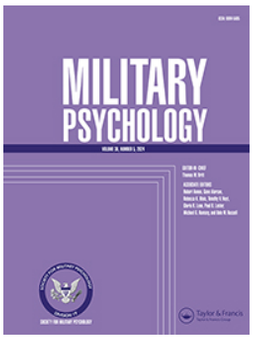

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A qualitative investigation of demands, resources and self-regulation during Navy deployment

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ABSTRACT

Creating a sustainable workplace for Navy personnel is vital for their wellbeing and retention. This qualitative study explores the interplay between job and personal demands, resources, and stress self-regulation strategies affecting psychological strain among Navy personnel during deployment. We conducted semi-structured key informant interviews with 25 Navy personnel (68% male) to determine the demands and resources at sea that affect psychological strain. The findings identified that individual differences in coping strategies (e.g., recovery management), abilities (i.e. ability to make social connections), and their mind-set about deployment (e.g., sense of purpose) were perceived to play a role in the experience of strain. Additionally, the presence of supportive peers and leaders was identified as a key resource, whereas external stressors (e.g., family crisis) and social tension onboard, amplified by confined spaces, were commonly reported demands. Our findings also contribute to a growing body of research suggesting a nuanced interaction between individual coping strategies and job design. Formal organizational support was identified as enabling adaptive self-regulation strategies, while the capacity to form and maintain positive relationships helped foster a sense of belonging, countering isolation. Another key contribution was the individual differences in the appraisal of resources offered by the organization and the potential importance of resource appraisal in how effective resources were perceived to be for addressing shipboard demands. We provide recommendations relating to targets for personnel training, interventions, and leadership in terms of communication, supporting day-to-day and equal opportunity for recovery, resource access, maintaining morale, and shaping the evaluation of demands.

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KEYWORDS
Resilience; work recovery; maritime, self-regulation; job demands and resources theory

What is the public significance of this article?— This study revealed that Navy deployment was perceived as physically and emotionally demanding, coupled with limited opportunities for recovery and quality sleep, contributing to extended periods of exhaustion. We also identified a nuanced interplay between job design and coping approaches, where job resources, such as support systems, provided opportunities for adaptive self-regulation. Leadership support was identified as key for personnel well-being, providing emotional and practical assistance.

Modern navies recognize the challenges of workforce sustainability and mitigating psychological stress in deployed personnel. Psychological job strain, the adverse psychological responses resulting from job roles (de Croon et al., 2004), is significant in Navy personnel perhaps due to prolonged role demands with limited recovery opportunities. Navy personnel exhibit a psychological strain prevalence of 31–34%, surpassing general workforce rates (Bridger et al., 2008). However, limited research exists on the causes of high psychological strain during Navy deployments (Gottschall & Guérin, 2023).

Applying job-design models to understand job strain in Navy deployment

The unique challenges of Navy deployments necessitate a critical evaluation of traditional job-design models to ascertain their relevance and potential need for adaptation in understanding personnel outcomes. Previous research has utilized job-design frameworks to analyze the impact of job demands (e.g., time pressure) and resources (e.g., support from job context) on psychological strain within Navy environments (Bridger et al.,

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2011; Gottschall & Guérin, 2023; Rowen et al., 2022). These frameworks suggest that while job demands can exacerbate strain, access to resources mitigates these effects and supports achievement of work goals.

Investigations into psychological strain during Navy deployments have predominantly applied the Effort-Reward Imbalance (ERI) and Job Demand-Control-Support (JDCS) models (Bridger et al., 2008). The ERI model argues that strain arises from disproportionate effort-reward exchanges, disrupting expected reciprocity (Siegrist, 1996). The authors of the JDCS model (Karasek, 1979) emphasize how high job demands, limited control, and insufficient support contribute to strain, albeit with potential moderation through workplace support. Consistent with the JDCS model, the demand most associated with strain in the Navy was role conflict, and resources such as leader support were also potentially important, particularly for males (Bridger et al., 2008). However, the ERI model has been found to explain more psychological strain in Navy personnel than the JDCS model (Bridger et al., 2008). Integrating elements of both models provided the most comprehensive understanding of strain in Navy personnel (Bridger et al., 2008) and highlighted that any one model including a narrow set of demands or resources is unlikely to capture the uniqueness and breadth of job-design features effecting Navy personnel. It also raises questions about whether there are additional novel job-design features or considerations that are not captured by existing models. One contribution of this work is to identify and categorize the job-design features perceived to impact psychological strain in deployed Navy personnel.

The unique challenges of Navy deployment

The unique demands of Navy deployment suggest that specific personal dispositions and capabilities may enhance coping in these environments. Studies in isolated work settings, like Polar Regions, indicate that individuals with high extraversion, owing to their social skills, adjust more effectively due to limited social support available (Sandal et al., 2006). Similarly, social competence has been associated with better adjustment, whereas a high need for varied interests and stimulation often leads to challenges (Biersner & Hogan, 1984). Recent frameworks on occupational strain emphasize the significance of self-regulation strategies-efforts to adjust one's response to stressors (e.g., optimism, self-efficacy) in combination with job demands and resources (Bakker & De Vries, 2021). From this perspective, exploring both job-related and individual factors are key to understanding psychological strain in Navy deployment (Bridger et al., 2011). However, little is known about which self-regulation strategies are adaptive or maladaptive in the Navy deployment context or the personal resources that foster positive outcomes. A second contribution of this work is to understand whether certain individual differences, such as self-regulation approaches or dispositions, are better suited to the Navy deployment setting.

