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The Effects of Digital Fatigue on Psychological Well-Being and Family Communication Patterns among Seafarers

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Abstract

Ships have become connected workplaces in which seafarers rely on digital systems for navigation and reporting, and on satellite internet for almost all contact with home. This connectivity eases isolation but also exposes seafarers to digital fatigue. This study aims to analyse the effects of digital fatigue on the psychological well-being and family communication patterns of seafarers. A systematic literature review was conducted following PRISMA 2020. Records were retrieved from the Consensus database and supplemented by citation searching through Google Scholar, yielding 25 peer-reviewed articles published between 2022 and 2026 (16 maritime studies and nine anchor studies on shore-based digital work), analysed through thematic synthesis. The findings reveal three mechanisms: (1) onboard digitalisation, fragmented connectivity, compressed contact windows and intensive off-duty screen use deplete psychological resources already strained by long hours and poor sleep; (2) this depletion is associated with stress, anxiety, depression, chronic fatigue and emotional exhaustion; and (3) family communication shifts toward shorter, fragmented and emotionally guarded exchanges. Reliable connectivity, onboard peer support, clear shore-management communication and agreed family contact routines are protective. This study proposes a Digital Fatigue–Ship–Shore Family Spillover framework and recommends implementing the social-connectivity provisions of the Maritime Labour Convention with digital-wellness training and family-inclusive welfare programmes.

INTRODUCTION

Seafaring remains the backbone of world trade, yet the conditions of life and work at sea have changed markedly over the past five years as ships have become digitally intensive and increasingly connected workplaces.

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Navigation, engine monitoring, cargo operations and environmental reporting are now managed through electronic systems linked to shore offices. The COVID-19 crew-change crisis also exposed how dependent seafarers are on ship-to-shore communication, and the 2022 amendments to the Maritime Labour Convention (MLC, 2006), in force since December 2024, require shipowners to provide social connectivity on board (International Labour Organization, 2022). Digital technology thus plays a double role: it is the lifeline to partners and children during long contracts, and the channel through which growing operational demands reach seafarers (Bayrak & Muslu, 2025; Strukcinskiene et al., 2025). Reviews identify isolation, long working hours, poor sleep and long duration at sea as risk factors for poor well-being (Brooks & Greenberg, 2022a; Nittari et al., 2024), but far less attention has been paid to the exhaustion added by this digital layer and to how it travels into the family ashore.

This exhaustion can be captured under the concept of digital fatigue: physical, cognitive and emotional depletion arising from prolonged, intensive and poorly bounded use of digital devices and platforms (Supriyadi et al., 2025). It is broader than technostress, which refers to strain from techno-overload, techno-invasion, techno-complexity, techno-insecurity and techno-uncertainty (Consiglio et al., 2023). Ashore, fatigue grows with long sequences of video meetings (Fauville et al., 2023) and with after-hours electronic communication that disturbs sleep (Ikeda et al., 2023). At sea, the ship is simultaneously workplace, dormitory and the only place from which family contact is possible, and connectivity is often fragmented, rationed or costly, so that staying connected can itself become a strain (Pauksztat, Grech, et al., 2022; Soerli et al., 2025).

The psychological vulnerability of seafarers is well documented. Reviews report stress, anxiety, depression, burnout and fatigue linked to job demands, isolation and separation from family (Brooks & Greenberg, 2022a, 2022b; Nittari et al., 2024). Depression and anxiety were higher during the pandemic than before it (Pauksztat, Andrei, et al., 2022) and were linked to longer stays on board in a survey of 17,861 seafarers (Hayes-Mejia & Stafström, 2023). Importantly, fast and reliable internet access, together with peer and external support, mitigated seafarers' chronic fatigue and mental health problems (Pauksztat, Grech, et al., 2022). Connectivity is therefore a psychological resource whose quality shapes well-being.

