

## Assessment of Workplace Stress of Naval Radar Plotters

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### ABSTRACT

Radar Plotting (RDP) is a highly important and sensitive industry, as radar plotters are required to not only be highly vigilant, but to be in an environment dealing directly with national security throughout their careers. The number of reported and recorded disciplinary cases involving RDP personnel is relatively high as compared to other specialisations. This purpose of this study is to identify the levels of occupational stress and the dominant sources of stress amongst Radar Plotters who for the purpose of this study are defined as those who take on primary radar plotting roles on naval ships and onshore operation units. It also sought to compare occupational stress levels between supervisory and non-supervisory RDP personnel. The Generic Job Stress Questionnaire, an instrument developed by the National Institute for Occupational Safety and Health (NIOSH) was used to assess job stress. Descriptive statistics was first applied to describe the mean scores of five job stressors. Then, an independent-samples t-test was used to compare occupational stress levels between supervisory and non-supervisory personnel. Results showed that overall, RDP personnel face a high level of occupational stress, and supervisory RDP personnel experience higher stress levels than non-supervisory RDP personnel in the dimensions of Job Roles, Job Requirements, and Physical Environment. However, supervisory RDP personnel were more satisfied and felt less pressure with their job, and reported better social support from their superiors.

#### Keywords:

Naval personnel, occupational stress,  
NIOSH generic job stress questionnaire

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## 1. Introduction

The primary roles of any nation's maritime force include strategic defence of national maritime interests from any threats, as well as safeguarding territorial integrity and security, including the preservation of life and property. Its secondary role is to support local law enforcement agencies in securing the country's safety. As such, a naval force has been highly capable and maintains the readiness to perform any mission to protect the country. Thus, it is imperative that navy personnel must always be in position and possess the mind-set to be ready to serve at all times.

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The situation is especially true for personnel of the Radar Plotting (RDP) unit which is the only specialization that operates at the frontline in operation centres on board ships or onshore. Radar plotters are critical members of navy as they operate the radar, navigation and communications equipment of the ships. As such, the support that they provide is critical in directly supporting the navy's primary and secondary roles of defending national security. Generally, RDP main roles are contributing in navigation plotting, monitoring and reporting of any activities that may be related to navigational strategies. During warfare, they track and identify enemy ships and aircrafts, and provide vital tactical information that is needed for combat and rescue operations.

Hence the job requires high accuracy and precision which are highly dependent on the RDP personnel's intense mental concentration, vigilance and unwavering attention. The nature of the job, along with work conditions and environment appear to have an impact on the RDP personnel. Their workplace on the ship's bridge or at combat information centres involves confined space with low room temperatures of approximately 16-20 degree Celsius in order to prevent the sensitive electronics and equipments maintenance from overheat. Besides that, RDP personnel have to work in shifts of intense 4 hour duty-8 hour rest cycles while aboard ship. Alternatively, their working hours are 24 hours straight without leaving their work stations except for meals and toilet breaks, with one or two days rest while ashore. RDP is the only specialisation in the navy that requires its personnel to endure such challenges throughout their career.

It had also been observed that a significant number of navy personnel had sought counselling in 2016, with over a hundred cases of personnel being declared medically unfit due to depression. It is further noted that the number of reported and recorded disciplinary cases involving RDP personnel is relatively high when compared to other specialisations. RDP is the only specialisation where the number of disciplinary cases has seen increases since 2012. Even though the root causes of these disciplinary cases have not been identified, it appears to be due to excessive pressures brought about by their job. Initial survey conducted by interviews with officers from the human resource department of the organization under investigation revealed that RDP personnel seem to have a high level of occupational stress.

Given the wealth of literature on occupational stress, this study intended to gather a better understanding of the work-related pressures and strains that RDP personnel face due to the peculiarities associated to the job in radar plotting. It begins by gauging the occupational stress level of the respondents using the NIOSH job stress measure. Next, it attempted to determine which of the five dimensions of stressors (Job Roles, Job Requirements, Job Satisfaction and Job Pressure, Social Support from Superior, and Physical Environment) contribute to the occupational stress of RDP personnel. Finally, the occupational stress levels of supervisory personnel and non-supervisory personnel were compared to in order to find out whether the two groups experience different levels of stress.

The questions that this study sought to answer are summarised below:

1. What is the level of occupational stress of RDP personnel?
2. Which of the stressors is the dominant source of stress among RDP personnel?
3. Is there a difference between the occupational stress levels of supervisory RDP personnel and non-supervisory RDP personnel?

## 2. Literature Review

It is reported that "stress refers to the generalised, patterned, unconscious mobilisation of the body's natural ability" [1], while others stated that "occupational stress is anything regarding the working environment or nature of work itself that causes individual perceived stress" [2]. Military

personnel are believed to face higher job stress than their civilian counterparts due to their profession, especially active duty military personnel, and non-officer personnel have significantly higher occupational stress than officers [3]. Generally, literature on occupational stress has noted that the sources of occupational stress are categorised into six main categories, namely, workplace and job conditions; job roles; social support; career development; organisational structure, and home-work interface [4]. Findings have also revealed that the physical environment or workplaces with poor working conditions can negatively affect occupational stress [1]. These sources or dimensions of stress, sometimes referred to as stressors, were deemed relevant to this study, as the workplace conditions of RDP personnel included confined spaces with low temperature.