In addition to the possible helpful personal dispositions or approaches, the maritime setting may increase the intensity of specific demands. Specifically, there is evidence of widespread sleep concerns during naval deployments, often resulting in sleep deficiency or insufficient sleep duration effecting personnel readiness (Jameson et al., 2023). Such disruptions may be caused by light, noise, sea-state, occupational stressors, and uncomfortable sleeping quarters (Matsangas & Shattuck, 2017). Moreover, work-family conflict (i.e., conflict between the obligations, responsibilities and roles associated with family and work life; Greenhaus & Beutell, 1985) may be particularly demanding given that deployment frequently requires absence from home. Past work identified that a small, albeit significant, amount of the variance in psychological strain experienced by Navy personnel was related to work-family conflict (Bridger et al., 2008). Supervisor support for family responsibilities has been found to reduce perceptions of work-family conflict in Navy personnel (Cavaleiro et al., 2019), but other under acknowledged resources may also exist. Additionally, the prolonged confinement on a Navy ship is believed to heighten social tension compared to other workplaces (Sandal et al., 2006). This research aims to deepen understanding of the specific demands impacting psychological strain during Navy deployments and identify crucial resources for alleviating such strain, addressing gaps in our knowledge of this unique workplace. Thus, a second contribution of this research is to better understand the nature of demands in the Naval deployment setting.

A further guiding question relates to the changing nature of technology and connectivity and how this may affect personnel deployment experiences. Authors suggest that isolation insulates personnel from home front demands, making the demands at sea comparable to those on land (Bridger et al., 2011). However, increased connectivity with home via Wi-Fi, may mean that these demands persist during deployment. It is unclear how access to certain resources that allow the maintenance of connectivity with home are changing the salience or impact of home front stressors. A third goal of this work is to understand how changes in communication technology, such as Wi-Fi, have affected personnel strain in positive or negative ways.

A further unique constraint of the Navy deployment setting that may influence personnel strain is the reliance on the organization or ship for resources. This dependency can lead to a lack of control over resource type and availability. The type or availability of resources may fail to meet the diverse needs of individuals and account for, in part, the reason that strain is observed to be higher in females than males serving at sea (Bridger & Kilminster, 2007). The appraisal of resources as essential for their effectiveness has been rarely studied (for exception see Morelli & Cunningham, 2012), casting doubt on their adequacy for all personnel. This work will explore individual experiences and perceptions of shipboard resources, and in doing so identify potential considerations for resource effectiveness.

The present study

This qualitative study aims to explore the individual and job-design factors affecting Navy personnel's deployment experiences. There is a gap in qualitative research on this topic (Schmied et al., 2021), with quantitative studies providing insights into workplace strain factors but lacking in-depth exploration of unique job characteristics and the potential for individual variances in the way those characteristics are appraised (Draper, 2004). By focusing on qualitative methods, we seek a deeper understanding of Navy personnel's lived experiences, examining how well-established workplace strain theories reflect real-world experiences and assessing the applicability of these theories to their unique context.

Method

Participants and design

Ethics approval was obtained from the Department of Defence and Veterans Affairs Human Research Ethics Committee (PN: 174/19). Twenty-five currently serving Australian Navy personnel (68% male), purposefully sampled based on their subject matter expertise (SME), defined as having deployed one or more times and having held leadership positions with responsibility for personnel at various levels on those deployments. To capture a range of work conditions and perspectives (Devers & Frankel, 2000), participants were selected from different divisions/work groups (e.g., navigation, maritime logistics, medical, technical, surface command), ranks (e.g., Leading Seaman, Petty Officer, Chief Petty Officer, Warrant Officer, Lieutenant), and surface platforms. Service experience ranged from 5 to 35 years, with an average deployment length of five months. At the time of the interview participants were posted to either shore or ship roles. Participant sampling was intended to achieve information power in the context of qualitative interview research whereby the sample holds rich information relevant to the study from a sufficiently varied group of participants (Malterud et al., 2016; Vasileiou et al., 2018). This required a sample with diverse personal and supervisory experiences of Navy deployments. Interviewees were encouraged to speak both from their direct experience, but also their observation, at times management, of others.

The research context

The data was collected from the Australian Navy during deployments primarily focused on regional presence, at-sea training, and humanitarian support (e.g., during the 2020 Australian bushfires). Respondents reflected on various deployments, including peacekeeping (e.g., East Timor) and wartime operations (e.g., Middle East). Throughout deployments, work hours were long and irregular, with physically demanding training exercises or operations. Typically, deployments lasted up to 4 months, with personnel confined to the ship for 1–2 weeks at a time before 3–4-day port visits.

Procedure

To ensure the study's questions accurately captured deployment experiences, a pilot study with two subject matter experts was conducted. Their feedback prompted minor adjustments in question wording for clarity and Navy terminology consistency. Interviews, lasting 40–60 minutes, were recorded and transcribed. The semi-structured interviews covered demographics, used a critical incident technique for in-depth event analysis (Hanton et al., 2009), and employed a repertory grid style approach to identify factors affecting outcomes, aiming to differentiate between sailors' coping effectiveness with deployment stress.

Philosophical positioning

The lead author, with 5 years of experience in interviewing Defence personnel, conducted the interviews with a critical realist perspective. This approach aims to understand reality through inference and the assumption that knowledge and understanding are constructed from experiences and perspectives. Adopting a critical realist view, the aim was to generate knowledge through a process of inductive/deductive inquiry and to evaluate and compare different theoretical explanations. The

qualitative method used was in line with the critical realist approach, as it focuses on describing social phenomena and capturing context.

Data analysis and methodological integrity

A range of strategies were implemented to enhance methodological rigor including: (a) selecting an appropriate, information rich (e.g., participants with extensive deployment experience) sample; (b) meeting appropriate ethical standards; (c) testing the interview protocol (e.g., pilot interviews); and (d) collection of contemporaneous field notes and reflections during the data collection process to provide additional context to inform the analysis.