Seafaring families are transnational families whose relationships depend on whatever communication the ship allows. Boundary theory explains that individuals continuously manage the borders between work and non-work domains (Shirmohammadi et al., 2023). Whereas digital technology collapses these borders for remote workers ashore, for seafarers it reopens a border that distance had kept closed: family life enters the cabin daily, and the seafarer's fatigue enters the home. Ashore, technostress spills over into work–family conflict and lower family satisfaction (Sommovigo et al., 2023; Shi et al., 2023; Harunavamwe & Ward, 2022). At sea, work–family conflict is associated with emotional exhaustion (Toygar et al., 2023), and marital status is related to officers' technostress (Bayrak & Muslu, 2025).

What remains insufficiently understood is the communicative dimension of this spillover. Family communication patterns, the habitual ways in which family members talk, express emotion, negotiate decisions and resolve conflict, are almost entirely mediated for seafarers: compressed into short off-watch calls, shaped by bandwidth limits and time zones, and interrupted when the ship moves out of coverage. Seafarer fathers use online contact to show affection and solve problems

from afar (Juanico, 2025), and communication with family was among the most effective supports during the pandemic (Tang et al., 2022); yet frequent updates from home can also be stressful (Soerli et al., 2025). These insights remain scattered across maritime health, occupational psychology and family studies (Gorla et al., 2026).

Three gaps follow. First, maritime research treats connectivity mainly as a welfare provision and rarely asks how intensive or poorly bounded digital use becomes fatiguing. Second, family outcomes are measured as work–family conflict or general separation rather than as communication patterns. Third, existing reviews of seafarers' mental health (Brooks & Greenberg, 2022a, 2022b; Nittari et al., 2024) do not take digital fatigue as a central construct, and evidence from Indonesia, a major seafarer-supplying country, is only emerging (Sudewo et al., 2024; Puspitacandri & Moejiono, 2026).

The novelty of this article is threefold. Conceptually, it positions digital fatigue as a maritime occupational risk and distinguishes its ship-specific sources from its consequences. Theoretically, it integrates the Conservation of Resources perspective with boundary theory and spillover–crossover reasoning in a Digital Fatigue–Ship–Shore Family Spillover framework. Analytically, it synthesises evidence from 2022–2026, combining maritime studies with anchor studies on shore-based digital work, and treats family communication patterns as an outcome in their own right.

This study addresses four questions: (1) What are the sources and forms of digital fatigue among seafarers? (2) How does it affect their psychological well-being? (3) How does it shape communication between seafarers and their families? (4) Which factors are protective? The answers are relevant for maritime scholars, shipping companies, crewing agencies, maritime training institutions and regulators implementing the MLC, 2006.

METHODS

Research design

This study employed a systematic literature review (SLR) with qualitative thematic synthesis, because the research questions span maritime health, occupational psychology, communication and family studies, and direct evidence on digital fatigue among seafarers is still emerging. The review followed the PRISMA 2020 guidelines for identification, screening, eligibility and inclusion.

Data sources and search strategy

The primary search was conducted in the Consensus academic search engine, which indexes peer-reviewed literature from Semantic Scholar. Two searches were run on 12 November 2026 using the English title and its Indonesian equivalent ("Dampak Kelelahan Digital terhadap Kesejahteraan Psikologis dan Pola Komunikasi Keluarga Pelaut"), and both result sets were exported in RIS format. The search was supplemented by citation searching in Google Scholar using the keywords *seafarers*, *onboard connectivity*, *technostress*, *work–family conflict* and *family communication*.

Eligibility criteria

Studies were included if they (a) were peer-reviewed journal articles; (b) were published in 2022–2026; (c) examined seafarers or, as anchor studies, shore-based workers exposed to intensive digitally mediated work; (d) reported an outcome

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related to digital fatigue, technostress, connectivity, well-being or family interaction; and (e) had a verifiable record in an indexed journal. Conference abstracts, industry reports, pre-2022 studies, scale-validation studies and studies with performance as the only outcome were excluded.

