Contributing Factors to Team Resilience

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Declarations:
Acknowledgments: None.
Prior Presentation: None.
Funding Sources: None.
Clinical Trial Registration: None.
Institutional Review Board (Human Subjects). The survey was approved by the Naval Medical Center Portsmouth Institutional Review Board (NMCP.2020.0051).
Institutional Animal Care and Use Committee (IACUC): N/A.
Competing Interests: None.
Individual Author Contribution Statement: KL analyzed the data and drafted the original manuscript. KL and ATB designed the analyses. All authors edited and approved the final manuscript.
Data Availability Statement: Data remains property of the United States Government.
Disclaimer: The views expressed in this article reflect the results of research conducted by the authors and do not necessarily reflect the official policy or position of the Uniformed Services University, Department of the Navy, Department of Defense, nor the United States Government.
Institutional Clearance: Institutional clearance approved for public release.
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Abstract

Introduction. Organizational performance depends upon both individual competencies and team dynamics. The collective ability to collaborate, adapt, recover, and maintain performance is as, or perhaps more, critical to organizational success than the skills or performance of any one team member. As such, it is important for organizations to account for resilience at both the individual and team levels. However, most of the extant research has been devoted to exploring individual resilience rather than team resilience. The current study aimed to fill this knowledge gap by exploring several predicted factors related to team resilience within a deployed military operational environment.

Materials and Methods. This study utilized a large sample of naval personnel who completed the Afloat Safety Climate Assessment Survey (N>11,000). Analyses included structural equation modeling to explore several possible factors related to team resilience, including minimizing factors (e.g., job resources and team processes), stressors, and mending efforts (e.g., exercise and socializing).

Results. Analyses indicated that each factor differentially contributed to team resilience. Whereas stressors and mending efforts had a nominal influence on team resilience, minimizing factors easily emerged as the largest predictor of team resilience. Minimizing factors also had a significant influence on stressors experienced in the operational environment.

Conclusions. These findings thus suggest that team resilience in a chronic stress environment may depend upon prioritizing team processes related to goals, expectations, and training resources. The outcome is notably different from previous work given the context of a naval operational environment, where stressors can be prolonged and team dynamics are critical to all personnel departments. Moreover, the findings suggest that improving team resilience may

require a greater focus upon team processes or equipment resourcing than trying to reduce stress or any mending efforts to restore resilience reservoirs.

Introduction

Collaborative teams form the basic building blocks of organizations (1). Teams offer several advantages over an individual, including diversity in skillsets and viewpoints. Still, team-based organizations are more likely to succeed when they have the capacity to withstand and persevere through inevitable challenges—that is, a resilient team can adapt and overcome when problems complicate achieving organizational goals. Despite the substantial amount of research into resilience at the individual level (2-4), more recently, greater attention has been paid to developing the concept of resilience as part of a team dynamic (5-6)..

Team resilience is not simply a collection of individuals who all happen to be resilient at the individual level. Instead, team resilience truly is a team-level factor that depends upon both the individuals and how they interact. This nascent and emerging concept has been characterized by variables including trust, collective efficacy, cohesion, and social support (7-9). Other factors such as adaptability may represent key ingredients to team resilience (10), whereas some arguments exist for organizational support supplementing team resilience through the resources provided (11-12). These findings provide some scope to the concept of team resilience while identifying how both individual-level and organizational-level focus can supplement team resilience.

A recent study proposed a team resilience framework which identifies minimizing factors, stressors, and mending efforts as core contributors to team resilience (13). Manifestations are also an important part of the model, but these outcomes represent behaviors that indicate team resilience rather than being contributing factors. Among the core factors, each element accounts for something unique in developing resilience. Minimizing factors can help build and protect resilience levels through staffing, training, planning, anticipating, and

resourcing. These aspects help equip the team to complete their assignment while also ensuring that team processes are designed to support good communication. Meanwhile, stressors adversely affect the team by potentially draining any resilience reservoirs the team might have stored. Any number of challenges could be counted among stressors that drain team resilience, including psychological stress, environmental stressors, and workload. High-risk working environments will only likely compound this problem as the consequences of failure become more dangerous. Conversely, mending efforts promote recovery or refilling of the resilience reservoir. These aspects would include things such as lessons learned, resting, healing, repairing relationships, and revising processes. Mending efforts thus help with team recovery following intense circumstances.

Although Tannebaum et al.'s resilience framework (13) is insightful, it is a nascent framework. As such, additional research is needed to further explore and validate its application in other team contexts, to include teams serving in operational settings in the military context. To that end, the current study seeks to assess the relationship between different factors contributing to team resilience in a deployed military operational environment. The specific instance involved a naval operating environment, where teams must live and work within the same spaces for weeks and months at a time. This context emphasizes both the need for effective teamwork while also maximizing the potential chronic stressors associated with naval operations.