Audio recordings were transcribed and imported into NVIVO software (QSR International Pty LTD, v. 12). A six-step coding approach (Braun & Clarke, 2016) was employed. These steps involved data familiarization whereby transcripts were read by two authors [GH, MC]. These coders conducted independent initial coding to identify significant ideas in the data related to the study objectives (e.g., impact of job demands on coping during deployment). Participants' experiences of deployment job design features were broadly categorized as demands or resources based on their accounts of these experiences as either draining resources and increasing strain or preserving resources and reducing strain. The coders also looked for evidence of individual resources and adaptive or maladaptive coping strategies to regulate strain. After the initial coding by two coders, comparative analysis and discussion took place between them and the authors [DG,EK,TR] and served as a critical friend to examine potential bias and facilitate agreement on final codes (Smith & McGannon, 2018). A critical friend in qualitative research are colleagues who are empowered to provide constructive criticism and feedback to help improve the quality of the research (Mat Noor & Shafee, 2021). The role of the critical friend in this research involved challenging the researcher's assumptions, interpretations, and methodologies in a supportive manner, fostering reflexivity, and encouraging more rigorous analysis. The initial codes were grouped by coders into descriptive themes of job demands (e.g., home front stressors), job resources (e.g., social support), individual resources (e.g., emotional intelligence), and maladaptive/adaptive processes (e.g., coping behaviors) based on participants' evaluation. The coders [GH, MC] analyzed the relationship between the identified themes, similarities and differences in participant experiences, and their evolving understanding of the strengths and limitations of job and individual factors on psychological strain. The analysis was iterative and comparative. To ensure accuracy, coders critically evaluated each theme before presenting to the research team, who acted as critical friends to challenge assumptions and interpretations. The quotes presented within this study were considered to best represent the theme, but also prototypical of the population of quotes within that theme.

Results

The nature of demands and resources in the Navy deployment environment

A summary of the discrete demands and resources identified by participants is presented in Figure 1. Central to understanding psychological strain in this unique work environment is developing an insight

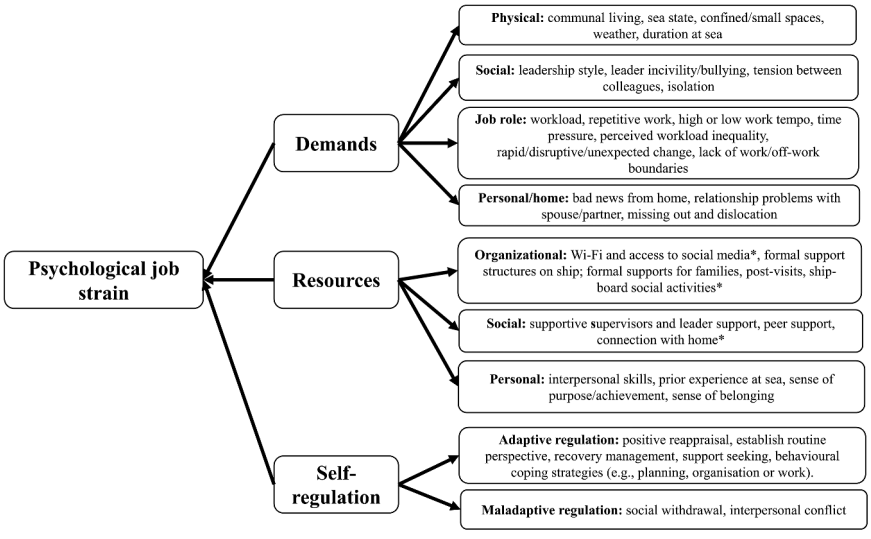

Figure 1. Summary of resource, demands and self-regulation strategies identified as features of the Navy deployment context. *Indicate those resources reported to be appraised differently by different individuals.

into the conditions that create strain, the interplay between different demand types, and the individual differences that may reduce the level of strain experienced or support the management of that strain. Four demand categories were identified, including physical (i.e., features associated with serving at sea that created physical strain), social (i.e., the source of strain was related to relationships among coworkers or leadership), personal demands (i.e., factors external to the job/role that relate to the individual's circumstance), and job role features (i.e., related to the nature of the day-to-day job role). These demand sub-types were identified as having the capacity to contribute independently, but also interactively, to psychological strain. Some demands within these categories were described as having an acute onset (e.g., relationship breakdown) resulting in noticeable changes in psychological strain. It was also acknowledged that there were chronic, or background demands (e.g., length of deployment/time at sea, workload, and work tempo) whose effects were felt more gradually or could accrue over time.

Resources were identified as falling into three major categories: personal, social, and organizational. Personal resources (e.g., interpersonal skills) were perceived to contribute to individual differences in the psychological strain imposed by demands. Social resources included aspects of the social context such as level of connection with home, peers, or leadership. Finally, organizations may use various structural resources to reduce and prevent job strain. Resources were identified by participants by comparing their experiences where a resource had been present in one circumstance and lacking in another, or by describing the effect the absence of a particular resource had on psychological strain. Finally, a set of adaptive and maladaptive self-regulation strategies were identified by participants indicating the importance of individual self-regulation strategies in addition to job-design features. Adaptive strategies (e.g., positive reappraisal) were identified to reduce strain and maladaptive strategies (e.g., social withdrawal) were seen to contribute to strain. The next sections seek to articulate the way that participants described the complex interplay of demands, resources, self-regulation, and their effects.

Role of demand and resource appraisal

Adaptive appraisals of demands as a self-regulation strategy

Participants mentioned that the ability to positively reinterpret the challenges of the work context played a key role in reducing psychological strain.

> Some of the good aspects . . . Watching the stars at night in the middle of nowhere where there's no light pollution, again something that's incredibly beautiful; really special, something not a whole lot of people get to see . . . So there are there are some physical limitations which impact negatively, and there are some physical limitations that you can try and take advantage of. (Senior officer rank; ID 4)

A further approach to appraisal was perspective taking, such as understanding the temporal dynamics of stressors (e.g., "*This too shall pass;*" Senior officer rank; ID 12), putting the severity of events into perspective (e.g., "*If you've got positive support from your friends who are saying, "No, it's really not that bad mate. You know, we're all cracking on at what's coming up;"* Senior officer rank; ID 15) and being able to take a "*bigger picture*" perspective on a situation in the sense that the situation was shared (e.g., "*I'm not the only one that's experiencing these emotions, I'm not the only one that's experiencing these gripes*;" Senior officer; ID 18). Participants reported that when sailors could see that they were not alone in their experiences this helped to break down isolating behaviors and make sailors more open to opportunities for social connection.