Selection process

The two Consensus exports yielded 41 records (22 and 19). After 9 duplicates were removed, 32 records were screened and six were excluded (three pre-2022; three conference abstracts or industry reports). Of 26 full texts, five were excluded (no relevant outcome, n = 3; performance only, n = 2). Twenty-one database studies and four from citation searching formed a final corpus of 25 studies: 16 maritime and nine anchor studies (Figure 1).

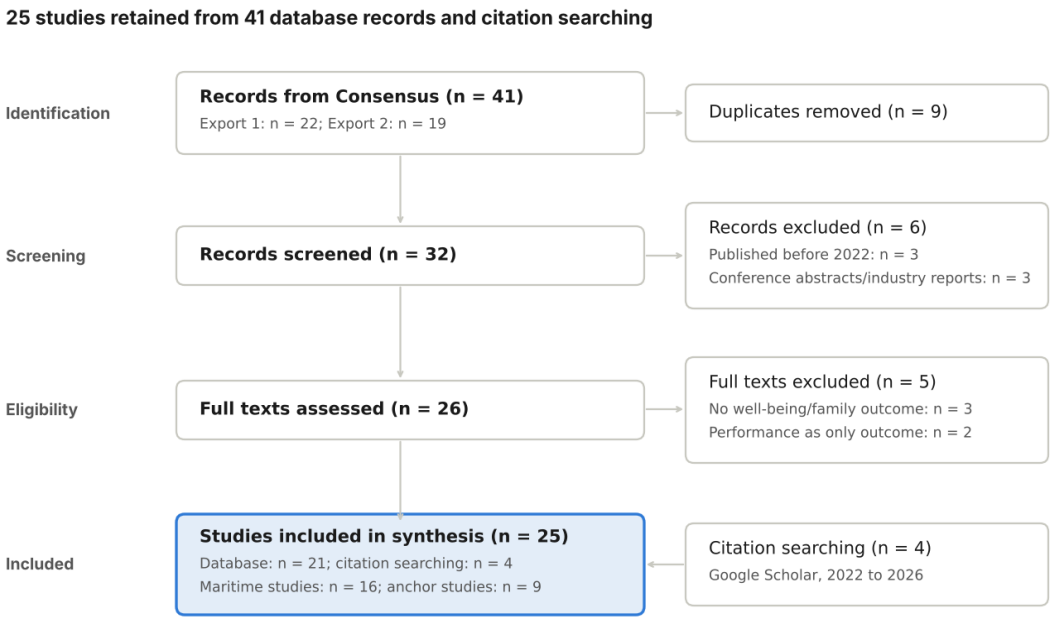


Figure 1. PRISMA 2020 flow diagram of study selection (Source: Compiled by the authors, 2026)

Data extraction and analysis

For each study, author, year, setting, population, design, digital-fatigue construct, psychological and family outcomes, and protective factors were extracted into a matrix. Data were analysed in three stages: line-by-line coding, descriptive themes and analytical themes. Anchor studies were used to clarify mechanisms and were transferred to the maritime context only where maritime evidence pointed in the same direction. Themes were interpreted through the Conservation of Resources perspective and boundary theory, and conflicting findings were reported rather than smoothed over.

RESULTS AND DISCUSSION

Characteristics of the included studies

The 25 studies were published between 2022 and 2026 and span Europe, Asia, Africa and the Americas. The 16 maritime studies comprise nine surveys (including Turkish, Lithuanian, Polish, Indonesian and multinational samples), three qualitative studies, one mixed-methods study and three reviews. The nine anchor studies comprise five surveys, one actigraphy study, one qualitative study and two

reviews. Table 1 summarises the corpus and its themes.