Methodology

The current study presents cross-sectional survey data from the United States Navy's Afloat Safety Climate Assessment Survey (ASCAS) (14). The ASCAS is routinely administered

to ships and evaluates multiple organizational climate constructs to inform operational safety as well as crew performance policies and practices.

Participants

The ASCAS was administered to 112 ship crews between November 2020 and September 2022. Respondents received an invitation to the ASCAS via their work emails that provided a link to the survey landing page, where they were presented with an informed consent document that outlined the survey's purpose and highlighted that participation was voluntary and anonymous. Of the 26,704 contacted, 14,581 opted-out and 828 were excluded due to a high missing data rate. The final sample size was 11,295 participants.

Measures

Minimizing Efforts consisted of two main latent constructs: Job Resources and Team Transition Processes. Job resources summarized both the training resources and equipment resources available to the individual. All resource questions asked participants to rate their level of agreement with the statements in relation to their current command on a 5-point Likert-type scale ranging from strongly disagree to strongly agree. Training Resources included 3 items: 1) Our training has prepared us well for the duties of our current jobs, 2) Our safety training goes above and beyond minimum requirements, and 3) Safety is consistently emphasized during our training. Equipment Resources included 3 items: 1) Our workplace facilities are adequate for the safe performance of our duties, 2) There is sufficient protective clothing and equipment available for tasks to be carried out safely, and 3) Necessary safety equipment is always accessible. Both training resources and equipment resources contributed to the Job Resources latent construct.

Transition Processes included three items: 1) Identify the key challenges that we expect to face, 2) Ensure that everyone on our crew clearly understands our goals, 3) Develop an overall strategy to guide our crew activities.

Stressors included the respondent's workload (time spent on work-related tasks), and also the latent constructs of Job Stress and Berthing Habitability. Job stress adapted several questions related to this concept (15), including: 1) A lot of the time my job makes me very frustrated or angry, 2) I am usually under a lot of pressure when I am at work, 3) My job is stressful. Berthing habitability factor assessed how ambient noise (e.g., air system, miscellaneous equipment), 1MC announcements, crew mate noise (e.g., open/closing rack, chatting, etc.), uncomfortable rack and mattress, invasive lighting, and temperature (cold and hot) affects respondent ability to sleep while onboard the current ship. Each item was rated on a five-point Likert scale ranging from 1 (not at all) to 5 (extremely).

Mending Efforts related the extent in which sailors engaged in recovery efforts. These items were taken from the survey section asking participants how many hours they spend on the following activities onboard their current ship: exercise, socializing (e.g., playing video games, chatting, etc.), and personal time (e.g., reading, sending emails home, etc.)

Team Resilience measure included three items: 1) Our crew tends to bounce back quickly after hard times, 2) It does not take our crew long to recover from a stressful event, and 3) Our crew usually come through difficult times with little trouble. Each item is rated on a five-point Likert scale ranging from 1 (not at all) to 5 (extremely).

Exploratory analyses

Visual inspection was first conducted to examine several feature characteristics: the frequency, percentage, and near-zero variance for categorical variables (e.g., gender, race); and, the empirical densities for quantitative variables (e.g., age, months on-board); and missing values (16). Near-zero variance was addressed by combining different category levels in order to produce a more balanced frequency distribution across the various levels.

Exploratory factor analysis (EFA)

Correlation matrices and plots were used to display candidate associations across the items. Because the questionnaire contained numeric items (e.g., how often you reported a safety issue to your supervisor) and ordinal items (e.g., your level of agreement with the statement: If you make a mistake on this crew, it is often held against you), Pearson and polychoric correlation tests were conducted. Multiple exploratory factor analyses were further conducted using oblique and orthogonal rotations to determine possible factorial solutions underlying the data, utilizing maximum likelihood as the extraction method. The selection of factor solutions involved scree plots, theoretically justified solutions, and solutions where items loaded with values above the 0.30 threshold on a single factor while other loadings were below that threshold.

Confirmatory factor analysis

The confirmatory measurement model involved four main latent constructs: minimizing factors, stressor, mending efforts, and resiliency. To compare the paths, the Wald test on linear restrictions between regressions paths was used to test the equality of the standardized regression coefficients. The models were evaluated using the following goodness-of-fit measures: Chi-squared statistics along with degrees of freedom and p-value, Comparative Fit Index (CFI),

Incremental Fit Index (IFI), Goodness-of-Fit Index (GFI), Relative Noncentrality Index (RNI), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA) (17-19).

Results

The study's overall sample was 11,295 participants. Consistent with the U.S. Navy's active duty population, the study sample was 80% male and 54% white, with 27% being between the ages of 22-25 years, followed by 20.8% 26-30, and 17.9% 31-35. Regarding paygrade, most participants were in the rank of E4-E6 (i.e., Petty Officers) (57.1%), followed by Officers (16%). In addition, most participants were in the departments of engineering (21.1%), combat system (18.9%), and operations (16.2%).