Repetitious work could either be perceived as a demand because it was monotonous or a resource because it allowed for a good routine *"So, you get the Groundhog Day element of doing the same thing every day, but you also get good routine, which is kind of rewarding, because you know how everything is going to happen each day."* (Senior officer; ID 18). Thus, repetitive tasks on one hand may be unchallenging and yet foster a feeling of competence and familiarity.

Individual differences in resource appraisal

Welfare Committees organize shipboard activities to boost morale, support recovery, and balance the demands of extended sea deployments, acknowledging the significant impact these factors have on crew wellbeing. A majority of participants acknowledged that these activities were important to addressing the effects of: long durations away from port, the effect of repetitious tasks, and confines of the shipboard environment. "*On a Sunday if we're not doing flying ops, [operations] we have like a little fun run on the flight deck. And then they have raffles. We also have um trivia quiz nights, ships concerts."* (Senior noncommissioned officer; ID 11). However, participants noted that while generally appreciated, ship-wide activities did not suit all sailors, offering varied support based on individual differences.

> I can't count how many times we've had team building exercises that involve playing some form of like, touch

> football, which is great for people who love touch football, but that can sometimes exclude quite a large amount of people . . . I don't necessarily want to play contact sport with a bunch of people . . . I think maybe the Navy can try, and they are, they do, but we can continue to try harder to work on team building activities or social activities that don't just necessarily suit the norm. (Senior officer; ID 21)

Quality of life services, in particular the availability of Wi-Fi, was considered a resource, but when these services were suspended temporarily their absence was perceived to be a direct strain. Reflected in several discussions there was a *duality* with respect to their effects.

> Once we lose quality of life services for reasons that aren't related to operation security it gets quite frustrating, especially for the juniors. It is definitely something that I've noticed more recently, . . . and obviously restricting their ability to contact loved ones at home as well. So when you do lose quality of life services, the majority of the ship probably don't have the opportunity to even be able to call home. So that also drives an extra level of disappointment/frustration to some people. (Senior non-commissioned officer; ID 1)

Access to technologies via Wi-Fi was identified as both a resource, but with the potential to create resource decrements. Social media platforms, gaming, and other applications were identified as providing a source of recovery. However, concerns were expressed that sailors may not be developing other more effective recovery and social support resources.

> . . . you walk past 20 years ago everyone's sitting there talking to each other and playing board games and different things. Now you walk past the junior sailor's café and they are all on the iPhones and iPads. (Senior officer; ID 22)

> Most deployments we don't get reception on our phones. Bushfire Assist, we had reception. So, there was people that were doing PT [personal training] every day that stopped doing PT. There was no interaction between co-workers in their off hours because in their off hours, on the phone (Senior non-commissioned officer; ID 11)

Interactions between job resources and demands and self-regulation

Communal living erodes peer relationships and is an obstacle to recovery

Adjusting to communal living on a ship, especially for those unaccustomed to it, was perceived to posed challenges both physically (like shared sleeping areas) and psychologically (such as privacy needs). This discrepancy between expectation and reality often required significant adaptation. Strain from communal living manifested in three main ways, with space sharing being particularly difficult for newcomers, potentially causing them to withdraw.

> They're [sailors] used to a big double bed and then you're sticking them into this little rack. There's all these other people around them, they've got to share toilets, and they have got to share showers. Especially for people who have never been exposed to that, that's sometimes difficult for them to assimilate, and some people never get used to it. (Senior officer; ID 5)

A second issue was escaping the pressures of being deployed. Participants spoke about this in terms of needing "space" to recharge and recover. Recovery opportunity was a recurrent concern across all the interviews, with participants raising the importance of recovery for immediate and ongoing performance and wellbeing.

> The limitations of your physical environment definitely plays a role, because there's not a whole lot of places you can escape to . . . there's the standard things that people can do to escape and recharge; using the gym, going down into your mess and playing video games, watching a movie, reading a book. . . . So you're not ever really alone - whilst physically being alone isn't necessarily the way an introvert needs to recharge, sitting around reading a book with 10 other people sitting chatting away detracts from that ability to recharge effectively. (Senior officer; ID 4)

Third, the close quarters of communal living and working on a ship increased the likelihood of interpersonal tensions, with limited opportunities to distance oneself from conflicts, whether with leadership or colleagues. This environment, where physical and psychological escape is difficult, often led to heightened conflicts. Interpersonal tensions mainly arose from interactions with peers, team dynamics, and leadership behavior.

> You know, people just don't get along sometimes - the longer you're at sea, the more things people do, especially in close quarters in the, in the smaller messes or bigger messes with lots of people in them, something that was a small issue when you first sail can become a big issue within a few weeks (Senior officer; ID 15)

Perceived workload inequality and opportunity for recovery

The design of work on deployments, including task type, speed, goals, and variety, played a notable role in creating strain. However, most strain came from perceived imbalances in workloads and uneven chances for rest, leading to tension among departments or individuals. Sometimes, duties like watch-keeping or specific operational needs prevented some crew members from

taking part in rest and recovery activities as much as others.

> . . in one of our previous deployments it was a really big imbalance of, how we treated our people and what we got them to do. (Senior non-commissioned officer; ID 1)

> there is a lot of resentment between different departments. My department is the, dirty day hands so we get to sleep every night. That works - but people don't see that - that our days aren't a six- and eight-hour shift like the shift work that people do (Senior officer; ID 12)

Tension among departments due to perceived differences in workload and rest opportunities differs across ships, influenced by various factors such as the ability to prevent unfairness. This includes how systems either reduce or exacerbate inequalities, like fairness in rewards and recognition. Additionally, how department leaders handle potential conflicts varies, with some being more adept at identifying and addressing disputes between departments.