Table 1. Characteristics of the included studies

No	Author (year)	Design and setting	Main focus	Theme
1	Puspitacandri & Moejiono (2026)	Survey, Indonesia	Well-being and mental health	T2, T4
2	Bayrak & Muslu (2025)	Survey, Turkey (n = 411)	Technostress of officers	T1, T3
3	Strukcinskiene et al. (2025)	Survey, Lithuania (n = 385)	Occupational stressors	T2, T4
4	Soerli et al. (2025)	Qualitative, Norway	Social media use at sea	T1, T3
5	Juanico (2025)	Qualitative, Philippines	Internet and father–child ties	T3, T4
6	Nittari et al. (2024)	Systematic review	Seafarers' mental health factors	T2
7	Sudewo et al. (2024)	Survey, Indonesia	Mental health as mediator	T2, T4
8	Hayes-Mejia & Stafström (2023)	Survey, global (n = 17,861)	Work environment and mental health	T2, T4
9	Toygar et al. (2023)	Survey (n = 360)	Work–family conflict, exhaustion	T2, T3
10	Szafran-Dobrowolska et al. (2023)	Survey, Poland (n = 115)	Psychosocial burden, sleep	T1, T2
11	Buscema et al. (2023)	Qualitative, Italy	Psychosocial risks on board	T1, T3
12	Pauksztat, Grech, et al. (2022)	Survey, global (n = 622)	Fatigue, peer support, Internet	T1, T2, T4
13	Pauksztat, Andrei, et al. (2022)	Survey, matched samples	Depression and anxiety	T2
14	Tang et al. (2022)	Mixed methods (n = 817)	Mental health support measures	T3, T4
15	Brooks & Greenberg (2022a)	Systematic review	Maritime personnel well-being	T2
16	Brooks & Greenberg (2022b)	Scoping review	Seafarers during COVID-19	T2
17	Gorla et al. (2026)	Policy review	Family-supportive tech policies	T3, T4
18	Supriyadi et al. (2025)	Scoping review	Digital fatigue and well-being	T1, T2
19	Consiglio et al. (2023)	Survey, Italy	Techno-stress and burnout	T2, T4
20	Sommovigo et al. (2023)	Survey, Italy	Technostress, work–family	T2, T3
21	Ikeda et al. (2023)	Observational, Japan	After-hours e-communication, sleep	T1, T2
22	Shi et al. (2023)	Survey	Technostress, family satisfaction	T3
23	Fauville et al. (2023)	Online survey (n = 9,787)	Videoconference fatigue	T1
24	Shirmohammadi et al. (2023)	Qualitative	Household boundary strategies	T3, T4
25	Harunavamwe & Ward (2022)	Survey, South Africa	Technostress, support	T3, T4

Source : Compiled by the authors from the reviewed studies (2026). Note. Studies 1–16 are maritime studies; studies 17–25 are anchor studies on shore-based digital work. T1 = sources of digital fatigue; T2 = psychological well-being; T3 = family communication and work–family interface; T4 = protective factors.

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Sources and forms of digital fatigue at sea

The corpus identifies four overlapping sources of digital fatigue at sea. The first is operational digitalisation. Officers in Turkey reported moderate techno-workload and techno-uncertainty but low techno-complexity, indicating that the problem is the volume and unpredictability of digital demands rather than system mastery (Bayrak & Muslu, 2025). These demands add to long working weeks and shorter sleep at sea (Szafran-Dobrowolska et al., 2023), while anchor studies show that techno-overload and after-hours communication produce fatigue and poorer sleep (Consiglio et al., 2023; Ikeda et al., 2023).

