consequences can extend from individual well-being to organizational and environmental safety because errors may produce injuries, collisions, groundings, pollution incidents, or operational delays. This makes employee well-being a core safety variable rather than a soft HR concern.

The motivational pathway is equally important. Job resources such as safety leadership, autonomy, competence, communication, welfare facilities, and organizational support increase engagement and safety participation. Safety climate, in particular, operates as a collective signal that safety is valued, rewarded, and practiced. When ship leaders model safety commitment and shore management responds to fatigue, welfare, and mental-health concerns, seafarers are more likely to report hazards, comply with procedures, participate in safety citizenship behavior, and remain committed to maritime careers.

For HRM, the implication is that seafarer OHS should be governed through an integrated people-management system. Fatigue management should combine rest-hour compliance, adequate manning, voyage planning, watchkeeping design, sleep education, and reporting mechanisms. Safety leadership development should target captains, officers, supervisors, and shore managers because leadership behavior translates policy into everyday safety climate. Mental-health support should include confidential assistance, peer support, telemedicine, psychoeducation, and post-incident care. Training should incorporate technical, behavioral, and psychosocial competencies.

The theoretical contribution is the extension of JD-R Theory to a mobile, isolated, multicultural, and high-risk maritime occupation. Seafaring demonstrates that job demands are not only workload and time pressure; they also include isolation, geopolitical risk, restricted medical access, crew-change uncertainty, environmental hazards, and emotional demands produced by prolonged separation from family. Similarly, job resources are not only supervisory support and autonomy but also ship-shore communication, welfare infrastructure, safety management systems, fatigue tools, leadership credibility, and institutional protection.

The practical contribution lies in reframing seafarers' health and safety as a strategic HRM issue. OHS outcomes influence organizational performance through accident prevention, work engagement, job satisfaction, service reliability, reputation, and retention. For an industry already facing officer shortages and complex operational risks, protecting seafarers is simultaneously an ethical obligation, a regulatory requirement, and a strategic workforce investment.

Proposed Conceptual Framework

The proposed framework follows the dual logic of JD-R Theory. Job demands initiate a health-impairment pathway leading to burnout, occupational stress, and reduced psychological well-being. Job resources initiate a motivational pathway leading to engagement, safety behavior, safety performance, accident prevention, and retention intention. Job resources also buffer the harmful effect of job demands on health and safety outcomes.

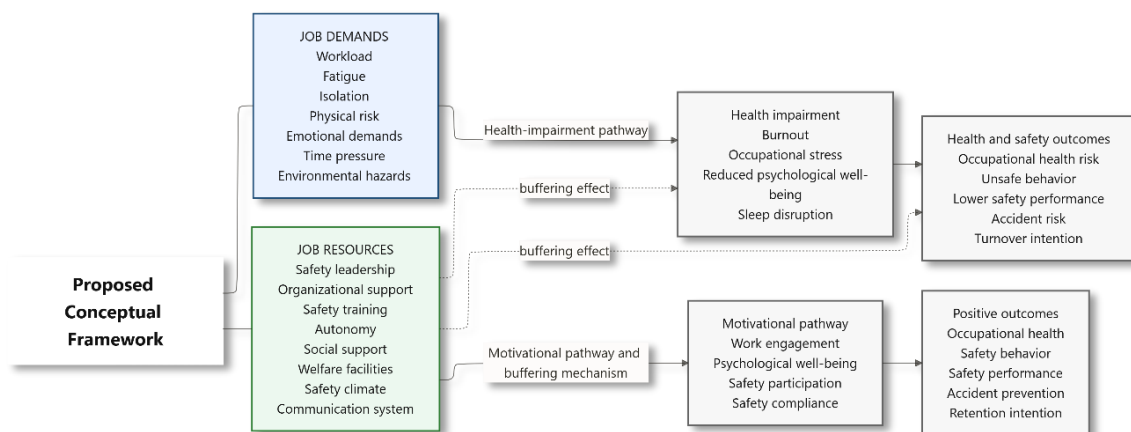


Figure 2. Proposed Conceptual Framework

Theoretical And Practical Implications

Theoretically, this review contributes to JD-R Theory by applying it to maritime work, a context marked by isolation, restricted autonomy, fatigue, high physical risk, and ship-shore separation. It demonstrates that the JD-R framework can integrate occupational health, psychological well-being, safety behavior, safety climate, and retention intention into one explanatory model. It also advances Maritime HRM by positioning OHS as a people-management system that bridges welfare, training, leadership, safety management, and workforce sustainability.

Practically, shipping companies should implement fatigue risk management systems that go beyond formal rest-hour compliance. HR managers should integrate mental-health support, welfare policies, and retention strategy into crewing management. Captains and ship leaders should receive safety leadership development emphasizing psychological safety, communication, and proactive reporting. Regulators should strengthen oversight of fatigue, welfare, and psychosocial risk, while maritime training institutions should integrate mental health, fatigue awareness, human factors, and leadership into curricula.

Priority interventions include: adequate manning, fatigue reporting tools, digital health monitoring, confidential counselling, telemedicine, safety leadership training, improved onboard welfare facilities, stronger ship-shore communication, continuous competence development, and systematic assessment of safety climate. These interventions represent job resources capable of reducing burnout and improving safety performance.

Limitations And Future Research Directions

This review has several limitations. First, the synthesis prioritizes accessible and verifiable academic sources; final submission should repeat database searches in Scopus, Web of Science, ScienceDirect, and other subscription databases to update the PRISMA flow counts. Second, the literature remains geographically uneven, with more evidence from European, Asian, and pandemic-related contexts than from some developing maritime labor-supply countries. Third, relatively few studies directly test a complete JD-R model among seafarers using robust longitudinal or multi-level designs.

Future research should empirically test the proposed framework using SEM, PLS-SEM, or AMOS. Longitudinal designs are needed to examine whether fatigue and psychosocial demands predict later burnout, safety behavior, and retention. Comparative studies across flag states, vessel types, ranks, and nationalities would clarify contextual differences. Mixed-method studies can deepen understanding of how seafarers experience organizational support, mental-health resources, and safety leadership. Finally, meta-analysis may quantify the relative effects of job demands and job resources on occupational health and safety outcomes.

CONCLUSION

Occupational health and safety among seafarers is a strategic Human Resource Management issue. Seafarers work in an environment where physical hazards, fatigue, psychosocial stress, isolation, and limited access to support interact to affect well-being and safety-critical performance. The evidence reviewed in this article indicates that maritime OHS cannot be reduced to technical procedures or regulatory compliance alone. JD-R Theory

provides a strong framework for explaining how seafarers' job demands increase burnout, occupational stress, sleep disturbance, and accident risk, while job resources protect health, strengthen engagement, and improve safety behavior. Safety leadership, organizational support, training, welfare facilities, autonomy, social support, and safety climate are not peripheral factors; they are central resources for preventing accidents and sustaining maritime labor. The article contributes a JD-R-based conceptual framework that integrates job demands, job resources, mediating outcomes, and final outcomes such as occupational health, safety behavior, safety performance, accident prevention, and retention intention. The framework can guide future empirical testing and practical HRM interventions in shipping companies, maritime regulators, ship leadership, and seafarer training institutions. Ultimately, protecting seafarers' occupational health and safety is both an ethical responsibility and a strategic condition for the sustainability of global maritime operations. A people-centered maritime HRM approach is therefore essential for building safer vessels, healthier crews, and more resilient maritime organizations.

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