Program disruptions to recovery opportunities

Disruptions, uncertainty, or reductions in access to recovery opportunities were identified as common barriers to the replenishment of individual resources and reductions in resource loss. There was a sense that structured down time, in particular port visits, served an important role on multiple fronts: permitting communication or reunion with family, respite, time away from others on the ship, and as an incentive to deploy.

> When you do a port visit, always helps morale for a number of reasons. Firstly, because you get off and you can do things, but secondly because it's healthy for people to talk to their people at home every day, for as long as you're in the port visit. (Senior officer; ID 15)

While respondents identified that sailors generally understood that operational circumstances limited access to recovery opportunities, including port visits, there was an acknowledgment of the need for recovery to reduce strain and a sense that port visits, intended for respite, were increasingly consumed by additional duties.

> When I first joined, when you did go ashore you did get rest and respite. When you go ashore now the OPTEMPO [operational tempo] is pretty high. You're not getting that rest and respite and time off . . . (Senior non-commissioned officer; ID 11)

The failure to be able to recover via port visits was implicated in burnout or work related strain, perceived as a hindrance to recovery, and detrimental to morale, wellbeing and performance across the remaining deployment: "*If you've been out for an X amount of days, weeks or months and you pull into port, it's the planning of that port visit that makes or breaks people these days*" (Senior noncommissioned officer; ID 1).

Unexplained changes to the ship's program as an obstacle to planning time with family

Unexpected change emerged as a significant stressor, hindering sailors' ability to schedule family time during or after deployment. This unpredictability often led to psychological strain, affecting not just the sailors but their families, particularly by disrupting planned activities.

> so that happens quite commonly, to the point where we've had people who were meant to get off for their own weddings and they've had to re-work their plans or have their replacement put in very quickly because um, yeah, plans change very, very quickly. (Senior officer; ID 21)

A second related issue was limitations on making plans. Uncertainty with the ship's program interfered with making plans with family or friends, such as on return home.

> If there's uncertainty in the program that's draining on people, because you, you really can't plan and you can't make plans for your kids and, and so forth. (Senior non-commissioned officer; ID 11)

Third, the work-life interference of unexpected change was described as elevated when those changes were not accompanied by an explanation. This was experienced as disenfranchising, according to participants who explained that sailors want to know what is going on, and when they feel left out of the loop it undermined their ability to adapt.

> If we can find mechanisms that do allow people to be part of the plan, or understand the stepping stones, I think that will help morale, particularly in the lower levels, on a ship. . . . when there is information being withheld, I can understand the frustration people get, because they just want to know what we're doing next, or why we're doing it. (Senior officer; ID 18)

Interactions between organizational support systems and self-regulation

Sailors found structured support from Navy frameworks like divisional systems, work groups, and supervisors crucial for their well-being. Key supports included the divisional system and chaplain services, although their benefit varied based on individuals' readiness to utilize them.

> Sometimes you'll have a pretty strong divisional system which essentially becomes your family at home, um, and there it's kind of in place to make sure that, like, your welfare is being looked after and that you've got someone to go and talk to and that sort of stuff. (Senior officer; ID 21)

Other systems were also in place to support families (e.g., Defence Community Organization, social workers). Personnel reported instances where organizational efforts to connect with families had had a positive effect. However, the timing and nature of the activities were important. It was perceived that families need to be engaged early to support their planning, engaging with families directly (rather than the deploying member only), activities would ideally enable families to connect with other families, but also give families a sense of what the deploying member was doing so that the situation was understood.

> We had a families day just before we sailed . . . everyone was allowed to bring three family members each onto the ship, and we went out to sea for a day, and showed them, this is what – the environment we're going to be in, this is all the people we're going to be with, and it was good, because it gave my mum an opportunity to have a chat to another girl's mum, who is in the same job role as me, and they kept in contact the whole time we were away, which was good for them, to be like, maybe this is kind of normal, this is what it's like (Senior officer; ID 18)

Interactions between personal resources and self-regulation

Associations were drawn between certain individual adaptive self-regulation strategies and other beneficial strategies or resources. For example, positive reappraisal was identified to be associated with sleep quality and recovery "*I think if you've got a good mindset and you're enjoying what you do, you don't feel tired. You sleep better*" (Senior noncommissioned officer; ID 11). Personal-levels of organization was also thought to reduce concern about being behind at work during off-work hours and allowing better recovery "*If you're really well organized, you sleep well at night because you get your work done*" (Senior noncommissioned officer; ID 11). Personnel who were organized were also perceived to be better equipped to support their own recovery by actively planning recovery routines.

> [Sailors need to] formalise the process [of recovery] – [to be] very conscious about doing it, so it then becomes just a standard routine. Then, next time they go to sea, they'll implement that without too much thought; and it will change a little bit, because every ship is a bit different, and as you go to sea, you know, your roles change, but you can still implement that within the grand scheme of how a ship works and maintain your sanity. (Senior officer; ID 19)

Social resources were perceived as able to facilitate the improved reappraisal of the situation. In one case, the participant reports how support from leadership enhanced the personal resource of confidence and therefore one's positive appraisal of coping potential.

> I've seen people struggling and quite regularly they've made improvements when they had someone more senior, who I guess provides them with that mentorship and someone to sort of really take an interest in them as an individual and to help them adjust . . . Then over time, they feel confidence and once they've built up that confidence and the experience required, and some of the skills required to survive, they start to flourish because they realise that they're doing it and there is a sense of achievement . . . (Senior non-commissioned officer; ID 17)

Port visits were universally understood as serving an important role in the deployment experience and personnel recovery. Often a port visit would interact with other support resources (e.g., access to external social networks) and a break from the workplace.