The second source is fragmented connectivity. Satellite coverage, bandwidth limits and data allowances mean that contact with home is rationed, unpredictable and frequently interrupted, and Pauksztat, Grech, et al. (2022) found that better internet quality was associated with less fatigue and fewer mental health problems, implying that poor connectivity drains rather than restores resources. The third source is the compression of contact into narrow time windows. Because family communication must fit around watches, time-zone differences and port operations, contact tends to compete with rest and sleep. The fourth source is intensive off-duty screen use. Bridge officers in Norway described social media as a way to pass time and to send and receive signs of life, but also observed that heavy use in cabins could produce isolation and loneliness despite abundant online contact (Soerli et al., 2025), while seafarers in southern Italy identified the lack of family and conflicts between work and rest as leading psychosocial burdens (Buscema et al., 2023). Videoconference research ashore adds that sustained camera-based interaction is itself tiring (Fauville et al., 2023), which suggests that daily video calls, although highly valued, carry a cognitive cost. Together, these findings indicate that seafarers' digital fatigue arises not from screen time alone, but from the combination of operational digital load, the effort of maintaining fragile connections, and the absence of protected time for recovery.

Digital fatigue and psychological well-being

The second theme is the most consistently supported. Across designs and countries, the strains described above are associated with stress, anxiety, depressive symptoms, chronic fatigue and emotional exhaustion. Systematic reviews identify high job demands, long working hours, poor sleep, poor social support, isolation and long duration at sea as risk factors for poor mental health (Brooks & Greenberg, 2022a; Nittari et al., 2024), and a scoping review of the pandemic period shows that uncertainty about repatriation, loneliness and feeling unsupported by management worsened seafarers' well-being (Brooks & Greenberg, 2022b). Matched-sample evidence confirms that depression and anxiety were higher during the pandemic (Pauksztat, Andrei, et al., 2022), and a survey of 17,861 seafarers linked anxiety and depression to longer shifts and longer stays on board, while clear communication from employers was associated with better mental well-being (Hayes-Mejia & Stafström, 2023). Among 622 seafarers, the pandemic increased both chronic fatigue and mental health problems (Pauksztat, Grech, et al., 2022). Anchor studies ashore show that techno-stress creators and sustained digital demands lead to exhaustion and burnout (Consiglio et al., 2023; Supriyadi et al., 2025), providing a plausible pathway through which the digital component of shipboard work contributes to the same outcomes.

The evidence also points to groups and contexts of heightened risk. In Lithuania, junior seafarers and those with shorter service experienced more stress

related to demands and role clarity, and changes at work and management support emerged as key stressors (Strukcinskiene et al., 2025). In Turkey, marital status was significantly associated with officers' overall technostress, techno-workload and techno-uncertainty (Bayrak & Muslu, 2025), suggesting that family responsibilities and digital demands combine rather than operate separately. Among Indonesian seafarers, both psychological well-being and workplace well-being were related to mental health (Puspitacandri & Moejiono, 2026), and mental health mediated the link between working conditions and seafarer quality (Sudewo et al., 2024). From a Conservation of Resources perspective, these results can be read as a loss spiral: seafarers invest attention, emotional regulation and scarce rest time to cope with operational digital demands and to sustain fragile ties with home, and when these investments are not replenished through sleep and detachment, the depletion accumulates and becomes chronic exhaustion.

Connectivity itself is not harmful: better internet buffered fatigue (Pauksztat, Grech, et al., 2022), and family contact was among the most effective supports (Tang et al., 2022). The problem lies in how digital demands are designed, rationed and bounded, so interventions should reduce fatiguing work-related digitalisation and make personal connectivity reliable enough to restore rather than drain.

Digital fatigue and family communication patterns

Although no study measured family communication with a dedicated instrument, the evidence reveals three mechanisms through which digital fatigue reshapes communication between seafarers and their families (Table 2).