INSERT FIGURE 1 APPROXIMATELY HERE

Figure 1. Structural Equation Model for Team Resilience framework

The model (Figure 1) yielded a satisfactory fit, χ^2 statistic of 7379.879 ($df=338$, $p < 0.001$), as well as multiple indicators of overall adequate model fit, including the Goodness of Fit Index (GFI = 0.953) and Comparative Fit Index (CFI = 0.947) with values greater than .90; and the Root Mean Square Error of Approximation (RMSEA = 0.043) and Standardized Root Mean Residuals (SRMR = 0.057) with values lower than .08. Furthermore, the Wald test showed that minimizing factors had a higher association to sailors' team resilience than stressors ($p < 0.001$),

and mending efforts ($p < 0.001$). Wald test also showed that minimizing factors had a higher association to stressors than mending efforts ($p < 0.001$).

Discussion

Resilience helps individuals, teams, and organizations persevere despite adversity. Although the bulk of empirical research has focused upon individual-level resilience, the concept of team resilience is receiving increased attention (5-6). Specifically, resilient teams are not just a combination of individuals who all happen to be resilient, but rather team resilience is the byproduct of team interactions that make it a distinct concept. The current study extended this idea by applying a recently developed team resilience model (13) to naval personnel following a deployment. This context underscores the importance of team resiliency as naval personnel live and work within the same space for weeks or months at a time, which makes the team dynamic critical to their success.

Three core factors were explored through structural equation modeling for their contributions to team resilience, including: 1) minimizing factors that assessed team process and resources; 2) stressors that could drain any resiliency reservoirs personnel might have; and, 3) mending efforts that could restore resiliency, such as exercise or personal time. Minimizing factors easily emerged as the most significant influence on team resilience. Although both stressors and mending factors contributed to team resilience, their influences were nominal compared to the minimizing factors. Thus, proactively providing the necessary resources or enhancing team processes might be more important to building resilience than the more reactive steps of handling stress or mending efforts afterward. A key difference would be how these different programs become implemented to improve team resilience since interventions can

target either the individual-level or team-level. Individual efforts should focus on enhancing team processes through personal communication, whereas organizational efforts can enhance resilience through training and equipment resources. Investing in team processes and job resources can contribute to increasing team resilience, which will affect team performance.

Further discussion is warranted by the different results produced for stressors and mending efforts, respectively. This evidence demonstrated that stressors have a small, negative effect on team resilience. Magnitude of the stress might be an issue here. Small amounts of stress could degrade resilience while providing purpose and urgency to the outcomes. As such, small amounts of stress could be good in the right context, yet large amounts of stress quickly become overwhelmingly negative. The presumption would therefore be a potential role for non-linear effects of stress on team resilience that do not adapt well to the current analytical method.

Another issue involves the marginal role for mending efforts. Although warships provide some methods of exercise and recreation while affording naval personnel some downtime, the facilities are inherently limited given space constraints. Individuals simply do not have the freedom to pursue any exercise, hobby, or other recreational activity that might prove to be an effective mending effort for them. This restriction is a byproduct of the limited space aboard a warship, yet it could explain the different result based on the differences in mending activities available to an afloat-based measure versus an ashore-based measure. Additionally, the naval operational environments regularly impose sleep disruptions (20-24) that prevent effective mending efforts while exposing personnel to some environmental disruptions across a 24-hour day, not just during working hours (25-26). These ideas raise the question as to whether team resilience dynamics differ based upon the particular context. In this case, a naval operating

environment might have fundamentally different contributions to developing team resilience given the deployed operational setting at sea.

Some other limitations and differences should be noted between these results and previous findings. For example, previous work utilized a more robust construct when measuring resilience manifestations (13). The outcomes here may then reflect the perception of resilience among the crew without aligning behaviors to those perceptions, which could contribute to the empirical differences. The cross-sectional nature of the analyses might also have impacted the results as they do not cover the longitudinal aspects of the minimizing and mending processes. Further research will be needed to explore whether this finding is unique to naval operations while also examining how team resilience unfolds over time. Different factors may then be differentially important within a given environment. This possibility would suggest some malleability to the framework between different organizational environments. Each possibility warrants further study in exploring the development of organizational resilience.

Ultimately, team resilience has important implications for an organization's success. The unique contributions of team dynamics differentiate this idea from individual resilience, but they also implicate different scenarios where team resilience might be important. Military operations represent settings where team dynamics are especially important as success depends on the individual as well as collective stewardship and camaraderie (27). The current evidence suggests that minimizing factors are the most important factors determining team resilience in a deployed environment. As such, military leadership should invest in minimizing factors over mending factors or reducing stress, which could include more team resources or focusing upon enhancing team communication. A focus on minimizing factors could be the most effective way for a military organization to enhance team resilience in the deployed setting.

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