> So that's actually just taking the ship alongside, getting off the ship, getting out of the environment for 24 hours with some people who are positive and just unloading, venting, decompressing, and then coming back and facing it all over again but from - I'd say from a - a more positive perspective. (Senior officer; ID 4)

Organizational systems for connecting with home as a demand and resource

Connection with home as a source of psychological strain and support

Sailors reported varying comfort levels with limited contact from home but recognized its importance for coping. One sailor said that contact from home was especially vital for those facing isolation or trouble forming shipboard connections. In this way, external social support was seen to help sailors adapt to deployment surroundings.

> Where the person who was isolated remains isolated and is then isolated during the port visit as well, which is really sad because then they really don't get to have that social integration, that positive social integration which builds self and community and belonging and that aspect of it. . . . Getting in contact with family at home is really important, and that's something that I highly encourage is getting them to just have a chat with people that they know and love (Senior officer; ID 4)

While staying connected with home was valued, it sometimes added stress for sailors who then had to deal with family issues from afar. The most frequent stressors included receiving bad news involving close relationships, leading to decreased performance, and increased psychological strain. Common issues involved parenting challenges, sudden family crises, spousal conflicts, relationship breakdowns, and maintaining relationships. Being away and feeling unable to manage these family concerns was a significant source of stress.

> The most frustrating things for most would be the inability to help their family ashore when things are not going well for them. It's very hard, as it always seems bad things happen as soon as you sail. . . . So, I think that's probably the biggest issue, is that inability to help people ashore and you lose that amount of control. (Senior officer; ID 15)

> They have constant contact with home and their partner is always onto them and they're like - they can't concentrate on their job because they're constantly worried about what's going on at home. (Senior officer; ID 5)

Dislocation from family, the world, and missing out

Related to the home front, the sense of being dislocated from family and friends or missing out on important milestones or events was also a contributor to psychological strain.

> I've experienced this myself – is the fact that the world keeps going, back at home, and your life that you've left, as you know it, back at home, keeps going . . . in a way, it feels like you get forgotten about. (Senior officer; ID 18)

Personnel described the potential for such concerns to be enhanced by the availability of Wi-Fi on some Navy ships that had the unintended effect of increasing the salience of missing out given access to social media. Participants reported that seeing others back home enjoying their time with family and friends could increase feelings of dislocation and missing out.

> So you're withdrawn away from home, away from your support network and if something's not going right on the ship that makes you feel worse seeing how well everyone's living at home. (Senior officer; ID 12)

Key identified adaptive dispositions and self-regulation strategies

Two adaptive self-regulation strategies were identified as playing a key role in reducing psychological job strain.

Recovery management as an adaptive self-regulation strategy

Participants used planning recovery management as an adaptive self-regulation behavior. This included strategies to reduce strain and recharge for work. Planning recovery between duties was noted as a difference between those who adjusted well and those who struggled. It facilitated the ability to detach from work and was an important part of the recovery process.

> Having hobbies that you can continue while you're away. Um, some people might play their computer games or whatever, but ideally, social hobbies. Having groups, interest groups onboard . . . I think about ones that are having a good time of it, they have a focus other than just their work and their meals and their sleeping. . . . they have these other hobbies and leisure activities or whether the leisure activities makes them happier and more content. (Senior officer; ID 10)

The ability to make and maintain social connections as an important personal resource

The ability to make and maintain social connections on board was raised as a resource for adapting and coping with the shipboard environment. In turn, having connections was perceived as providing resources to personnel in terms of both support and recovery.

> I think those who find it easier to form friendships, whether they're professional or on a more personal level; and have those connections with people, seem to do a lot better with the demands of being at-sea than those who are a little bit different and don't sort of fit that mould of the majority of the people on the ship. They probably would struggle because they're lacking that. [connection] (Senior non-commissioned officer; ID 3)

The respondent recognized the value of relationships and their impact on those without support. The ability to form and maintain relationships is seen as a key skill in deployment. Moreover, a sense of belonging can also result from the deployment experience. This idea of inclusion and belonging was described at several points, participants indicating that the ship would function as a surrogate family "*Usually the ship does become a family*" (Junior noncommissioned officer; ID 16).

By contrast, difficulties making connections or social withdrawal was characterized as potential indicators of vulnerability. Respondents suggested that some people may not find acceptance with their colleagues and find it difficult to form a sense of belonging. Participants recalled personnel who were unable to fit in "*a ship is kind of a family, and for whatever reason, if you don't click with that family, it can be quite isolating*" (Senior officer; ID 19). Individual

inexperience in the environment or being new to the crew was sometimes seen as the cause of challenges with social integration.

> I have seen many times where someone is very inexperienced or new and sometimes it can even be someone joining a new crew because it's like starting all over again at a new school, trying to I guess integrate. (Senior non-commissioned officer; ID 17)

A sense of purpose as a personal resource

A sense of purpose and achievement was an important aspect of deployment and described as an individual difference that could provide a greater tolerance for role demands. Purpose in the role was crafted in many ways. Some quotes reflected higher-order purpose and respondents cited "service to the country" and "protection of Australian borders" as features of a sense of purpose. However, purpose could be more localized to the department or ship (e.g., training).

> if you're actually going somewhere to do something, people feel a lot more satisfied – like, there's that satisfaction side, that I'm actually doing my job. I'm going out there, I'm helping people. (Senior officer; ID 18)

> People understand why they're doing the work up. They understand why they need to be better, and they need to be trained up as a team because we need to operate as a team out there. (Senior officer; ID 19)

At the same time, participants often reflected on when they or others had a lack of purpose or when purpose could wane over time with longer deployments or repetitive work. Other participants identified that at times sailors were uncommitted to the purpose of the Navy and that lacking purpose was likely to make the investment of effort required for deployment unsustainable.