Stress from job roles, on the other hand, include the behaviours and demands that are related to the job and individual performance such as role ambiguity, role conflict, responsibility, and role overload. This is relevant as in one study on occupational stress of personnel at a naval base in Malaysia showed that there a significant relationship between job demands and job satisfaction due to the frequency of military missions [5]. In the case of social support, work relationships, such as relation with chiefs, subordinates, and colleagues, can also be the cause of stress. However, social support from superiors or managers have a larger effect on occupational stress in the context of military occupations [6]. However, the relationship between career development and organisational factors had not been reported as significant when related to occupational stress in the context of military professions from previous studies. Lastly, home-work interface describes problems at work because of personal problems.

The global warfare has evolved tremendously affecting the basis of the peace-keeping culture itself. Besides the increasing of destructiveness of modern weapons and the changing of modern warfare had significantly heightened the levels of stress faced by personnel involved in defending the safety and security of a country [7]. Peace-keeping work has multiplied and new military tasks include natural disaster assistance, humanitarian aids delivery, and nation-building programmes [8-9]. As a result, armed forces personnel now have higher job stress than their civilian counterparts where it is said that nearly 15% blamed work stress for causing significant emotional stress and 8% reported work stress was severe enough to affect their emotional health [10]. Moreover, military personnel also reported higher levels of stress at work than in their family life especially active duty military personnel [3].

### **3. Methodology**

The study utilised the NIOSH Generic Job Stress Questionnaire (NGJSQ) to measure occupational stress as the flexible modular instrument allows for relevant modules to be used to suit the RDP profession and working environment. The NGJSQ was developed by the National Institute for Occupational Safety and Health (NIOSH) of the United States and it was chosen as the instrument due to its high scores of validity and reliability (Cronbach Alpha value average of more than 0.7). Based on a literature on stress in military environment, the relevant modules from NGJSQ which were deemed as the potential occupational stress sources (dimensions) amongst RDPs were chosen. These dimensions are Job Roles, Job Requirements, Job Satisfaction and Job Pressure, Social Support from Superiors, and Physical Environment.

The questionnaire consists of six parts based on the NGJSQ measures, and was developed as the research instrument for data collection which includes Demographic Information, Job Roles, Job Requirements, Job Satisfaction and Job Pressure, Social Support from Superiors, and Physical Environment. The questions used various Likert scales, based on NGJSQ measures. The sample size was 185 respondents, determined by referring to the Krejcie and Morgan sample size tables. The

questionnaire is divided into six parts in the form of close-ended questions. Part I relates to Demographic Information, while Part II relates to Job Roles, consisting of role ambiguity and role conflict. Part III is related to Job Requirements, consisting of quantitative workload and job requirements. Part IV is related to Job Satisfaction and Job Pressure, consisting of job satisfaction and mental demand, and Part V is related to Social Support from Superiors. Lastly, Part VI is related to Physical Environment.

Descriptive statistics were used to summarise the data set by its mean scores, percentage, and frequency in order to identify the stress levels of RDP personnel and the dominant sources of stress that contributed to the occupational stress of RDP personnel. The occupational stress levels of RDP personnel were determined based on the mean result of occupational stress level categories as shown in Table 1.

**Table 1**  
 Occupational Stress Levels Categories

Scale	Stress Level
1	Low
2	Moderate
3	High

The range for mean score was categorised into class intervals for various Likert scales based on the formula below (Figure 1):

$$\text{Range} = \frac{\text{Highest Value (Likert Scale)} - \text{Lowest Value (Likert Scale)}}{\text{Numbers of Class Interval}}$$

**Fig. 1.** Class Interval Calculation Formula

An independent-samples t-test was later employed to compare occupational stress levels between supervisory RDP personnel and non-supervisory RDP personnel in order to know whether there is a difference in occupational stress levels between the two groups with regards to each dimension.

## 4. Results and Discussion

### 4.1 Level of Occupational Stress of RDP Personnel

Table 2 shows the mean score and standard deviation for the seven stress factors related to occupational stress.

**Table 2**  
 Mean Score, Standard Deviation and Range of Stress on 7 Stressors

No.	Stressors	Likert Scale	Mean	Standard Deviation	Range Of Stress
1.	Job Roles	7	5.52	0.66	High
2.	Job Requirements	5	3.86	0.35	High
3.	Workload	5	3.74	0.72	High
4.	Mental Demand	4	3.13	0.60	High
5.	Job Satisfaction	3	1.81	0.42	Moderate
6.	Social Support from Superior	5	2.05	0.32	Low
7.	Physical Environment	2	1.70	0.19	High

Table 3 shows the mean score of occupational stress levels of RDP personnel concluded from five dimensions. The level of occupational stress of RDP personnel was identified as High. Four dimensions were also identified as high stress, namely Job Roles, Job Requirements, Job Satisfaction and Job Pressure, and Physical Environment, whereas Social Support from Superiors was identified as low stress.