Table 2. Mechanisms linking digital fatigue to communication between seafarers and their families

Mechanism	How it operates	Observable change in family communication	Supporting studies
Resource depletion	Exhaustion carried from watches and digital workload into scarce contact time	Shorter, task-oriented calls; lower patience; withholding difficulties	Toygar et al. (2023); Sommovigo et al. (2023); Harunavamwe & Ward (2022)
Compression and fragmentation	Bandwidth limits, coverage gaps, time zones and watches fragment contact	Interrupted, crisis-oriented talk; delayed problem-solving; contact competing with sleep	Pauksztat, Grech, et al. (2022); Soerli et al. (2025); Ikeda et al. (2023)
Renegotiation	Seafarers and families create explicit contact routines	Agreed call times; everyday sharing; affectionate talk with children	Juanico (2025); Tang et al. (2022); Shirmohammadi et al. (2023)

Source : Compiled by the authors from the reviewed studies (2026).

The first mechanism is resource depletion. A seafarer who ends a watch exhausted has fewer emotional resources for attentive listening, patient discussion and affectionate expression during the brief window available for contact. Toygar et al. (2023) found among 360 seafarers that work–family conflict was associated with emotional exhaustion, which partly explained work alienation, and anchor studies ashore show that technostress increases work–family conflict and undermines flourishing (Sommovigo et al., 2023; Harunavamwe & Ward, 2022). In communication terms, this spillover is likely to appear as shorter, more task-oriented calls and a greater tendency to withhold difficulties in order to protect

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family members from worry. The second mechanism is compression and fragmentation. Unlike remote workers ashore, whose problem is too much shared space, seafarers face too little shared time. Fragmented coverage and rationed data mean that conversations are interrupted and that domestic problems cannot always be resolved in real time, while frequent updates from home require seafarers to deal with family matters alongside onboard duties (Soerli et al., 2025). Studies of after-hours electronic communication ashore show how such intrusions extend effort into rest periods (Ikeda et al., 2023); on board, the same intrusion competes directly with sleep between watches.

The third mechanism is renegotiation, which shows that seafarers and their families are not passive recipients of digital strain. Filipino seafarer fathers described using the internet to express affection, help resolve problems and feel at home with their children despite the distance (Juanico, 2025), and communication with family emerged as one of the most effective mental health supports in a survey of 817 seafarers (Tang et al., 2022). Ashore, dual-earner families protect shared time through informal boundary governors, live boundary agreements and increased family communication (Shirmohammadi et al., 2023). This means that digital fatigue can push seafarer family communication toward two opposite patterns: an eroded pattern, marked by fragmented, crisis-oriented and emotionally guarded exchanges, or an adaptive pattern, marked by agreed routines, everyday sharing and explicit negotiation of what each side needs. Which pattern emerges depends on the resources available to the seafarer and the family and on the support they receive from employers.

The family left ashore deserves particular attention. Seafaring households are often organised around a partner who manages children, finances and daily decisions alone during long contracts. Connectivity allows the seafarer to remain involved in these decisions, but it can also draw an exhausted seafarer into problems that cannot be solved from sea, and expose the partner ashore to the seafarer's fatigue and low mood. The corpus does not yet test these crossover effects directly, and maritime studies rarely include the voices of spouses and children. This is a priority for future research, particularly in collectivist societies such as Indonesia and the Philippines, where extended-family obligations are dense and the seafarer's role as provider carries strong cultural expectations.

Protective factors

Protective factors operate at four levels: individual, family, shipboard and organisational (Table 3).

Table 3. Protective factors against digital fatigue and its family consequences among seafarers

Level	Protective factor	Evidence
Individual	Psychological well-being, self-efficacy	Puspitacandri & Moejiono (2026); Consiglio et al. (2023)
Family	Agreed contact routines	Juanico (2025); Shirmohammadi et al. (2023)
Shipboard	Peer support, collegial atmosphere	Pauksztat, Grech, et al. (2022); Tang et al. (2022)
Organisational	Fast, reliable, affordable internet	Pauksztat, Grech, et al. (2022)
Organisational	Clear communication, management support, training	Hayes-Mejia & Stafström (2023); Strukcinskiene et al. (2025); Bayrak & Muslu (2025)
Policy	Social-connectivity rules, protected rest hours, family-supportive policy	International Labour Organization (2022); Ikeda et al. (2023); Gorla et al. (2026)

Source *:* Compiled by the authors from the reviewed studies (2026).