> It's very easy to actually forget why you're there, or what you're doing, or that bigger picture, so it's finding little, subtle ways to reinforce it. (Senior officer; ID 18)

> A lot of, I don't know, they're sort of people that come through and don't really understand the purpose of Defence and they're not always here for the right reasons, um. Sort of just here for the good pay and the work cos it's easy, not because it's, you're serving your country (Junior non-commissioned officer; ID 16)

Factors identified in influencing purpose were the clear goals of the operation or the role of leaders in reinforcing a sense of purpose. Several respondents mentioned operations to support the Australian bushfire response as engendering clear purpose:

> I think the bush fire assistance is the perfect example. So, that ship, whilst they were the humanitarian response to ship for the leave period, they all got twelve hours' notice that they were sailing. But it was for the bush fires. So, I think once you've got a purpose or a clear goal as to why you're sailing, a lot of people, whilst it's difficult, well not difficult but you'd rather be on summer leave than sailing, it's really easy to switch on. (Senior officer; ID 21)

Leadership behavior as a demand and a resource

Respondents identified the direct effects of problematic leadership behavior on sailor wellbeing. Participants described how leaders could make large differences to people's experience of the deployment for good or bad.

> That continuous eroding of someone's self-worth, self-esteem from bad management styles I've seen people go - the colloquial term - crazy. (Senior officer; ID 12)

There were two main ways that leadership appeared to create strain. Some participants identified that leadership style had the potential to have a collective effect on the psychological strain of the group or crew.

> Leadership is always an issue. If you've got someone who micromanages or doesn't get along with everyone. That can, even just one person especially, that's in the command team can make a big difference to the morale and to the frustration of the crew. (Senior officer; ID 15)

> When you have so much control over so many people and you constantly erode them with bad management style, inappropriate behavior you - it ruins people. (Senior officer; ID 12)

Participants highlighted unique conflicts between individuals and leaders, intensified by the ship's communal living, which offers little escape from negative interactions. This isolation exacerbates interpersonal tensions, restricting both physical and psychological relief.

> She just did not get on with the Commanding Officer and that was as simple as that. There's nothing anybody could have changed, like there was just a personality clash . . . and you can't escape that when it's the boss, you know what I mean. (Senior non-commissioned officer; ID 1)

Leader support, through encouragement, understanding, communication, and instrumental help, can positively impact sailors' performance and wellbeing. Mentorship and care for others by senior personnel was seen as a valuable resource. When leadership assisted sailors to manage home stressors, it was perceived to make a significant difference to personnel's psychological outcomes: *"it might be that we allow them to go home a couple of weeks early, maybe on compassionate grounds"* (Senior officer; ID 15).

Discussion

Our study sought to uncover the factors influencing psychological stress during naval deployments, examining a range of demands, resources, and coping mechanisms. We identified key demands contributing to stress and resources that mitigate it, noting the interplay between job-related demands and personal challenges, such as family issues. This underscores how personal life demands, often overlooked in traditional job-design models, combine with job demands to impact personnel's well-being, aligning with recent insights from the Job Demands Resources model (Demerouti & Bakker, 2022). While this research was conducted in the Navy setting, several of the themes identified are not unique to Navy deployment and are likely to be similarly challenging in other deployment settings.

Aligned with the ERI model (Siegrist, 1996), Navy deployment was perceived as effortful, both physically and emotionally, and requiring significant personal effort and investment. This is consistent with previous work identifying that difficult physical working conditions predicted psychological strain in UK and US Navy personnel (Bridger et al., 2011; Wilcove et al., 2003). Adverse and taxing physical conditions (e.g., discomfort and intolerable heat and humidity) has also been reported as characteristic in other services, including aircrew and army deployments contributing to psychological strain (Osório et al., 2013; Stetz et al., 2014). A recent synthesis of the scholarship revealed that while less studied, physical demands on deployment were frequently associated with mental ill-health outcomes across services (Crane et al., 2023).

The effect of physical and emotional demands was underscored by a lack of recovery opportunities, a previously recognized issue in naval deployment (Bridger et al., 2011). Frequent recovery opportunities were referred to in the context of the inability to obtain relaxation time away from shipboard demands (e.g., via gaming, shore leave) or quality sleep. Past work has identified that Navy personnel report getting less opportunity for sleep than required and less than the accepted recommended minimum sleep of 7-hours (Jameson et al., 2023). Sleep and relaxation time was frequently disturbed by noise and announcements, lighting and uncomfortable temperatures (Jameson et al., 2023). Additionally, we identified several job-related demands, personal and job resources, and key self-regulation strategies contributing to the experience of psychological strain. Participants highlighted significant social demands, including isolation, problematic leadership styles or behaviors, and conflicts. Similarly, work in deployed Australian military personnel from all three services (Army, Airforce, and Navy) has also demonstrated the role of social demands in contributing to increased reporting of mental ill-health symptoms (Waller et al., 2012). Consistent with prior studies, social support emerged as crucial for managing these challenges, with emphasis on the value of both informal supports, such as peer mentorship, and formal organizational mechanisms like the divisional system and family support services. This finding is consistent with models that emphasize the role of social support as a resource (e.g., DCSM; Karasek, 1979) and research highlighting the role of social support as a key resource to reduce the experience of psychological distress in high-demand work contexts (Van Der Doef & Maes, 1999).

Leadership support emerged as crucial, consistent with findings that it significantly influences employee well-being beyond other mental health factors (Gilbreath & Benson, 2004). Leaders not only provided emotional support but also facilitated access to practical resources, such as time off for family matters. In the unique, isolated maritime setting, where resources largely depend on organizational provision, leaders are likely to be essential in permitting access to resources. The role of leader support on the wellbeing of personnel has also been highlighted in the context of deployment in other services (i.e., Army) were there is a level of organizational dependence. Health-promoting leadership behaviors, as reported by soldiers, explained unique variance in burnout after accounting for relevant covariates in a sample of Army personnel deployed to Afghanistan (Adler et al., 2017). Thus, the role of perceived supportive leadership is likely to be consistent across military services. The study highlighted that physical and emotional exhaustion, scarce recovery opportunities, stress from family responsibilities, and shipboard social interactions are central to the strain experienced by Navy personnel during deployment.