**Table 3**  
Occupational Stress Levels of RDP Personnel based on five dimensions

No.	Dimension	Stressors	Range Of Stress	Scoring	Mean	Stress Levels (mean)
1.	Job Roles		High	3	3	High (2.5)
2.	Job Requirements	Job Requirements	High	3	3	
		Workload	High	3		
3.	Job Satisfaction & Job Pressure	Mental Demand	High	3	2.5	
		Job Satisfaction	Moderate	2		
4.	Social Support from Superior		Low	1	1	
5.	Physical Environment		High	3	3	

#### 4.2 Dominant Source Contributing to Occupational Stress of RDP Personnel

Descriptive statistical analysis presenting the mean score, percentage and range of stress for the five dimensions of occupational stress sources is shown in Table 4. The results show that four of the dimensions were the dominant dimensions that contributed to occupational stress levels with percentages of mean score more than 60% each, except for Social Support from Superiors, which is only 41%. The dimension with the highest percentage of mean score is Physical Environment, while the lowest percentage of mean score is Social Support from Superiors.

**Table 4**  
Percentage of Mean Score for Each Dimension

No.	Dimension	Stressors	Likert Scale	Mean	Percentage	Average %	Range Of Stress
1.	Job Roles		7	5.52	78.86%	78.86%	High
2.	Job Requirements	Job Requirements	5	3.86	77.20%	76.00%	High
		Workload	5	3.74	74.80%		
3.	Job Satisfaction and Job Pressure	Mental Demand	4	3.13	78.25%	69.30%	High
		Job Satisfaction	3	1.81	60.34%		
4.	Social Support from Superior		5	2.05	41.00%	41.00%	Low
5.	Physical Environment		2	1.70	85.00%	85.00%	High

#### 4.3 Stress Levels between Supervisory RDP Personnel and Non-supervisory RDP Personnel

Table 5 shows the results of the independent-samples t-test. The results suggest there is significant differences between these two groups in all aspects. It can be concluded that supervisory RDP personnel have higher stress levels than non-supervisory RDP personnel in terms of Job Roles, Job Requirements, and Physical Environment. However, supervisory RDP personnel were more satisfied and felt less pressure with their jobs, while receiving better support from superiors.

**Table 5**  
 Independent-Samples T-Test Results

Dimensions	Stress Factors	Job Function	Freq	Mean	Standard Deviation	t	df	sig.
Job Roles	Job Roles	Non-supervisory	125	5.35	0.74	-7.6	135.0	.000
		Supervisory	60	<b>5.87</b>	0.11			
Job Requirements	Job Requirements	Non-supervisory	125	3.78	0.40	-6.6	130.2	.000
		Supervisory	60	<b>4.02</b>	0.04			
	Workload	Non-supervisory	125	3.68	0.85	-2.2	165.9	.027
	Supervisory	60	<b>3.87</b>	0.27				
Job Satisfaction & Job Pressure	Mental Demand	Non-supervisory	125	<b>3.34</b>	0.46	7.1	89.0	.000
		Supervisory	60	2.68	0.64			
Social Support from Superior	Job Satisfaction	Non-supervisory	125	<b>1.86</b>	0.44	2.6	136.0	.012
		Supervisory	60	1.70	0.37			
		Social Support from Superior	Non-supervisory	125	<b>2.08</b>	0.38	-2.5	124.0
	Supervisory	60	2.00	0.00				
Physical Environment	Physical Environment	Non-supervisory	125	1.65	0.18	-5.5	183.0	.000
		Supervisory	60	<b>1.80</b>	0.17			

## 5. Conclusion

The levels of occupational stress of RDP personnel was identified as high, while Job Roles, Job Requirements, Job Satisfaction and Job Pressure, and Physical Environment were the dominant dimensions that contributed to the occupational stress levels of RDP personnel, with Social Support from Superiors being a low contributor. The study also found that supervisory RDP personnel had higher stress levels than non-supervisory RDP personnel in terms of Job Roles, Job Requirements, Workload, and Physical Environment. However, supervisory RDP personnel were more satisfied and felt less pressure within their jobs, and reported having better social support from superiors. This is likely due to how supervisory RDP personnel frequently work directly with superiors and provide solutions for certain tasks as well as handle coordinated task execution as compared to non-supervisory RDP personnel, who work by following orders. Supervisory RDP personnel, perhaps due to higher rank, may expect and receive better treatment from superiors, such as, for example, obtaining better workplace conditions. Supervisory RDP personnel were generally more satisfied and felt less pressure, probably due to longer service durations and a better working experience, as well as having gotten used to the job. These findings may contribute to occupational stress management in related fields. Future researchers may use these findings as a guidance to focus on improvement of occupational safety and health in the navy.

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