The distribution of these factors carries a theoretical point. Individual resources matter, but they cannot compensate for shipboard and organisational conditions that ration connectivity, overload crews with digital reporting or leave seafarers without support. Notably, two of the strongest protective factors in the maritime evidence, onboard peer support and reliable internet access, are largely under the control of shipowners and ship managers (Pauksztat, Grech, et al., 2022; Tang et al., 2022). This finding is relevant for Indonesia, where seafarers form a large labour force but research on their mental health and family well-being is only beginning to develop (Sudewo et al., 2024; Puspitacandri & Moejiono, 2026).

Toward a Digital Fatigue–Ship–Shore Family Spillover framework

Integrating the four themes, this review proposes a Digital Fatigue–Ship–Shore Family Spillover framework. Digital demands at sea (operational digitalisation and reporting, fragmented connectivity, compressed contact windows and intensive off-duty screen use) combine with traditional maritime stressors to produce digital fatigue. Digital fatigue depletes psychological resources and lowers well-being. Through the same digital channels that connect ship and shore, this depletion spills over into the family system, where it reshapes communication either toward an eroded pattern or, when resources and support are present, toward an adaptive pattern; strain within the family, in turn, flows back to the seafarer on board. Protective factors at the individual, family, shipboard and organisational levels moderate each link. The framework extends existing maritime well-being models in two ways: it treats connectivity as both a resource and a demand rather than as a simple welfare provision, and it treats family communication as a distinct outcome rather than folding it into work–family conflict. Its main limitation is that direct maritime evidence on digital fatigue is still scarce, several mechanisms are inferred with the help of anchor studies ashore, and most studies are cross-sectional and self-reported, so causal direction and longitudinal dynamics remain to be tested.

CONCLUSIONS

This systematic review of 25 studies published between 2022 and 2026 concludes that digital fatigue is an emerging but significant threat to both the psychological well-being and the family communication of seafarers. At sea, digital fatigue arises from operational digitalisation and reporting demands, fragmented

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and rationed connectivity, the compression of family contact into narrow time windows and intensive off-duty screen use, layered on top of long working hours, poor sleep and isolation. It is consistently associated with stress, anxiety, depressive symptoms, chronic fatigue and emotional exhaustion, with junior seafarers and those carrying heavy family responsibilities at particular risk.

Digital fatigue also travels ashore. Through resource depletion and the compression and fragmentation of contact, it shifts communication between seafarers and their families toward shorter, more crisis-oriented and emotionally guarded exchanges, and it can draw seafarers into domestic problems they cannot resolve from sea. At the same time, seafarers and their families can renegotiate their communication through agreed routines and everyday sharing, producing an adaptive pattern. Whether the eroded or the adaptive pattern prevails depends on protective factors at four levels: individual psychological resources, family contact agreements, onboard peer support, and organisational provision of reliable connectivity, clear communication and management support.

The proposed Digital Fatigue–Ship–Shore Family Spillover framework offers a basis for future research and practice. Shipping companies and crewing agencies are advised to implement the social-connectivity provisions of the MLC, 2006 through reliable, fast and affordable internet; to reduce non-essential digital reporting and protect rest hours from non-urgent ship–shore contact; to involve crews and provide training when introducing new digital systems; to foster onboard peer support; and to extend welfare programmes to seafarers' families, including guidance on healthy long-distance communication. Maritime education and training institutions, including those in Indonesia, should integrate digital-wellness and family-communication skills into pre-sea and refresher training. Future studies should use longitudinal and dyadic designs that include spouses and children, measure digital fatigue and family communication patterns directly with validated instruments, and examine seafarer-supplying countries such as Indonesia and the Philippines, where family structures and the provider role may shape how digital fatigue is experienced across ship and shore.

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