A second contribution was to understand the self-regulation strategies or dispositions that were adaptive or maladaptive. Several key adaptive self-regulation strategies were identified to reduce the experience of strain (e.g., positive reappraisal and perspective taking, support seeking, and recovery management). In support of the integration of job-design and self-regulation approaches (Bakker & De Vries, 2021; Demerouti & Bakker, 2022) there was evidence of a dynamic interaction between certain individual resources or strategies and the presence or absence of resources on board. For example, formal organizational support was identified as enabling adaptive self-regulation strategies, while the capacity to form and maintain positive relationships

helped foster a sense of belonging, countering isolation. Additionally, the emphasized dispositional and self-regulation strategies play a significant role in reducing social and exhaustion-related strains. Research involving deployed Army personnel has also identified interactions between job design and self-regulation. Job control only mitigated the relationship between demands and general psychological health when peacekeepers adopted an active coping style, such as seeking social support, engaging in proactive coping, and employing positive coping strategies (Ippolito et al., 2005). These results contribute to a growing body of work suggesting a nuanced and complex interaction between personnel coping strategies and job-design.

Another contribution was examining the effect of changing technology, specifically increased connectivity, on the shipboard environment. While it allowed sailors to connect with their families at home, Wi-Fi was also reported to increase feelings of missing out, reduced social connections on board, and created an expectation of constant availability for both personnel and their loved ones. Similar challenges exist in land-based deployments where connectivity may be restricted due to opportunity, connectivity, and regulation (Bush et al., 2012). In other deployment settings, increased connectivity has had mixed outcomes for personnel. Greater connectivity with home may increase the potential for greater awareness of home front difficulties shown to detrimentally effect the mental health of land deployed personnel (Mulligan et al., 2012). Yet, other research has demonstrated that increased contact with home can reduce the negative affective states of soldiers during deployment (Ferrier-Auerbach et al., 2010). Thus, the effect of connectivity (e.g., Wi-Fi) on psychological strain in the deployment environment is likely to depend on other factors (e.g., quality of communication with home, level of home-based stressors).

We explored how appraisal influences the effectiveness of resources, finding that (re)appraisal impacts both demands and resources. Viewing demands in the Navy deployment context adaptively was crucial for managing physical and role-specific challenges. Similarly, how resources were perceived also affected their usefulness. Participants noted that certain organizational resources, like shipboard activities and Wi-Fi, varied in utility based on individual appraisal-benefiting some while excluding others, which underscores the challenge of providing the right types of resources among diverse groups.

Theoretical implications

The study raises four theoretical and empirical considerations relevant to the Navy context, but also job design models more broadly. First, it is necessary for job design models to integrate demands from various areas of life, even in geographically isolated environments, and understand how they interact to effect psychological strain. Second, individual differences (e.g., personal resources and self-regulation) may have a complex relationship to job resource availability. Personal resources (e.g., ability to make friends), was reported to increase the sense of belonging. On the other hand, the availability of organizational resources had the potential to encourage adaptive self-regulation, such as seeking support when needed. These ideas has been captured by recent job-design models (Bakker & De Vries, 2021; Demerouti & Bakker, 2022), but research is needed to investigate the dynamic interaction between personal resources, self-regulation, and job-resources. Third, appraisal may also play a role in resource effectiveness. The role of *demand* (re)appraisal is frequently considered in theories addressing self-regulation in the management of psychological strain (e.g., transactional model of stress and coping; Lazarus & Folkman, 1984); less considered is the role of appraisal in the effectiveness of resources (Van Veldhoven et al., 2020). In geographically isolated work environments, the type and availability of resources is often determined by the organization and may be perceived as ineffective, or these resources may contribute to demands. Thus, the effect of resources may be determined not only by their availability, but also by how they are appraised. Finally, job-design models need to consider the potential for some job resources to limit access to other resources. This highlights the potential effect of some resources to reduce the diversity of resources or limit access to those that are potentially more effective. However, research has rarely studied resource appraisal and its impact on effectiveness.

Applied implications

This study sheds light on the experiences of deployed Navy personnel and highlights several critical roles for leaders. First, there is a need for leaders in communicating purpose and aligning the mission with role tasks. Second, given the role of leaders as a pathway to resource access, supervisory leaders need to understand the resources available and what can be achieved for addressing personnel difficulties as part of their job-related knowledge. In addition, there is a role for supervisory leadership in being aware of observable changes in sailors' morale and knowing how to respond to these changes. Third, leaders need to be able to actively maintain morale and reduce social

tensions. Finally, another lever open to leaders is in shaping the evaluation of demands, such as helping the crew understand the sharedness of their difficulties or experiences. Moreover, a greater emphasis on day-to-day recovery is needed. This involves system-level changes, such as the removal of non-essential activities that reduce recovery opportunities, but also individual-level training to support the active daily recovery skills of personnel. Leaders have a role in communicating both the importance of daily recovery and recovery consistent behavior.

Limitation and future directions

Informant interviews provided a broad overview of psychological strain during deployment but relied on subject matter experts' interpretations. Further investigation is needed to fully understand deployment experiences through first-person accounts. Longitudinal studies exploring key variables can improve understanding the effect of deployment on psychological strain.

Conclusion

Experienced Navy personnel's insights highlighted the specific mix of job and personal demands and resources affecting their psychological strain during deployment. Our findings highlight the importance of examining the interaction among life demands, the pros and cons of connectivity, the intricate dynamics between personal and job resources, and the significance of how resources are appraised. Practical implications point to leadership's crucial role in facilitating communication, providing resource access, bolstering morale, and influencing demand assessment, alongside the emphasized importance of daily recovery.

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Data availability statement

The data used in this manuscript cannot be made available given the data sharing constraints within our contract with the Department of Defence Science and Technology Group and Defence and Veteran Affairs Human Research Ethics Committee.

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